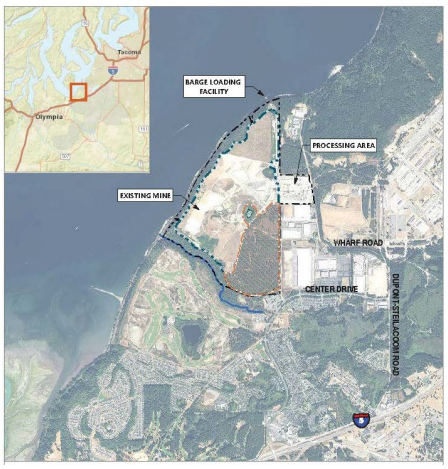
FINAL ENVIRONMENTAL IMPACT STATEMENT

for the proposed

PIONEER AGGREGATES SOUTH PARCEL PROJECT



prepared by

City of DuPont

May 22, 2025

CITY OF DUPONT
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NOTICE OF AVAILABILITY OF FINAL ENVIRONMENTAL IMPACT STATEMENT (FEIS)

Notice is hereby given under WAC 197-11-460 and 197-11-510 that the City of DuPont is issuing the Final Environmental Impact Statement (Final EIS) for the proposed ***Pioneer Aggregates South Parcel Project*.**

Project Name: Pioneer Aggregates South Parcel Project
Proponent: CalPortland
Lead Agency: City of DuPont Public Services Department
File Number: SEPA 2021-002
Final EIS Issuance Date: May 22, 2025

Description of the Proposal: The proposed *Pioneer Aggregates South Parcel Project* would occur on an approximately 313-acre site located on and to the southeast of the existing Pioneer Aggregates Mine in the City of DuPont, southwestern Pierce County, sections 22, 23, and 26, Township 19 North, Range 1 East of the Willamette Meridian. The site includes areas previously undisturbed by mining (termed the "Expansion Area") and mining deeper within a portion of existing mine, referred to as the "Re- Mine Area". The Expansion Area is approximately 188 acres and is comprised of three subareas as follows: The Kettle Area is a 10.8-acre previously undisturbed area; the 9.2-acre Buffer Strip is a strip of vegetation that was retained along the inside of the originally permitted mine bordering the South Parcel; and, the South Parcel Area is 168 acres located southeast of the original mine. The Re-Mine Area consists of 125 acres in the southeastern portion of the existing mine where current mining activities are permitted above current groundwater levels.

A Draft Environmental Impact Statement (DEIS) was prepared and issued on June 14, 2024 with a 30-day comment period. Agencies, affected tribes, and members of the public were invited to comment on the DEIS through July 14, 2024. The DEIS process was provided pursuant to the Washington Administrative Code (WAC) 197-11-455. Information regarding the EIS process can be reviewed on the city's website at: https://www.dupontwa.gov/577/Pioneer-Aggregates-South-Parcel-Project

The DEIS analyzed the probable significant adverse environmental impacts associated with one alternative and one no action alternative, including:

- **Alternative 1 (Proposed Action)** – Horizontal expansion of mining into approximately 188 acres previously undisturbed by mining (Expansion Area) and vertical deepening of approximately 125 acres of the existing mine; and,

- **Alternative 2** – **No Action Alternative**.

Mitigation: The Final EIS has identified impacts and mitigation measures for Alternative 1 (Proposed Action).

Availability of the FEIS and Background Materials: The Draft EIS and Final EIS may be viewed on the city's website at https://www.dupontwa.gov/719/Pioneer-Aggregates-South-Parcel-Project-

Appeal and Noticing: This notice of availability is provided in accordance with WAC 197-11-460. The City will not take action on the proposal for 7 days following the issuance date of this notice. The adequacy of this Final EIS may be appealed to the DuPont Hearing Examiner in accordance with the DuPont Municipal Code (DMC) 23.01.210. Timely appeals shall be delivered, with the appropriate appeal fee, to the SEPA Lead Agency by mail or by personal delivery before 5pm within 14-days of the issuance of this Final EIS, on or before June 5, 2025. Information for filing an appeal may be found on the city's website at this location: https://www.codepublishing.com/WA/DuPont/#!/DuPont23/DuPont2301.html#23.01.210 or by contacting the SEPA Lead Agency Contact.

SEPA Lead Agency Contact: Barb Kincaid, Public Services Director and SEPA Responsible Official, bkincaid@dupontwa.gov

FINAL
ENVIRONMENTAL IMPACT STATEMENT

for the

PIONEER AGGREGATES SOUTH PARCEL PROJECT

This Final Environmental Impact Statement (FEIS) for the proposed *Pioneer Aggregates South Parcel Project* has been prepared in compliance with the State Environmental Policy Act (SEPA) of 1971 (Chapter 43.21C, Revised Code of Washington); the SEPA Rules (Chapter 197-11, Washington Administrative Code); and rules adopted by the City of DuPont implementing SEPA (DuPont Municipal Code Chapter 23.01). Preparation of this EIS is the responsibility of the City of DuPont, and based on a scoping process has directed the areas of research and analysis that were undertaken in preparation of this EIS. This document is not an authorization for an action, nor does it constitute a decision or a recommendation for an action. This Final EIS will accompany the Proposed Action and will be considered in making final decisions concerning mining operation of the proposed *Pioneer Aggregates South Parcel Project*.

Date of Draft EIS Issuance..... **June 14, 2024**

Date of Final EIS Issuance..... **May 22, 2025**

PREFACE

The purpose of this Environmental Impact Statement (EIS) is to:

- identify and evaluate probable significant adverse environmental impacts that could result from development associated with the *Proposed Action* and development alternatives, and the *No Action Alternative;* and
- identify measures to mitigate those impacts.

This EIS does not authorize a specific action or alternative nor does it recommend for or against a particular course of action; it is one of several key documents that will be considered in the decision-making process for this project. A list of expected regulatory actions, including: licenses, permits and approvals is contained in the **Fact Sheet** to this Final EIS (FEIS) (pgs. ii-iii); the FEIS will accompany the applications specifically associated with the permit processes and will be considered as the final environmental (SEPA) document relative to those applications.

The environmental elements that are analyzed in this EIS were determined as a result of the formal, public EIS scoping process, which occurred from September 20, 2021 through October 20, 2021. The SEPA Determination of Significance/Scoping Notice was mailed to numerous governmental agencies, organizations, and owners and current occupants of parcels located within approximately 500 feet of the site. Following review of the written comments received, the City of DuPont determined the issues and alternatives to be analyzed in this EIS. They include broad areas of environmental review consisting of: Earth, Air Quality, Surface Water & Groundwater, Fisheries, Plants & Animals, Noise, Land & Shoreline, Aesthetics, Cultural Resources, Transportation, and Economic & Fiscal Conditions.

The Table of Contents for this FEIS is contained on pgs. v-ix of the **Fact Sheet**. In general, the DEIS is organized into four major chapters:

- **Fact Sheet** (immediately following this Preface) provides an overview of the proposed action and development alternatives, permits and major approvals needed, contact information and the Table of Contents;
- **Chapter 1** (beginning on page 1-1) summarizes the description of the proposed project, the Proposed Action, and the No Action Alternative, and provides a summary of environmental impacts, mitigation measures, and significant unavoidable adverse impacts (if any);
- **Chapter 2** (beginning on page 2-1) provides a detailed description of the Proposed Action and alternatives and the No Action Alternative; and,
- **Chapter 3** (beginning on page 3-1) is an analysis of potential impacts in the subject areas mentioned above for the Proposed Action and development alternatives. This chapter also identifies relevant mitigation measures and potential significant unavoidable adverse environmental impacts.
- **Chapter 4** (beginning on page 4-1) provides a discussion on the comments received on the Draft EIS, Key Topics raised in the comments, and a matrix listing all comments received along with a responses to comments.

FACT SHEET

Information added or changed subsequent to issuance of the Draft EIS, if any, is shaded to ease identification of the added or changed information.

Name of Project

Pioneer Aggregates South Parcel Project

Proponent

CalPortland

Location

The proposed *Pioneer Aggregates South Parcel Project* would occur on an approximately 313-acre site located on and to the southeast of the existing Pioneer Aggregates Mine in the City of DuPont, southwestern Pierce County, sections 22, 23, and 26, Township 19 North, Range 1 East of the Willamette Meridian. The site includes areas previously undisturbed by mining (termed the "Expansion Area") and mining deeper within a portion of existing mine (referred to as the "Re- Mine Area"). The Expansion Area is approximately 188 acres and is comprised of three subareas as follows: The *Kettle Area* is a 10.8-acre previously undisturbed area; the 9.2-acre *Buffer Strip* is a strip of vegetation that was retained along the inside of the originally permitted mine bordering the undeveloped South Parcel; and, the *South Parcel Area* is 168 acres located southeast of the original mine. The Re-Mine Area consists of 125 acres in the southeastern portion of the existing mine where current mining activities are permitted above current groundwater levels.

EIS Required

The City of DuPont issued a Determination of Significance (DS) on September 20, 2021 indicating that an Environmental Impact Statement must be prepared for the *Pioneer Aggregates South Parcel Project*.

EIS Alternatives

The EIS evaluates the Proposed Action (Alternative 1) and the No Action Alternative (Alternative 2) as described below:

Alternative 1 – Proposed Action

The Proposed Action is to allow horizontal expansion of mining into approximately 188 acres previously undisturbed by mining (Expansion Area), and vertical deepening of approximately 125 acres where mining

would deepen a portion of the Existing Mine (Re-Mine Area). In advance of proposed mining, the Proposed Action includes installation of wells to intercept and pump groundwater to dry out gravels for mining. The intercepted groundwater would be conveyed by surface channels and infiltrated in ponds on the floor of the Existing Mine. The Proposed Action is anticipated to extend mining at the current average rate for approximately 14 years. The method of mining and materials processing, and transport of materials would not change from current conditions at the Existing Mine.

Alternative 2 – No Action Alternative

This alternative is typically defined as what would most likely happen if the proposal does not move forward. According to the SEPA Rules, "no action" does not necessarily mean that nothing (no development in this case) would occur. The No Action Alternative that will be studied in this EIS will include two scenarios: Scenario A – Continuation of Existing Conditions (i.e. continuation of mining at the Existing Mine which has an estimated remaining life of 6 to 10 years with mining currently limited to an elevation of 10 feet above groundwater level); and, Scenario B – Site Development Under Existing Zoning (i.e. development under the existing Manufacturing and Research, Residential-4, Residential Reserve, and Open Space/Sensitive Area zoning designations). While it is unlikely that the Sequalitchew Creek Restoration Plan would be implemented if the proposal does not occur, it is possible that other funding (e.g., grants) could be obtained to carry out the Restoration Plan. Therefore, the No Action Alternative will reference the potential for the Sequalitchew Creek Restoration Plan to be implemented without the Proposed Action.

Lead Agency

City of DuPont

SEPA Responsible Official

Barbara Kincaid
Community Development Director
City of DuPont
DuPont, WA 98327

EIS Contact Person

Barbara Kincaid
Telephone: (253) 912-5393
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Required Approvals and/or Permits

Preliminary analysis indicates that the following approvals and/or permits may be required from agencies with jurisdiction[1] for continued mining. Additional permits/approvals may be required. Note that mining permits will not be legally effective unless and until permits for the Restoration Plan are issued.

State of Washington

- Dept. of Natural Resources – Surface Mine Reclamation Permit, Forest Practices Permit.
- Dept. of Ecology - NPDES, Administrative Order for Wetland Impacts.

City of DuPont

- Community Development – Site Plan Review, Tree Modification, Critical Areas Permit, Site Development Permit (including Grading Permit), Building Permit, Determination of Transportation Concurrency.
- Public Works – Site Work (Civil Work) Review and Storm Drainage Facilities Review.

EIS Authors and Principal Contributors

EA Engineering, Science and Technology, Inc., PBC

- EIS Project Manager, Primary Author: Project Description, Land Use, Peer Review Aesthetics and Air Quality.

DE Sherrard & Associates

- Surface Water & Groundwater Lead.

Aspect Consulting

- Surface Water, Groundwater, Earth.

Anchor QEA

- Trees, Critical Areas, Wetlands, Floodplain, Parking.

[1] An agency with jurisdiction is "an agency with authority to approve, veto or finance all or part of a nonexempt proposal (or part of a proposal)" (WAC 197-11-714(3)). Typically, this refers to a local, state or federal agency with licensing or permitting approval responsibility concerning a project.

Landau Associates

- Air Quality, Noise, and peer review for Earth and Surface Water.

Heffron Transportation

- Transportation

Historical Research Associates

- Cultural Resources

Mott MacDonald

- Peer Review - Groundwater

Raedeke Associates

- Peer Review - Trees, Critical Areas, Wetlands, Floodplain

BRC | Coffman Engineers

- Peer Review – Noise

Transpo Group

- Peer Review – Transportation, Parking

Cultural Resource Consultants

- Peer Review – Cultural Resources

ECONorthwest

- Economics & Fiscal

Location of Background Information

Background material and supporting documents are available at the offices of:

EA Engineering, Science and Technology, Inc., PBC
600 Stewart Street, Suite 800
Seattle, WA 98101

City of DuPont
1700 Civic Drive
DuPont, WA 98327

Date of FEIS Issuance

May 22, 2025

Availability of the DEIS and FEIS

Copies of the DEIS and FEIS have been distributed to agencies, organizations and individuals noted on the Distribution List. The DEIS and FEIS can be reviewed at:

DuPont City Hall
1700 Civic Drive
DuPont, WA 98327

The DEIS and FEIS can be reviewed and downloaded by following the link below:
https://www.dupontwa.gov/719/Pioneer-Aggregates-South-Parcel-Project-

TABLE OF CONTENTS

FACT SHEET

1. SUMMARY

1.1 Introduction & EIS Alternatives 1-1
1.2 Impacts, Mitigation, and Significant Unavoidable Impacts 1-2

2. DESCRIPTION OF PROPOSED ACTION(S) AND ALTERNATIVES

2.1 Overview of the Proposed Action 2-1
2.2 Environmental Review and Purpose 2-5
2.3 Previous Planning, Environmental Review, Settlement Agreement 2-7
2.4 Description of Proposed Action 2-14
2.5 Description of EIS Alternatives 2-15
2.6 Benefits and Disadvantages of Deferral 2-33

3. AFFECTED ENVIRONMENT, IMPACTS, MITIGATION MEASURES AND UNAVOIDABLE ADVERSE IMPACTS

3.1 Earth 3.1-1
3.2 Air Quality 3.2-1
3.3 Groundwater 3.3-1
3.4 Surface Water 3.4-1
3.5 Fisheries 3.5-1
3.6 Plants & Animals 3.6-1
3.7 Noise 3.7-1
3.8 Land & Shoreline Use 3.8-1
3.9 Aesthetics 3.9-1
3.10 Cultural Resources 3.10-1
3.11 Transportation 3.11-1
3.12 Fiscal Conditions 3.12-1

4. KEY TOPICS AND COMMENT RESPONSES

Introduction 4-1
4.1 Earth 4-5
4.2 Air Quality 4-10
4.3 Groundwater 4-13
4.4 Surface Water 4-26
4.5 Fisheries 4-32

4.6 Plants & Animals 4-34
4.7 Noise 4-39
4.8 Land & Shoreline Use 4-42
4.9 Aesthetics 4-43
4.10 Cultural Resources 4-44
4.11 Transportation 4-48
4.12 Sequalitchew Creek Character Conditions 4-50
4.13 Other Topics 4-52
Comment Response Matrix- Agencies 4-58
Comment Response Matrix – Other Agencies 4-65
Comment Response Matrix – Organizations 4-71
Comment Response Matrix – Individuals 4-77

5. ACRONYMS

6. REFERENCES

APPENDICES

A. Distribution List
B. Earth and Water Resources Report, Aspect Consulting, February 2025
C. Air Quality Assessment, Ramboll Corporation, September 2022
D. Stormwater Management Report, Aspect Consulting, February 2021
E. Groundwater Model Update, Aspect Consulting, June 2017
F. South Parcel Monitoring Plan, Aspect Consulting, November 2017
G. Fisheries Technical Report, Anchor QEA, June 2023
H. Plants & Animals Technical Report, Anchor QEA, March 2025
I. Landmarks Tree Inventory, Anchor QEA, August 2021
J. Floodplain Habitat Assessment & Mitigation Report, Anchor QEA, November 2020
K. Noise Study, Ramboll Corporation, September 2022
L. Visual Impact Analysis, ESA, December 2022
M. Cultural Resources Desktop Analysis, May 2025 [Confidential/Not Included. May be available upon request]
N. Traffic Impact Assessment, Heffron Transportation, July 2022
O. Parking Narrative, Anchor QEA, November 2020
P. Fiscal Condition Assessment, ECONorthwest, February 2024
Q. Comment Letters/Emails/Forms

LIST OF TABLES

1-1 Impact Summary Matrix....1-3
2-1 Annual Aggregate Mining Quantities/Timing....2-24
2-2 Site Conditions Comparison.... 2-27
3.3-1 Summary of Hydrostratigraphic Units 3.3-2
3.3-2 Groundwater Flow 3.3-21
3.4-1 Monthly Average Creek Flows 3.4-4
3.4-2 Fresh Water Quality Criteria 3.4-9
3.4-3 Predicted Surface Water Flows 3.4-22
3.6-1 Landmark Trees on the Site 3.6-2
3.7-1 DuPont Maximum Permissible Sound Levels 3.7-2
3.7-2 Applicable Ln Noise Limits for Class C EDNA Noise Sources 3.7-3
3.7-3 Range of Existing Measured Hourly Sound Levels 3.7-5
3.7-4 Model Calculated Sound Levels 3.7-7
3.7-5 Calculated Increases Over Existing Sound Levels 3.7-9
3.8-1 Existing Site Conditions 3.8-8
3.8-2 Site Conditions Comparison 3.8-13
3.9-1 Summary of Simulation Key Viewpoints 3.9-5
3.10-1 Pre-Contact and Historic-Period Sites Within or Near the South Parcel 3.10-3
3.11-1 Summary of Project-Generated Off-Site Trips – 2013 FEIS 3.11-1
3.11-2 Comparison of FEIS Truck Estimates to Actual Truck Volumes 3.11-5
3.12-1 Summary of Assessed Value 3.12-7
3.12-2 Summary of Personal Property Value 3.12-8
3.12-3 Sales Tax Estimates 3.12-8
3.12-4 B & O Tax Estimates 3.12-9
3.12-5 Utility Tax Estimates 3.12-10
3.12-6 Summary of Tax Estimates 3.12-11
3.12-7 Cost Allocation – Public Services 3.12-13
3.12-8 Cost Allocation Average/Use Comparison 3.12-14
3.12-9 Annual Estimated Surplus 3.12-15

LIST OF FIGURES

2-1 Vicinity Map 2-2
2-2 Site Map 2-3
2-3 Hydrogeologic Cross Section.... 2-17
2-4 Groundwater Dewatering Plan.... 2-20
2-5 Mine Phasing Plan.... 2-23
2-6 Reclamation Plan 2-26
3.1-1 Existing Topography.... 3.1-2

3.1-2 Geologic Cross Section 3.1-5
3.1-3 Geological Hazardous Areas – Existing Conditions 3.1-9
3.1-4 Proposed Topography 3.1-13
3.1-5 Geological Hazardous Areas – Proposed Action 3.1-18
3.3-1 Generalized Geologic Cross Section 3.3-4
3.3-2 Regional Geologic Map 3.3-5
3.3-3 Edmond Marsh Cross Section 3.3-6
3.3-4 Surface Water System 3.3-8
3.3-5 Existing Monitoring Well Network 3.3-16
3.3-6 Maximum Model Calculated Groundwater level Changes: Step 1 ..... 3.3-23
3.3-7 Maximum Model Calculated Groundwater level Changes: Step 2 ..... 3.3-24
3.3-8 Maximum Model Calculated Groundwater level Changes: Step 3 ..... 3.3-25
3.3-9 Maximum Model Calculated Groundwater level Changes: Post Mining 3.3-26
3.3-10 Annual Precipitation 3.3-29
3.3-11 Annual Precipitation Exceedance Plot 3.3-30
3.3-12 Precipitation by Month 3.3-30
3.3-13 Model Period of Record 3.3-31
3.4-1 Sequalitchew Creek Watershed & JBLM Stormwater System 3.4-2
3.4-2 Sequalitchew Lake Outflow and Creek Measurements 3.4-4
3.4-3 Proposed Stormwater Management Basins 3.4-12
3.4-4 Observed and Predicted Marsh water Levels 3.4-14
3.4-5 Observed and Predicted Creek Flow Hydrographs 3.4-17
3.4-6 Observed and Predicted Sequalitchew Creek Flow Hydrographs 3.4-18
3.5-1 Existing Aquatic Resources 3.5-2
3.6-1 Existing Aquatic Resources 3.6-4
3.7-1 Sound Level Measurement and Receptor Location Map 3.7-4
3.8-1 City of DuPont Comprehensive Plan Map 3.8-3
3.8-2 City of DuPont Zoning Map 3.8-4
3.8-3 Existing Land Use Map 3.8-10
3.9-1 Key Viewpoint Location Map 3.9-4
3.9-2 Key Viewpoint Location 1 ..... 3.9-12
3.9-3 Key Viewpoint Location 2 ..... 3.9-13
3.9-4 Key Viewpoint Location 3 ..... 3.9-15
3.9-5 Key Viewpoint Location 4 ..... 3.9-16
3.9-6 Key Viewpoint Location 5 ..... 3.9-17
3.9-7 Key Viewpoint Location 6 ..... 3.9-19
3.9-8 Key Viewpoint Location 7 ..... 3.9-20
3.9-9 Key Viewpoint Location 8 ..... 3.9-21
3.10-1 Area of Direct Impacts Map 3.10-2
3.11-1 Daily Truck Loads (Outbound Truck Trips): 2016-2020 ..... 3.11-3
3.11-2 Percent Trucks by Hour – Weekday (2020) 3.11-4
3.12-1 Summary of Trends of Major Tax Sources 3.12-3
3.12-2 Summary of Trends of Expenditures 3.12-5
3.12-3 Assessed value and new Construction 3.12-6

3.12-4 Highest Prior Levy (2002-2021) 3.12-6
3.12.5 Highest Prior levy (20005-2021) 3.12-7

Chapter 1
SUMMARY

CHAPTER 1
SUMMARY

1.1 INTRODUCTION

This chapter provides a summary of the Final Environmental Impact Statement (Final EIS) for the *Pioneer Aggregates South Parcel Project*. **Chapter 1** briefly describes the Proposed Action (Alternative 1) and the No Action Alternative (Alternative 2) and contains a comprehensive overview of environmental impacts identified for the Proposed Action and alternatives. Please see **Chapter 2** of this Final EIS for a more detailed description of the Proposed Action and alternative, **Chapter 3** for a detailed description of the affected environment, environmental impacts, mitigation measures, and significant unavoidable adverse impacts, and **Chapter 4** for a discussion on the key topics raised in the comments received on the Draft EIS along with a matrix listing all comments received on the Draft EIS and responses to the comments received.

The proposed *Pioneer Aggregates South Parcel Project* would occur on an approximately 313-acre site located on and to the southeast of the existing Pioneer Aggregates Mine in the City of DuPont, southwestern Pierce County, Sections 22, 23, and 26, Township 19 North, Range 1 East of the Willamette Meridian. The site includes areas previously undisturbed by mining (termed the "Expansion Area") and mining deeper within a portion of existing mine (referred to as the "Re- Mine Area"). The Expansion Area is approximately 188 acres and is comprised of three subareas as follows: The *Kettle Area* is a 10.8-acre previously undisturbed area; the 9.2-acre *Buffer Strip* is a strip of vegetation that was retained along the inside of the originally permitted mine bordering the undeveloped South Parcel; and the *South Parcel Area* is 168 acres located southeast of the original mine. The Re-Mine Area consists of 125 acres in the southeastern portion of the existing mine where current mining activities are permitted above current groundwater levels.

Alternative 1 – Proposed Action

The Proposed Action is to allow horizontal expansion of mining into approximately 188 acres previously undisturbed by mining (Expansion Area), and vertical deepening of approximately 125 acres where mining would deepen a portion of the Existing Mine (Re-Mine Area). In advance of proposed mining, the Proposed Action includes installation of wells to intercept and pump groundwater to dry out gravels for mining. The intercepted groundwater would be conveyed by surface channels and infiltrated in ponds on the floor of the Existing Mine. The Proposed Action is anticipated to extend mining at the current average rate for approximately 14 years. The method of mining and materials processing, and transport of materials would not change from current conditions at the Existing Mine.

Alternative 2 – No Action Alternative

This alternative is typically defined as what would most likely happen if the proposal does not move forward. According to the SEPA Rules, "no action" does not necessarily mean that nothing (no development in this case) would occur. The No Action Alternative that will be studied in this EIS will include two scenarios: Scenario A – Continuation of Existing Conditions (i.e. continuation of mining at the Existing Mine which has an estimated remaining life of 6 to 10 years with mining currently limited to an elevation of 10 feet above groundwater level); and, Scenario B – Site Development Under Existing Zoning (i.e. development under the existing Manufacturing and Research, Residential-4, Residential Reserve, and Open Space/Sensitive Area zoning designations). While it is unlikely that the Sequalitchew Creek Restoration Plan would be implemented if the proposal does not occur, it is possible that other funding (e.g., grants) could be obtained to carry out the Restoration Plan. Therefore, the No Action Alternative will reference the potential for the Sequalitchew Creek Restoration Plan to be implemented without the Proposed Action.

1.2 IMPACTS, MITIGATION MEASURES AND SIGNIFICANT UNAVOIDABLE ADVERSE IMPACTS

The following highlights the impacts, mitigation measures, and significant unavoidable adverse impacts that would potentially result from the alternatives analyzed in this EIS. **Table 1-1** summarizes the potential impacts that would be anticipated under the EIS Alternatives. This summary is not intended to be a substitute for the complete discussion of each element that is contained in **Chapter 3**.

For the EIS analysis, the Sequalitchew Creek Restoration Plan is considered a separate project. As such, the summary of impacts of the Proposed Action only addresses the impacts of proposed mining/reclamation and does not include implementation of the Restoration Plan. The combined impacts of mining under the Proposed Action together with implementation of the Sequalitchew Creek Restoration Plan are discussed as cumulative impacts.

Table 1-1
IMPACT SUMMARY MATRIX

Alternative 1 Proposed Action	Alternative 2 No Action Alternative
3.1 – EARTH	
• Natural deposits of sand and gravel would be removed, altering the topography and leaving an irregular-shaped bowl. Following mining, slopes would be re-contoured consistent with the reclamation plan.	• Under Scenario A mining activities at the Re-Mine Area would continue as permitted, with the Expansion Area remaining in forest. The Expansion Area would be redeveloped under existing zoning and would likely remain relatively flat under Scenario B.
• Stability of the slopes would be acceptable and exceed static and seismic safety values.	• Under Scenario A the mine slopes within the Re-Mine Area would be consistent with approved permits, with the Expansion Area remaining undeveloped. Development under existing zoning in the Expansion Area under Scenario B would not be expected to result in substantial slopes.
• Considering the course-grained nature and good infiltration characteristics and the proposed stormwater control system, erosion impacts are not anticipated.	• Under Scenario A stormwater in the Re-Mine Area would be controlled as under current conditions. Under Scenario B clearing and development under existing zoning would result in the potential for erosion; stormwater control during construction and operations would be required to be consistent with applicable regulations.
• The proposed mining and reclamation are intended to serve as a final remedy for any lead and arsenic impacted soils, and impacts associated with past industrial activities on the site and deposits associated with the Tacoma Smelter Plume are not anticipated.	• Under Scenario A the Re-Mine Area would be reclaimed consistent with the current approved Reclamation Plan, and the Expansion Area would remain forest land. Development under existing zoning under Scenario B would require measures for final remedy of contaminants on the site.
• Impacts to Landslide, Steep Slope, and Erosion Hazard Areas associated with Sequalitchew Creek ravine are not anticipated.	• As under Alternative 1, impacts to Landslide, Steep Slope, and Erosion Hazard areas associated with Sequalitchew Creek would not be anticipated under Scenario A or Scenario B.
• Proposed dewatering and associated groundwater level drawdown are not anticipated to significantly affect the fate and transport of contaminants from, or settlement at, JBLM Landfill 5.	• As under Alternative 1, effects associated with contaminants or settlement would not be anticipated under Scenario A or Scenario B.
• The majority of infrastructure (including sewer lines) within the proposed dewatering area are underlain by soil types that do not	• As under Alternative 1, impacts to utility lines would not be anticipated under Scenario A or Scenario B.

Alternative 1 Proposed Action	Alternative 2 No Action Alternative
pose a risk of settlement. The sewer main installed under the Robinson Trail berm is within organic soils that have a low potential to experience an increase in compression with proposed dewatering. With proposed mitigation, significant impacts are not anticipated.	
3.2 – AIR QUALITY	
• Site preparation activities (logging and clearing, topsoil removal, and construction of perimeter berms) may temporarily cause localized increases in particulate matter (dust) and engine exhaust pollutants. Emissions would be temporary and localized and is expected to be minimal compared to regional emissions.	• Under Scenario A mining activity on the Re-Mine Area would continue until permitted mining is complete (6 to 10 years estimate). Under Scenario B development of the Expansion Area under existing zoning would result in fugitive dust, equipment emissions, and GHG emissions from construction, Operations of uses under existing zoning would also generate emissions.
• Fugitive dust emissions associated with mining and transport of materials would occur, primarily during the drier summer months. With operations conducted consistent with applicable air quality regulations, significant impacts are not anticipated.	• Fugitive dust emissions under Scenario A and Scenario B would generally be as described above.
• Greenhouse gas emissions (GHG emissions) associated with direct emissions (proposed mining, processing, and transport) and indirect emissions (production of electricity utilized and transport) would occur. The annual generation of GHG emissions would not change, although the timeframe for mining on the site would be extended. The direct/indirect GHG emissions associated with the Proposed Action would represent a very small percentage of the total state-wide inventory.	• GHG emissions on the Re-Mine Area under Scenario A would be as under current conditions with the Expansion Area remaining undeveloped. Under Scenario B development of the Expansion Area with construction and operation of uses under existing zoning would be anticipated to generate GHG emissions at a similar magnitude as Alternative 1.
3.3 – GROUNDWATER	
Impacts of the Proposed Action • Vashon Aquifer water levels would decrease due to dewatering activities needed for mining. Ultimately, the gravel deposits of which the Vashon Aquifer is comprised would be removed from the Re-Mine Area and part of the South Parcel. Drawdown of the Vashon Aquifer is anticipated to affect groundwater within a one to two-mile radius from the proposed mine site, with aquifer drawdown projected to generally decrease with increasing	• Under Scenario A, mining activities at the Re-Mine Area would continue as permitted and would occur above the groundwater level. No active dewatering wells or passive dewatering trough would be installed and the associated decrease in Vashon Aquifer levels would not occur. Under Scenario B, the increase in impervious surfaces on the site with development consistent with existing zoning would increase surface water runoff and decrease area available for groundwater

Alternative 1 Proposed Action	Alternative 2 No Action Alternative
distance from the dewatering area. The extracted groundwater would be conveyed to a constructed wetland system and ultimately infiltration galleries located at the bottom of the current mine, where the Vashon Aquifer and the Sea Level Aquifer are comingled and permeable Steilacoom Gravels are present.	recharge to underlying aquifers; however, with adherence to applicable regulations related to stormwater quantity, significant impacts are not anticipated.
• Potential impacts on aquifer water levels are expected to build slowly over time as wells are added and mining progresses southward. At the end of mining, a passive dewatering trough would be constructed at the toe of the eastern mine slope to collect groundwater and replace the dewatering wells.	• No potential impacts on aquifer levels would occur because no active dewatering wells or passive dewatering trough would be installed under Scenario A or Scenario B.
• With active dewatering during mining, the ("worst case scenario") maximum predicted aquifer drawdown is 69.56 feet beneath the South Parcel and is up to 9.29 feet beneath the western edge of the off-site marsh complex. Maximum performance threshold drawdowns farther east in the marsh complex are approximately one foot or less. With passive dewatering at the end of mining, the maximum predicted aquifer drawdown is 64.43 feet beneath the South Parcel and is up to 8.73 feet beneath the marsh complex. Maximum performance threshold drawdowns farther east in the marsh complex are approximately one foot or less.	• No aquifer drawdown would occur because no active dewatering wells or passive dewatering trough would be installed under Scenario A or Scenario B.
• With the Proposed Action, the general groundwater flow direction in the Vashon Aquifer is expected to remain to the northwest. However, in the immediate vicinity of the project site, local groundwater flow paths are expected to change and flow toward the dewatering wells (or the groundwater collection trough in the last step of groundwater dewatering) rather than flowing toward their existing natural discharge points (i.e., the Olympia Beds Truncation or seeps in the Sequalitchew Creek ravine). Up to 79% of the groundwater flows to Sequalitchew Creek would be lost. Predicted water level changes in the Sea Level Aquifer are expected to be negligible beneath the Olympia Beds.	• No changes in groundwater flow direction are expected under Scenario A or Scenario B.

Alternative 1 Proposed Action	Alternative 2 No Action Alternative
Lower groundwater levels in the Vashon Aquifer near the site are expected to result in less groundwater discharge to surface water bodies and more aquifer recharge due to surface water losses.	
• Groundwater quality beneath and in the area of the South Parcel would largely be unaffected by the Proposed Action. Mining permits require best management practices for groundwater and stormwater pollution prevention, defined spill control and cleanup procedures, and operations management to minimize the use of potential pollutants within the mine.	• No significant impacts on groundwater quality are expected with continuing mining activities at the Re-Mine Area under Scenario A as mining permits requiring BMPs would be required, similar to for the Proposed Action. Clearing and grading associated with construction activities for Scenario B would increase potential for erosion impacts to surface and groundwater resources. With adherence to applicable regulations during construction, significant impacts to groundwater quality are not anticipated
• Drinking water supplies near the South Parcel (Sequalitchew Springs, DuPont's Bell Hill and Hoffman Hill wellfields) are not expected to be impacted by the Proposed Action since they are either significantly up gradient of the project site (Sequalitchew Springs) or completed in deeper aquifers that are separated from the Vashon Aquifer by confining units.	• No significant impacts on water supplies are expected under Scenario A or Scenario B, similar to under the Proposed Action.
Cumulative Conditions • The combined impacts of mining under the Proposed Action together with implementation of the Sequalitchew Creek Restoration Plan (the "cumulative condition") on groundwater would include: ○ East Edmond Marsh is predicted to become a groundwater discharge feature; groundwater recharge is expected to increase beneath West Edmond Marsh; significant changes in the groundwater recharge/discharge relationships are not expected at Bell, McKay, and Hamer Marshes. ○ Greater surface water flow through West Edmond Marsh and the Sequalitchew Creek "losing reach" is likely to increase groundwater recharge in its vicinity. Increased recharge in this area would potentially cause spring discharge in the upper Sequalitchew Creek ravine to increase.	• There is a potential that the Sequalitchew Creek Restoration Plan could be implemented without the Proposed Action (alternative funding sources would be necessary). If so, cumulative conditions would be generally similar to Alternative 1.

Alternative 1 Proposed Action	Alternative 2 No Action Alternative
○ Streamflow loss from Lower Sequalitchew Creek to the combined Vashon-Sea Level Aquifer should increase (as well as nearby aquifer water level). ○ During dry summers (when Sequalitchew Springs discharge to Sequalitchew Lake is fully consumed by JBLM), no surface water outflow from Sequalitchew Lake to East Edmond Marsh and Sequalitchew Creek would occur. Lower reaches of Sequalitchew Creek would be dry. ○ Intertidal spring water quality and discharge rates from the combined Vashon-Sea Level Aquifer are not expected to change. ○ Recharge near the Diversion Canal (if any) would likely decrease; however, the canal is not a significant source of recharge to the aquifer.	
3.4 – SURFACE WATER	
Impacts of the Proposed Action • Under the Proposed Action, there would likely be impacts to surface water features both onsite and within the larger Sequalitchew Creek watershed, primarily due to the permanently lowered groundwater levels in the vicinity of the site due to long-term pumping and groundwater drainage at the site.	• Under Scenario A, mining activities at the Re-Mine Area would continue as permitted. No active dewatering wells or passive dewatering trough would be installed and the associated impacts from these activities on surface water features would not occur. Under Scenario B, the increase in impervious surfaces on the site with development consistent with existing zoning would increase surface water runoff; however, with adherence to applicable regulations related to stormwater quantity, significant impacts on surface water are not anticipated.
• On an overall basis, on-site grading would affect stormwater flows, but not the overall stormwater balance, within the site. Primarily, changes in groundwater levels beneath the site resulting from proposed groundwater lowering are expected to affect flow in Sequalitchew Creek and surface water levels in the marsh system.	• On-site grading would occur under Scenario A in the Re-Mine Area. On-site grading would also occur under Scenario B, but much less than under the Proposed Action. Similar to the Proposed Action, grading for these Scenarios would affect stormwater flows but not the overall stormwater balance.
• *Sequalitchew Lake* - Water levels in the lake are not anticipated to be significantly impacted by the Proposed Action because the primary water source to the lake is groundwater (spring) discharge at the far eastern end. This source is far from appreciable	• Water levels in the lake are not anticipated to be significantly impacted under Scenario A or Scenario B because groundwater drawdown would not occur.

Alternative 1 Proposed Action	Alternative 2 No Action Alternative
groundwater drawdown area from the project. Also, the lake level is controlled by the Diversion Weir.	
• *Marsh System* - Water levels in the off-site marshes are expected to be lowered, due to the proposed groundwater lowering. The effect on marsh water levels is anticipated to vary seasonally as well. In West Edmond Marsh, there could be an average decline of 1.9 ft., in East Edmond Marsh an average decline of 0.1 ft., and in Bell-McKay-Hamer Marshes and average decline of 0.3 ft.	• Water levels in the marsh system are not anticipated to be lowered under Scenario A or Scenario B, because groundwater drawdown would not occur.
• *Sequalitchew Creek* - The Proposed Action and associated groundwater-level lowering would decrease the number and flow rate of groundwater seeps and springs feeding Sequalitchew Creek within the ravine section. With passive dewatering at the end of mining, reductions in spring flows leading to the creek are anticipated to occur throughout the entire year and to range from 76% (in January) to 86% (in summer). Base flow and peak flow in the creek are accordingly expected to be reduced. The annual average flow in Sequalitchew Creek is anticipated to be reduced from approximately 1.6 cfs to approximately 0.34 cfs.	• Decreases in the number and flow rate of groundwater seeps and springs feeding Sequalitchew Creek are not expected under Scenario A or Scenario B because groundwater drawdown would not occur.
• *Other Surface Water Features* - Wetland 1-D; Pond Lake, Strickland, Grant, and Old Fort Lakes; and Wetlands #8, #9, #10, and #11 may be impacted by the proposed groundwater lowering. The magnitude of the impact would depend on proximity to the proposed groundwater lowering activities at the site. Impacts to Wetland 1-D water levels would be the greatest (reduced by approximately 3 ft). Water levels at the other off-site water features would be reduced from 0.5 ft (Old Fort Lakes) to 2 ft (Pond Lake). The on-site Kettle Wetland and its buffer would be cleared under the Proposed Action, and the entire wetland would be eliminated. The proposal includes creation of a new wetland onsite.	• Other off-site water features are not expected to be impacted under Scenario A or Scenario B because groundwater drawdown would not occur. The on-site Kettle Wetland would not be eliminated under either Scenario.
Cumulative Conditions • The combined impacts of mining under the Proposed Action together with implementation of the Sequalitchew Creek Restoration Plan (the "cumulative condition") on surface water would include:	• There is a potential that the Sequalitchew Creek Restoration Plan could be implemented without the Proposed Action (alternative funding sources would be necessary). If so, cumulative conditions would be generally similar to Alternative 1.

Alternative 1 Proposed Action	Alternative 2 No Action Alternative
○ *Marsh System* - Target water levels in the East and West Edmond Marshes could generally be achieved, resulting in continuous surface water flow from Sequalitchew Lake through to Sequalitchew Creek. In general, the water quality within East and West Edmond Marshes is expected to be improved under the Proposed Action and the Restoration Plan, due to increased and consistent surface water inflows from Sequalitchew Lake and flushing out through Sequalitchew Creek. ○ *Sequalitchew Creek* - Flow rates and volumes delivered to and flowing through the losing reach segment of Sequalitchew Creek between West Edmond Marsh and the ravine section of the creek are generally expected to increase. However, even with the Restoration Plan, there may still be periods of dry, no-flow conditions in the losing reach of the creek. The number of no-flow days at the mid-ravine would be expected to increase under the Proposed Action and Restoration Plan scenario because of reduced or eliminated groundwater seepage to the ravine section of the creek that would no longer be present to add flows to the creek. These lower predicted flows in the creek are anticipated to occur typically in the period from July through October. However, no flow days are rare under existing conditions and would remain rare with the Proposed Action and Restoration Plan. The water quality effects in the ravine section of Sequalitchew Creek from the combined Proposed Project and Restoration Plan scenario would be primarily related to temperature. Temperatures in the creek in the winter are expected to fall to 5 or 6°C (41°F to 43°F). Creek temperatures in the summer—particularly June through August—are expected to rise to 21°C. ○ *Other Surface Water Features* – other nearby surface water bodies would not benefit directly from the Restoration Plan	

Alternative 1 Proposed Action	Alternative 2 No Action Alternative
implementation and would be expected to be impacted by the proposed groundwater lowering in a similar manner to described under the Proposed Action. ○ *Stormwater Management* – stormwater management would be implemented similar to under the Proposed Action.	
3.5 – FISHERIES	
Impacts of the Proposed Action • Potential fisheries impacts to the marine shoreline include effects from the spillage of sand and gravel from the conveyor, potential for overturning of barges during loading, accidental spills of pollutants, shading, and lighting. Extending the life of the conveyor and barge loading dock by about 14 years would extend any impacts to areas directly beneath the dock by shading the shallow water, as well as impacts associated with dock lighting.	• Under Scenario A the current conditions associated with the marine shoreline associated with potential spillage of sand and gravel from the conveyer and potential barge spills would continue, although for a shorter mine life. Under Scenario B clearing and grading associated with construction of residential and manufacturing/research park use would increase potential for erosion impacts to area fisheries resources; with adherence to applicable regulations during construction, significant impacts to these resources are not anticipated. The increase in impervious surfaces on the Expansion Area portion of the site with development consistent with existing zoning would increase surface water runoff; with adherence to applicable regulations related to stormwater quantity and quality, significant impacts are not anticipated.
Cumulative Conditions • The combined impacts of mining under the Proposed Action together with implementation of the Sequalitchew Creek Restoration Plan (the 'cumulative condition') on stream habitat would include a re-establishment of flow from Sequalitchew Lake to flow through the marshes and into Sequalitchew Creek ravine, and re-establishing ecosystem processes. The increase in hydrology and stream energy would increase aquatic ecosystem productivity and create and maintain habitat diversity, particularly for target species such as chum salmon and cutthroat trout in the system.	• Under Scenario A, the condition of Sequalitchew Creek fish habitat would remain as under existing conditions. There is a potential that the Sequalitchew Creek Restoration Plan could be implemented without the Proposed Action (alternative funding sources would be necessary) and cumulative conditions would be generally similar to Alternative 1. Under Scenario B, an increased potential for fisheries impacts from stormwater runoff during construction and operation uses consistent with existing zoning on the Expansion Area would occur. Cumulative conditions under Scenario B would be similar to Scenario A.
• The cumulative condition would affect stream temperature in the Sequalitchew Creek ravine by restoring the flow of surface water in the system at a different temperature. The effects would vary seasonally as the volume of water from Sequalitchew Lake and temperature vary. In summer, the outflow from Sequalitchew Lake is warmer than Sequalitchew Creek; groundwater input to the creek	• Water temperature conditions associated with the Sequalitchew Creek Restoration Plan may not occur under Scenario A or Scenario B. There is a potential that the Sequalitchew Creek Restoration Plan could be implemented without the Proposed Action (alternative funding sources would be necessary); if implemented, temperature conditions under either alternative would be similar to Alternative 1,

Alternative 1 Proposed Action	Alternative 2 No Action Alternative
would also be reduced due to groundwater diversion. This temperature increase could alter habitat for juvenile fish.	although the temperature increase in creek water could be less than under Alternative 1 given retention of groundwater input to the creek.
• Flows in the losing reach area upstream of Sequalitchew Creek ravine (an area that currently receives inconsistent flow, with periods of no flow) would increase in the cumulative condition and improve fisheries habitat conditions. However, there could be periods where there would continue to be no flow which would temporarily disrupt the enhanced habitat and fish migratory functions of the stream reach.	• Flows in the losing reach area upstream or the Sequalitchew Creek ravine would not increase under Scenario A or Scenario B without implementation of the Sequalitchew Creek Restoration Plan. There is a potential that the Sequalitchew Creek Restoration Plan could be implemented without the Proposed Action (alternative funding sources would be necessary); if implemented, flow conditions in the losing reach area would be similar to Alternative 1.
• The vast majority of flow at mid-ravine would originate from Sequalitchew Lake. Springs within the ravine currently contribute to mid-ravine flows, and groundwater input to springs would be reduced or eliminated. The contribution from springs with the Proposed Action and Sequalitchew Creek Restoration Plan would be lower than under existing conditions.	• Flow to the mid-ravine under Scenario A and Scenario B would be similar to current conditions without implementation of the Sequalitchew Creek Restoration Plan. There is a potential that the Sequalitchew Creek Restoration Plan could be implemented without the Proposed Action (alternative funding sources would be necessary); if implemented, flow conditions in the mid-ravine would be similar to Alternative 1 although contribution from springs to mid-ravine flows would likely be higher than under Alternative 1.
• Climate change is likely to result in greater variability in rainfall events which may result in more frequent or longer dry periods, although increased precipitation in wet seasons, along with aquifer size dampening, could reduce impacts.	• Climate change conditions to fisheries habitat under Scenario A and Scenario B would be similar to under the Proposed Action.
3.6 – PLANTS & ANIMALS	
Impacts of the Proposed Action - Plants • Direct plant and habitat impacts would include clearing of remaining forest within the Re-Mine Area and majority of forest and shrubland/grassland within the Expansion Area.	• Under Scenario A the remaining forest within the Re-Mine Area, and forest and shrubland/grassland within the Expansion Area would remain. Under Scenario B the majority of the forest and shrubland/grassland in the Expansion Area would be cleared to accommodate development under existing zoning.
• Approximately 90 landmark trees would be removed. Replacement of landmark trees would be provided consistent with City of DuPont replacement ratio guidance.	• The existing landmark trees on the site would remain as under existing conditions under Scenario A. Under Scenario B, the majority of the Expansion Area would likely be cleared in association with development under existing zoning, with landmark trees retained or replaced in accordance with DMC requirements.
• The 1.78-acre Kettle Wetland and buffer would be cleared and eliminated. Proposed mitigation includes creation of new wetland.	• The Kettle Wetland and wetland would be retained under both Scenario A and Scenario B. The Kettle Wetland buffer width could be reduced to the DMC minimum under Scenario B.

Alternative 1 Proposed Action	Alternative 2 No Action Alternative
Cumulative Conditions - Plants • No cumulative impacts to forest, landmark trees, shrublands, or grasslands habitat anticipated.	• No cumulative impacts to forest, landmark trees, shrublands and grasslands habitat anticipated under Scenario A or Scenario B.

• Sequalitchew Creek Restoration would include re-establishment of flow from Sequalitchew Lake through marshes and to Sequalitchew Creek. Cumulative conditions at specific aquatic resources most applicable to the proposal are as follows:
  • *West Edmond Marsh* – seasonal fluctuations in water levels would decrease which would help stabilize vegetation communities;
  • *East Edmond Marsh* – restored gradient between Lake Sequalitchew to Sequalitchew Creek ravine would allow for re-establishment forested wetland and wetland buffer.
  • *Sequalitchew Creek Ravine Wetlands* – Changes to groundwater flow would disrupt ravine (seep) wetland habitat. Increased creek flow would also change creek width and increase sediment load which would affect riparian and floodplain wetland communities.
  • *Brackish Marsh* – Increased flows in Sequalitchew Creek would increase sediment input and decrease salinity at the creek mouth; these conditions are not expected to impact existing marsh vegetation or functions.
	• Under Scenario A and Scenario B the Sequalitchew Creek Restoration Plan would not receive funding from the Applicant, although it is possible that funding for the plan could be provided from another source(s).
	If funding for the Sequalitchew Creek Restoration Plan were to be obtained and the plan in implemented, conditions at the West Edmond Marsh, East Edmond March, and Brackish March would be similar to the cumulative condition under Alternative 1. The changes to groundwater flow that would disrupt ravine (seep) wetlands under Alternative 1 would likely not occur under Scenario A and Scenario B.

Impacts of the Proposed Action - Animals • Foraging and breeding habitat for birds and mammals would be reduced and degraded. Clearing of vegetation would increase the fragmentation and isolation of remaining habitat.	• Under Scenario A the remaining forest habitat within the Re-Mine Area, and forest and shrubland/grassland habitat within the Expansion Area would remain. Under Scenario B the majority of the vegetation habitat in the Expansion Area would be cleared and/or fragmented to accommodate development under existing zoning.
• Removal of mature trees in the coniferous forest could reduce habitat for big brown bat, little brown bat, and Yuma myotis bat species. Clearing of forested areas within the site would reduce habitat that is thought to have once been within the historical range of gray squirrels but is unlikely to be occupied by the current population.	• Under Scenario A the remaining forest within the Re-Mine Area, and forest within the Expansion Area would remain as would associated animal habitat. Under Scenario B the majority of the forest and associated animal habitat in the Expansion Area would be cleared to accommodate development under existing zoning

Alternative 1 Proposed Action	Alternative 2 No Action Alternative
• Within the Kettle Wetland any existing amphibians would perish or be displaced during the clearing of the surface vegetation and soils. New habitat with similar hydrology would be provided in the mitigation wetland.	• The Kettle Wetland and wetland would be retained under both Scenario A and Scenario B. The Kettle Wetland buffer width could be reduced to the DMC minimum under Scenario B.
Cumulative Conditions - Animals • For birds the cumulative condition (specifically the Restoration Plan) would reverse the changes in bird habitat in East and West Edmond Marsh that have occurred over the last three decades. This would include a reorganization of some specific habitats to include scrub-shrub wetlands and forested wetlands. It would increase the area of forested wetland buffer as water levels in some areas of East Edmond Marsh drop and increase the amount of and persistence of emergent wetland habitat in the west end of West Edmond Marsh.	• Under Scenario A, the condition of bird would remain as under existing conditions. There is a potential that the Sequalitchew Creek Restoration Plan could be implemented without the Proposed Action (alternative funding sources would be necessary) and cumulative conditions would be generally similar to Alternative 1. Under Scenario B, an increased potential for South Parcel clearing during construction and activity associated with uses consistent with existing zoning on the Expansion Area would occur. Cumulative conditions under Scenario B would be similar to Scenario A.
• Beaver in the Edmond Marsh complex would be actively managed under the cumulative condition (specifically the Sequalitchew Creek Restoration Plan). The intent is to maintain the beaver population while managing water levels to restore flow. Other mammal species are expected to see increases in available habitat, particularly where water levels drop providing additional denning opportunities in the wetland banks and increasing the size of upland islands within the wetland complex.	• Beaver management in the Edmond Marsh complex would not occur under Scenario A or Scenario B without implementation of the Sequalitchew Creek Restoration Plan. There is a potential that the Sequalitchew Creek Restoration Plan could be implemented without the Proposed Action (alternative funding sources would be necessary); if implemented, beaver management would be similar to Alternative 1.
• Amphibian reproduction can be adversely affected by sudden, non-seasonal changes in water levels. This occurs in West Edmond Marsh when the large beaver dam above the losing reach is breached. Amphibian eggs attached to the stalks of emergent vegetation would suddenly be above water, causing complete mortality. Areas of reduced wetland area under the cumulative condition in the Edmond Marsh complex could reduce the area of habitat for some amphibian species, while others would benefit from the re-establishment of the forested riparian buffer.	• Amphibian conditions would remain as under current conditions under Scenario A or Scenario B without implementation of the Sequalitchew Creek Restoration Plan. There is a potential that the Sequalitchew Creek Restoration Plan could be implemented without the Proposed Action (alternative funding sources would be necessary); if implemented, amphibian conditions would be similar to Alternative 1.

Alternative 1 Proposed Action	Alternative 2 No Action Alternative
3.7 – NOISE	
• Site preparation activity (logging, top soil removal, extension of conveyors, etc.) would entail heavy equipment similar to that used in current mining, and noise levels associated with site preparation would be similar to that under current and proposed mining. Site preparation activities could result in temporary and short-term increases in noise levels.	• Under Scenario A noise associated with continued mining in the Re-Mine Area would continue to generate noise similar to existing conditions for the duration of remaining mining (6 to 10 years estimated). The Expansion Area would remain undeveloped. Under Scenario B construction associated with development under existing zoning would generate temporary increases in noise.
• Operational noise from equipment used for mining (front-end loaders, bulldozer, and electric conveyor) would increase compared to existing conditions.	• Under Scenario A noise associated with continued mining in the Re-Mine Area would continue to generate noise similar to existing conditions for the duration of remaining mining (6 to 10 years estimated). Operation of residential and manufacturing/research uses under Scenario B would generate noise associated with traffic and on-site activity.
• Noise associated with proposed mining was modeled (CadnaA noise model), and modeled noise levels generally complied with applicable noise limits. Some exceedance at the upper floors of the Creekside Apartment units facing the site may exceed limits if Phase 2C mining occurred during early morning hours (between 5 and 7 AM); limiting bulldozer use during these morning hours results in modeled noise levels below the noise limit.	• Noise associated with continued mining on the Re-Mine Area under Scenario A would be as under current conditions. Under Scenario B construction and operation of uses under existing zoning on the Expansion Area would generate noise; noise levels would be required to be in compliance with applicable noise limits.
3.8 – LAND USE	
• The Proposed Action would continue mining use on the Re-mine Area and would change the land use of the Expansion Area from undeveloped forest area to mining use.	• Under Scenario A the use of the Re-Mine Area would continue in mining use and the Expansion Area would remain as undeveloped forest. The Expansion Area would be converted to manufacturing/research and residential use under Scenario B.
• No existing uses would be displaced under the Proposed Action.	• No existing uses would be displaced under Scenario A or Scenario B, although the Expansion Area would be developed consistent with existing zoning under Scenario B.
• Portions of the Expansion Area are proximate to surrounding sensitive uses off-site and mining activity (noise, dust) has the potential to be perceived at surrounding uses, including recreational and residential land uses.	• Under Scenario A the use of the Re-Mine Area would continue in mining use and the Expansion Area would remain as undeveloped forest. Under Scenario B the Expansion Area would be redeveloped with manufacturing/research and residential uses under existing zoning, and activity associated with these uses (noise, traffic, etc.) has the potential to be perceived at surrounding land uses.

Alternative 1 Proposed Action	Alternative 2 No Action Alternative
• The proposed minimum 100-foot wide vegetated setback from the top of the Sequalitchew Creek ravine slope, coupled with a 20-foot high berm where the trail is not in the ravine, would limit the potential for impacts to users of the trail.	• Under Scenario A the Expansion Area would remain in undeveloped forest use. Redevelopment of the Expansion Area with manufacturing/research and residential uses consistent with existing zoning under Scenario B would be required to provide 25-foot front setbacks and 15-foot side and rear setbacks; providing a 20-foot high berm where the trail is not in a ravine is not a zoning requirement.
• The southeast corner of the Expansion Area is proximate to the Creekside Village apartment complex and phased clearing and mining (Phase 2C) would occur in proximity to this residential use. The vegetated perimeter buffer and 20-foot high berm would limit the potential for impacts.	• The Expansion Area would remain in undeveloped forest use under Scenario A. Under Scenario B the southeast corner of the Expansion Area would be developed with uses consistent with the Manufacturing/Research Park zoning. A 20-foot high berm is not required under existing zoning.
• On an overall basis, proposed mining is not expected to indirectly affect uses in the vicinity. Proposed mining activities are considered a transitional use and would not prevent future uses of the area. It is not anticipated that the Proposed Action would generate any spin-off uses in the area.	• As under Alternative 1, land use under Scenario A would not be anticipated to result in indirect land use impacts or generate spin-of uses. Residential and manufacturing/research uses under Scenario B would provide new site residents and employees that would increase the potential for spin-off uses in the area
• The potential for the Proposed Action to result in changes to the character of the Sequalitchew Creek ravine was evaluated and no significant Impacts to ravine character – including visual changes , loss of vegetation, increase in erosion and/or noise -- are anticipated to occur.	• Under Scenario A the use of the Re-Mine Area would continue in mining use and the Expansion Area would remain as undeveloped forest. The Expansion Area would be converted to manufacturing/research and residential use under Scenario B. Impacts to the character of the ravine would not be anticipated.
3.9 - AESTHETICS	
• Under the Proposed Action site preparation and extraction of mined material would result in a permanent change in the visual character of the Expansion Area portion of the site.	• Under Scenario A the Expansion Area would remain in undeveloped forest visual character. Manufacturing/research park and residential development under Scenario B would permanently change the visual character of the Expansion Area.
• The change of visual character of the Expansion Area would occur incrementally over an approximately 14-year period.	• Under Scenario A the Expansion Area would remain in undeveloped forest visual character. Manufacturing/research park and residential development under Scenario B would permanently change the visual character of the Expansion Area.

• Six viewpoints representative of viewpoints where public views toward the site are simulated to illustrate to illustrate the potential for visual impacts.
  ○ Changes to the existing view from the identified viewpoints primarily relate to the removal of mature trees on the site
	• Visual conditions would be as under existing conditions under Scenario A with a similar potential for visual change under Scenario B as under Alternative 1.
	  ○ Depending on the level of development on the Expansion Area under Scenario B some removal of mature trees could be visible. Depending on the location and height of buildings some buildings could be visible.

Alternative 1 Proposed Action	Alternative 2 No Action Alternative
from viewpoints along Powerline Road and at Powerline Road Community Garden. ○ Views to the site would not be affected from viewpoints at Sequalitchew Drive, Sequalitchew Trail, or the Home Course.	○ Given the intervening topography, development under Scenario B would likely not be visible from the Sequalitchew Drive, Sequalitchew Trail or Home Course viewpoints.
3.10 – CULTURAL RESOURCES	
• A review of archaeological sites in or near the Area of Impacts (ADI) was completed for this EIS.	• Same as Alternative 1 for Scenario A and Scenario B.
• Three known archaeological sites are located within the ADI and one known site is located south of the ADI. ○ Site 45PI62 – Railroad Dump #2 (*within the ADI*) ○ Site 45PI63 – Railroad Dump #3 (*within the ADI*) ○ Site 45PI66 – Methodist Episcopal Mission (*outside ADI*) ○ Site 45PI70 – DuPont Company (*within ADI*)	• Same as Alternative 1 for Scenario A and Scenario B.
• Sites 45PI62, 45PI63 and 45PI70 within the ADI have been determined not eligible for listing in the National Register of Historic Places (NRHP) and Site 45P166 is located outside of the ADI and would not be impacted.	• Same as Alternative 1 for Scenario A and Scenario B.
• Potential Traditional Cultural Places Properties (TCPs) were identified in a comment, including Sequalitchew Ancestral Village Landscape, Sequalitchew Creek, Kettle Lakes and Wetlands, and Camas Gathering Areas. Limited information is available on the boundary and character-defining features of these potential resources , however, which limits the ability to evaluate impacts. Some potential resources are spiritual and non-corporal in nature; SEPA, however, is focused on physical impacts to the environment. As such, it is not possible to accurately assess the nature or degree of physical impacts that could occur to intangible, spiritual resources and cultural values. While mining activities could	• Similar to or less than Alternative 1 for Scenario A and Scenario B.

Alternative 1 Proposed Action	Alternative 2 No Action Alternative
potentially cause an impact to Kettle Lakes and Wetland TCPs, the probability and significance of any cannot be accurately assessed. Camas gathering areas were historically located in areas that have been used for industrial purposes and remediated and the potential for impacts to resources to occur would be remote.	
3.11 – TRANSPORTATION	
• Trip generation would continue at current levels and would remain below the peak day estimates evaluated in the 2013 North Parcel FEIS.	• Under Scenario A current traffic conditions associated with the Re-Mine Area would continue and there would be no traffic associated with the Expansion Area. Construction and operational traffic typical of manufacturing/research and residential uses would be generated on the Expansion Area under Scenario B.
• As indicated in the 2013 North Parcel FEIS, "*because the project generated trips would represent a small portion of traffic volumes at study intersections and would have negligible effect on the levels of service at the I-5 ramps and city intersections, no adverse level of service impacts are projected to result from the South Parcel proposal.*" This conclusion is applicable to the Proposed Action.	• The conclusion from the 2013 North Parcel FEIS is not applicable to either Scenario A or Scenario B.
3.12 – FISCAL	
• Fiscal conditions are primarily a function of tax revenues to the City of DuPont generated by the Proposed Action and City of DuPont service costs associated with the proposal.	• Similar to Alternative 1 for Scenario A and Scenario B.
• The most relevant tax revenue sources to the City of DuPont associated with the Proposed Action include property taxes, sales & use taxes, business & occupation taxes, and utility taxes.	• Similar to Alternative 1 for Scenario A and Scenario B.
• Public service costs to the City of DuPont associated with the Proposed Action include costs associated with: Police and Fire Departments; Parks/Facilities/Greenways; General City Administration; Community Development; and Public Works (street maintenance).	• Similar to Alternative 1 for Scenario A and Scenario B.
• The cost/revenue balance to the City of DuPont associated with the Proposed Action is analyzed under two approaches (cost allocation approach and average value approach). The fiscal analysis indicates a surplus to the City of DuPont under either approach, ranging from	• For Scenario A the current cost/revenue condition associated with the Re-Mine Area would continue, with minimal revenue and cost associated with the Expansion Area. For Scenario B the current cost/revenue condition associated with the Re-Mine Area would continue. For the Expansion Area, both

Alternative 1 Proposed Action	Alternative 2 No Action Alternative
an estimated annual surplus of $18,400 under the cost allocation approach to an estimated annual surplus of $125,700 under the average value approach.	manufacturing/research and residential uses represent a more intense use of the land that would lead to more property, sales, and utility, and other taxes on a per square foot basis. However, on the cost side these uses also generate more needs for public services such as public safety services for residential uses and public works needs to support manufacturing uses.

SUMMARY OF MITIGATION MEASURES AND SIGNIFICANT UNAVOIDABLE ADVERSE IMPACTS

3.1 Earth

Mitigation Measures

The following mitigation measures have been included in the Proposed Action to reduce impacts on slope stability and erosion (see Section 3.3, **Surface Water**, and Section 3.4, **Groundwater** for additional discussion and mitigation measures related to surface water and groundwater):

- A reclamation plan would be prepared and implemented in accordance with the Surface Mining Act (RCW 78.44). The reclamation plan would be submitted to DNR for review and approval prior to mining. Prior review by the City is also required as part of that process.

- Mining would occur in segments; no mass clearing of the Expansion Area portion of the site would occur.

- An erosion and sediment control plan would be prepared and implemented in accordance with the requirements of the City of DuPont Municipal Code (DMC 22.01.180) and the NPDES Sand and Gravel General Permit. Erosion control features would include stormwater drainage into the interior of the mine and onsite stormwater disposal.

- A vegetated buffer would be maintained between the proposed mine area and the top of steep slopes in accordance with the City of DuPont's Sensitive Areas Code [DMC 25.105.070(2)].

- A 100-foot setback would be maintained from the top of slopes greater than 40% within the Sequalitchew Creek ravine, consistent with the conditions for the existing mine and the 1994 and 2012 Settlement Agreements.

- Earthwork for excavation and reclamation would be in accordance with the federal and state statutes of the Mine Safety and Health Act and the Surface Mining Act.

- Topsoil would be stockpiled and used for reclamation of mined areas. Consistent with the approved Reclamation Plan, Cleanup Action Plan developed for the South Parcel Project and published Ecology guidance, samples would be collected from stockpiled topsoil to confirm arsenic concentrations meet Ecology standards.

- After application of the topsoil, slopes would be re-vegetated by planting with trees and grass. When reclamation is complete, heavy equipment would generally not operate on the reclaimed slopes except for construction or maintenance of pedestrian paths, access roads, utilities, or other permitted facilities.

- The Expansion Area would be cleared in segments corresponding to the mining plan.

- Internal drainage would be maintained during mining.

- Mine slopes would be track-walked to tamp soils and create surface roughness to encourage infiltration of stormwater on the slope.

- Mine slopes would be reclaimed with soil amendments and vegetation according to a DNR-approved Reclamation Plan.

- The existing wheel wash, or equivalent equipment, would continue to be used and maintained for vehicles exiting the mine.

- Settling ponds would be constructed upstream of the infiltration ponds.

- Mine slopes would be periodically inspected and repaired or revegetated to reduce erosion or improve surface stability.

- Provisions for monitoring the Robinson Trail sewer main would be included as part of a project monitoring plan document.

Significant Unavoidable Adverse Impacts

The Proposed Action would result in the unavoidable alteration of topography and creation of new slopes. With implementation of proposed mitigation measures, however, no significant unavoidable adverse earth-related impacts are anticipated from the Proposed Action.

3.2 Air Quality

Mitigation Measures

The following mitigation measures have been included in the Proposed Action to reduce air quality impacts.

Proposed Mitigation Measures

- The use of control equipment, enclosures, and wet (or chemical) suppression techniques, as practical, and curtailment during high winds.

- Surfacing roadways and parking areas with asphalt, concrete, or gravel.

- Treating temporary, low-traffic areas (e.g., construction sites) with water or chemical stabilizers, reducing vehicle speeds, constructing pavement or rip rap exit aprons, and use of the existing wheel wash system or equivalent equipment by vehicles before they exit to prevent the track-out of mud or dirt onto paved public roadways.

Other Possible Mitigation Measures

- Converting incandescent lighting systems to LED and implementing motion-activated lighting.

- Regenerating electricity from the conveyor belt leading downhill to the barge load-out facility.

- Participating in PSE's Schedule 258 electricity energy efficiency program.

- The Puget Sound Clean Air Agency Regulation I is intended to control the emission of air contaminants from all sources within the jurisdiction of the Agency, to provide for the uniform administration and enforcement of this Regulation, and to carry out the requirements and purposes of the Washington Clean Air Act and the Federal Clean Air Act. The Proposed Action would comply with all applicable provisions of Regulation I, including the below.

    - Operations would be subject to Puget Sound Clean Air Agency Regulation I, Section 9.15 (Fugitive Dust Control Measures), Section 9.18 (Crushing Operations), and Section 9.20 (Maintenance of Equipment).

    - The facility should be sure to comply with all applicable Agency regulations.

    - The City of DuPont should ensure compliance with RCW 46.61.655 relating to vehicles driven on public highways.

    - Stationary engines may be required to undergo air quality permitting through the Agency's Notice of Construction program (in Agency Regulation I, Section 6,

and WAC 173-400), while non-road engines are subject to the Agency's notification requirements in Regulation I, Section 15.

Significant Unavoidable Adverse Impacts

With the application of some or all the mitigation measures described above and consistent use of best management practices, no significant air quality impacts are expected from the proposed project.

3.3 Groundwater

Mitigation Measures

Proposed Mitigation Measures

The following mitigation measures have been included in the Proposed Action to reduce surface water and groundwater impacts.

- Groundwater and surface water level monitoring for features in the site area that could potentially be affected would be implemented. Monitoring data would be reviewed throughout the active dewatering period and used in support of the Proposed Action mitigation measures bulleted below. City review of monitoring data should include retention of a qualified hydrogeologist to provide qualified review of both data and projected impacts.

- Steps 1 and 2 of the aquifer pumping tests would be completely reversible and would allow for confirmation testing of groundwater model predictions. If observed impacts differ significantly from predicted impacts, updates to the groundwater model would be pursued to improve its predictive accuracy for subsequent dewatering steps and/or adjustments to the dewatering and mining activity plans would be made.

- The dewatering plan would be phased so that dewatering would start at locations farthest from Sequalitchew Creek and the wetland complex, and gradually would proceed closer to the waterbodies only if observed aquifer water levels do not exceed performance threshold values established by City conditions of approval.

- If performance threshold water levels established by City conditions of approval are exceeded, adaptive management responses (such as adjusting the dewatering operations and/or the boundaries and depth of mining so that performance threshold exceedances do not occur) would be required before additional mining could occur.

- Since dewatering Step 3 would be irreversible, increased monitoring vigilance at different phases of Step 3 as dewatering and mining progress southward could be warranted to ensure that performance threshold water levels are not exceeded.

- Erosion and sediment controls and stormwater treatment, which are intended to protect groundwater quality and the long-term performance of the proposed infiltration facilities, would be implemented (see ***Section 3.1, Earth***, for details).

Other Possible Contingency Mitigation Measures

As an element of the approval conditions for the Proposed Action, the City of DuPont could require a Monitoring and Response Plan. The Monitoring and Response Plan could include, among other things, definition of monitoring methodology, establishment of performance thresholds, and identification of contingency response measures to be considered for implementation if monitoring indicates exceedance of a performance threshold. The Monitoring and Response Plan could incorporate elements of the adaptive management processes proposed to be established for the Proposed Action and the Sequalitchew Creek Restoration Plan.

The Sequalitchew Creek Restoration Plan is a separate but related action that is intended to be implemented in parallel with the Proposed Action. The mine and the stream restoration project each have their own adaptive management process tailored to achieving the goals and objectives of each specific project. The interaction between the two adaptive management processes could include: 1) project schedules that encourage restoration in advance of the potential impacts from mining; 2) development of performance thresholds for mining that support restoration and 3) coordinated monitoring and open sharing of information. The City, as the permitting authority for both projects would have a key role in assuring consistency between the two adaptive management plans. The adaptive management process included in the Monitoring Plan (Aspect Consulting, 2017) includes, but is not limited to, the following potential mitigation actions if the impacts of dewatering on groundwater levels are greater than anticipated including: Installing additional monitoring locations; modifying the dewatering system or approach; revising the mining plan; and providing additional mitigation to impacted surface waters.

The Sequalitchew Creek Restoration Plan's adaptive management process similarly identifies examples of potential response actions to be implemented if restored flows do not meet the plans objectives that include, but are not limited to: removing beaver obstructions; installing additional beaver exclusion devices; escalating beaver management; installing additional flow paths through the former railroad grade that divides Edmond Marsh; sealing the losing reach; creating connections to Bell and/or McKay marshes; and expediting later elements of the Restoration Plan.

Other groundwater contingency mitigation measures that could be implemented as part of

the adaptive management process include:

- Groundwater captured from the mine could be conveyed to the Sequalitchew Creek ravine (either by open channel or micro-tunneling). This approach could provide mitigation for decreased seep discharge within the ravine if the conveyance outfall (or confluence) is located in the vicinity where groundwater discharge currently occurs. However, this mitigation measure could require revisiting conflicting provisions in the 2011 Settlement Agreement and would not augment streamflow between Sequalitchew Lake and the ravine.

- All or some groundwater captured from the mine could be pumped into Edmond Marsh rather than into the Sequalitchew Creek ravine. Benefits of this mitigation approach would be that cool groundwater (which has a low summer water temperature relative to surface water) would enter the marsh and could enhance Sequalitchew Creek surface water flow and fish and other habitat. A potential drawback of this mitigation action is that groundwater discharge/infiltration to the comingled Vashon-Sea Level Aquifer would substantially decrease. In addition, it likely would over-mitigate expected dewatering impacts to Sequalitchew Creek if active year-round (as opposed to only during certain dry or low-flow conditions).

- Water could be actively conveyed to Edmond Marsh during dry periods, while during all other periods captured groundwater from the South Parcel could be conveyed to the lower mine area for infiltration (as is planned in the Proposed Action). This could serve as a contingent measure for consideration and/or further study to supplement Sequalitchew Creek flows during dry periods when no outflow from Sequalitchew Lake occurs or if the Restoration Plan provides less environmental benefit than currently expected.

Significant Unavoidable Adverse Impacts

- The Vashon Aquifer water table would significantly decrease in the vicinity of the South Parcel. Groundwater levels beneath Edmond Marsh, the closest marsh to the site, are predicted to decrease by up to 0.87 feet near its center (at MW-EM-2S) and remain up to 0.84 feet lower following completion of the Proposed Action. At the west end of the marsh (MW-EM-1S), long-term groundwater level declines of up to 8.73 feet could occur.

- Groundwater discharge in the Sequalitchew Creek ravine is expected to significantly decrease (by an annual average of up to 83%) at the peak of active dewatering (Step 3) and is expected to provide on average 79% less baseflow to Sequalitchew Creek during the passive phase of dewatering in Step 4 and following completion of mining. Greater percentage decreases in baseflow are expected during the dry season. Impacts to baseflow quantity could be mitigated by the Sequalitchew Creek Restoration Plan,

except during low-flow or no-flow periods when surface water outflow from Sequalitchew Lake does not occur which will occur about 10% of the time.

3.4 Surface Water

Mitigation Measures

Proposed Mitigation Measures

- Mitigation for the elimination of the Kettle Wetland will be accomplished by the creation of a new 3.56-acre constructed wetland in the southwest portion of the existing mine's bottom. The constructed wetland will be designed, constructed, maintained, and monitored in accordance with a detailed wetland mitigation plan (Anchor QEA, 2021). This is discussed in further detail in Section 3.5, **Plants and Animals**.

- On-site stormwater flow and groundwater seepage and the associated potential for increased erosion will be managed in accordance with a series of Mine Best Management Practices, as described in the Preliminary Stormwater Management Report (2021) and the Earth and Water Resources Report (Aspect 2022, Revised 2025).

Proposed Mitigation Measures for Off-Site Resources

As described in **Chapter 2** of this FEIS, the 2011 Settlement Agreement states that permits for the Pioneer Aggregates South Parcel Project (Proposed Action) shall not be effective until permits for the Sequalitchew Creek Restoration Plan (Restoration Plan) are in place. The Restoration Plan will be evaluated as a separate but related action. The Restoration Plan seeks to restore and enhance streamflow and ecological functions from Sequalitchew Lake through Edmond Marsh into Sequalitchew Creek ravine by sequentially restoring diverted flows back to the creek, improving the sustainability of flows through the system, and restoring aquatic habitat.

The impacts of this mitigation measure are the same as described above in the subsection Cumulative Impacts with Proposed Action and Sequalitchew Creek Restoration Plan.

As discussed in Section 2.3 (Summary of Previous Planning and Environmental Review, 2011 Settlement Agreement Summary, and Sequalitchew Creek Restoration Plan sub-sections) and Section 2.5 (Alternative 1 – Proposed Action, Groundwater Management sub-section), a Monitoring Plan (Appendix F) was developed in 2017 by CalPortland and the Environmental Caucus non-governmental organizations and included in application submittals. This

applicant-proposed Monitoring Plan provides an adaptive management approach that proposes groundwater performance thresholds which must be met for the project to proceed as planned. Along with the Sequalitchew Creek Restoration Plan, the Monitoring Plan (Appendix F) would, if approved by the City, fulfill both the terms of the 2011 Settlement Agreement and the Monitoring and Response Plan measures described above.

Key points from the applicant-proposed Monitoring Plan (Appendix F) include the following that relate to groundwater. These are reproduced here because groundwater impacts affect both flows in Sequalitchew Creek and in the Edmond Marsh complex.

- The Monitoring Plan provides a detailed adaptive management process based on anticipated and observed groundwater levels that includes an iterative five step process of assessment, design, implementation and monitoring, evaluation, and adjustment.
- The Monitoring Plan would establish groundwater levels at each monitoring well through conditions imposed by the city as part of permit approval during each phase of dewatering as performance thresholds to be maintained. It also would specify the frequency of measurements and comparisons with those thresholds.
- The Monitoring Plan establishes limitations on the rate mining can progress during the active dewatering phase including a minimum time for mining each segment and a commitment that mining will not advance to the next segment or dewatering intensify (such as adding new dewatering wells or increasing pumping rates) if performance thresholds are not met.
- If groundwater levels are below the performance thresholds set by city approval, the Monitoring Plan requires that CalPortland evaluate and implement potential adjustments to the dewatering system, including revising mine phasing, adjusting the dewatering plan (number of wells, spacing, alignment, pumping duration), changing the depth or extent of mining, and other actions including ceasing dewatering and mining.
- The Monitoring Plan also specifies a series of required notifications about dewatering progress, milestones, data collection and response actions, as well as identifying routine reporting requirements.

In addition, the Sequalitchew Creek Restoration Plan identified performance and aspirational thresholds to measure the success – and guide implementation of adaptive management – of the Sequalitchew Creek restoration activities and fulfillment of that plan's objectives. Consistent with the performance thresholds identified in the Restoration Plan for the objective of restoring year-round flow in the creek, the following minimum threshold surface water flows, as measured as average monthly flows at the Sequalitchew Creek ravine monitoring stations, are proposed as specific criteria for triggering adaptive management, as described in the Restoration Plan:

- Performance thresholds of average monthly surface flows in all monitoring stations in the ravine section of Sequalitchew Creek:
    - December to April - 4.0 cfs
    - May to November - 0.5cfs

These threshold values are based on predictions of the 90th percentile exceedance flow in Sequalitchew Creek after mining and creek restoration activities are implemented. Flows below this threshold would be experienced 10 percent of the time, or with about a 14 percent statistical probability of occurring during the 14 years of projected operation of the mine.

The December to April proposed performance measure of 4.0 cfs is about 20 percent of the projected average monthly flows during that period of 19.5 cfs with the proposed Restoration Plan and 30 percent of the projected lowest monthly flows within that period with the Restoration Plan as shown in Table 3.4-4. It also is about 6 percent greater than the existing average monthly flow during that period of 3.7 cfs and is about 25 percent greater than lowest monthly flows within that period as shown on Table 3.3-1.

The May to November proposed performance measure of 0.5 cfs is about 7 percent of the projected average monthly flows during that period of 6.4 cfs with the Restoration Plan and 20 percent of the projected lowest monthly flows within that period with the Restoration Plan as shown in Table 3.4-4. It also is about 30 percent of the existing average monthly flow during that period of 1.8 cfs and is about 45 percent of the lowest monthly flows within that period as shown on Table 3.3-1. The applicant proposed standard for initiating adaptive management would generally match the lowest level of flows currently experienced in the upper ravine weir and therefore the proposed Restoration Plan would be held to a standard no higher than existing conditions.

Alternative thresholds for initiating adaptive management might be adopted by the City as approval conditions.

Other Possible Contingency Mitigation Measures

As an element of the approval conditions for the Proposed Action, the City of DuPont could require a Monitoring and Response Plan. The Monitoring and Response Plan could include, among other things, definition of monitoring methodology, establishment of performance thresholds, and identification of contingency response measures to the considered for implementation if monitoring indicates exceedance of a performance threshold. The Monitoring and Response Plan could incorporate elements of the adaptive management processes proposed to be established for the Proposed Action and the Sequalitchew Creek Restoration Plan.

The Sequalitchew Creek Restoration Plan is a separate but related action that is intended to be implemented in parallel with the Proposed Action. The mine and the stream restoration project each have their own adaptive management process tailored to achieving the goals and objectives of each specific project. The interaction between the two adaptive management processes could include: 1) project schedules that encourage restoration in advance of the potential impacts from mining; 2) development of performance thresholds for mining that support restoration and 3) coordinated monitoring and open sharing of information. The City, as the permitting authority for both projects, would have a key role

in assuring consistency between the two adaptive management plans.

The adaptive management process included in the Monitoring Plan (Aspect Consulting, 2017) includes, but is not limited to, the following potential mitigation actions if the impacts of dewatering on groundwater levels are greater than anticipated including: Installing additional monitoring locations; modifying the dewatering system or approach; revising the mining plan; and providing additional mitigation to impacted surface waters.

The Sequalitchew Creek Restoration Plan's adaptive management process similarly identifies examples of potential response actions to be implemented if restored flows do not meet the plans objectives that include, but are not limited to: removing beaver obstructions; installing additional beaver exclusion devices; escalating beaver management; installing additional flow paths through the former railroad grade that divides Edmond Marsh; sealing the losing reach; creating connections to Bell and/or McKay marshes; and expediting later elements of the Restoration Plan.

Other surface water contingency mitigation measures that could be implemented as part of the adaptive management process include:

- As described in Section 3.3, **Groundwater**, a possible contingency mitigation measure not considered in recent CalPortland documents – but discussed in the 2010 Final Feasibility Study (Anchor QEA 2010) – is to convey at least some of the intercepted groundwater seepage from the eastern slopes of the proposed mine expansion area to discharge to the ravine section of Sequalitchew Creek or West Edmond Marsh. Such mitigation has the potential to provide surface water flows in Sequalitchew Creek to offset the reduced groundwater seepage to the creek due to the Proposed Action and/or to make up for low- or no-flow periods in the creek and marsh system due to low or no flow discharges from Sequalitchew Lake under implementation of the Restoration Plan. If coupled with the Restoration Plan (including lining the losing reach section of the creek), the diversion of the groundwater seepage through pumping during Steps 1 through 3 from the proposed expansion area to West Edmond Marsh would provide flows to the losing reach as well as the ravine section of Sequalitchew Creek. Such diversions, however would not occur during the Step 4 and permanent post mining periods. Step 4 and permanent passive flow diversion to the ravine section of the creek would provide flows to the ravine section where salmon spawning and the most productive rearing habitat is located. It would not provide benefits to the marsh complex or the losing reach. Such mitigation could be adaptively managed, based on flow and temperature conditions in Sequalitchew Creek, and in such a way as to allow for some groundwater seepage from the proposed expansion area to be retained on-site and infiltrated to the Vashon-Sea Level Aquifer via the planned infiltration facilities. The significance of potential impacts to the intertidal springs is limited by

the small average of 5.2 cfs discharged from groundwater diverted from mine dewatering compared to total spring discharge to Puget Sound which is estimated to be 131.5 cfs along the entire approximately 3.5 miles of shoreline modeled . Conveying groundwater from the mine expansion area to the ravine may require resolving conflicting provisions in the 2011 Settlement Agreement.

- Another possible additional mitigation measure that was considered in the 2010 Final Feasibility Study (Anchor QEA 2010) is raising the level of Sequalitchew Lake to increase the hydraulic gradient of Sequalitchew Creek through the East and West Edmond Marshes in order to better facilitate flows through the marsh system. With Restoration Plan implementation, the anticipated hydraulic gradient across the marsh system is approximately 0.0006 ft/ft. According to the 2010 Final Feasibility Study, the primary limitation to raising the lake level to induce a higher gradient is the protection of the Sequalitchew Springs located on the east end of Sequalitchew Lake. The Sequalitchew Springs are the drinking water source for JBLM and are protected behind a back-flow prevention weir. Reportedly, the lake level could potentially be raised (by modifying the outlet structure at the west end of the lake) by 0.56 ft with a moderate level of effort for modifications to the back-flow prevention weir at the springs. Raising the lake level higher than that is possible but would reportedly require a significant reconstruction of the facilities at the springs.

Significant Unavoidable Adverse Impacts

Under the Proposed Action with the Sequalitchew Creek Restoration Plan, unavoidable adverse impacts to the surface water system of the Sequalitchew Creek watershed would likely include:

- Increasing the surface water gradient between Sequalitchew Lake and the top of the ravine to restore the natural flow regime to the Sequalitchew Creek watershed, in combination with lower groundwater levels resulting from mining, would result in water levels in East and West Edmond Marshes being lowered by up to approximately 3 ft compared to existing conditions.

- Water levels in isolated lakes and kettle wetlands not directly connected by surface water to the Sequalitchew Creek system would be lowered due to lowered groundwater levels from the Proposed Action. The anticipated decrease in water levels would be approximately 3 ft for Wetland 1D; 2 ft for Pond Lake; 1 ft for Wetlands, #8, #9, #10, and #11; and 0.5 ft for Old Fort Lake. Implementation of the Restoration Plan would likely not mitigate these impacts. These isolated wetlands have significant seasonal variability in water levels and are often dry during the summer. For these reasons, changes that result from changes in groundwater level may be difficult to observe.

- Flows in the ravine section of Sequalitchew Creek would likely be lower than under existing conditions an estimated 10% of the time due to the reduction in groundwater seeps and spring discharges to the creek following groundwater lowering. This would have adverse effects on aquatic habitat discussed in Sections 3.5 and 3.6.

- Water temperatures in Sequalitchew Creek from April through September would likely be warmer than under existing conditions and could be expected to exceed 16°C (the 7--day average of daily maximum temperatures water quality criterion provided in WAC 173-201A-200) from May to September.

- If the contingency mitigation measure of conveying the intercepted groundwater from the eastern slopes of the proposed expansion area to Sequalitchew Creek and/or West Edmond Marsh is feasible and implemented as part of the adaptive management process for the Proposed Action and Restoration Plan Alternative, the flow and temperature impacts to Sequalitchew Creek would likely be at least partially reduced, if not eliminated, and may result in greater overall improvement of conditions within the creek.

- Flows in the JBLM Diversion Canal would be reduced with the redirection of Sequalitchew Lake outlet flows to the historically natural drainage course through Sequalitchew Creek. Because the Diversion Canal was originally constructed to convey stormwater flows from JBLM and provide a watercourse for Sequalitchew Lake outlet flows, the reduced flows in the Diversion Canal are not considered an adverse impact.

- Because on-site stormwater flows will be managed in a similar manner as existing conditions (i.e., on-site collection, conveyance, and infiltration) and because the removal of the Kettle Wetland will be mitigated by a new constructed wetland, no significant unavoidable adverse impacts to on-site surface waters are anticipated under the Proposed Action and Restoration Plan scenario.

3.5 Fisheries

Mitigation Measures

Proposed On-Site Mitigation

- Existing mitigation measures at the barge loading facility at Tatsolo Point that minimize the potential for impacts on fisheries resources would continue. These include:
    - The facility is designed in accordance with adopted federal, state, and local regulations and guidelines to reduce the likelihood of spills of lubricants, fuels, and chemicals employed in the processing and manufacturing proposed for the site;

    - The overwater portion of the conveyor is enclosed to prevent spillage of gravel; and
    - The dock is not used for the delivery of supplies, or chemical or other materials by water; a spill plan has been prepared for all elements and operations of the facility (marine and upland). Appropriate oil spill containment equipment is available at the dock site.

- Mining operations would continue to manage fugitive dust, and forested buffers around Sequalitchew Creek would remain to protect water quality and its support of healthy fisheries resources.

- Site water and stormwater would continue to be recycled and/or infiltrated in the mine, eliminating turbid runoff and its potential to impact fisheries resources.

- During construction of the mitigation wetland and other excavation of soils, construction best management practices would be used to prevent erosion of soils and sedimentation of water resources that support fisheries resources.

Proposed Mitigation for Off-Site Resources

- Implementation of the Sequalitchew Creek Restoration Plan would mitigate for potential impacts to aquatic resources and vegetation resulting from changes to groundwater levels. The Sequalitchew Restoration Plan will be permitted and implemented contemporaneously with mining of the South Parcel. Among other things, the Restoration Plan would mitigate for the impacts of the mine. Monitoring and mitigation measures, including specific timeframes for monitoring and mitigation efforts, are defined in the Restoration Plan. The goal of the Restoration Plan is to offset potential impacts to aquatic resources within the area subject to changes in groundwater level.

- The Sequalitchew Creek Restoration Plan and proposed mining both include monitoring and adaptive management programs aimed at ensuring the projects achieve their objectives (e.g., to maintain and enhance fisheries resources). A main purpose of ongoing monitoring and adaptive management is to look for detrimental cumulative effects and, if identified, adaptively respond to minimize them.

Other Possible Contingency Mitigation Measure

- As an element of the approval conditions for the Proposed Action, the City of DuPont could require a Monitoring and Response Plan. The Monitoring and Response Plan could include, among other things, definition of monitoring methodology, establishment of performance thresholds, and identification of contingency response measures to be considered for implementation if monitoring indicates exceedance of a performance

threshold. The Monitoring and Response Plan could incorporate elements of the adaptive management processes proposed to be established for the Proposed Action and the Sequalitchew Creek Restoration Plan.

- The Sequalitchew Creek Restoration Plan is a separate but related action that is intended to be implemented in parallel with the Proposed Action. The mine and the stream restoration project each have their own adaptive management process tailored to achieving the goals and objectives of each specific project. The interaction between the two adaptive management processes could include: 1) project schedules that encourage restoration in advance of the potential impacts from mining; 2) development of performance thresholds for mining that support restoration and 3) coordinated monitoring and open sharing of information. The City, as the permitting authority for both projects would have a key role in assuring consistency between the two adaptive management plans. The adaptive management process included in the Monitoring Plan (Aspect Consulting, 2017) includes, but is not limited to, the following potential mitigation actions if the impacts of dewatering on groundwater levels are greater than anticipated including: Installing additional monitoring locations; modifying the dewatering system or approach; revising the mining plan; and providing additional mitigation to impacted surface waters.

- Other groundwater contingency mitigation measures that could be implemented as part of the adaptive management process include:

    - Groundwater captured from the mine could be conveyed to the Sequalitchew Creek ravine (either by open channel or micro-tunneling). This approach could provide mitigation for decreased seep discharge within the ravine if the conveyance outfall (or confluence) is located in the vicinity where groundwater discharge currently occurs. However, this previously considered mitigation measure would require revisiting conflicting provisions in the 2011 Settlement Agreement and would not augment streamflow between Sequalitchew Lake and the ravine.

    - Groundwater captured from the mine could be pumped into Edmond Marsh rather than into the Sequalitchew Creek ravine. Benefits of this mitigation approach would be that cool groundwater (which has a low summer water temperature relative to surface water) would enter the marsh and could enhance Sequalitchew Creek surface water flow and fish habitat. A potential drawback of this mitigation action is that it is, at best, a temporary action because pumping in perpetuity is not feasible, and groundwater discharge/infiltration to the comingled Vashon-Sea Level Aquifer would substantially decrease. In addition, it likely would over-mitigate expected dewatering impacts to Sequalitchew Creek if active year-round (as opposed to only during certain dry or low-flow conditions).

    - Water could be actively conveyed to Edmond Marsh during dry periods, while during all other periods captured groundwater from the South Parcel could be conveyed to

the lower mine area for infiltration (as is planned in the Proposed Action). This could serve as a contingent measure for consideration and/or further study to supplement Sequalitchew Creek flows during dry periods when no outflow from Sequalitchew Lake occurs or if the Restoration Plan provides less environmental benefit than currently expected. However, this mitigation measure is also likely at best, a temporary action because pumping in perpetuity is not feasible.

Significant Unavoidable Adverse Impacts

The cumulative impacts of the Proposed Action and Sequalitchew Creek Restoration Plan (the cumulative condition) would generally improve all aspects of the freshwater fish habitat in the Sequalitchew Creek watershed compared to current conditions.

The existing low flows do not currently support a fish population. The flows in the ravine section of Sequalitchew Creek under the Proposed Action would likely be lower than under existing conditions an estimated 10% of the time (during drought years) with the reduction in groundwater discharge to the creek.

Increased water temperature in the Sequalitchew Creek system is anticipated to occur in late summer when only resident fish are present. Fish movement and growth could be limited during the period when water temperature peaks in late summer until temperatures reduce in fall.

Considering the overall increase in freshwater fish habitat conditions in the cumulative condition, in combination with the proposed and potential measures identified in Sub-section 3.5.3, significant unavoidable adverse impacts are not anticipated.

3.6 Plants & Animals

Mitigation Measures

Proposed On-Site Mitigation

- Revegetation of cleared and mined area on the site would occur as part of segmental reclamation under the Reclamation Plan reviewed and approved by the Washington State Department of Natural Resources.

- Mitigation for impacts for the removal of the Kettle Wetland are identified in the Project *Wetland Mitigation Plan*. The design of the mitigation wetland complex is intended to create aquatic, wetland, riparian, and upland forest habitat by using groundwater

intercepted within the mine. Specific Kettle Wetland mitigation goals include the following:

- Create a constructed palustrine depressional wetland complex consisting of forested, scrubshrub, emergent, and aquatic bed wetland areas at least 3.56 acres in size.
- Provide adequate wetland acreage, functions, and values to mitigate all Project-related wetland impacts to the Kettle Wetland.
- Construct a vegetated buffer at least 100 feet around the boundary of the wetland.
- Create a larger complex of seep wetlands and springs within the mine.

- Springs and seeps will generally emanate on the eastern and southeastern slopes of the proposed mine in the South Parcel. Generally, seeps and springs will form within the lower one-third of the mine slope, approximately 20 to 30 vertical feet above the Olympia Beds. These areas will be colonized or planted with pioneer wetland species, such as horsetail *(Equisetum* sp.), buttercup (*Ranunculus* sp.), and miner's lettuce (*Montia fontana*). Additional species would be introduced later, once the soils have developed sufficiently to support seral grasses such as foxtails, rushes, sedges etc. The buffers around these new seeps will be subject to the City of DuPont's Critical Areas Ordinance (DMC 25.105.050) and protected. The minimum buffer size is 50 feet. These buffers would be planted in accordance with the mine reclamation plan and monitored in accordance with the Wetland Mitigation Plan. Control of Scot's broom, reed canarygrass, Himalayan blackberry (*Rubus armeniacus*), and other noxious weeds within areas affected by the proposed Project would also be included as part of the Project mitigation activities.

- The Applicant (CalPortland) has provided a tree replacement proposal as part of its application and will coordinate with the City of DuPont regarding the appropriate strategy for replacement of removed landmark trees through proposed mine reclamation plans.

Proposed Mitigation for Off-Site Resources

- Implementation and monitoring of the Sequalitchew Creek Restoration Plan would provide mitigation to minimize potential impacts to aquatic resources and vegetation resulting from changes to groundwater levels. As described in **Chapter 2** of this FEIS, the Sequalitchew Creek Restoration Plan will be permitted and implemented contemporaneously with mining of the South Parcel.

- Conditions associated with this mitigation measure are the same as described above in the subsection Cumulative impacts with Proposed Action and Sequalitchew Creek Restoration Plan.

Other Possible Contingency Mitigation Measure

- As an element of the approval conditions for the Proposed Action, the City of DuPont could require a Monitoring and Response Plan. The Monitoring and Response Plan could include, among other things, definition of monitoring methodology, establishment of performance thresholds, and identification of contingency response measures to the considered for implementation if monitoring indicates exceedance of a performance threshold. The Monitoring and Response Plan could incorporate elements of the adaptive management processes proposed to be established for the Proposed Action and the Sequalitchew Creek Restoration Plan.

- The Sequalitchew Creek Restoration Plan is a separate but related action that is intended to be implemented in parallel with the Proposed Action. The mine and the stream restoration project each have their own adaptive management process tailored to achieving the goals and objectives of each specific project. The interaction between the two adaptive management processes could include: 1) project schedules that encourage restoration in advance of the potential impacts from mining; 2) development of performance thresholds for mining that support restoration and 3) coordinated monitoring and open sharing of information. The City, as the permitting authority for both projects would have a key role in assuring consistency between the two adaptive management plans.

Significant Unavoidable Adverse Impacts

Development of the Proposed Action would result in the loss of existing conifer forest/shrublands, the existing kettle wetland, and associated animal habitat on the site. The proposed site reclamation plan and wetland mitigation plan would mitigate loss of on-site resources. These impacts would be unavoidable but not considered significant with mitigation described above in Section 3.6.3.

The Proposed Action would indirectly impact the off-site Seep Wetlands associated with the Sequalitchew Creek Ravine by disrupting the hydrology of these wetlands. This impact would be unavoidable and mitigated by creation a larger complex of seep wetlands on the eastern slope of the reclaimed mine, resulting in a net impact that is considered insignificant.

Cumulatively, implementation of the Sequalitchew Creek Restoration Plan would further mitigate for the loss of wetland acreage associated with reduction in groundwater levels. The intent of the proposed mitigation measures described in 3.6.3 with the Sequalitchew Creek Restoration Plan, is to reduce these unavoidable adverse impacts to a non-significant status. If implementation of the proposed mitigation measures fails to mitigate these unavoidable adverse impacts, the City will consider implementing other possible

contingency mitigation measures listed in Section 3.6.3 as part of the adaptive management process.

3.7 Noise

Mitigation Measures

The following mitigation measures have been included in the Proposed Action to reduce noise impacts.

Proposed Construction Measure

- Construction activities (i.e., logging and construction of the southern berm) would be conducted during daytime hours only (7 AM to 10 PM) to minimize noise impacts.

Proposed Operation Measures

- The plans for the site include construction of a 20-foot high berm on the south side of Phase 2C to reduce noise at off-site locations, especially at the Creekside Apartments. With such a berm, modeled sound levels of worst-case mining activities are well below the applicable daytime noise limits at all receptor locations.

- Excavation in Phase 2C during early morning hours (i.e., between 5 and 7 AM) may exceed the stricter nighttime limit of 50 dBA applicable at the Creekside Apartments. Restriction of the bulldozer to daytime hours only within Phase 2C reduces the modeled sound levels at the Creekside Apartments to 48 dBA or less, which would comply with DuPont's nighttime noise limit.

Significant Unavoidable Adverse Impacts

With construction of the proposed berm as noted above and with restriction of hours of bulldozer operation in Phase 2C to daytime hours only, the project is expected to comply with City of DuPont noise limits. Furthermore, potential noise impacts at the Creekside Apartments (R1) can be mitigated by the proposed mitigation measures, although short-term unavoidable noise impacts may be expected. Due to the short-term nature of the impacts at R1, any such impacts would not be considered significant.

3.8 Land Use

Mitigation Measures

No significant adverse land use impacts have been identified. However, the following mitigation measures have been identified to further reduce the potential for land use impacts associated with the proposed South Parcel Project.

Proposed Mitigation Measures

- Maintain a vegetated buffer along Powerline Road. Trees will be planted densely to establish screening during mining operations. After mining is completed, selective thinning may be necessary to facility a healthy future forest within the buffer.

- Mitigation measures identified throughout the EIS would minimize impacts to land use from mining activities, consistent with City regulations (see Section 3.1, **Earth**, Section 3.2, **Air Quality/GHG Emissions**, Section 3.6, **Noise**, and Section 3.10, **Transportation**).

Significant Unavoidable Adverse Impacts

The proposed Pioneer Aggregates South Parcel Project would result in an unavoidable change to the land use character of the existing landscape within the Expansion Area portion of the site. The extraction of mined material would result in a permeant change in the land use character of the site. However, the Proposed Action is not expected to result in a significant adverse impact to land uses of the surrounding community. Mining is a transitional use of the site; although mining would alter the site for a number of years, after mining is complete, the site would likely be developed to another permitted use.

3.9 Aesthetics

Mitigation Measures

The following mitigation measure have been included in the Proposed Action to reduce aesthetics impacts.

Proposed Mitigation Measures

- A vegetated buffer would be maintained along Powerline Road. Trees would be planted densely to establish screening during mining operations. After mining is completed, selective thinning may be necessary to facility a healthy future forest within the buffer.

- As mining progresses, completed mine segments would be reclaimed to a vegetated condition. The reclamation plan would be reviewed by the Washington State Department of Natural Resources ("DNR") for consistency with the Surface Mining Act (RCW 78.44). In general, reclamation would consist of regrading, replacement of topsoil, and revegetation.

Significant Unavoidable Adverse Impacts

The Proposed Action would result in an unavoidable change to the visual character of the Expansion Area portion of the site. The extraction of mined material would result in a permeant change in the visual character of the site. However, the Proposed Action is not expected to result in a significant adverse impact to the visual environment of the surrounding community. The mining operation is expected to be only minimally visible to the general public from outside of the property boundary. In addition, mining is a transitional use of the site; although mining would alter the site for a number of years, after mining is complete, the site would be reclaimed and ultimately it would be available for development to another permitted use.

3.10 Cultural Resources

Mitigation Measures

The following mitigation measures have been included in the Proposed Action, or in a prior decision applicable to the property, to reduce cultural resources impacts.

Mitigation for Potential TCPs, Kettle Lakes and Wetlands, and Resource Gathering Areas

The City, CalPortland and the property owner acknowledge and respect tribal sovereignty and have consulted and worked cooperatively with the Nisqually Tribe for decades. The City and applicant have made repeated efforts to consult with the tribe in regard to the South Parcel proposal; those efforts continue. The City and applicant express their commitment to honor existing and on-going commitments and continuing consultation and collaboration with the Nisqually Tribe.

If it is determined that any resources are eligible for listing in the NRHP and that mining activities would constitute a significant adverse impact to them, then DAHP and the affected Tribes should be consulted for guidance regarding appropriate mitigation measures. Mitigation measures may include but are not limited to data recovery and/or interpretation (e.g., displays, exhibits).

Proposed Mitigation Measures

- Mitigation requirements that address archaeological monitoring and inadvertent discovery of cultural resources or human remains prior to ground disturbance or during mining as required as a result of the 2004 Settlement Agreement between Quadrant Corporation, Weyerhaeuser real Estate Company, the City of DuPont and the Nisqually Tribe. These mitigation requirements apply to all Weyerhaeuser properties in the City of DuPont, and have been recommended, applied as conditions of approval, and implemented as ongoing management practices in all Glacier NW/CalPortland mining projects in the City. These mitigation measures should continue to be implemented as applicable to the South Parcel Project. These measures include the following (paraphrased from North Parcel conditions No. 28-30):

    - Notification of Nisqually Indian Tribe resource representative in advance of any clearing or topsoil stripping for each mine segment; and employment of the tribal Archaeologist to write a closing report to DAHP documenting coordination with the Nisqually Indian Tribe and observed conditions.
    - Notification of DAHP and the Nisqually Indian Tribe if any Native American remains are unearthed.
    - Monitoring of clearing activities by the Nisqually Indian Tribe to identify any historic resources and appropriate notice and treatment of any resources discovered.

- If any archaeological sites are identified under the Proposed Action, and they are determined to be eligible for the NRHP, and that proposed mining activities would constitute a significant adverse impact to them, then DAHP and the affected Tribes should be consulted for guidance regarding appropriate mitigation measures. Mitigation measures may include, but not be limited to data recovery and/or interpretation (e.g., displays, exhibits).

Significant Unavoidable Adverse Impacts

No historically significant cultural resources have been previously identified within the site to date; therefore, no significant adverse impacts would occur to known resources. However, if a previously unidentified cultural resource is discovered with in the ADI, there is potential for a significant adverse impact to occur if the resource is determined to be eligible for the NRHP.

3.11 Transportation

Mitigation Measures

No transportation-related mitigation measures are necessary, and no additional transportation-related measures are provided.

Significant Unavoidable Adverse Impacts

The proposed Pioneer Aggregates South Parcel Project is not expected to result in significant transportation impacts in the study area. Trip generation is expected to continue at current levels and would remain below the peak day estimates that had been evaluated in the 2013 FEIS.

3.12 Fiscal

Mitigation Measures

No significant adverse fiscal impacts have been identified. Beyond the payment of required payment of applicable property tax, sales & use tax, business & occupation tax, and utility taxes, no additional mitigation is identified.

Significant Unavoidable Adverse Impacts

The fiscal analysis conducted for this EIS indicates that expected revenues to the City of DuPont would exceed expected costs. Therefore, no significant unavoidable adverse are anticipated.

Chapter 2

DESCRIPTION OF PROPOSED ACTION(S) & ALTERNATIVES

CHAPTER 2

DESCRIPTION OF PROPOSED ACTION AND ALTERNATIVES

This chapter of the *Pioneer Aggregates South Parcel Project* Final Environmental Impact Statement (FEIS) provides discussion on the following: Overviews of the *Pioneer Aggregates South Parcel Project*, the Environmental Review Process, and Previous Planning, Environmental Review and Settlement Agreement; Description of the Proposed Action; Overview of Major Elements of the EIS and Alternatives; and Discussion of Benefits and Disadvantages of Deferring the Proposed Action. A detailed description of the affected environment, environmental impacts, mitigation measures, and significant unavoidable adverse impacts is provided in **Chapter 3** of this FEIS. Information added or changed subsequent to issuance of the Draft EIS, if any, is shaded to ease identification of the added or changed information.

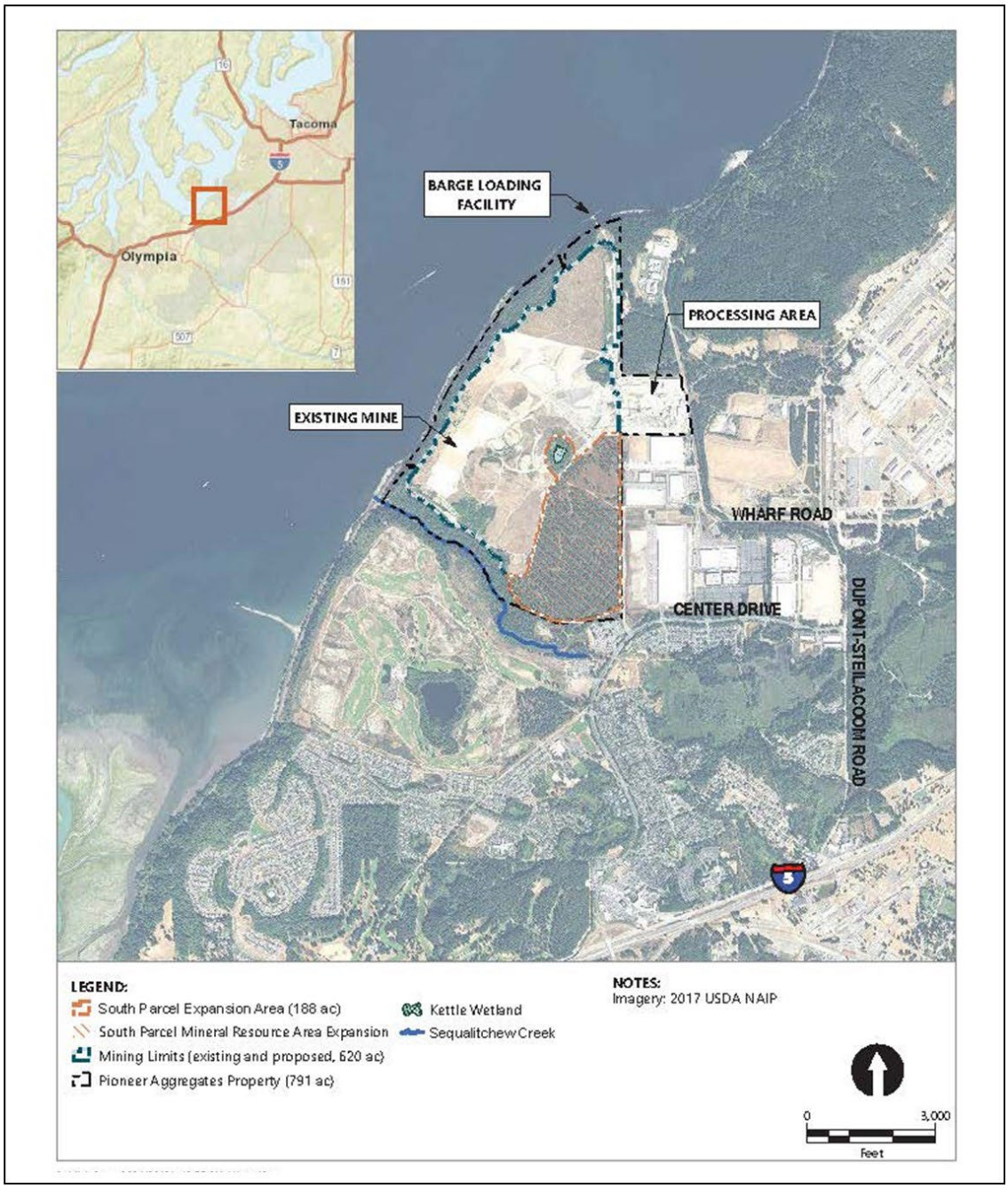
2.1 Overview of the Proposed Action

Project Location

The Pioneer Aggregates Mine is located in the City of DuPont, southwestern Pierce County, and Sections 22, 23, and 26, Township 19 North, Range 1 East of the Willamette Meridian (see **Figure 2-1 - Vicinity Map** and **Figure 2-2 – Site Map**). The mine is comprised of four areas: the Original Mine area, the North Parcel and the processing area that now comprise the Existing Mine, and South Parcel. The proposed *Pioneer Aggregates South Parcel Project* ("South Parcel Project") is focused on the easterly portion of the Existing Mine and the South Parcel (see **Figure 2-2**). The project site is bordered to the north by the Pioneer Aggregates North Parcel; to the east by industrial/distribution facilities including Amazon, Dania, Pier 1 Imports, and FedEx; to the south by Sequalitchew Creek and the Creekside Village residential development; and to the west by Puget Sound. The South Parcel Project would occur on lands owned by Weyerhaeuser Company and leased to CalPortland[1]

The South Parcel Project site includes areas previously undisturbed by mining deemed the Expansion Area. The 187.5-acre Expansion Area includes portions of the 167.5-acre South Parcel, the 10.8 acre kettle wetland and surrounding buffer and a 9.2-acre buffer strip between the Existing Mine and the south parcel property boundary. The South Parcel Project also includes a plan to mine deeper within a portion of the Existing Mine, referred to as the "Re-Mine Area". The Expansion Area is located southeast of the Existing Mine.

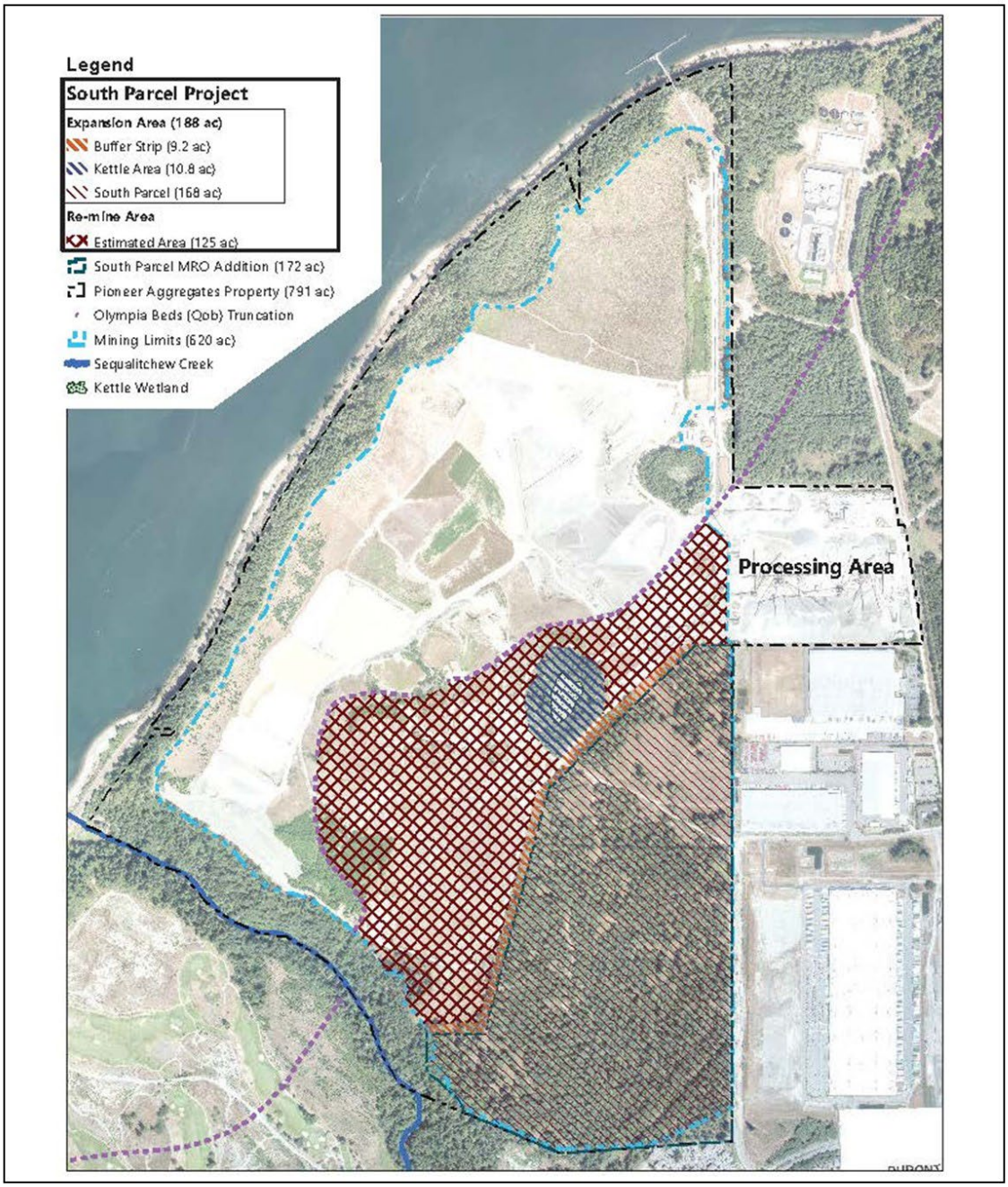
[1] *Glacier Northwest, Inc. (Glacier NW) does business as CalPortland in the State of Washington. Glacier NW leases the proposed expansion area from Weyerhaeuser. Glacier NW also owns the Pioneer Aggregates operation and maintains the bond required under the reclamation permit. The North Parcel Property and property where the aggregate processing plant are located are owned by Northwest Aggregates Co. a Wholly owned subsidiary of Glacier Northwest, Inc.*



Source: Anchor QEA, 2021

EA Engineering, Science, and Technology, Inc., PBC

Figure 2-1
Vicinity Map



Source: Anchor QEA, 2021

EA Engineering, Science, and Technology, Inc., PBC

Figure 2-2
Site Map

The Existing Mine Area and the Expansion Area are included within the Mineral Resource Overlay in the City of DuPont's adopted Comprehensive Plan. The Re-Mine Area consists of 125.2 acres in the southeastern portion of the Existing Mine where current mining activities are permitted above current groundwater levels (see **Figures 2-1** and **2-2**).

The current proposal is for a new permit that would allow mining to occur in the Expansion Area and additional mining in the Re-Mine Area to deepen these areas to below the current groundwater level.

Current Mining Operations

CalPortland's original approximately 355-acre sand and gravel mine was permitted in 1996 and is referred to as the "Existing Mine".

In 2013 CalPortland applied for permits to allow mining of approximately 142 acres within the North Parcel; the North Parcel mining expansion was permitted in 2014.[2]

Current activities at the Pioneer Aggregates Mine include mining, processing, transport of sand and gravel, and manufacturing of concrete. The processing area is located adjacent to the mine site on a 52-acre parcel owned by Northwest Aggregates Co. a wholly owned subsidiary of Glacier Northwest, Inc. ("Glacier") (see **Figures 2-1** and **Figure 2-2**). Sand and gravel is removed from the mine by bull dozers and wheel loaders and transferred to the processing area by conveyor belts. At the processing facility, the material from the mine is crushed, washed, and separated into different size gradations. Aggregate products are stored in stockpiles in the processing area for distribution.

After completion of the production process, the majority (approximately 80%) of the finished aggregate products are transported from the plant area by conveyors and placed onto barges at Glacier's dock and barge-loading facility at Tatsolo Point on Puget Sound (see **Figure 2-1**). The remainder (approximately 20%) is sold as aggregate or used to make concrete onsite; in both cases it is transported by truck.

Water used to wash gravel during processing is recycled through a clarifying process to remove silt and clay. The fine sediments are then run through a belt press to remove excess water and transported by truck and placed in holding cells in the mine where it is allowed to dry for up to three years. After drying, fines may be used to raise the floor of the mine by placing the material in cells separated by rock curtains to facilitate drainage. The material is placed in approximately 6-inch lifts and compacted to a material dry density of 90% (ASTM:D-1557)[3] or greater. Once filled to the desired height with fines from the belt press in this manner, a gravel cap of not less than 10 feet is placed over the compacted fines to mitigate potential for settlement and facilitate drainage.

[2] *Consistent with applicable provisions of the 2011 Settlement Agreement (see Section 2-3 of this Chapter for detail).*
[3] *American Society for Testing and Materials (ASTM) D-1557 provides standard test methods for laboratory compaction characteristics of soil.*

Summary of Proposed Action

In May 2021, CalPortland applied for permits to allow horizontal expansion of mining into approximately 188 acres previously undisturbed by mining (the Expansion Area), and vertical deepening of approximately 125 acres where re-mining would deepen a portion of the Existing Mine (Re-Mine Area). In advance of the mining, the project proposes to install wells to intercept and pump groundwater to dry out gravels for mining. The intercepted groundwater would be conveyed by surface channels and infiltrated in ponds on the floor of the Existing Mine. As is the case currently, the pace of mining will depend on market conditions. The proposed South Parcel Project is anticipated to extend mining at the current average rate for approximately 14 additional years. Additionally, the method of mining and materials processing, and transport of materials within the South Parcel Project would not change from the methods used in the Existing Mine (see Section 2.4 of this chapter for additional detail on the Proposed Action).

2.2 Environmental Review and Purpose

Consistent with the provisions of the State Environmental Policy Act (SEPA) (RCW 43.21C and WAC 197-11-050), the City of DuPont is serving as the lead agency under SEPA and directing environmental review for the proposal.

The City of DuPont determined that the *Pioneer Aggregates South Parcel Project* may have a significant adverse impact on the environment, and that an Environmental Impact Statement (EIS) should be prepared, consistent with RCW 43.21C.030 (2)(c). Accordingly, the City of DuPont initiated the EIS scoping process for the South Parcel Project on September 17, 2021, by carrying out the following actions:

- Issued a SEPA Determination of Significance (DS)/Request for Comments on the Scope of the EIS. The DS/Request for Comments included notification of a public meeting on September 30, 2021, to provide the public with an opportunity to become more familiar with the proposal and to comment on the scope of the EIS. It also gave notice of the 30-day extended scoping period, ending on October 20, 2021 (the statutory requirement is for a 21-day scoping period). The DS/Request for Comments is available for review at: https://www.dupontwa.gov/DocumentCenter/View/4891/Pioneer-Aggregates-So-Parcel-DS_PLNG2021-006

- Mailed copies of the DS/Request for Comments to federal, state, regional and local agencies, and tribes;

- Published the DS/Request for Comments in the Washington State Department of Ecology's (Ecology's) SEPA Register;

- Posted the DS/Request for Comments on the City of DuPont's website;

- Published the DS/Request for Comments in the *Tacoma News Tribune* (on September 18, 2021); and,

- Posted on the City of DuPont bulletin board.

The EIS public open house was held on September 30, 2021, during the scoping period. This meeting offered an opportunity for the public to learn more about the Proposed Actions and to provide input on the scope of the EIS. A total of 21 people signed in at the meeting. An opportunity to provide written comments was provided throughout the open house. City staff and Pioneer Aggregates representatives were available throughout the open house to answer questions about the SEPA process and the proposal, respectively.

A total of 88 comment letters were received from 43 commenters during the EIS scoping period. All the comments are available for review at City of DuPont. **Appendix A** of the EIS includes a report containing a detailed summary of the EIS scoping process, comments received during the scoping period, and any revisions to the EIS scope based on public input received through the scoping process.

The *Pioneer Aggregates South Parcel Project* Draft EIS was published on June 14, 2024 with a 30-day public comment period provided; based on a request, the City of DuPont extended the comment period from July 15, 2024 to July 22, 2024. Various ways to provide comments on the Draft EIS were provided, including: Draft EIS Comment forms provided on the City's website; comments provided via email; and comments provided via letter. In some cases, both website comments and email/letter were received from the same agency/organization/individual, with each comment submittal counted as a separate comment submittal. All the comments that were received from agencies, tribes, organizations, and individuals during the comment period are contained in **Appendix Q** of this FSEIS. A total of 251 written comment letters/emails were received, consisting of seven from public agencies, six from organizations, and 238 from individuals[4].

The scope of the EIS was defined by City of DuPont. The following environmental elements were identified for analysis in the EIS.[5]

- *Earth*
- *Air Quality*
- *Land & Shoreline Use*
- *Aesthetics*

[4] *Note that the total number of comment letters/emails/forms received reflects a number of repeats from the same commentor.*

[5] *Conditions associated with ground preparation, surface mine operations, and reclamation are analyzed under the EIS Alternatives.*

- *Surface Water & Groundwater*
- *Fisheries*
- *Plants & Animals*
- *Noise*
- *Cultural Resources*
- *Transportation*
- *Economic & Fiscal Conditions*

The EIS evaluates two alternatives:

- **Alternative 1** – No Action Alternative, and
- **Alternative 2** – Proposed South Parcel Project.

Three other possible alternatives - **1**- less mining on the South Parcel and/or at the Existing Mine, **2** - preserving the Kettle Wetland, and **3**- no dewatering by wells for mining and creation of an interceptor channel southeast of Edmond Marsh - are referenced in the EIS (see Section 2.5 later in this chapter for details on the EIS Alternatives).

It is assumed that the Sequalitchew Creek Restoration Plan (as discussed later in this Chapter) is not part of the Proposed Action. The Restoration Plan, in combination with the Proposed Action, is analyzed in this EIS under Cumulative Impacts in the context of mitigation for the Proposed Action.

2.3 Previous Planning, Environmental Review and Settlement Agreement

The DuPont area has been the subject of numerous proposals and environmental studies over the last 40+ years. From approximately 1909 to 1975 the DuPont de Nemours Company conducted munitions manufacturing in the area. In the 1970s, the Weyerhaeuser Company studied the area for possible construction of a log export facility. The plan for the log export facility was later dropped and Weyerhaeuser began developing Northwest Landing, a mixed-use residential, commercial and employment center.

Recognizing the value of the aggregate resources (i.e., sand and gravel) in the DuPont area, Weyerhaeuser began working with CalPortland (then Lone Star Northwest) in the late 1980s to evaluate the hydrogeologic characteristics of the general area and its suitability as a source of construction aggregate materials. The area, including the Pioneer Aggregates Existing Mine and North and South Parcels, was identified as containing substantial deposits of high-quality aggregate materials. Groundwater studies, which encompassed the North and South Parcels, included deep well and aquifer tests for mine water supply, a conceptual assessment for groundwater inflow and dewatering, and an evaluation of the quality of groundwater flowing beneath the area from the Fort Lewis Landfill No. 5, which is located approximately one-half mile to the east of the South Parcel, on Joint Base Lewis-McCord (JBLM) property. Barge loading of aggregates at Tatsolo Point was also identified as an alternative mode of transport to trucks.

A summary of the previous planning and SEPA environmental review efforts specific to the site and relevant to the Proposed Action are listed below; see Section 3.7, **Land and Shoreline Use**, of this Final EIS for additional detail.

Summary of Previous Planning and Environmental Review

The original Lone Star NW sand and gravel mine (Existing Mine) was permitted for an approximately 355-acre site in 1997. An EIS and Supplemental EIS (SEIS) were prepared for that proposal, which included construction of a dock at Tatsolo Point for shipment of mined material by barge.

The Washington State Growth Management Act requires cities and counties to designate mineral lands of long-term commercial significance in their comprehensive plans. In the City of DuPont, such lands are included within the City's Mineral Resource Overlay zoning district. In 2006, the City amended its Comprehensive Plan to revise its overall land use plan to expand the City's Mineral Resource Overlay. The expanded Mineral Resource Overlay included an approximately 168-acre area leased by CalPortland southeast of the Existing Mine (South Parcel) and an approximately 201-acre area located north of the Existing Mine owned by CalPortland (North Parcel). After the City issued a SEIS for the South Parcel in 2007, CalPortland submitted permit applications to mine the South Parcel.

In 2009, in response to a prior application to begin mining the South Parcel, a group of environmental and conservation organizations formally disputed the proposed South Parcel activities and mitigation measures proposed at the time. This dispute process resulted in a Memorandum of Understanding (2009) and Feasibility Study (2010), which explored alternatives for mining and restoration, and the *2011 Settlement Agreement for DuPont Mine, Restoration of Sequalitchew Creek Watershed, and Preservation of Puget Sound Shorelands and Adjacent Open Space* (2011 Settlement Agreement). The 2011 Settlement Agreement set forth a process for the submittal and review of permit applications (including SEPA review) for the North Parcel first and then the South Parcel (see *2011 Settlement Agreement Summary* below).

As provided for in the 2011 Settlement Agreement, in 2013 CalPortland applied for permits to allow mining within the North Parcel. Following publication of a Final EIS ("North Parcel EIS") in 2013, the North Parcel mining expansion was permitted in 2014. The North Parcel EIS contemplated mining the South Parcel as an independent but related proposal and evaluated the cumulative impacts of mining both the North and South Parcels.

A summary of previous key mining permits, applications, and SEPA environmental review efforts applicable to the current Proposed Action is provided below.

- 1992, 1993 – *Pioneer Aggregates Mining Facility and Reclamation Plan EIS* issued.

- 1994 – *Settlement Agreement* between Ecology, City of DuPont, CalPortland, Weyerhaeuser Real Estate Company, Nisqually Delta Association, Black Hills Audubon Society, and the Anderson Island Quality of Life Committee. The 1994 Settlement Agreement includes agreements related to shoreline improvements, including aggregate dock facility at Tatsolo Point, Sequalitchew Creek/shoreline protection measures, and a process for resolving disputes related to enforcement of the Agreement's terms through consultation, mediation, or arbitration.

- 1995 – *Pioneer Aggregates Barge-Loading Facility and DuPont Shoreline Master Program Amendment SEIS* issued.

- 1996 – The original 355-acre sand and gravel mine (Existing Mine) permitted.

- 2001 – 1st *City of DuPont Comprehensive Plan EIS Addendum* issued.

- 2004 – Settlement Agreement between Quadrant Corporation, Weyerhaeuser Real Estate Company, the City of DuPont and the Nisqually Tribe, resulting in agreements for requirements that address archeological monitoring and inadvertent discovery of cultural resources or human remains prior to ground disturbance or during mining.

- 2005 – 2nd *City of DuPont Comprehensive Plan EIS Addendum* issued.

- 2006 – The City's Mineral Resource Overlay expanded to 201-acre area north of the Existing Mine (North Parcel) and 168-acre area south of Existing Mine (South Parcel)

- 2007 – *Glacier Northwest DuPont Mining Area Expansion and North Sequalitchew Creek Project SEIS* issued.

- 2007 – CalPortland submitted applications to permit mining on the South Parcel along with additional areas within the Existing Mine (including a proposal to collect groundwater in a new tributary to Sequalitchew Creek). A Final SEIS was issued for this proposal. Following issuance of the Final SEIS and preparation of the City of DuPont Staff Report, the Nisqually Delta Association invoked settlement discussions regarding potential impacts to Sequalitchew Creek (see below). After initiating settlement discussions, no further action was taken by the City or CalPortland on the 2007 South Parcel application.

- 2008 – The Nisqually Delta Association formally invoked the dispute resolution process under the 1994 Settlement Agreement.

- 2009 –A memorandum of understanding (MOU) was executed in November among the interested environmental organizations (Environmental Caucus non-governmental organizations), Washington Department of Ecology, City of DuPont

and the applicant for the development of a feasibility study to evaluate various alternatives for expansion of the mine, and actions to improve water flows and habitat in the Sequalitchew Creek watershed. The MOU also established a process, including SEPA review, for separately considering future mining applications for the North Parcel and South Parcel, and for a settlement agreement.

- 2010 – Final Feasibility Study completed, analyzing 24 alternatives for mining of the North and South Parcels, dewatering options and actions to enhance and restore regional environmental resources.

- 2011- The studies and deliberations initiated in 2009 resulted in tentative agreement among the negotiating parties in June of 2011 who then presented the *2011 Settlement Agreement for DuPont Mine, Restoration of Sequalitchew Creek Watershed, and Preservation of Puget Sound Shorelands and Adjacent Open Space* to the DuPont City Council for consideration. Several town hall meetings and hearings were held by the Council that included opportunities for citizens and interested stakeholders to provide verbal and written comments on the proposal. The Council ultimately approved the settlement agreement and it was finally executed on February 12, 2012 (see discussion below under *2011 Settlement Agreement Summary*).

- 2013 – *CalPortland DuPont North Parcel Mining Final EIS* issued.[6]

- 2014 – North Parcel Mining permitted.

- 2017 – CalPortland worked with the Environmental Caucus non-governmental organizations to develop the South Parcel Monitoring Plan. (The "Environmental Caucus" comprises the non-governmental environmental organizations listed in the Settlement Agreement Summary below.)

- 2018 – The non-governmental organizations who are parties to the 2011 Settlement Agreement incorporated input from JBLM and finalized the Sequalitchew Creek Watershed Restoration Plan.

- August 2020 – A Memorandum of Agreement (MOA) was executed by Joint Base Lewis-McChord (JBLM), CalPortland, the City of DuPont, the Environmental Caucus non-governmental organizations and the South Puget Sound Salmon Enhancement Group (SPSSEG) defining roles and responsibilities for Restoration Plan actions on JBLM.

[6] *The CalPortland DuPont North Parcel EIS included discussion and analysis of mining on the South Parcel as a Potential Similar Action.*

- September 2020 – Application including Cleanup Action Plan (CAP) submitted to Washington State Department of Ecology for review under the Voluntary Cleanup Program for remediation of Asarco Tacoma Smelter Plume related contaminants in surface soils of the South Parcel property.

- February 2021 – Washington State Department of Ecology issued Opinion that implementation of Cleanup Action Plan would be likely to result in "no further action" being necessary to clean up the DuPont South Parcel Property.

- March 2021 – CalPortland and Environmental Caucus non-governmental organizations finalized the Sequalitchew Creek Restoration Plan Funding Agreement and CalPortland funded the Restoration Plan Permit Fund per the terms of the agreement.

- May 2021 – CalPortland applied for permits to allow mining in the Expansion Area (including the South Parcel) and vertical extension within the Existing Mine (Re-Mine Area); the 2021 application is referred to as the Proposed Action.

The 1992/93, 1995, 2001, 2005, 2007 and 2013 EISs, Supplemental EISs, and EIS Addendums listed above are hereby incorporated by reference into this EIS, in accordance with WAC 197-11-625 and 754. Accordingly, all or part of the incorporated documents, including any studies or reports that provide information relevant to the proposal, become part of the City of DuPont's environmental documentation for the current proposal.

2011 Settlement Agreement Summary

The 2011 *Settlement Agreement for DuPont Mine, Restoration of Sequalitchew Creek Watershed, and Preservation of Puget Sound Shorelands and Adjacent Open Space*, was signed by CalPortland; the Nisqually Delta Association, the Black Hills Audubon Society, the Tahoma Audubon Society, the Seattle Audubon Society, the Anderson Island Quality of Life Committee, the Washington Environmental Council, and People for Puget Sound (collectively known as the "Environmental Caucus"); the Washington Department of Ecology; and the City of DuPont. The 2011 Settlement Agreement was also signed by WPP LLC who owned the property for a period of time and is both a successor and a predecessor in interest to Weyerhaeuser.

The 2011 Settlement Agreement set forth a process for the submittal and review of permit applications for the North Parcel first, and then the South Parcel. As a preferred alternative to the mitigation CalPortland had originally proposed in 2007 for the South Parcel, the Settlement Agreement also prescribed the process for the development, funding, and implementation of a Sequalitchew Creek Restoration Plan to help restore and enhance the Sequalitchew Creek watershed, including flows along the length of the Sequalitchew Creek. The Restoration Plan process provided for the approval of a separate Monitoring Plan for the South Parcel Mine by CalPortland and the Environmental Caucus non-governmental

organizations. Further, the Agreement ensured that buffers along Puget Sound and Sequalitchew Creek would be maintained at a prescribed distance. To achieve these goals, the Settlement Agreement set forth a detailed series of mining and restoration actions to occur in a prescribed sequence over several years. See Section 3.3, **Surface Water**, Section 3.4, **Groundwater**, and Section 3.7, **Land and Shoreline Use**, for additional detail on the Settlement Agreement and relationship to the EIS Alternatives.

Sequalitchew Creek Restoration Plan

The Sequalitchew Creek Restoration Plan is sponsored by the South Puget Sound Salmon Enhancement Group (SPSSEG) which is one of 14 Regional Enhancement Groups (RFEGs) state-wide established by the Washington Legislature through RCW 77.95.060 as nonprofit corporations with state grant support with the mission of involving local citizens and agencies in salmon enhancement efforts. The plan is the result of a 2011 Settlement Agreement for DuPont Mine, Restoration of Sequalitchew Creek Watershed, and Preservation of Puget Sound Shorelands and Adjacent Open Space which provides for (SPSSEG) to lead a multi-stakeholder effort to develop a restoration plan for the Sequalitchew Creek Watershed.

This agreement was the result of the CalPortland 2007 application to expand their aggregate mine and the resulting 2009 action by a group of environmental and conservation organizations to invoke a dispute resolution process with regard to a previous settlement agreement for the first phase of the mine. This dispute resolution process resulted in a mediation process that led to the 2011 Settlement Agreement between the environmental and conservation organizations, CalPortland, the Washington State Department of Ecology and the City of DuPont. This agreement described five major elements to be incorporated into a plan to restore flows to Sequalitchew Creek and directed the non-governmental parties to the agreement to execute a stakeholder process in order to receive input for development of a restoration plan. That stakeholder process was facilitated by the South Puget Sound Salmon Enhancement Group and involved a “Core Group” of representatives including: CalPortland, who operates and proposed to expand the aggregate mine on the north side of Sequalitchew Creek; the Nisqually Tribe; the Sequalitchew Creek Watershed Council, a non-profit organization; the Environmental Caucus which represents a number of non-profit organizations including the Nisqually Delta Association (NDA), the Black Hills Audubon Society, Washington Environmental Council (WEC), the National Audubon Society, People for Puget Sound, the Tahoma Audubon Society, the Seattle Audubon Society, and the Anderson Island Quality of Life Committee; Joint Base Lewis-McChord which controls the headwaters of Sequalitchew Creek; Pierce County; the City of DuPont; and the Washington Department of Ecology.

The Settlement Agreement directed the non-governmental entities involved to develop the restoration plan to sequentially restore flows in the creek, improve the sustainability of flows through the system, and restore aquatic habitat by removing flow-related fish passage barriers and increasing the habitat available to aquatic species through the

restoration and enhancement of flows. The Agreement established a stakeholder "Core Group" of representatives to provide input.[7] The Core Group examined a number of alternatives with technical assistance provided by CalPortland consultants. In June, 2013 the group adopted a set of recommended restoration actions and solicited comments through August 30, 2013. The stakeholders adopted the final set of recommendations in December 2013 and prepared a Final Briefing Memo in January 2014. In March 2018 the Restoration Plan, Sequalitchew Creek Watershed, was released. That plan contains a set of goals and objectives with defined quantified performance standards, tied to each objective, together with an adaptive management process for determining if and when the goals and objectives have been achieved.

Mining of the South Parcel and the Restoration Plan for Sequalitchew Creek are separate, but interacting, projects. Each project is anticipated to have its own monitoring and adaptive management process tailored to achieving the goals and objectives of that project. The interaction between the two adaptive management processes include: 1) project schedules that encourage restoration in advance of the potential impacts from mining; 2) development of performance thresholds for mining that support restoration; this includes a monitoring plan for the South Parcel, which was drafted with the input of the Environmental Caucus non-governmental organizations; and, 3) coordinated monitoring and open sharing of information. The Settlement Agreement also specifies that mining permits will not be legally effective unless and until permits for the Restoration Plan are issued by the responsible government agencies.

Consistent with the 2011 Settlement Agreement, the Restoration Plan was developed by the non-governmental parties to the Settlement Agreement (CalPortland and the Environmental Caucus). Although it builds upon the five components of Sequalitchew Creek restoration identified in the Settlement Agreement and involved input from both the non-governmental and governmental members of the Core Group, the Plan has not been formally reviewed and approved by any governmental agency. The Settlement Agreement references the understanding that State Environmental Policy Act (SEPA) review will be required at the time specific implementation actions are pursued. Under Section 4.5.3 of the Agreement, CalPortland and the Environmental Caucus agreed that CalPortland's commitments regarding the Restoration Plan "shall be deemed, adequate mitigation of all direct and indirect impacts of mining on Sequalitchew Creek" and that implementation of the plan is intended to constitute "more than 'mitigation" as defined in WAC 197-110-768 and other similar definitions. This part of the agreement is binding only on the non-governmental entities. The agreement also acknowledges that further mitigation measures may be suggested and implemented through the applicable permit processes.

[7] *The "Core Group" includes representatives from CalPortland Company, who operates and proposed to expand the aggregate mine on the north side of Sequalitchew Creek; the Nisqually Tribe; the Sequalitchew Creek Watershed Council, a non-profit organization; the Environmental Caucus (*non-governmental organizations) *which represents a number of non-profit organizations including the Nisqually Delta Association (NDA), the Black Hills Audubon Society, Washington Environmental Council (WEC), the National Audubon Society, People for Puget Sound, the Tahoma Audubon Society, the Seattle Audubon Society, and the Anderson Island Quality of Life Committee; Joint Base Lewis McChord which controls the headwaters of Sequalitchew Creek; Pierce County; the City of DuPont; and the Washington Department of Ecology.*

2.4 Description of the Proposed Action

The following identifies the Applicants Objectives for the *Pioneer Aggregates South Parcel Project* and describes the Proposed Actions necessary to implement these objectives.

Applicant's Objectives

The Applicant's goals and objectives for the South Parcel Project are as follows:

- Extract and utilize mineral resources of long-term commercial significance, consistent with the Growth Management Act and DuPont Comprehensive Plan.

- Continue to meet the Puget Sound regional demand for high-quality aggregates from designated mineral resource lands, including the existing mine and the South Parcel site in DuPont, using existing processing and transport facilities, and to achieve consistency with the terms of the 2011 Settlement Agreement.

- Expand mining horizontally into approximately 188 acres previously undisturbed by mining (including South Parcel), and vertical expansion of the depth of mining on approximately 125 acres where re-mining will deepen a portion of the Existing Mine to:
    - Fully utilize the site's high-quality reserves of sand and gravel that exists below the current permitted depth on the Existing Mine and under the surface of the South Parcel.
    - Extend the useful life of the existing processing and transport facilities by providing a reliably supply of quality aggregates for processing and transport.
    - Continue to provide the quality product mix to the sand and gravel market.

- Maintain barge export of the majority of mined aggregate materials to continue to limit the amount of export by truck and to maximize the environmental and other benefits associated with marine transport.

- Carry out a mine plan for the site that minimizes environmental impacts associated with mining activity, adheres to state and local regulations, and maximizes the economic value of the site;

- Ultimately, reclaim the site, including regrading, replacement of topsoil, and revegetation.

- Implement applicable provisions of the 2011 Settlement Agreement

Description of the Proposed Actions

To implement the Applicants Objectives for the site, the Proposed Actions for the Pioneer Aggregates South Parcel Project includes the following reviews and approvals:

- City of DuPont Community Development – Site Plan Review, Tree Modification Review, Critical Areas Permit, Determination of Transportation Concurrency.

- Washington State Dept. of Natural Resources – Surface Mine Reclamation Permit, and Forest Practices Permit.

The need for additional permits or approvals could be identified during the project review process.

2.5 Description of EIS Alternatives

Consistent with the September 2021 EIS Scoping Summary (see **Appendix A**), and to conduct a comprehensive environmental review, the alternatives analyzed in the EIS include: Alternative 1 - Proposed Action and Alternative 2 - No Action. Other possible alternatives are also discussed.

Alternative 1 - Proposed Action

Overview

The proposed South Parcel Project includes horizontal expansion of the mine footprint by approximately 188 acres onto the Expansion Area (including the South Parcel), vertical deepening on the approximately 125-acre Re-Mine Area where re-mining would deepen a portion of the Existing Mine, and extension of the existing rate of mining for an additional approximate 14-year period (depending on market conditions), increasing the available sand and gravel resources by 30 to 40 million tons. The Expansion Area is located within a Mineral Resource Overlay applied by the City of DuPont's Comprehensive Plan. The purpose of the overlay is to conserve mineral resources of long-term commercial significance for eventual extraction, as required by the Grown Management Act.

The geologic character of the site (and the Existing Mine) follows the configuration of geological features that determine the location of high-quality aggregate resources. The aggregate proposed to be mined is part of a geologic deposit known as the Steilacoom gravels that were deposited in the waning years of the last ice glaciations in the area. The Steilacoom gravels were deposited as a result of a glacial outburst, probably the failure of an ice dam that previously impounded a large lake. The resulting flood carried sands and gravels some distance and the associated transport, rework, and sorting washed much of

the silt and clay out of the gravels. That makes this source of aggregate particularly well suited to a variety of applications, particularly as a component of concrete. In this area, the Steilacoom gravels were deposited over older Vashon outwash and Olympia Beds (Qob) deposits. The Steilacoom gravels are deepest in the western portion of the site and become increasingly shallower to the east, as shown in the geologic cross section in **Figure 2-3**.

Mining on the site would generally proceed from north to south and east to west in the same manner as occurs in the Existing Mine. Annual mining quantities would be similar to quantities from the current mine as shown in **Table 2-1** (provided later in this Chapter) and would be extracted after groundwater flowing into the materials is intercepted. A 20-foot high noise berm would be constructed along the southern boundary of the site; the noise berm would be located behind existing vegetation on the site.

The South Parcel Project would involve seven primary activities: logging, clearing and topsoil removal, groundwater management, stormwater management, mining, processing & transport, and reclamation. These activities would overlap, with multiple actions occurring at any one time, as described below.

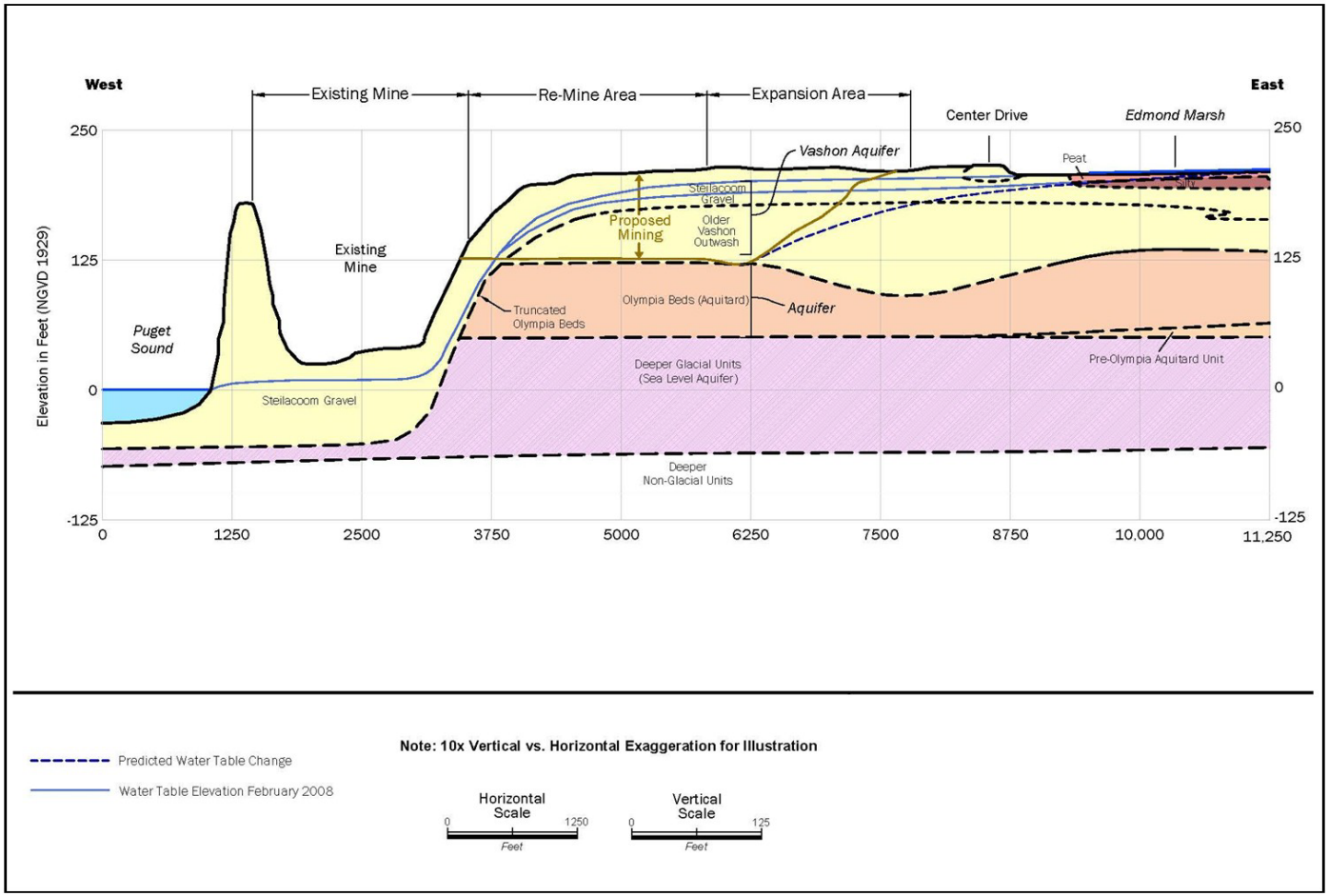
Logging

Timber was last logged from the South Parcel several decades ago, but tree cutting would be required on the majority of the South Parcel prior to clearing and mining in the Expansion Area. A substantial portion of the proposed mining would occur in areas where logging is not required, for example within previously reclaimed areas of the Existing Mine (i.e., the Re-Mine Area) or in previously unmined areas of the Existing Mine where Scot's broom shrub dominates the landscape.

The Expansion Area (including South Parcel, kettle wetland and buffer strip) would be logged at a single time prior to initiating mining, including proposed removal of trees meeting the definition of Landmark trees (DMC 25.10.120.005) within the mine footprint such as Oregon white oak, Douglas fir, western red cedar, Pacific madrone, and Pacific yew.

Clearing and Topsoil Removal

Prior to mining, excavators would be used to remove stumps and vegetation. This material would then be processed through a portable tub grinder and used to amend topsoil for use in reclamation. Clearing and topsoil removal would occur in the mine area, in segments as mining advances into the Expansion Area, over the life of the project.



Source: Aspect Consulting, 2022.

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Figure 2-3

Hydrogeologic Cross Section

Past industrial activities have resulted in elevated metals concentrations in portions of the Expansion Area. The Former DuPont Works Site is a clean-up site associated with the historical explosives and commercial munitions facility that operated from 1909 through 1976. The primary contaminants are arsenic and lead in surface soils. Cleanup activities were completed in 1993 to address the highest concentrations of lead, generally found along the foundations of the former buildings. Weyerhaeuser entered a Consent Decree with Ecology that required implementation of a restrictive covenant limiting land use on the Former DuPont Works Site to industrial uses, which is the origin of the Manufacturing and Research Park zoning for much of the site. The Expansion Area is also located downwind of the former Asarco copper smelter and refinery in Ruston, Washington. Airborne pollution emitted from the former smelter has resulted in a 1,000-square-mile, area-wide plume of arsenic- and lead-contaminated soil known as the Tacoma Smelter Plume ("TSP"). Surficial soils in the Expansion Area that have been undisturbed since the mid-1980s may contain arsenic and lead at concentrations above cleanup levels. These soils would be cleaned up in consultation with Ecology through the Voluntary Cleanup Program ("VCP"). Under the VCP, CalPortland has submitted a Cleanup Action Plan to Ecology describing the plan to address arsenic and lead in surface soils resulting from the TSP and remaining from the Former DuPont Works Site. The plan incorporates the same process that is being implemented on the North Parcel. Ecology has reviewed the Cleanup Action Plan and issued an opinion letter stating that after implementation of the plan "no further remedial action will likely be necessary at the Property to clean up contamination." The letter also describes the potential steps required to remove the restrictive covenant after arsenic and lead concentration in the surface soils have been reduced on the property.

Groundwater Management

As described under "Mining" later in this chapter, mining under the Proposed Action would proceed slowly from the north to the south over a period of five to eight years, extracting gravel to create a broad trough along the eastern property boundary.

An aquifer is present in the sands and gravels proposed to be mined under the South Parcel Project. Wells would be installed and pumped in advance of mining to intercept groundwater and dry out the gravels for mining. Pumped water is proposed to be infiltrated in the Existing Mine. The purpose of mining a trough would be to minimize the amount of time that active dewatering by pumping wells is required. Once mining of each section of the trough is completed, the adjacent wells would be turned off, allowing groundwater to passively seep from the stable mine slope and flow by gravity via a surface conveyance system to an infiltration facility on the floor of the western margin of the Existing Mine. After mining the trough along the perimeter, gravel would be extracted from the interior area.

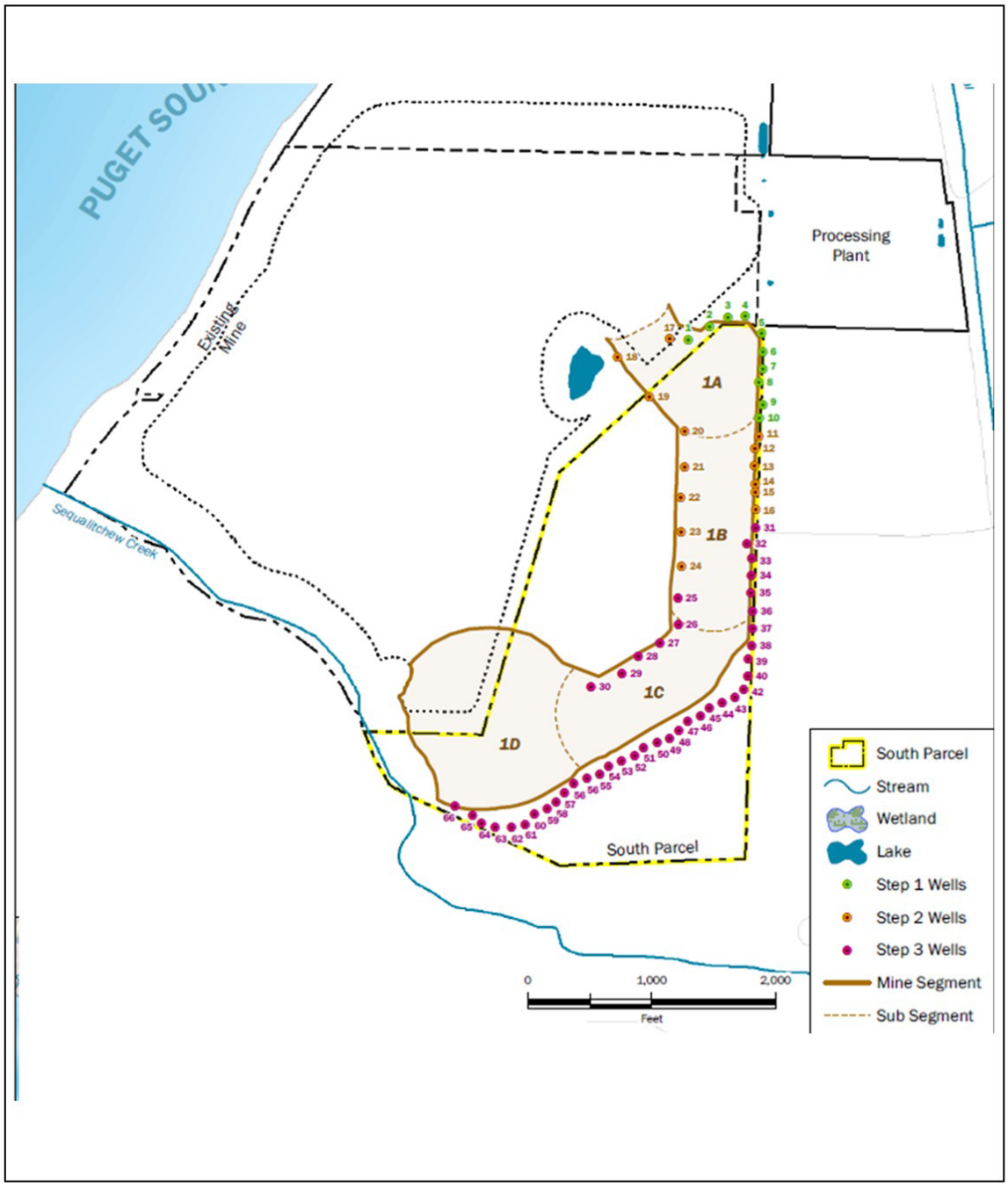
A detailed dewatering plan has been developed and involves four steps, occurring over the lifetime of the proposal (see **Figure 2-4, Groundwater Dewatering**). The four steps are:

- **The initial step** is a 60-day pumping test that would be completely reversible (i.e., no gravel would be extracted during the test). The results of that test would be analyzed to confirm predictions from the groundwater drawdown model and would be used to adjust the dewatering plan (well spacing, well screening, etc.) as necessary prior to commencing the next phase.

- **The second step** would involve installing and pumping additional dewatering wells to lower water levels in the first mine segment in preparation for mining. This step would last about six months and would function as a greatly expanded pumping test. As with the initial step, it would also be completely reversible. Groundwater observations during pumping would be compared to model predictions in order to confirm that actual changes in groundwater are within the range predicted during project planning, when potential impacts from the project are evaluated. This step would confirm model predictions before any gravel is removed from the Expansion Area.

- **The third step** – active dewatering during mining – would involve mining the trough described above. Additional dewatering wells would be installed and pumped as mining progresses. Mining would begin at the northerly location farthest from the Edmond Marsh and Sequalitchew Creek and proceed slowly south. Completing the trough would require five to eight years depending on market conditions and the success in meeting predicted groundwater levels. The potential impact on groundwater levels would build slowly over time as wells would be added and mining would progress to the south. This would allow ample opportunity to monitor, confirm model predictions, and adapt to the conditions observed before mining proceeds into each dewatered segment.

- **The final step** – passive dewatering – would begin when mining of the trough described above is complete and the last dewatering well is turned off. Passive dewatering represents the groundwater condition that would continue in perpetuity. Groundwater, no longer intercepted by wells, would form seeps at the toe of the eastern mine slope. It would flow by gravity down the slopes and into and through a conveyance ditch to newly created wetlands on the bottom of the Existing Mine and eventually to an infiltration facility at the western margin of the Existing Mine. Once this step has begun, further mining activities in the interior of the South Parcel would not have additional effects on groundwater. See Section 3.3, **Surface Water**, and Section 3.4, **Groundwater,** for additional detail.



Source: CalPortland, 2021

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Figure 2-4

Groundwater Dewatering Plan

An adaptive management plan aimed at observing and responding to changes in groundwater levels has been developed to guide dewatering activities during all four dewatering steps. The adaptive management plan, called the Monitoring Plan (Aspect Consulting. 2017), was developed in consultation with the Environmental Caucus non-governmental organizations as required by the Settlement Agreement. During dewatering, adaptive management involves the following steps: (1) monitoring at groundwater wells throughout each dewatering step; (2) comparing those monitoring results with thresholds established for each well; and (3) adapting dewatering activities if water levels are below the thresholds. The thresholds established in the Monitoring Plan were developed using a groundwater model based on 12 years (2004-2015) of data, using available data for observed groundwater levels at wells throughout the watershed. The thresholds are established for each well, in each month of the year, at each dewatering step. The Monitoring Plan also includes a process for notification of results below the thresholds and any adaptive management actions taken, and routing periodic reporting.

Stormwater Management

A stormwater management system would be installed onsite, consistent with City of DuPont's stormwater requirements which adopt the minimum requirements of the *Washington State Department of Ecology's (Ecology) Stormwater Management Manual for Western Washington* (as amended in 2014). These facilities would be constructed as mining advances and would serve the site at the completion of mining. They would also be used as the primary components of temporary stormwater management during construction. The proposed stormwater management system would preserve the natural drainage pattern of the site. Precipitation falling on the site would be collected and infiltrated internally within the site. From there it would join the sea-level aquifer beneath the site and flow to Puget Sound, as it does currently. Once the site is reclaimed, stormwater from the eastern slope of the proposed mine expansion would be collected along with groundwater inflows and drain to a mitigation wetland to be constructed on the floor of the Existing Mine to provide hydrologic support to the wetland. There are no outfalls or other discharges of stormwater to surface water proposed. Stormwater runoff best management practices (BMPs) -- two-celled wet ponds – would be included upstream of the proposed infiltration facilities to prevent contamination of surface or groundwaters.

A Stormwater Pollution Prevention Plan (SWPPP) developed under Ecology's Sand and Gravel General Permit would be implemented to control erosion and sedimentation. (See Section 3.3, **Surface Water***,* for further details.)

Mining

Mining under the Proposed Action would begin by proceeding slowly from the north to the south over a period of five to eight years, extracting gravel to create a broad trough along the eastern property boundary (see **Figure 2-5, Mine Phasing**). The method of mining would be similar to that currently used in the permitted mine area. A dozer would push excavated

material from the top of the mine face to two front-end loaders working on the mine floor. The front-end loaders would scoop up the sand and gravel and dump it into portable hoppers that would feed conveyors leading to the processing area.

The mine face would be a maximum of 80 feet high and would decrease as mining progresses east. During reclamation, as described further below, the graded side slopes and mine areas would be revegetated and stabilized in accordance with the mine reclamation plan.

A conveyor would start at the north end of the Expansion Area and would be extended south as mining progresses. The conveyor would be comprised of a 48-inch-wide rubberized belt that would be supported by a series of rollers, called idlers, mounted on steel-framed segments that would support the conveyor about five feet off the ground.

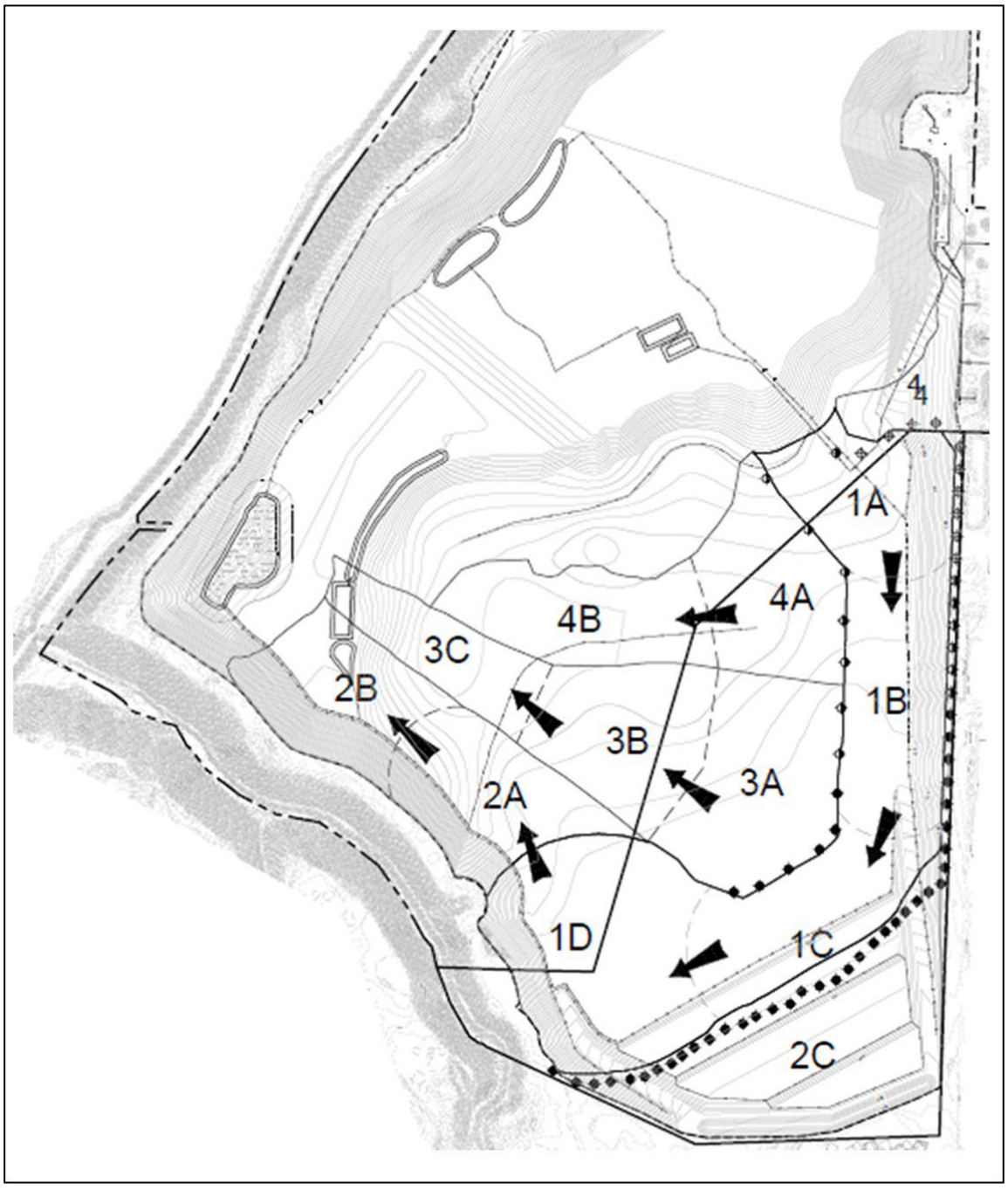
As indicated above, clearing (topsoil stripping and stump removal) of the Expansion Area would occur in sequences lasting approximately one year, in coordination with mining. Mass clearing of the site would not occur.

A 20-foot-high noise berm would be constructed along the southern boundary of the South Parcel, behind retained vegetation. The berm would help reduce potential noise associated with mining for adjacent land uses. The berm would be constructed prior to clearing in the adjacent portion of the South Parcel.

The Proposed Action would directly impact an approximately 1.78-acre kettle wetland located within the Existing Mine immediately west of the South Parcel. The kettle wetland is supported by groundwater and would be impacted by dewatering in preparation for mining, then removed during the initial phases of mining of the South Parcel Project. Impacts to the kettle wetland are proposed to be mitigated by creation of a larger wetland within the Existing Mine. See Section 3.5, **Plants and Animals**, for discussion on wetland impacts and mitigation under the EIS Alternatives.

Processing and Transport

Material mined with the South Parcel Project would be conveyed from the mine to the existing processing facility and would be processed in the same general manner as at present. The material extracted under the South Parcel Project is anticipated to have a higher moisture content and fines content than the aggregate currently being extracted. As a result, there may be minor adjustments to some of the equipment used in the processing area, but the overall process and most of the equipment would remain unchanged from current conditions.



Source: CalPortland, 2021

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Figure 2-5

Mine Phasing Plan

Water would be used to wash the raw material conveyed from the mine to remove silt and clay. Sand and gravel smaller than 1.5 inches would pass through a screening and classifying process that would separate and convey the material to a series of stockpiles sorted by size and stacked on the south side of the processing plant. Stones larger than 1.5 inches would be crushed, sorted by size, and conveyed to a series of crushed-rock stockpiles sorted by size north of the processing plant. Screening equipment, rock crushers, and other processing equipment would be located between the stockpiles of sorted rock products. Custom blended rock products would also be made to customer specifications.

As under current conditions, approximately 95% of water used to process the mined material would be recycled through a treatment system where silt and clay would be removed so the water could be reused to process more raw material from the mine.

The mode and extent of transporting aggregate products from the site would not change relative to existing operations. Approximately 80% of the product would be loaded onto barges at the existing barge loading facility at Tatsolo Point and transported to the Puget Sound regional market by barges (refer to **Figure 2-1, Vicinity Map**). Approximately 20% of the product would be transported to the local market by truck. Some material would continue to be incorporated into concrete at the existing on-site concrete batch plant serving the local market.

Estimated Volume and Extraction Rates

Estimated mining quantities are shown in **Table 2-1**. Based on past market demand, material would be extracted at an average rate of approximately 2.8 million cubic yards per year. In total, an estimated 30 to 40 million cubic yards of material would be extracted under the South Parcel Project, which would extend the life of the current operation by approximately 14 years. The actual extraction rate and life of the mine would depend on the market demand for materials.

Table 2-1
ANNUAL AGGREGATE MINING QUANTITIES / TIMING

Timing	Existing Mine[1] in Cubic Yards	Proposed Action in Cubic Yards
Years 1 – 14	1.4 Million	1.4 Million
Years 15 – 19	0	2.8 Million

Source: CalPortland, 2021.

[1] Includes North Parcel.

Reclamation

As mining progresses, completed mine segments would be reclaimed. The reclamation plan would be reviewed by the Washington State Department of Natural Resources ("DNR") for

consistency with the Surface Mining Act (RCW 78.44). In general, reclamation would consist of regrading, replacement of topsoil, and revegetation. CalPortland is in the process of preparing an application to revise the existing reclamation plan incorporated into the surface mining permit. DNR cannot approve the revised reclamation plan until after the City's permits are issued. The proposed reclamation plan will be similar to the plan approved by DNR for the Existing Mine. See **Figure 2-6, Reclamation Plan** for an illustration of the reclaimed site.[8]

Table 2.2 provides a comparison of existing site conditions with site conditions under the Proposed Action (post-reclamation).

Alternative 2 - No Action

A No Action alternative is required by SEPA. "No action" is interpreted to mean that the South Parcel Project mining proposal would not be implemented. It does not necessarily mean that nothing would happen on the subject site. The site (including a portion of the Existing Mine and the South Parcel) could remain undeveloped or could be developed in the future in residential and manufacturing and research park uses, based on the existing zoning in this area. Accordingly, the No Action Alternative includes two scenarios: Scenario A – Continuation of Existing Site Conditions; and, Scenario B – Site Development under Existing Zoning.

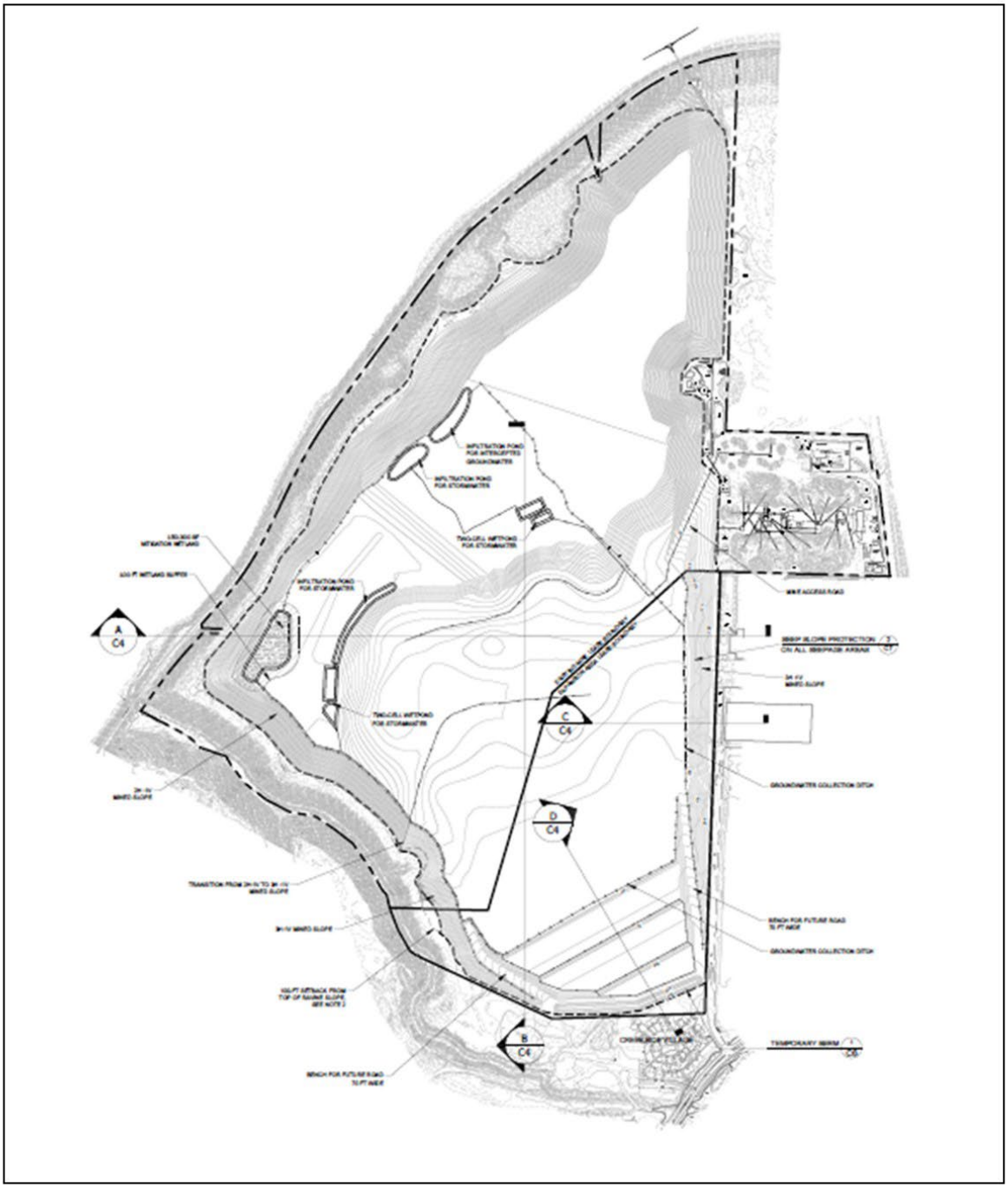
No Action Scenario A – Continuation of Existing Conditions

The No Action Alternative assumes that the South Parcel Project (including horizontal expansion into the Expansion Area and vertical deepening into the Re-Mine Area of the Existing Mine) would not occur. Mining activities associated with the Re-Mine Area of the site and the Existing Mine would continue as currently permitted. The kettle wetland within the Re-Mine Area would remain intact, the wetland buffers would remain vegetated, and mining operations would continue in other portions of the Existing Mine. The Existing Mine has an estimated remaining life of 6 to 10 years with mining currently limited to 10 feet above groundwater.[9] For Scenario A, it is assumed that annual extraction of approximately 2.8 million cubic yards associated with the currently permitted mining activities on the Existing Mine would continue, with processing and export as at present. However, actual extraction, processing, and export would depend on market conditions.

The South Parcel portion of the site is assumed to remain undeveloped and would continue in its vegetated condition.

[8] *Includes Existing Mine, North Parcel, and South Parcel.*

[9] *Currently permitted mining includes mining activities on the Existing Mine and North Parcel*.



Source: CalPortland, 2021

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Figure 2-6
Reclamation Plan

Table 2-2
SITE CONDITIONS COMPARISON

Land Use	Area [1] in Acres									
	Existing Conditions					Proposed Action - Post-Reclamation				
	Expansion Area			Re-Mine Area	Total	Expansion Area			Re-Mine Area	Total
	South Parcel	Kettle Area	Buffer Strip			South Parcel	Kettle Area	Buffer Strip		
Built Areas										
Buildings	--	--	--	--	0.00	--	--	--	--	0.00
Roads, Access, and Parking	--	--	0.4	9.2	9.55	--	--	--	--	0.00
Processing Areas	--	--	0.2	17.9	18.08	--	--	--	--	0.00
Active Mining	--	--	--	--	0.00	--	--	--	--	0.00
Active Reclamation	--	--	0.2	20.5	20.62	--	--	--	--	0.00
Cleared for Mining	--	--	--	--	0.00	--	--	--	--	0.00
Water Management Ponds	--	--	--	--	0.00	--	--	--	--	0.00
Total Built Areas	**0**	**0**	**0.8**	**47.5**	**48.26**	**0**	**0**	**0.00**	**0.00**	**0.00**
Natural & Reclaimed Areas										
Areas Reclaimed as Forest	--	--	--	3.3	3.3	29.4	0.6	0.6	35.8	0.6
Areas Reclaimed as Grass	--	--	--	68.5	68.5	138.2	10.2	8.6	89.4	10.2
Wooded Areas	146.2	5.6	7.4	5.8	165.1	--	--	--	--	0.0
Grass Areas	21.3	--	1.0	0.21	22.5	--	--	--	--	0.0
Wetland	--	1.78	--	--	1.78	--	--	--	--	0.0
Wetland Buffer	--	3.4	--	--	3.4	--	--	--	--	0.0
Total Natural & Reclaimed Areas	**167.5**	**10.8**	**8.4**	**77.7**	**264.5**	**167.5**	**10.8**	**9.2**	**125.2**	**312.7**
Total	**167.5**	**10.8**	**9.2**	**125.2**	**312.7**	**167.5**	**10.8**	**9.2**	**125.2**	**312.7**

Source: CalPortland, 2022.

Notes: -- Indicates no area of this type.

1) Totals may not exactly equal the sum of their components due to rounding.

The Sequalitchew Creek Restoration Plan developed by CalPortland and the Environmental Caucus non-governmental organizations in accordance with the 2011 Settlement Agreement includes a commitment from CalPortland for funding, monitoring data, and advocacy The plan also requires coordination between the Environmental Caucus non-governmental organizations, South Puget Sound Salmon Enhancement Group (SPSSEG), and Joint Base Lewis-McCord (JBLM). In the absence of CalPortland, the advocate and sponsor for the Sequalitchew Creek Restoration Plan under the No-Action Alternative would be SPSSEG.

The No-Action Alternative Scenario A includes the potential for the Sequalitchew Creek Restoration Plan to be implemented without the Proposed Action. The Restoration Plan entails Creek restoration activities both on JBLM property and outside JBLM within the City of DuPont. Funding for alterations to the diversion system on JBLM property is currently programmed by JBLM. For the portions of the plan outside JBLM, other funding sources (e.g., grants) would be required to implement the plan and may include a variety of sources of watershed restoration funds including Washington State salmon recovery funds. Such funds would likely need to be obtained through a competitive process and may or may not be at the same level of funding and/or at the same timeline as under the Proposed Action. At the present time, CalPortland is the only confirmed source of funding available to complete the portion of the work that the Restoration Plan requires outside JBLM.

No Action Scenario B – Site Development Under Existing Zoning

As indicated above, the No Action Alternative assumes that the proposal would not occur and the site (including the Re-Mine Area and South Parcel) could be developed in the future in residential and manufacturing and research park uses, based on the primarily R-4, R-R, and MRP zoning in this area. Accordingly, No Action Alternative Scenario B assumes site development under existing zoning.

Portions of the site are zoned for Manufacturing and Research Park (MRP; 136.2 acres), Residential-4 (R-4; 16.1 acres), Residential Reserve (RR; 22.3 acres), and Open Space/Sensitive Area (3.8 acres) uses. The MRP zoned areas are currently subject to restrictive covenants related to the former DuPont Works Cleanup Site, which restrict use of the property to industrial uses.

The extent of development could vary considerably depending on zoning/density, site planning, economic considerations, and numerous site-specific, project-specific and regulatory requirements (e.g., setbacks, open space, and the presence of critical areas). The following is intended to be a general estimate of the possible intensity of development for purposes of analysis only and is based primarily on zoned density and permitted site coverage. Development estimates are based on assumptions of building and parking areas as a percentage of developable area and do not represent a specific or detailed development proposal.

Areas zoned MRP would be available for development of up to 112 acres of light manufacturing and research park. Buildings may be up to 65 to 70 feet tall and there are no maximum lot coverage requirements other than necessary to meet required setback (25 feet on the front property line, 15 feet on the sides and rear) and landscaping (20% of lot area) requirements. This MRP zoned area could yield approximately 109 acres of impervious area at up to 80% lot coverage. The areas of the South Parcel zoned R-4 could be developed at a density of up to 4.5 single-family residences per gross acre, resulting in a total of approximately 76 residences with 69% impervious coverage. An additional four single-family residences could be developed in the smaller portion zoned for Residential Reserve density (one dwelling unit per 5 gross acres) and 34% impervious coverage.

There would be no changes in the use of the areas of the South Parcel zoned for Open Space. These areas are currently the naturally vegetated slope of the Sequalitchew Creek ravine and the Sequalitchew Creek pedestrian trail.

The No-Action Alternative Scenario B also includes the potential for the Sequalitchew Creek Restoration Plan to be implemented without the Proposed Action. However, as described under No Action Scenario A, while it is theoretically possible that another advocate could be identified and other funding could be obtained to implement the Sequalitchew Creek Restoration Plan developed by CalPortland and the Environmental Caucus non-governmental organizations, there are no other known likely substantial funding sources.

Alternatives Considered but not Carried Forward

SEPA requires that an EIS consider “reasonable alternatives” to a proposal, in addition to “no action” (i.e., not implementing the proposed action). A reasonable alternative is defined in the SEPA rules as one that can feasibly attain the proponent’s objectives at a lower environmental cost (WAC 197-11-440(5)(b)). Existing regulations and commitments are also relevant considerations when determining whether a particular course of action is reasonable. This EIS evaluates the Proposed Action and No Action. Three additional alternatives that were suggested in scoping comments are considered further below.

Prior environmental documents, including four EISs and SEISs for mining proposals within DuPont’s Mineral Resource Overlay, have considered numerous alternatives for the location, design or operation of mining plans and components, key mining facilities and modes of transporting. The range of options has included processing plant locations, dock locations, conveyor route alignments, access road locations, varied transportation modes (barge, truck and rail) and mode split options, barge staging locations, alternative process water recycling methods, mining methods and mining area boundaries, alternative dewatering methods, and mitigation actions. These options are summarized in the North Parcel Draft EIS (2013) in Table 2-4. In addition, some options, and some elements of prior proposals, have been identified or eliminated by the terms of past Settlement Agreements. The 2011 Settlement Agreement, for example, eliminated several options for mining the

North Parcel and established a mining boundary that avoided mining the bluffs along Puget Sound.

The *Final Feasibility Study* (2010), which provided information for the 2011 Settlement Agreement, identified and evaluated 24 alternatives for mining, dewatering and mitigation actions within the Sequalitchew Creek Watershed. Evaluation criteria that were applied to screen the full range of alternatives included operational viability, cost, environmental effects, uncertainty and regulatory viability, as well as several others. Mining options evaluated for the South Parcel included the following: (1) Mining Above the Aquifer; (2) Subaqueous (Wet) Mining Within the Aquifer; and (3) Various Dewatering Options, a category of actions to manage groundwater that consisted of several options for conveying groundwater for discharge to Sequalitchew Creek, including creation of an open channel (North Sequalitchew Creek), micro-tunneling, or diversions by pipe using other routes. The Feasibility Study's list of recommended options did not include alternatives that would involve conveying dewatering water to Sequalitchew Creek by gravity via tunnels or artificial structures (e.g., FS Alternatives 3.2.5) and these alternatives were not carried forward into the 2011 Settlement Agreement. The micro tunneling option of conveying groundwater to Sequalitchew Creek discussed in this EIS is among the potential mitigation measures that could be evaluated and implemented as part of adaptive management if necessary and appropriate and would require resolution of conflicting provisions in the in the 2011 Settlement Agreement.

The Feasibility Study evaluation concluded that the mining options (wet mining or mining above the aquifer) were infeasible or unreasonable. The most salient reasons for eliminating these options included exorbitant capital and/or operational costs (wet mining in the aquifer and North Sequalitchew Creek dewatering options); and unreasonable reduction in the amount of sand and gravel that could be extracted (mining above the aquifer).

Additional Alternatives Considered

Comments received during the scoping process for the EIS suggested three possible additional alternatives which are discussed below.

1. Reduced Mining Alternative

Several comments received during EIS scoping suggested a "reduced mining" alternative. Reduced mining could be interpreted to mean a reduced area that is mined, a reduced depth of mining, and/or a reduced amount of material that is extracted by mining. The areal extent and depth of mining is based on site geology and the amount of material the Applicant proposes to extract is based on stated project objectives, the economics of mining, and the market demand for sand and gravel resources. The proposal would also maintain the same rate of mining as for the original mine and the North Parcel. The proposed area of the South Parcel Project is also based on maintaining a buffer around the

active mine area to mitigate noise and visual impacts, and to maintain separation from adjacent off-site historical resources required by applicable conditions of approval. Reducing the size of the mine area by some additional amount would not, by itself, likely result in noticeable reductions in impacts to the environment that could not also be achieved through mitigation measures that are or could be incorporated into the proposal. For example, noise impacts to adjacent land uses could be effectively mitigated by the proposed noise berm as well as reducing the mine area and/or providing greater separation between uses. A smaller mining area would not, per se, result in less traffic or different impacts to land use, for example. In developing the Proposed Action, CalPortland revised the mining plan from prior submittals to increase the distance between the noise berm and the Creekside Village development to leave intact the existing vegetation. The proposed berm is set back an average of 145 feet from the property line, compared with 30 feet under earlier proposals. This change reduced the mine footprint in the shallowest portion of the mine.

"Reduced mining" could also suggest reducing the depth of mining. A potential rationale for this scenario could be to avoid mining into the aquifer. As noted in the previous discussion of this potential alternative in the 2010 Final Feasibility Study, the site's high seasonal groundwater level would result in effectively prohibiting commercially viable mining under this scenario. The prior analysis concluded that this alternative does not meet the criteria for reasonable alternatives because it could not feasibly attain or approximate the proposal's objectives and does not appear to reduce environmental impacts.

2. Preserve the Kettle Wetland Alternative

The 1.78-acre kettle wetland, which is discussed in Section 3.5, **Plants and Animals**, is located on the original Pioneer Aggregates mine site and was maintained pursuant to a condition of approval. The South Parcel Project proposes to remove the wetland and to mitigate for the impact by creating a 3.56-acre wetland complex off-site within the existing mine. The amount of sand and gravel material that would be extracted as a result of removing the wetland would not be significant and is not the reason for its removal. Because the kettle wetland is supported by groundwater from the site's aquifer, mining and dewatering as proposed would remove its source of water and the wetland would dry up over time. It is not feasible to retain the wetland and to mine into the aquifer. Any reduction in environmental impact from retaining the wetland would be offset by the wetland mitigation that is proposed.

3. No Dewatering for Mining Using Wells, and Creation of an Interceptor Channel

This alternative, which was suggested during the EIS scoping process, would involve construction of an interceptor channel along the western edge of Edmond Marsh. The comment hypothesized that the Olympia Beds rise to near the ground surface in the vicinity of Edmond Marsh, forming a convenient location for constructing an interceptor channel to collect groundwater flow. The interceptor channel would be an open channel, much like a

ditch. To be effective at dewatering to support mining, it would need to extend vertically to the depth of the Olympia Beds and horizontally the full length of the east side of the South Parcel.

Extensive drilling conducted in the 1980s during initial geologic and groundwater studies for the Pioneer Aggregates mine indicates that the Olympia Beds are found between 87 to 139 feet below the ground surface in the borings closest to Edmond Marsh. Several of the borings closest to the marsh did not encounter the Olympia Beds at their completion depths of 65 to 103 feet. None of these borings encountered the Olympia Beds near the ground surface. These borings are located in the southeast corner of the South Parcel and in the southern portion of the parcel now occupied by the Amazon Fulfillment Center. In 2002, a boring was completed in the western end of Edmond Marsh and encountered the Olympia Beds at a depth of 84 feet. Thus, it is reasonable to expect that the Olympia Beds are present under Edmond Marsh at around 80 to 100 feet below the ground surface (see **Appendix E** for details on the borings and depth of the Olympia Beds).

The shallow interceptor channel along the western and southern perimeter of Edmond Marsh envisioned in public comment would not capture sufficient groundwater to allow for mining of the South Parcel. To be effective, an interceptor channel would need to be approximately 80 to 100 feet deep and extend several thousand feet to the north, crossing through existing developed areas. An open channel 80 to 100 feet deep would be at least 500 to 600 feet wide at the top. Such an interceptor channel would have dramatic land use impacts, and by being closer to Edmond Marsh would likely have a greater impact on wetland water levels than the Proposed Action.

Evaluation of the interceptor channel alternative concluded the following: (1) the alternative relies on a presumed geologic structure (the rise of the Olympia Beds to near the ground surface) that is not supported by the borings completed in the vicinity; and (2) it is not feasible to construct an open channel along the western edge of Edmond Marsh that extends from the surface to the depth of the Olympia Beds and runs along the full length of the South Parcel. Therefore, this alternative was determined to be infeasible and is not carried forward for detailed analysis.

In summary, prior studies, environmental documents, feasibility analyses and the provisions of settlement agreements over a period of almost two decades have considered a wide range of options for mining, locating mining facilities, and mitigating for environmental impacts and, in combination, have narrowed the range of reasonable alternatives to the Proposed Action and No Action. The additional alternatives that were considered and are discussed in this section of the Final EIS are not consistent with the objectives of the proponent, are not considered feasible, and are not reasonable alternatives for purposes of SEPA analysis.

2.6 Benefits and Disadvantages of Deferring Implementation of the Proposal

The benefits of deferring approval of the Proposed Action include the following:

- Potential impacts associated with vertical deepening of mining in the current mining area and horizontal expansion into the area not mined, including changed conditions associated with surface and groundwater, plants and animals, noise, air quality, and traffic.

- Alternative uses of the property allowed under the underlying zoning could provide for uses without the constraints of developing within the reclaimed mine pit.

The disadvantages of deferring the approval of the Proposed Action include the following:

- Development pressure in the City for alternative uses of the property could compromise preservation of a commercially valuable deposit of high-quality sand and gravel, which deposit is designated as Mineral Resource Land of long-term commercial significance in the City's Comprehensive Plan, in conformance with the State Growth Management Act.

- Deferring mining would limit the supply of sand and gravel material for infrastructure and building projects in the Puget Sound region. Public and private sector builders would be required to travel further distances to obtain sand and gravel, with greater impact to the regional road system, air quality, and greenhouse gas emissions.

- Diminished ability to continue to utilize water transportation of mined sand and gravel resource to the Puget Sound region from this source. The availability of alternate aggregate sources with barge access has not been documented.

- Funding for the Sequalitchew Creek Restoration Plan, pursuant to the 2011 Settlement Agreement could be deferred. Alternative funding from competitive grants likely would be required for implementation.

- Remediation of surface soil contaminants in the expansion area would occur in the future, consistent with the Cleanup Action Plan, as part of a future mining proposal or other development.

- Excise taxes and other revenues to the state and City of DuPont would be deferred.

- Jobs associated with the CalPortland's mining operation in DuPont would be reduced over time as the Existing Mine is exhausted. This reduction would also reduce indirect employment supported by the aggregate industry and associated wages and spending.

Chapter 3

AFFECTED ENVIRONMENT, IMPACTS, ALTERNATIVES, MITIGATION MEASURES, & SIGNIFICANT UNAVOIDABLE ADVERSE IMPACTS

CHAPTER 3
AFFECTED ENVIRONMENT, IMPACTS, MITIGATION MEASURES, AND SIGNIFICANT UNAVOIDABLE ADVERSE IMPACTS

This chapter of the Final Environmental Impact Statement (FEIS) describes the affected environment (i.e., existing conditions), impacts of the EIS Alternatives, mitigation measures, and any significant unavoidable adverse impacts on the environment that would be anticipated under the EIS Alternatives. Information added or changed subsequent to the Draft EIS, if any, is shaded to ease identification of any added or changed information.

3.1 EARTH

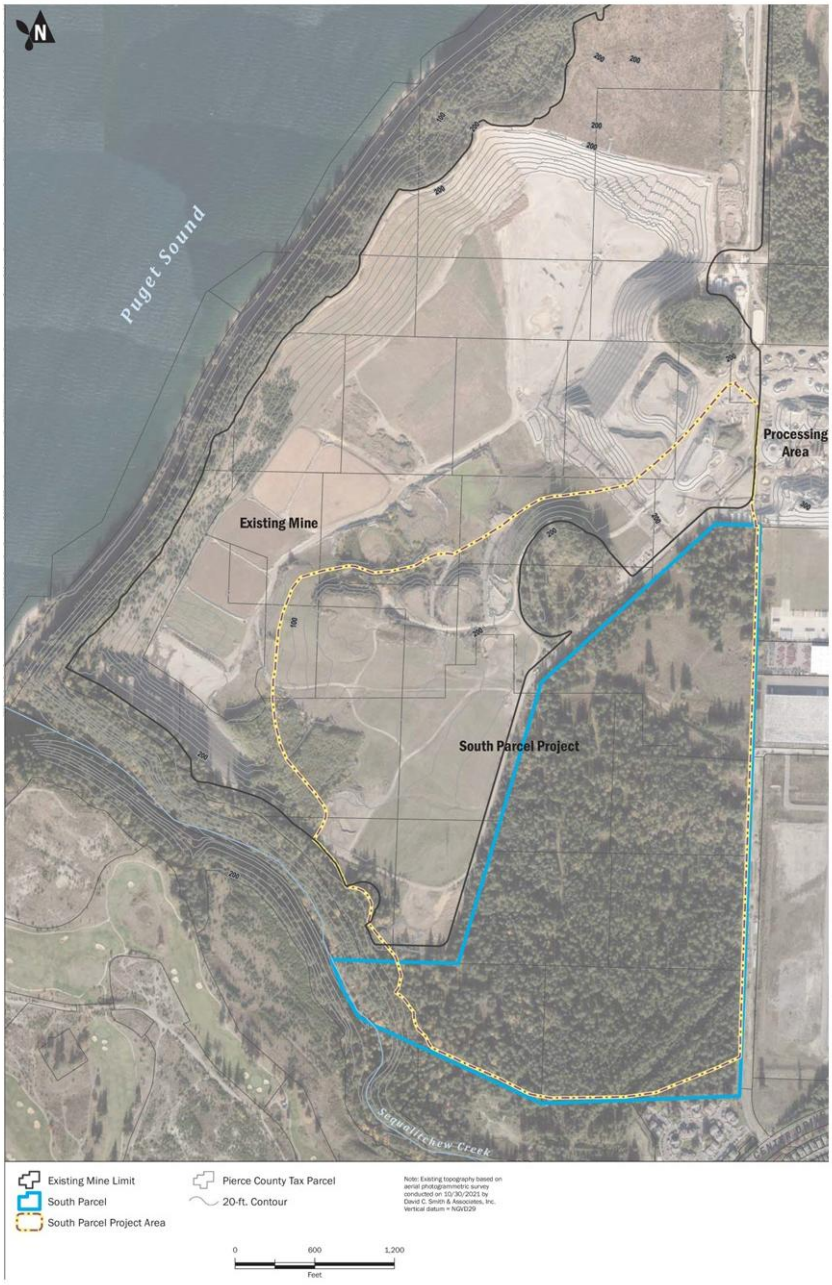
This section of the FEIS describes the existing topographic, soils, and geologic conditions on and in the vicinity of the site (including the approximately 188-acre Expansion Area and approximately 125-acre Re-mine Area onsite). Potential impacts associated with the EIS Alternatives are evaluated and mitigation measures identified. This section is based on the *Earth and Water Resources Report* (May 2023) prepared by Aspect Consulting and peer reviewed by Landau Associates (see **Appendix B**).

3.1.1 Affected Environment

Geologic and geotechnical analyses were performed to determine geologic conditions beneath the existing ground surface of the Pioneer Aggregates South Parcel Project site (including both the Expansion Area and Re-Mine Area portion of the site). These analyses were completed to evaluate the stability of proposed cut slopes and identify areas prone to geologic hazards, such as slope failure or seismically-induced soil liquefaction. The analysis rely on geologic investigations conducted over a period of more than 30 years, notably including over 109 borings completed in the late 1980s to facilitate planning of the initial Pioneer Aggregates mine (see **Appendix B** for detail).

Topography and Landform Geography

The site is comprised of the Expansion Area, which is undisturbed by mining, and the Re-Mine Area, which is a portion of the existing mine. Existing topography of both areas is shown on **Figure 3.1-1**. The Expansion Area portion of the site is generally flat and at an elevation of approximately 200 feet. The Re-Mine Area has a rolling slope toward the west down to the floor of the existing mine (western boundary of the site). The slopes to the west within the Re-Mine Area portion of the site vary between a grade of 10% to 70% locally.



Source: Aspect, 2022.

EA Engineering, Science, and Technology, Inc., PBC

Figure 3.1-1
Existing Topography

The Sequalitchew Creek ravine is located south and southwest of the site; this ravine forms most of the southern boundary of the existing mine. The ravine deepens as it approaches Puget Sound to a maximum depth of 175 feet below the plateau elevation. Slopes along the northern side of the Sequalitchew Creek ravine range from approximately 30% to 75%. A narrow-gauge railroad associated with the former E.I. DuPont de Nemours Company munitions facility was constructed on a bench cut into the northern slope of the ravine; it has since been converted to a public trail.

Regional Geology and Geologic History

The geology of the region, and South Parcel Project site, is dominated by past glaciation. The most recent ice-sheet glaciation of the Puget Lowland is termed the Vashon Stade of the Fraser Glaciation. Global and regional scientific observations indicate that there were many cooler climatic periods prior to the Vashon glaciation that produced ice-sheet glaciations, and deposits from a number of these pre-Vashon glacial and non-glacial periods in the Puget Lowland have been identified.

During the southward advance of the Vashon ice sheet, ice blocked the normal northward drainage of water from the Puget Sound Lowland, creating a lake into which silt, clay, and fine sand were deposited. As the Vashon ice sheet advanced farther southward, meltwater streams and rivers filled the remaining low areas with a blanket of sand and gravel that extended throughout the lowland. These subglacial troughs are visible today as the major waterways of Puget Sound, Hood Canal, Lake Washington, and Lake Sammamish, and many of the broad river valley bottoms in the Puget Lowland. A discontinuous layer of basal till (also described as lodgment till) was deposited where the glacial ice sheet contacted previously deposited sediment.

The Vashon ice sheet was short lived in the lowland and the advance of glacial ice appears to have stagnated abruptly. Sediment that was entrained on or within the ice was deposited on the landscape when the ice melted. These deposits are called ablation till and are found largely intact where they were deposited on the uplands. Ablation till deposited in low areas was reworked by meltwater streams that flowed from the melting glaciers to form recessional outwash. In places, the deposits were influenced by shifting ice margins creating highly variable ice contact deposits, which contain both water-worked sands and gravels, and interbeds and lenses of silt and clay and till-like deposits.

These recessional sand and gravel deposits and interbedded ice contact deposits are collectively identified as Vashon Recessional Outwash (Qvr). The recessional outwash generally consists of clean (containing very little silt and clay) sand and gravel, or sand and gravel with variable amounts of silt and interbeds and lenses of silty sands and gravels.

As the glaciers melted and receded, a lobe of ice blocked the northward drainage of the Puyallup valley, creating Glacial Lake Puyallup. A prominent late recessional gravelly outwash member called the Steilacoom Gravel is interpreted to have formed when a series

of ice dam bursts (jokulhlaups) released the glacially impounded water in Glacial Lake Puyallup. Floodwaters spilled and transported coarse-grained sediments into a broad outwash plain in the Sequalitchew Creek area. These coarse-grained deposits created thick deltas where the outburst channels flowed into a lower elevation lake (Glacial Lake Russell) that had formed behind the remaining Vashon glacial ice.

Glacial Lake Russell (which is now partially occupied by modern Puget Sound) was deep and had steep sided walls in the site area, similar to those of the modern coastal bluffs. The contact between the sediments exposed in the former walls of Glacial Lake Russell and the overlying late glacial delta and flood deposits derived from Glacial Lake Puyallup is similarly steep and exhibits a marked change in soil types. The contact is called the "Olympia Beds Truncation". The location of the Olympia Beds Truncation is a key geologic and hydrologic feature at the site; see Figure 6 of **Appendix B**).

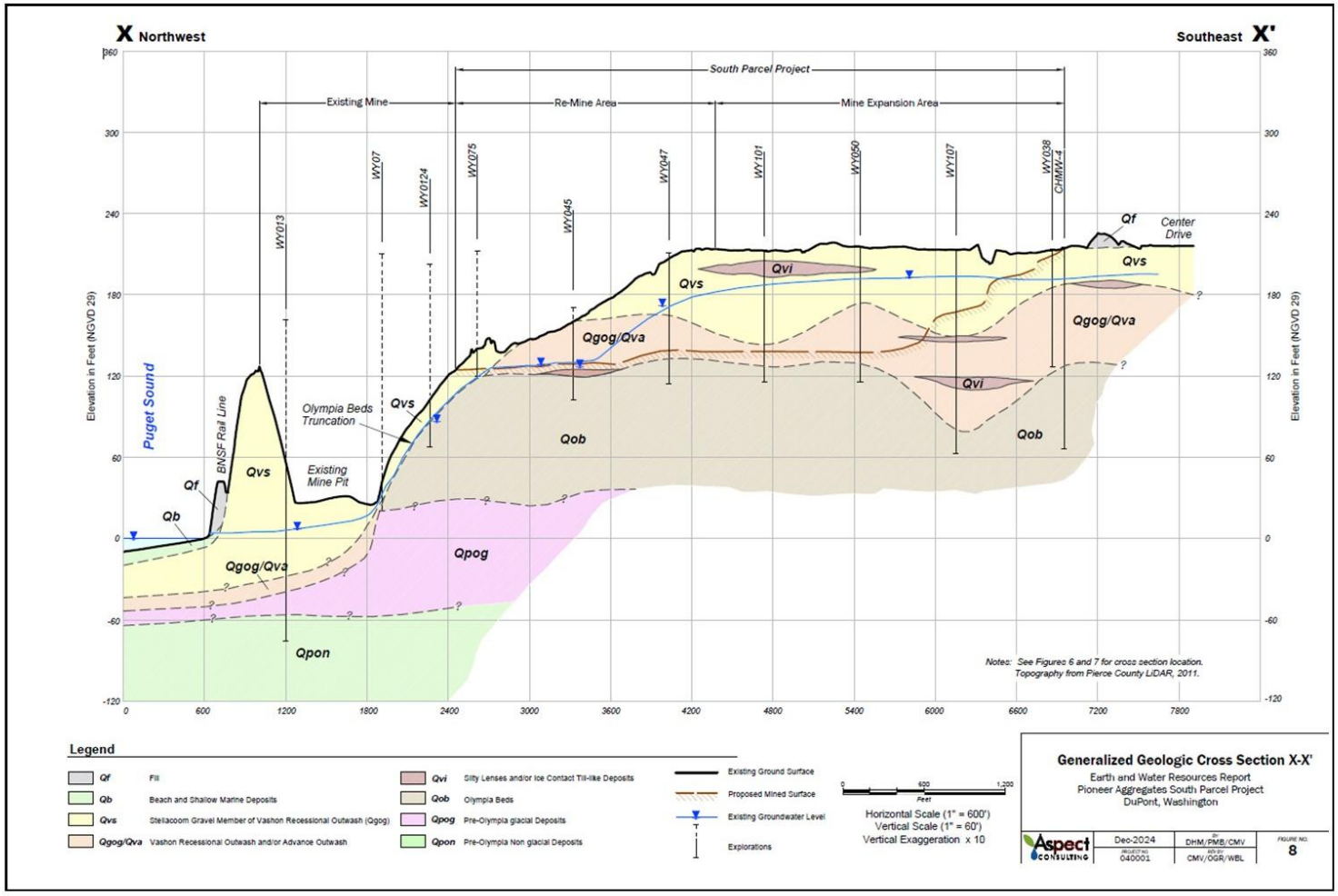
Site Geology

The geologic units of glacial and non-glacial origin were deposited at the site vicinity before, during, and after the Vashon glaciation. Understanding of site geologic conditions was further informed through borings and monitoring well explorations installed at the site (see Figures 5 and 6 of **Appendix B**). **Figure 3.1-2** shows the extent of the geologic units. These units are described below (see **Appendix B** for details.)

The surface geology of the site area consists primarily of Vashon-age recessional sand and gravel (Qgog) locally known as Steilacoom Gravel (Qvs). The recessional glacial unit is underlain by older Vashon-age glacial deposits, pre-Vashon non-glacial deposits, and pre-Vashon glacial deposits – all comprised primarily of sand and gravel.

The uppermost pre-Vashon non-glacial sequence at the site is identified as the Olympia beds. These non-glacial deposits are generally marked by an increase in silt, organics, and wood fragments. Older unnamed glacial and non-glacial deposits lie below the Olympia beds. These are identified as pre-Olympia non-glacial deposits (Qpon) and pre-Olympia glacial deposits (Qpog).

Steilacoom Gravel, which is comprised of the late-glacial delta and flood deposits, is a member of the Vashon Recessional Outwash unit and is identified as Qgog on the geologic map (see **Figure 3.1-2**). Steilacoom Gravel is located at the site and is considered an aggregate resource; this is the same geologic unit currently being mined in the existing mine area.



Source: Aspect, 2022.

EA Engineering, Science, and Technology, Inc., PBC

Figure 3.1-2

Geologic Cross-Section

After the end of the Vashon glaciation, non-glacial conditions resumed in the site area. Post-glacial geologic units deposited at the site included beach and shallow marine deposits, colluvium on slopes, and alluvium in drainage bottoms. Topsoil developed on soils in stable and forested uplands areas.

The site's geology was and continues to be influenced by tectonic/seismic events. The site lies within the Puget Sound Lowland, between the Cascade and Olympic Mountain Ranges. The Cascade and Olympic Mountains and the Puget Sound Lowland resulted from tectonic forces. These forces cause moderate-size earthquakes that are frequently felt throughout the region as well as infrequent large earthquakes.

Subsurface Conditions

Subsurface conditions at the site are inferred from review of the existing soil boring and well logs, published geologic data and maps, and geological reconnaissance. Based on the available information, the inferred geologic units at the site are described in sequence below.

Topsoil

Topsoil, including up to several inches of forest duff (organic debris), is present at the site. The duff layer is primarily present within upland forested areas. Portions of the site (primarily the Expansion Area) are vegetated with conifer and deciduous trees. The Re-Mine Area portion of the site has been previously cleared and is now vegetated with shrubs and grasses. Undisturbed, native topsoil is generally not present in the Re-Mine Area; however, topsoil has been placed over portions of the Re-Mine Area as a component of mine reclamation.

Steilacoom Gravel Subunit of Vashon Recessional Outwash

The majority of near-surface Vashon recessional outwash in the area is composed of the Steilacoom Gravel subunit (Qvs) of the Vashon Recessional Outwash (Qgog) deposit. This deposit consists of sandy gravel and gravelly sand with minor amounts of silt, ranging between 2 and 6%.

The Steilacoom Gravel has not been glacially overridden and is anticipated to be medium dense at the surface, grading to dense at depth. Like most outwash deposits, Steilacoom Gravel possesses a minor degree of cohesion which gives it a good intermediate-term standup time that is exhibited by the near vertical temporary cuts up to 70 feet high in the active area of the existing mine.

Olympia Beds

The Olympia Bed (Qob) deposits are located below the Steilacoom Gravel. The Qob unit is generally composed of interbedded lacustrine (lake sediments) and fluvial (river and stream sediments) deposits. Lacustrine deposits consist of silt and clay. The fluvial deposits consist primarily of sand but may contain oxidized gravelly lenses and layers. Interbed thickness of this unit ranges from inches up to about 10 feet. Some organic silt and peat layers that were deposited in wetlands and bogs are also generally present in this unit. The Qob unit has been overridden by the Vashon ice sheet and is generally very dense to hard in its natural state. Where exposed to seepage or weathering, its surface degrades and loosens.

The Qob deposits generally are considerably finer grained than the Vashon deposits above and can perch groundwater. Seepage has been noted at the top of the Qob unit where exposed in the road cut and natural ravine slopes along Sequalitchew Creek. If a lacustrine bed perches groundwater and is intersected by the surface of the slope, it could result in seepage onto the slope.

The contact between the top of the Olympia Beds and the overlying outwash deposits is generally encountered in the Olympia Beds at 80 to 140 feet below the ground surface.[1] (See **Appendix B** for detail).

Hydrogeology

Surficial site soils are generally highly transmissive to water. Stormwater tends to infiltrate into the natural soil surface rather than collect as runoff. The Steilacoom Gravel is generally highly transmissive to groundwater flow and storm water will infiltrate until it encounters the regional groundwater table, or until it encounters a silty interbed that locally perches groundwater. Additional information on surface water and groundwater is provided in Section 3.3, **Surface Water and Groundwater**, of this FEIS.

Geologically Hazardous Areas

Geologically hazardous areas (GHAs) are areas "susceptible to erosion, sliding, or other potentially hazardous geological events" as described in Section 25.105.030 of the DuPont Municipal Code (DMC). GHAs are defined in DMC 25.105.030, including the following:

[1] *Olympia Beds are found between 87 to 139 feet below the ground surface in the borings closest to Edmond Marsh. Several of the borings closest to the marsh did not encounter the Olympia Beds at their completion depths of 65 to 103 feet. These borings are located in the southeast corner of the South Parcel and in the southern portion of the parcel now occupied by the Amazon Fulfillment Center. In 2002, a boring was completed in the western end of Edmond Marsh and encountered the Olympia Beds at a depth of 84 feet. Boring logs for these explorations are provided in* ***Appendix B.***

- Landslide Hazard Areas
- Steep Slopes
- Erosion Hazard Areas
- Seismic Hazard Areas

The presence of GHAs in the Expansion Area and Re-Mine portions of the site are shown in **Figure 3.1-3** and described below. GHAs associated with the existing mine and Sequalitchew Creek areas immediately off the site are also identified and described.

Expansion Area Portion of Site

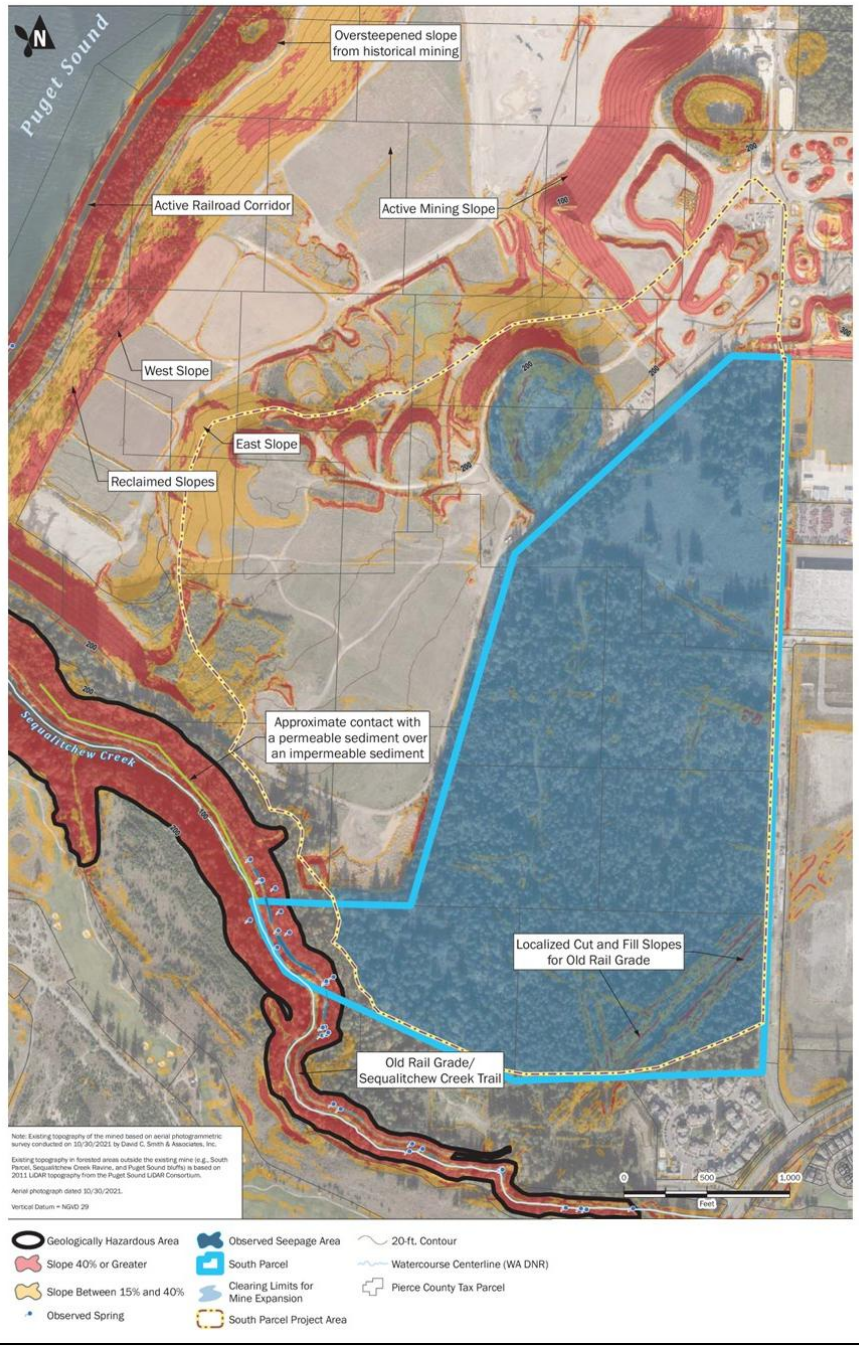
The Expansion Area portion of the site does not include any areas that meet the definition of GHAs. Topography is generally characterized by level ground or gentle slopes, typically inclined at gradients less than 15% that do not fall under the GHA criteria.
Areas interpreted as old rail grade cut and fill slopes steeper than 40% that locally exceed more the 10 feet of vertical relief were observed in the southeast portion of the Expansion Area. These do not qualify as GHAs because they do not intersect a geologic contact with relatively impermeable sediment or bedrock; do not have spring or groundwater seepage (DMC 25.105.030.345); and include stable constructed slopes that have historically performed well.

There are no channels, channel forming processes, or areas subject to coastal erosion within the Expansion Area, and there are no erosion hazard areas as defined by the City.

The Expansion Area does not include soils on slopes greater than 40% that are expected to be seasonally or perpetually saturated that pose a specific risk of settlement, movement, or liquefaction for seismic hazard areas as defined by the City.

Re-Mine Area Portion of Site

Existing conditions in the Re-Mine Area portion of the site do not meet the definition of GHAs, although there are areas with slopes steeper than 15% (see **Figure 3.1-3**). The topography of the Re-Mine Area generally consists of a gentle slope to the northwest descending toward the floor of the existing mine. Steeper slopes are present to the northwest of the Kettle wetland, where the slope is greater than 40%, and along the westernmost portion of the Re-Mine Area, where it typically varies between 15 to 40% Some of the steeper slopes shown on **Figure 3.1-3** within the Re-Mine Area represent temporary stockpiles or fill placement.



Source: Aspect, 2022.

EA Engineering, Science, and Technology, Inc., PBC

Figure 3.1-3

Geological Hazardous Areas—Existing Conditions

The areas of steeper slopes within the Re-Mine Area do not qualify as GHAs as they are either temporary slopes within an active mine or were designed and approved by a qualified professional experienced with the site and are thus exempted from being a GHA. There are no channels, channel-forming processes, or areas subject to coastal erosion within the Re-Mine Area, so there are no erosion hazard areas as defined by the City.

The Re-Mine Area does not contain seismic hazard areas because the soils on slopes greater than 40% are not expected to be seasonally or perpetually saturated and do not pose a specific risk of settlement, movement, or liquefaction.

Existing Mine Area (Off-Site)

The existing mine includes constructed slopes on the south and west sides that have been graded to their final configuration and reclaimed with topsoil and planting. The west slope is about 175 feet high and is smoothly graded at about 30% up to 50%, as shown on **Figure 3.1-3**. The subsurface soil under the topsoil of the west slope is sand and gravel with a trace of fines. The slope has been planted with grasses and conifer trees.

The west slope has a slope gradient of greater than 40% with a vertical relief greater than 10 feet, but it does not meet GHA criteria because it was designed and approved by a qualified professional experienced with the site, and thus is exempted from being a GHA.

No indication of past or imminent slope failure, land sliding, or erosion was observed (see **Appendix B** for detail). There are no topographic features that would suggest slumping or calving (when chunks of slopes are released), and there are no areas of exposed soil. The vegetation shows no evidence of disturbance from slope instability or erosion.

There are no channels, channel forming processes, or areas subject to coastal erosion within the existing mine, so there are no erosion hazard areas as defined by the City.

The existing mine does not contain seismic hazard areas because the soils on slopes greater than 40% are not expected to be seasonally or perpetually saturated and do not pose a specific risk of settlement, movement, or liquefaction.

Sequalitchew Creek Ravine (Off-Site)

Most of the Sequalitchew Creek ravine lies offsite, along the southern boundary of the existing mine and the site (see **Figure 3.1-3**). A small portion of the Sequalitchew Creek ravine is located within the Expansion Area portion of the site, but outside the proposed mining area. The ravine runs westward for approximately 1.5 miles down to the creek confluence with Puget Sound. The slopes on the northern side of the ravine range from approximately 30% to 75%.

The north slope of the Sequalitchew Creek ravine includes a bench cut for a former railroad grade that ran down the full length of the ravine. The railroad grade has been redeveloped into the Sequalitchew Creek Trail, surfaced with asphalt on the upper portion and crushed rock lower down.

Perennial groundwater seeps from the ravine's north slope at several locations, as shown on **Figure 3.1-3**. On the eastern two-thirds of the ravine, the subsurface soil in the upper part of the slope (from the top of the ravine at approximate elevation 200 feet down to about elevation 110 feet) is permeable sand and gravel with minor silt; below approximately elevation 110 feet, the soil is silty and relatively impermeable. In the western third of the ravine, the subsurface soil is permeable sand and gravel for the entire height of the ravine valley wall.

The channel of Sequalitchew Creek is a relatively confined channel formed by historically higher flows (see Section 3.3, **Groundwater**, and Section 3.4, **Surface Water**, for details). The creek currently experiences limited flow and thus has limited channel-forming processes. No indication of an active channel migration zone is evident (see **Appendix E** for details).

The existing Sequalitchew Creek ravine includes areas with soils on slopes greater than 40% that are expected to be seasonally or perpetually saturated that pose a specific risk of settlement, movement, or liquefaction associated with seismic hazards, as defined by the City.

Based on the slope steepness, the presence of the seeps, and the contact between permeable and impermeable soils, the north slope of the Sequalitchew Creek ravine qualifies as a landslide hazard area, steep slope, and seismic hazard under DMC GHA criteria. The slope is identified by the DNR as susceptible to shallow landslides.

DMC 25.105.050 (3) defines erosion hazards as including channel migration zones (areas along a river or stream where the channel can be reasonably predicted to migrate over time). The Sequalitchew Creek migration zone is considered an erosion hazard.

3.1.2 Impacts of the Alternatives

This section identifies and analyzes impacts to topography, soils, and geologic hazard areas on and in the vicinity of the Pioneer Aggregates South Parcel Project site under the EIS Alternatives.

ALTERNATIVE 1 – PROPOSED ACTION

Topography

Site (Expansion Area and Re-Mine Area Onsite)

Natural deposits of sand and gravel would be removed from a 313-acre area, altering the topography and leaving an irregular-shaped bowl feature where the mine operated. Additional slopes would be created in an area where slopes did not previously exist, thus providing more opportunity for shallow slope instability and erosion. However, proper reclamation and erosion control measures as planned for in the Proposed Action would limit any potential slope instability and erosion impacts (as illustrated in **Figure 3.1-4)**.

Following mining, the slopes on the eastern edge of the Expansion Area would be about 80 to 120 ft. tall and would be inclined at 3H:1V (33%). Benches would be excavated in the southeast corner of the Expansion Area. The bottom surface of the Expansion Area would generally follow the contours of the top of the Olympia Beds. A thin layer of gravel, several feet thick, is anticipated to be left on top of the Olympia Beds to provide a stable working surface.

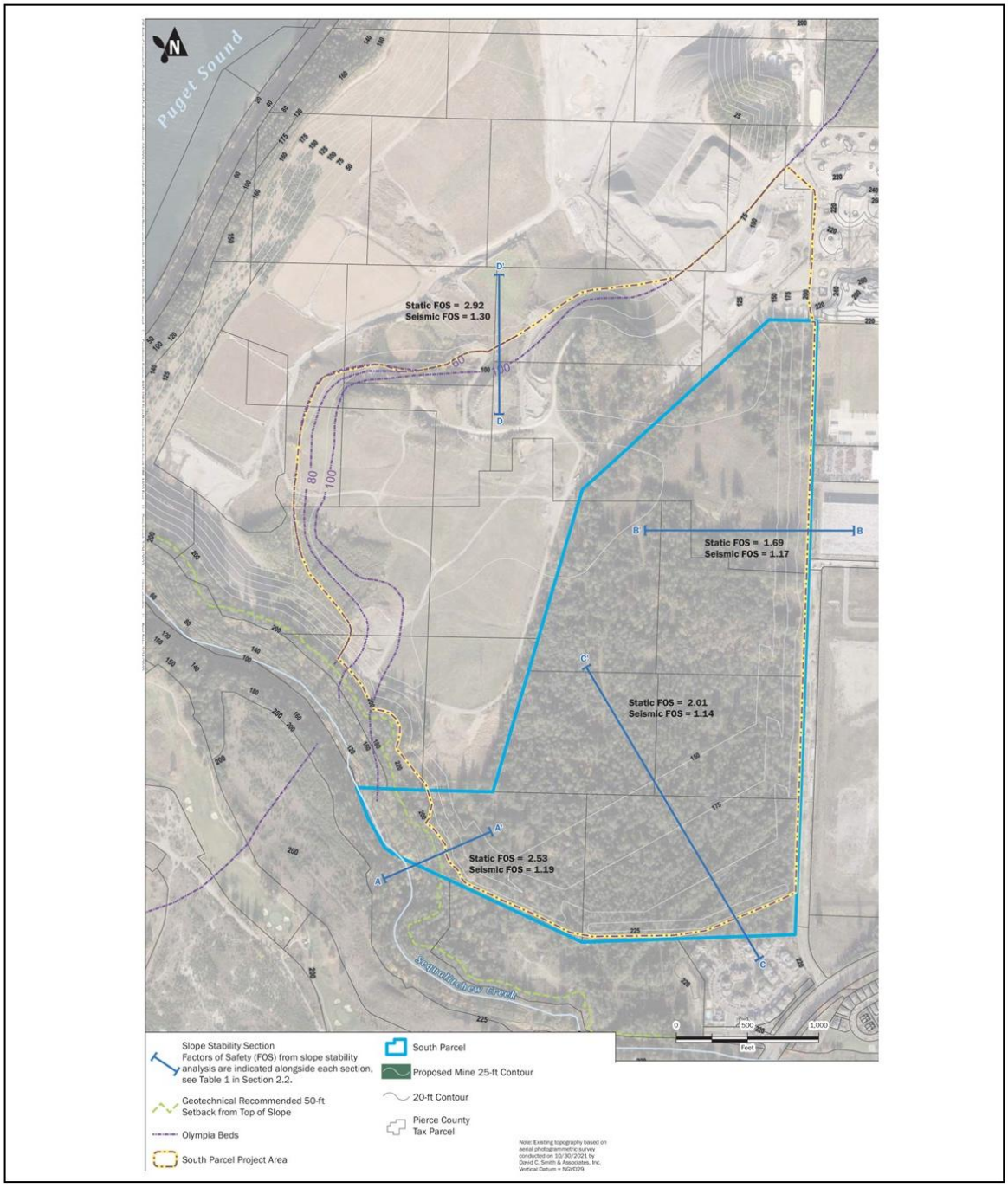
Within the Re-Mine Area portion of the site, topography would also substantially change as the current rolling slopes would be mined down to the Olympia Beds. As with the Expansion Area, a working surface of gravel would be left atop the Olympia Beds. Slopes within the Re-Mine Area would be inclined at 3H:1V (33%), where groundwater is expected to emanate from the toe of the slope and 2H:1V (50%), where the slopes are anticipated to be dry.

The proposed finished slopes would be less steep than other areas that have been mined and reclaimed to the west. The slopes steeper than 40% (up to 50%) and the slopes along the Sequalitchew Creek Trail exceeding 60% all appear to be performing well (see **Appendix B**). The soils are fairly homogenous across the active mine area and Re-Mine Area and are generally expected to perform similarly to in the past (**see Appendix B** for details).

Existing Mine (Off-Site)

There would be no change to the topography of the slopes of the Existing Mine as a result of the Proposed Action. However, these slopes may be modified under the current permits as mining activity continues and have already been evaluated for potential impacts in SEPA analysis associated with the current permits. Changes to the existing slopes under the current permits are not evaluated in this FEIS.

A constructed wetland mitigation area has been proposed near the toe of the west slope at the base of area where mining has already been completed. The constructed wetland slopes would be at gradients less than 15%.



Source: Aspect, 2022.

EA Engineering, Science, and Technology, Inc., PBC

Figure 3.1-4

Proposed Topography

Other minor changes within the existing mine include the construction of storm water conveyance, treatment, and infiltration facilities, and groundwater conveyance and infiltration facilities.

Sequalitchew Creek Ravine (Off-Site)

Topography in the Sequalitchew Creek ravine would not be altered as a result of the Proposed Action (see **Figure 3.1-4**).

The dewatering and grading associated with the Proposed Action would reduce groundwater flow toward the steep slopes of Sequalitchew Creek ravine along the east portion of the Expansion Area onsite. The Proposed Action would also route groundwater that would potentially flow toward the creek instead toward the mined areas. Ultimately, this is anticipated to reduce the potential for landslides and slope failures within the Sequalitchew Creek ravine. The seeps and springs identified on **Figure 3.1-3** are expected to be reduced or dewatered in their entirety, which may reduce the level of landslide hazard susceptibility within the ravine (see Section 3.3, **Surface Water** and Section 3.4, **Groundwater**, for details on groundwater and surface water flow).

Slope Stability

A geotechnical analysis (Aspect 2021) evaluated the stability of the proposed cut slopes of the South Parcel Project during mining operations. The analysis showed acceptable factor of safety values (that exceed 1.5 static and 1.1 for seismic conditions) for slope stability for the mined condition within the site area and the adjacent Sequalitchew Creek ravine (see **Appendix B** for detail).

Under a post-mining reclamation plan approved by the DNR, the mine slopes would be progressively reclaimed over the life of the Proposed Action. Mine slopes would be graded to 3H:1V or flatter where groundwater seepage is expected (i.e., on the eastern and southern slopes of the Expansion Area portion of the site) once the slope is no longer being mined. Slopes where groundwater is not anticipated to be present, such as along the southern boundary of the Re-Mine Area portion of the site, would be graded to 2H:1V.

Backfill is not required to achieve the reclaimed configuration; however, backfill may be used to enhance reclamation, as has been done elsewhere within the Existing Mine, to improve vegetation performance. The backfill would consist of retained finer material from the Expansion Area and imported clean fill. The proposed slope angles are flatter than the natural angle of repose of the remaining original soils and would provide the long-term erosion control and landscape base for planting. After establishment of vegetation, any long-term slope stability impact to earth-related features is expected to be low. The already high stability of newly created slopes would generally increase with the establishment of vegetation.

Erosion Potential

Due to their generally coarse-grained nature and good infiltration characteristics, the soils in the site area possess a low erosion risk and are generally not moisture sensitive. The erosion potential is increased by the removal of vegetation and construction of mine slopes; however, with proper storm water management techniques in place, these conditions are not anticipated to result in significant erosion of the coarse soils. The primary element of the Proposed Action potentially susceptible to erosion is the placement of loose topsoil for revegetation on the final cut slopes. Revegetation would minimize the potential for erosion.

Under the Proposed Action, mining activities would create a closed depression and all surface water runoff would drain internally. Therefore, erosion is not anticipated to impact on- or off-site surface water bodies or aquatic resources. However, management of erosion remains important for establishment of vegetation during reclamation, visual appearance of the slopes, and the long-term performance of the infiltration ponds. The Proposed Action includes erosion control Best Management Practices (BMPs), consistent with Ecology's Sand and Gravel General Permit and City of DuPont's requirements as defined in DMC 25.105.030.25, that would reduce the potential for off-site transport of sediment.

To reduce the risk for erosion impacts to the Sequalitchew Creek ravine slopes south of the site, the Proposed Action includes a 100-foot buffer along the top of the slope along the Sequalitchew Creek ravine (**see Figure 3.1-3**). This buffer exceeds that required by DMC 25.105.070(2)[2], which requires a 50-foot buffer between proposed development activity and hillslopes of 40% (22 degrees or approximately 2.5H:1V) and is also greater than the buffer recommended in a previous geotechnical report, and therefore provides greater protection to the off-site ravine. The 100-foot buffer is intended to provide protection for erosion of steep slopes along with other recommended mitigation measures and Best Management Practices (BMPs) identified under 3.1.3 Mitigation Measures.

The City of DuPont requires preparation of an erosion control plan per DMC 22.01.180 for all sites disturbing more than one acre. The erosion control plan for the Pioneer Aggregates South Parcel Project identifies the specific BMPs to be used during and after mining for erosion and sediment control.

Topsoil Removal and Replacement

Topsoil contains fines and organic material that is not suitable for construction aggregate and has physical characteristics that are not compatible with efficient use of the equipment

[2] *Note that the Geotechnical Engineering Report (Aspect Consulting, 2021a) on file with the City of DuPont recommended maintaining at least a 50-foot buffer from the top of steep slopes.*

used to transport and process aggregate materials extracted from the mine. Topsoil is also generally the most fertile part of soil, containing soil structure, organic matter, and micro-organisms beneficial to plants and an essential component for successful reclamation of the mine.

Washington's laws governing Surface Mine Reclamation (RCW 78.44) require the conservation of topsoil as a component of reclaiming surface mines for future uses. The Proposed Action includes the steps typically used to conserve topsoil on aggregate mines. Topsoil would be stripped and stockpiled as the mining operation advances into the property and topsoil would be replaced as the mined areas are reclaimed following extraction.

Heavy Metals

Past industrial activities have resulted in elevated metals concentrations in portions of the Expansion Area. The Former DuPont Works Site is a clean-up site associated with the historical explosives and commercial munitions facility that operated from 1909 through 1976. The primary contaminants are arsenic and lead in surface soils. Cleanup activities were completed in 1993 to address the highest concentrations of lead, generally found along the foundations of the former buildings. Weyerhaeuser entered a Consent Decree with the Washington State Department of Ecology (Ecology) that required implementation of a restrictive covenant limiting land use on the Former DuPont Works Site to industrial uses, which is the origin of the Manufacturing and Research Park zoning for much of the site.

In addition, the Expansion Area is located within the Tacoma Smelter Plume (TSP) in an area where Ecology predicts concentrations of arsenic in surface soils may range between 40 and 100 parts per million (ppm). Ecology has established cleanup levels for properties within the TSP. The cleanup levels are conservative and support residential use. Ecology's cleanup level for arsenic in soil is 20 ppm and the cleanup level for lead in soil is 250 ppm. For comparison, the United States Environmental Protection Agency (EPA) has established an action level of 230 ppm for arsenic and 500 ppm for lead to guide cleanup decisions in areas near the former smelter. Ecology has pre-approved certain approaches to achieve the established cleanup levels at properties within the TSP. Mixing of impacted surface soils with deeper clean soils is one of the approved approaches under the Final Interim Action Plan

The proposed mining and reclamation activities are intended to serve as a permanent and final remedy for any lead- and arsenic-impacted soils within the Expansion Area. Under the Proposed Action, topsoil within the Expansion Area would be removed to facilitate extraction and would be conserved and maintained on site to be incorporated into the reclaimed mine landscape and support re-vegetation and reclamation of mined areas consistent with the potential subsequent residential land use identified in the City of DuPont Comprehensive Land Use Plan. Stripping, stockpiling, and replacement of topsoil

would be completed using methods and procedures that are generally the same as those used in the existing mine area, including employment of BMPs to control erosion and fugitive dust. Samples would be collected from stockpiled topsoil for each mine segment and analyzed in accordance with a Cleanup Action Plan developed for the Pioneer Aggregates South Parcel Project. If the sample results indicate the topsoil does not contain arsenic in concentrations exceeding 20 ppm (the conservative cleanup level established by Ecology for the TSP) or lead in concentrations exceeding 250 ppm, then the topsoil would be used in reclamation. If the sample results indicate the topsoil contains arsenic in concentrations equal to or greater than 20 ppm, then clean soil would be mixed with the topsoil to reduce the arsenic concentration. Stockpiled topsoil would not be used for reclamation until sample results confirm the concentrations of arsenic and lead meet cleanup criteria.

Geologically Hazardous Areas

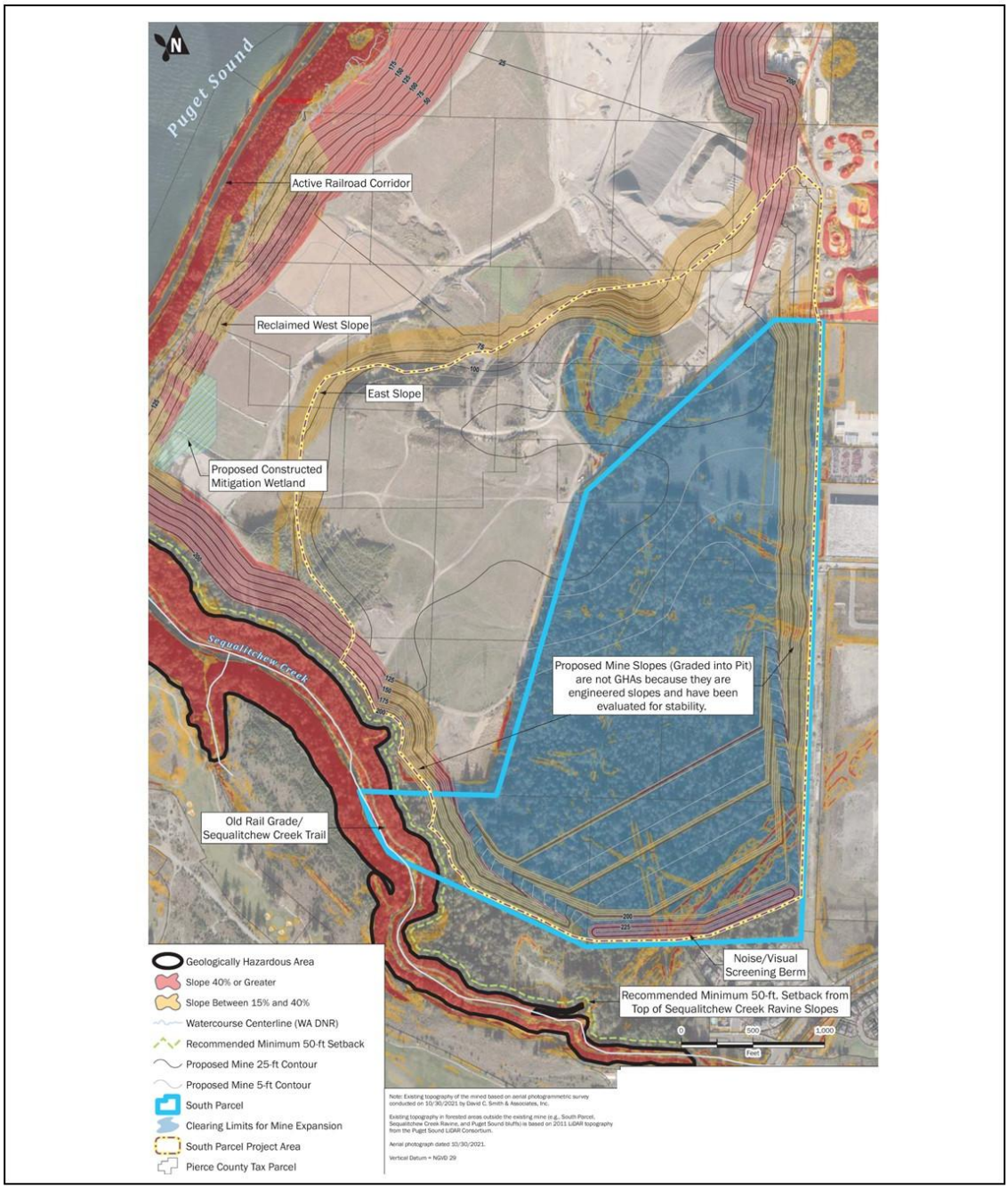
The impacts of the Proposed Action relative to landslide and steep slope hazards, and seismic hazards and liquefaction hazards are discussed below (also see **Figure 3.1-5)**. The identified Geologically Hazardous Areas are shown in **Figure 3.1-5** encircled with a bold black line. **Figure 3.1-5** also includes shading to indicate slope angles; shaded areas are not necessarily Geologically Hazardous Areas.

Landslide and Steep Slope Hazardous Areas

Landslide and steep slope hazards are not present within the site area but are present nearby in the Sequalitchew Creek ravine. The proposed mined slopes would be contoured to drain away from the ravine as shown on **Figure 3.1-5**. The slope stability analysis (see **Appendix B**) determined acceptable factor-of-safety values (greater than 1.5) for each of the profiles in the Expansion Area and Re-Mine Area portions of the site, as shown on **Figure 3.1-4**. Thus, the mined slopes would not be considered landslide or steep slope hazards.

Mining under the Proposed Action would locally reduce seeps and springs that have been observed in the Sequalitchew Creek ravine, as shown on **Figure 3.1-3**, resulting in an improvement in slope stability (see Section 3.5, **Plants and Animals**, for discussion on wetland habitat conditions). The Sequalitchew Creek ravine slope would also have an acceptable Factor of Safety greater than 1.5, as shown on **Figure 3.1-4**.

The hazard mitigations listed in Section 3.1.3, Mitigation Measures are intended to protect landslide and steep slope hazards located outside of, but nearby, the site area.



Source: Aspect, 2022.

EA Engineering, Science, and Technology, Inc., PBC

Figure 3.1-5

Geological Hazardous Areas—Proposed Action

Erosion Hazardous Areas

The channel migration zone within the Sequalitchew Creek ravine, which is defined as an erosion hazard area, is not anticipated to be impacted by the Proposed Action. The flows from ravine springs would be reduced by the proposed dewatering process which would reduce the potential for channel migration and its associated potential for erosion. Therefore, no significant adverse impacts are anticipated to erosion hazards from the Proposed Action at the site or in adjacent areas.

Seismic Hazard Areas

No adverse impacts are anticipated to seismic hazards from mining under the Proposed Action at the site or in adjacent areas. The slope stability analysis for seismic condition shows acceptable factor of safety values (greater than 1.1) in the Expansion Area portion of the site, Re-Mine Area portion of the site, and Sequalitchew Creek ravine.

Topography at the Expansion Area portion of the site would be permanently altered as a result of mining activities. These changes are illustrated by comparing **Figures 3.1-3** and **3.1-5**. The proposed conditions would include finished slopes inclined at 3H:1V (33%) toward the interior of the existing mine (**Figure 3.1-5**). A 20-foot-high soil berm would be constructed with side slopes at 2H:1V (50%) along the south side of the Expansion Area portion of the site.

The proposed finished slopes would be less steep than other areas that have been mined and reclaimed to the west. As within the reclaimed mine areas, the slopes steeper than 40% (up to 50%) and the slopes along the Sequalitchew Creek Trail exceeding 60% are all performing well.

There would be no seismic hazard areas created, as slopes in the Expansion Area portion of the site would be below 40%.

Other Potential Geologic Hazards in the Dewatering Area

In addition to the Geologically Hazardous Areas evaluation discussed above, the potential for dewatering associated with the Proposed Action to contribute to geologic hazards outside of the immediate project area was assessed. A summary of those conclusions is presented below (see **Appendix B** for more detail).

Settlement and Sinkholes/Subsidence

Land subsidence, sinkholes, and differential settlement are hazards that can occur under certain conditions within certain geologic environments (including soft fine-grained or highly organic compressible soils, karst terrain, soluble evaporites, etc.). In general, the area

that will be affected by the proposed dewatering is underlain by soils that are not prone to this type of hazard. As discussed in **Appendix B** and shown in Figure 6 of that document, geologic units in the project vicinity consist primarily of near-surface recessional glacial outwash deposits or ice contact deposits underlain by older, glacially consolidated glacial/non-glacial deposits. Due to their grain size characteristics and relative density, these types of soils do not pose a settlement risk for structures or underground utilities.

Compressible, organic-rich peat soils are present in limited areas of the site vicinity; however, these soils are well-constrained to the marshes and immediately areas (see Figure 3 of Aspect, 2004[3]). Furthermore, such soils are generally not suitable for development and the areas around the marshes where these soils are present are restricted for development by the City of DuPont. There is one segment of Pierce County sewer line within the Robinson Trail berm that crosses between East and West Edmond Marshes which warrants additional consideration because it overlies peat soils (see additional discussion below).

JBLM Landfill

Proposed dewatering and associated groundwater level drawdown are not anticipated to significantly affect the fate and transport of groundwater contaminants, leachate, or gas from JBLM Landfill 5. Dewatering is similarly not anticipated to affect the rate of differential settlement at the landfill, create ponding, or otherwise cause damage to foundations, landfill liners, or cover systems, as further discussed below.

Landfill settlement, dominated by the process of waste decomposition (transformation of material states from solid to liquid to vapor), has historically occurred at JBLM Landfill 5, as visually observed and documented by Tacoma-Pierce County Health Department annual reporting. However, due to the age of waste, burned condition of older waste in the landfill, and stabilization of microbiological activity from the recent transition from active to passive landfill gas collection, JBLM Landfill 5 materials are likely nearing functional stability, as demonstrated by little to no settlement, little to no landfill gas generation, and little to no leachate generation. Because of the age and condition of waste materials and relatively minor extent of dewatering (a maximum of approximately 9 feet at the southeast corner of the landfill area), the proposed dewatering is anticipated to have little to no effect on the rate of approach of JBLM Landfill 5 toward functional stability.

[3] *Aspect Consulting, 2004. Surface Water and Groundwater System with Predictions on Effects to Wetland Hydrology Upstream of Proposed North Sequalitchew Creek. Technical Memorandum. July 21.*

Infrastructure (Sewer Lines)

A review of Pierce County utility mapping[4] indicates that nearly all sewer mains within the proposed dewatering area are underlain by soil types that do not pose a risk for settlement, with one potential exception: an eight-inch sewer main (installed under the Robinson Trail in a former railroad berm that bisects West and East Edmond Marsh. As-built drawings (ESM, 1989[5]) indicate that this sewer line is buried approximately three to eight feet below ground surface within fill soils that overlie potentially compressible organic marsh soils/peat (FEIS Appendix B Figure 28; Anchor[6]). These types of soft, organic-rich soils can compress when physically loaded (e.g., by construction of an overlying berm or structure). Dewatering can also "load" such soils by reducing pore pressures (either in the compressible soil itself or in overlying soils), thereby increasing the effective load carried by the soil.

The Robinson Trail berm has likely been settling over time due to ongoing biodegradation and secondary compression of the peat from berm loading (and historical use of the previous rail line) over the past ~80+ years since the berm was constructed in the 1940s (or earlier). Due to the loading (timing and magnitude) history of the berm, the majority of potential peat compression may have already occurred. However, the peat will continue to compress at a very slow rate, with or without the proposed project. Due to initial compression plus ongoing long-term biodegradation, it is possible that the sewer line has already experienced measurable settlement since it was installed over three decades ago. Though unlikely, the proposed dewatering (by an amount that is less than the existing seasonal groundwater level fluctuation) could cause some incremental, but difficult to quantify, additional settlement of the sewer line beyond the ongoing slow biodegradation and secondary compression settlement. The potential for settlement will be partially mitigated in the vicinity of the proposed bridge that will be implemented as part of the restoration plan, where the sewer pipe will be encased and suspended from the bridge.

Despite the very low potential for this project to cause any significant settlement of the existing sewer, CalPortland will develop and include provisions for monitoring the Robinson Trail sewer main in a project monitoring plan document. An initial baseline survey, including utility elevation surveying at selected monitoring points as well as television inspection of the relevant section of pipeline, should be performed prior to project implementation to identify existing sags or leakage. Additionally, Pierce County Public Works and Utilities should provide CalPortland with any existing information about the current sewer condition, any prior video inspections, and history of prior settlement-related maintenance

[4] Pierce County PublicGIS: https://matterhornwab.co.pierce.wa.us/publicgis/.

[5] ESM, 1989. Gravity Sewer Plan and Profile, Sheets 15 and 16. City of DuPont Local Improvement District No. 1. As-built certification dates 12/15/1992 and 1/6/1992.

[6] Anchor QEA, 2023. Sequalitchew Creek Watershed Ecosystem Restoration Project Geotechnical Engineering Report. Prepared for South Puget Sound Salmon Enhancement Group. May.

issues. If, during dewatering, new sags or leakage are detected in sewer lines (beyond the rate of anticipated change that would be expected to result from natural conditions alone, based on review/documentation of pre-project conditions), and such damage appears to correlate with measured dewatering-related groundwater drawdown in the vicinity, CalPortland will work with Pierce County to take corrective action to restore the affected areas. Due to a lack of settlement-prone soils in sewer locations outside of the Robinson Trail area, monitoring is not necessary elsewhere.

CUMULATIVE IMPACTS

The annual amount of earth moving mining activity with the Proposed Action in combination with mining at the Existing Mine would not exceed existing levels, and cumulative earth impacts associated with mining are not anticipated. In addition, earth-related impacts associated with mining would be temporary in nature and would occur some distance from potential future development that could occur in the vicinity. Therefore, no significant cumulative earth-related impacts from the combination of mining and future development are anticipated.

ALTERNATIVE 2 – NO ACTION

The No Action Alternative includes two scenarios: Scenario A - Continuation of Existing Conditions; and Scenario B - Site Development Under Existing Zoning.

Scenario A

Under Scenario A - Continuation of Existing Conditions, mining activities associated with the Re-Mine Area portion of the site and the Existing Mine would continue as currently permitted. The mining operation would retain a vegetated buffer at its perimeter, and active mining conditions that currently exist would continue. The Existing Mine has an estimated remaining life of 6 to 10 years with mining currently limited to 10 feet above groundwater. The Expansion Area is assumed to remain undeveloped and would continue in its vegetated condition.

Scenario B

Under Scenario B - Site Development Under Existing Zoning, the proposal would not occur. The site would be developed for urban uses consistent with the City's Future Land Use Map. The majority of the area affected is currently designated by the City of DuPont as Manufacturing/Research, with a portion designated Residential. Mining and reclamation would continue within the currently permitted footprint of the existing mine. The kettle wetland and its buffer would remain undisturbed.

Development of the Expansion Area portion of the site would likely occur over time on one or more individual parcels at a time. As each parcel is developed, it would likely be mostly logged and cleared, then graded and developed consistent with applicable zoning regulations. Logging and clearing along with the development would likely leave a 50-foot buffer along the top of the Sequalitchew Creek ravine, as required under the DuPont Municipal Code, rather than the 100-foot buffer required for the mine under the Settlement Agreement. Topography would be expected to remain relatively flat, with the minor topographic depressions filled to level building sites. Under the existing zoning, a portion of each parcel would need to remain vegetated, either as the existing forest or as landscaped areas.

Clearing would increase the potential for surface erosion during construction; however, standard erosion and sediment control BMPs would reduce adverse impacts. Future development would be required to comply with City of DuPont Sensitive Areas Code, and state and local erosion and sediment control requirements.

Development would also increase the volume of stormwater generated as permeable soils with established vegetation (forest) are replaced with impervious areas (including building roofs and pavement) and landscaped areas. Stormwater would likely be managed through infiltration, which would result in an increased volume of groundwater flow, although the change would likely be minor relative to the groundwater flow in the aquifer.

Individual development of the parcels would not be likely to address the metals-contaminated soils as comprehensively as the Proposed Action. It is more likely that capping would be used as a remedy given the lower cost compared with mixing, as well as consistency with the likely developed condition (e.g., paved parking lots and building footprints). The use of capping, combined with differences in parcel remediation extent and approach as individual parcels are developed separately, would likely prevent lifting of the restrictive covenants from the former DuPont Works site and rezoning of the Manufacturing and Research Park area.

3.1.3 Mitigation Measures

The following mitigation measures have been included in the Proposed Action to reduce impacts on slope stability and erosion (see Section 3.3, **Groundwater**, and Section 3.4, **Surface Water**, for additional discussion and mitigation measures related to surface water and groundwater):

Proposed Mitigation Measures

- A reclamation plan would be prepared and implemented in accordance with the Surface Mining Act (RCW 78.44). The reclamation plan would be submitted to DNR for review

and approval prior to mining. Prior review by the City is also required as part of that process.

- Mining would occur in segments; no mass clearing of the Expansion Area portion of the site would occur.

- An erosion and sediment control plan would be prepared and implemented in accordance with the requirements of the City of DuPont Municipal Code (DMC 22.01.180) and the NPDES Sand and Gravel General Permit. Erosion control features would include storm water drainage into the interior of the mine and onsite storm water disposal.

- A vegetated buffer would be maintained between the proposed mine area and the top of steep slopes in accordance with the City of DuPont's Sensitive Areas Code [DMC 25.105.070(2)].

- A 100-foot setback would be maintained from the top of slopes greater than 40% within the Sequalitchew Creek ravine, consistent with the conditions for the existing mine and the 1994 and 2012 Settlement Agreements.

- Earthwork for excavation and reclamation would be in accordance with the federal and state statutes of the Mine Safety and Health Act and the Surface Mining Act.

- Topsoil would be stockpiled and used for reclamation of mined areas. Consistent with the approved Reclamation Plan, Cleanup Action Plan developed for the South Parcel Project and published Ecology guidance, samples would be collected from stockpiled topsoil to confirm arsenic concentrations meet Ecology standards.

- After application of the topsoil, slopes would be re-vegetated by planting with trees and grass. When reclamation is complete, heavy equipment would generally not operate on the reclaimed slopes except for construction or maintenance of pedestrian paths, access roads, utilities, or other permitted facilities.

- The Expansion Area would be cleared in segments corresponding to the mining plan.

- Internal drainage would be maintained during mining.

- Mine slopes would be track-walked to tamp soils and create surface roughness to encourage infiltration of storm water on the slope.

- Mine slopes would be reclaimed with soil amendments and vegetation according to a DNR-approved Reclamation Plan.

- The existing wheel wash, or equivalent equipment, would continue to be used and maintained for vehicles exiting the mine.

- Settling ponds would be constructed upstream of the infiltration ponds.

- Mine slopes would be periodically inspected and repaired or revegetated to reduce erosion or improve surface stability.

- Provisions for monitoring the Robinson Trail sewer main would be included as part of a project monitoring plan document.

3.1.4 Significant Unavoidable Adverse Impacts

The Proposed Action would result in the unavoidable alteration of topography and creation of new slopes. With implementation of proposed mitigation measures, however, no significant unavoidable adverse earth-related impacts are anticipated from the Proposed Action.

3.2 AIR QUALITY

This section of the FEIS describes existing air quality conditions on the site and in the site vicinity. Potential impacts associated with the EIS Alternatives are evaluated and mitigation measures are identified. This section is based on the *Air Quality Assessment* (September 2022) prepared by Landau Associates and peer reviewed by EA Engineering (see **Appendix C**). Information added or changed subsequent to issuance of the Draft EIS, if any, is shaded to ease identification of the added or changed information.

3.2.1 Affected Environment

Regulatory Context

Air quality is generally assessed in terms of whether concentrations of air pollutants are higher or lower than ambient air quality standards established to protect human health and welfare. Three agencies have jurisdiction over ambient air quality in the project area: the U.S. Environmental Protection Agency (EPA), the Washington Department of Ecology (Ecology), and the Puget Sound Clean Air Agency (PSCAA). These agencies establish regulations that govern both the concentrations of pollutants in the outdoor air and contaminant emissions from air pollution sources. Although their regulations are similar in stringency, each agency has established its own standards. Unless the state or local jurisdiction has adopted more stringent standards, the EPA standards pertain.

To track air quality conditions over time, Ecology and PSCAA maintain a network of monitoring stations throughout the Puget Sound region. These stations are typically located where air quality problems may be expected to occur, and so are usually in or near urban areas or close to specific large air pollution sources. Other stations are used to indicate regional air pollution levels. Based on monitoring information collected over a period of years, the EPA and Ecology designate regions as being "attainment" or "nonattainment" for particular air pollutants. Attainment status is therefore a benchmark of whether air quality in an area complies with the National Ambient Air Quality Standard (NAAQS) for one or more "criteria" air pollutants.[1] Regions once designated nonattainment that have since attained the standard are considered air quality "maintenance" areas through two 10-year cycles of review, after which the area achieves "attainment" if the ambient standards have been maintained.

The site area is considered in attainment for all monitored air pollutants. This suggests that air quality in the site vicinity is generally good. Pertinent air pollutants are discussed in greater detail below.

[1] *The criteria air pollutants are particulate matter, CO, SO_2, NO_2, ozone, and lead.*

Existing Air Quality

Carbon Monoxide

Carbon monoxide (CO) is a by-product of incomplete combustion. CO is generated by vehicular traffic and other fuel-burning activities, such as residential space heating, especially space heating using solid fuels such as coal or wood. There are two short-term air quality standards for CO: a 1-hour average standard of 35 ppm and an 8-hour average standard of 9 ppm.

The impacts of CO are usually localized near the source(s), with the highest ambient concentrations typically occurring near congested roadways and intersections during periods of cold temperatures (autumn and winter months), light winds, and stable atmospheric conditions. Such weather conditions reduce the atmospheric mechanisms that disperse and dilute pollutants.

The site is located next to a past CO maintenance area where the 20-year maintenance period ended in 2016. Due to violations of the federal 1-hour CO standard, the Puget Sound region was designated as nonattainment for CO. In 1996, EPA determined that the Puget Sound ozone nonattainment area had attained the health-based CO standard in effect at that time. EPA then reclassified the Puget Sound region as attainment for CO and approved the associated air quality maintenance plan. Under present plans and policies, the CO attainment/nonattainment status of the area would have no direct effects on the proposed Pioneer Aggregates South Parcel Project.

Ozone

Ozone is a reactive form of oxygen created by sunlight-activated chemical transformations of nitrogen oxides and volatile organic compounds (hydrocarbons) in the atmosphere. Ozone problems tend to be regional in nature because the atmospheric chemical reactions that produce ozone occur over a period of time, during which ozone precursors can be transported far from their sources. Transportation sources like automobiles and trucks are among the sources that produce ozone precursors.

The site is located next to a past ozone maintenance area within the Puget Sound region where the 20-year maintenance period ended in 2016. In the past, due to violations of the federal 1-hour ozone standard, the Puget Sound region was designated as nonattainment for ozone. In 1997, EPA determined that the Puget Sound ozone nonattainment area had attained the health-based ozone standard in effect at that time. EPA then reclassified the Puget Sound region as attainment for ozone and approved the associated air quality maintenance plan. In 2005, EPA revoked the 1-hour ozone standard in most areas of the US including the Puget Sound region, which ended the ozone maintenance status of this region. In March of 2008, the EPA adopted a new more stringent 8-hour average ozone standard of 75 parts per billion (ppb). The 8-hour standard was later strengthened to 70 ppb for most

areas, effective December 2015.[2] Under present plans and policies, the ozone attainment/nonattainment status of the area would have no direct effects on the proposed Pioneer Aggregates South Parcel Project.

Particulate Matter (PM_{10} and $PM_{2.5}$)

Particulate matter air pollution is comprised of particles either emitted directly into the air (e.g., dust) or formed when hot gases cool and condense. Such air pollution is generated primarily by industrial activities and operations involving fuel combustion and material handling, and by other fuel combustion sources like motor vehicle engines, vessel engines, and residential wood burning. Federal, state, and local regulations set limits for particle concentrations in the air (i.e., weight per unit volume) based on the size of the particles and the related potential threat to health. When first regulated, particle pollution limits were based on "total suspended particulate," which included all size fractions. As sampling technology improved and the importance of particle size and chemical composition became more apparent, ambient standards were revised to focus on the size fractions thought to be most dangerous to human health. Based on the most recent studies, EPA has redefined the size fractions and set new, more stringent standards for particulate matter based on fine and coarse inhalable particulate matter to focus control efforts on the smaller size fractions. The previous PM10 maintenance area for health-based ambient air quality standards for PM10, or particles less than or equal to about 10 micrometers (microns) in diameter, was for all of Pierce County. The 20-year maintenance period ended in 2021 and is now classified as an attainment area for PM10. This site is close to a current maintenance area for PM2.5, or particulate matter less than or equal to 2.5 microns in diameter, which was designated in 2015. The latter size fraction and even smaller (ultra-fine) particles are now considered the most dangerous size fractions of airborne particulate matter because such small particles (e.g. a typical human hair is about 100 microns in diameter) can be breathed deeply into lungs. In addition, such particles are often associated with toxic substances that are deleterious in their own right and that adsorb to the particles and be carried into respiratory system.

The nearest PM2.5 maintenance area encompasses Tacoma and surrounding lowland areas in Pierce County.[3] The site is south of Tacoma in the lowlands of Pierce County and is considered part of this maintenance area.

In gravel excavation and processing operations, particulate matter (dust) is typically the only pollutant emitted in sufficient quantities to be a potential concern. Therefore, particulate emissions, inhalable and fine particulate matter (PM10/PM2.5), are a focus of this discussion.

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[2] *80 Fed. Reg. 65,292 (Oct. 26, 2015).*

[3] *The maintenance area is called the Tacoma – Pierce County area. See information and maps at: https://ecology.wa.gov/Regulations-Permits/Plans-policies/State-implementation-plans/Maintenance-SIPs.*

PSCAA states that reasonable precautions must be in place to control fugitive dust if visible emissions are present. PSCAA must respond to any emission of fugitive dust that is or can be damaging to human health, plant or animal life, property, or the enjoyment of life. The Agency can respond to complaints and will take enforcement action if necessary.

Greenhouse Gases (GHGs) and Climate Change

The GHGs of primary importance are CO_2, methane, and nitrous oxide. Because CO_2 is the most abundant of these gases, GHGs are usually quantified in terms of CO_2e (carbon dioxide equivalent), based on their relative longevity in the atmosphere and the related "global warming potential" of these constituents. CO_2 is not considered an air "pollutant" that causes direct health-related effects, so it is not subject to ambient air quality standards used to gauge pollutant concentrations in the air.

Fuel combustion used for transportation is a substantial source of GHG emissions, primarily through the burning of gasoline and diesel fuels. National estimates indicate the transportation sector (including on-road, construction, airplanes, and vessels) accounts for about 29% of total domestic CO_2e emissions from fossil fuels in 2017.[4] In a tabulation of 2017 emissions within Washington, Ecology estimated transportation accounted for about 45% of statewide GHG emissions;[5] the higher percentage is due to lower GHG emissions from electrical generation because the state relies heavily on hydropower for electricity.

No specific federal, state, or local emission reduction requirements or targets are applicable to the site, and there are no generally accepted emission level thresholds against which to assess potential localized or global consequences of GHG emissions. Therefore, this assessment includes a qualitative consideration of GHG emissions that may be associated with emissions related to operations at the facility.

3.2.2 Impacts of the Alternatives

This section identifies and analyzes impacts to air quality on and in the vicinity of the site under the EIS Alternatives.

ALTERNATIVE 1 – PROPOSED ACTION

Construction Impacts

Construction related to the Proposed Action includes site preparation activities such as logging and clearing, topsoil removal, and construction of perimeter berms using diesel-

[4] *Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990–2017*, February 2020, https://www.epa.gov/ghgemissions/inventory-us-greenhouse-gas-emissions-and-sinks

[5] *2017 Greenhouse Gas Data,* https://ecology.wa.gov/Air-Climate/Climate-change/Greenhouse-gases/2017-greenhouse-gas-data

powered, heavy equipment (e.g., dozers and loaders). During construction, fugitive dust from site preparation may temporarily cause a localized ambient concentration increase of particulate matter (PM_{10} and $PM_{2.5}$). In addition, heavy machinery would emit diesel engine exhaust pollutants that could slightly degrade local air quality in the immediate vicinity of the activity. However, these emissions will be temporary and localized and are expected to be minimal in comparison to regional emissions considering the limited amount of this equipment.

In addition to emissions from diesel-powered equipment, logging of the site in preparation of mining may result in GHG emissions due to the removal of the trees. The extent of the GHG emissions would ultimately depend on the final use of the logs. For example, use of the trees to produce wood products used in construction would result in the storage of some of the GHG emissions. Regardless of the ultimate use of the trees, GHG emissions resulting from the logging of the site would be minimal in comparison with other local sources, such as truck and vehicular traffic.

Operational Impacts

Fugitive Dust

Fugitive dust emissions could continue to be emitted in the current and new pit, in the processing areas, and on the transport roads from a number of sources, including wind erosion over exposed surfaces and stockpiles; automobiles and off-site haul trucks; heavy equipment operation; and, on-site haul trucks. Fugitive dust emissions from these sources are likely to be greatest in the dry summer months. It is not likely that gravel extraction would significantly affect particulate matter concentrations during the winter months (when existing concentrations are typically higher due to residential wood burning and other factors) because greater precipitation keeps the material wet.

Due to the nature of the process, excavation associated with the Proposed Action may cause dust deposition in the surrounding area. Although fugitive dust deposition is not a health issue, excess dust deposition is considered a nuisance as it can increase the soiling of surfaces, such as parked cars or the exterior of buildings.

The State of Washington does not have any quantitative standards pertaining to dust deposition. However, Section 9.11 of PSCAA Regulations states that “It shall be unlawful for any person to cause or allow the emission of any air contaminant in sufficient quantities and of such characteristics and duration as is, or is likely to be, injurious to human health, plant or animal life, or property, or which unreasonably interferes with enjoyment of life and property.” Members of the public can contact PSCAA if they feel the project is interfering with the use and enjoyment of their property due to a dust deposition issue. The Agency will respond to complaints and potentially issue a Notice of Violation to the facility if the concern is determined to be valid. In that event the facility would likely have to pay a fine and provide assurances to PSCAA that measures to resolve the dust problem have been

implemented and impacts will not continue. In the event of repeated violations, PSCAA may levy an enforcement action against the facility. This scenario could result in a shutdown of the facility, criminal penalties for the operators and firm requirements for changes at the facility.

Greenhouse Gas Emissions

A GHG emission inventory was prepared for the Proposed Action which separates associated GHG emissions into three categories, or scopes. Scope 1 GHG emissions are direct emissions from sources that are owned or controlled by the facility, such as on-site fossil fuel combustion and industrial processes. Scope 2 GHG emissions are indirect emissions from the generation of electricity, heat or steam purchased by the facility from a utility provider. Scope 3 GHG emissions are all indirect emissions linked to facility operations and production that are not included in Scope 2.

GHG emissions emitted by operation of the loaders and dozer are classified as Scope 1 emissions. GHGs emitted by off-site sources that generate electricity used by the conveyor drives and water pumps are Scope 2 emissions. Because the annual production and operating time would not change, Scope 3 emissions are not expected to change as a result of the Proposed Action.

Annual Scope 1 emissions were estimated using CO_2-equivalent (CO_2e) emission factors, expected annual operating hours, and the estimated fuel usage for each piece of equipment. It is anticipated that the Proposed Action would be operated 2,080 hours per year and is expected to be the area of highest production. Total Scope 1 GHG emissions are expected to be 1,497 metric tons per year (mtpy) of CO_2e. It should be noted that the expansion of mining into the Expansion Area portion of the site would not require the addition of new equipment to the site but would instead redirect use of existing equipment into the Expansion Area. In this way, the overall annual hours of operation of the dozer and loaders are not expected to increase over current active mining operations. In this way, the emission calculations can be considered a very conservative estimation of the GHG emissions due to the Proposed Action (see **Appendix C** for details).

Scope 2 emissions were estimated using CO_2e emission factors, expected annual South Parcel operating hours, and the quantity of electricity required to operate the conveyor belt and water pumps. The South Parcel is expected to require approximately 1,200 feet of conveyors when operations begin, and approximately 5,000 feet of conveyors when operations are at their maximum expected extent (i.e., driver motors totaling approximately 1,667 HP). It was assumed that the conveyor belts would be operated the same number of hours per year as the loaders (i.e., 2,080) because they would be operated jointly with the loaders.

There are expected to be a total of approximately 50 water pumps used at the Expansion Area portion of the site to intercept water at the edge of the pit, and each pump would be

driven by a 10 HP electric motor. Total Scope 2 emissions attributable to planned operations associated with the Proposed Action are expected to range from 2,034 to 3,062 mtpy of CO_2e as the extent of the conveyor system increases from an initial 1,200 ft to a maximum of 5,000 ft (see **Appendix C** for details).

Adding the worst-case potential Scope 1 and Scope 2 emissions at the maximum extent of mining results in overall annual GHG emissions of 4,559 mtpy of CO_2e under the Proposed Action. There are no well-established nor well-recognized thresholds for determining whether GHG emission rates from an individual project would be considered significant, although there are reporting thresholds established by the USEPA and by Ecology for stationary sources. Furthermore, GHG emission rates are reported by Ecology for the State of Washington, by USEPA for the United States, and by the World Resources Institute (and others) for the entire globe. The large-scale (United States and global) emission inventories are relevant since the impacts due to GHG emissions are considered to be global in scale. Even these maximum potential worst-case GHG emissions from the proposed sources are less than half of the reporting thresholds identified by Washington State (10,000 mtpy CO_2e) and federal agencies (25,000 mtpy CO_2e). Therefore, the GHG emissions from the Proposed Action would represent a very small percentage of the total state-wide inventory.

CUMULATIVE IMPACTS

The annual amount of mining activity, and associated air quality conditions, with the Proposed Action in combination with mining at the Existing Mine would not exceed current levels, and cumulative mining air quality impacts are not anticipated. In addition, air quality impacts associated with mining would be temporary in nature and would occur some distance from potential future development that could occur in the vicinity, and no significant cumulative air quality impacts are anticipated.

ALTERNATIVE 2 – NO ACTION

There are two No Action Alternatives- Scenario A Continuation of Existing Conditions; and Scenario B Site Development Under Existing Zoning.

Scenario A

In Scenario A, mining activities associated with the Re-Mine Area of the site and the Existing Mine would continue as currently permitted. The mining operation would continue to generate emissions as under the existing conditions. The Existing Mine has an estimated remaining life of 6 to 10 years with mining currently limited to 10 feet above groundwater. The Expansion Area portion of the site is assumed to remain undeveloped and would continue in its vegetated condition.

Scenario B

In Scenario B, the proposal would not occur. The site would be developed for urban uses consistent with the City's Future Land Use Map. The majority of the area affected is currently designated by the City of DuPont Comprehensive Plan as Manufacturing and Research, with a smaller area designated for residential uses. The corner of the property near Center Drive is designated as Residential 12, which would allow higher density residential development where multifamily density averages 12 units per acre. Urban development, as permitted under current planning and zoning designations, is assumed to occur east of the lease line demarcating existing mining operations. The timing and nature of any such development would be driven by market forces.

Development of individual parcels would result in construction-related impacts including fugitive dust emissions, exhaust emissions from equipment and vehicles, and GHG emissions from construction. Operation of development on individual parcels would also generate emissions from operational activities, including GHG emissions associated with potential manufacturing/research uses and residential development.

3.2.3 Mitigation Measures

The following mitigation measures have been included in the Proposed Action to reduce air quality impacts.

Proposed Mitigation Measures

- The use of control equipment, enclosures, and wet (or chemical) suppression techniques, as practical, and curtailment during high winds.
- Surfacing roadways and parking areas with asphalt, concrete, or gravel.
- Treating temporary, low-traffic areas (e.g., construction sites) with water or chemical stabilizers, reducing vehicle speeds, constructing pavement or rip rap exit aprons, and use of the existing wheel wash system or equivalent equipment by vehicles before they exit to prevent the track-out of mud or dirt onto paved public roadways.

Other Possible Mitigation Measures

- Converting incandescent lighting systems to LED and implementing motion-activated lighting.

- Regenerating electricity from the conveyor belt leading downhill to the barge load-out facility.

- Participating in PSE's Schedule 258 electricity energy efficiency program.

- The Puget Sound Clean Air Agency Regulation I is intended to control the emission of air contaminants from all sources within the jurisdiction of the Agency, to provide for the uniform administration and enforcement of this Regulation, and to carry out the requirements and purposes of the Washington Clean Air Act and the Federal Clean Air Act. The Proposed Action would comply with all applicable provisions of Regulation I, including the below.

    - Operations would be subject to Puget Sound Clean Air Agency Regulation I, Section 9.15 (Fugitive Dust Control Measures), Section 9.18 (Crushing Operations), and Section 9.20 (Maintenance of Equipment).

    - The facility should be sure to comply with all applicable Agency regulations.

    - The City of DuPont should ensure compliance with RCW 46.61.655 relating to vehicles driven on public highways.

    - Stationary engines may be required to undergo air quality permitting through the Agency's Notice of Construction program (in Agency Regulation I, Section 6, and WAC 173-400), while non-road engines are subject to the Agency's notification requirements in Regulation I, Section 15.

3.2.4 Significant Unavoidable Adverse Impacts

With the application of some or all the mitigation measures described above and consistent use of best management practices, no significant air quality impacts are expected from the proposed project.

3.3 WATER RESOURCES - GROUNDWATER

This section of the FEIS describes the existing groundwater conditions on the site and in the site vicinity (including the Sequalitchew Creek watershed). Potential impacts associated with the EIS Alternatives are evaluated and mitigation measures identified. This section is based on the *Earth and Water Resources Report* (May 2023), *Stormwater Management Report* (February 2021)*, Groundwater Model Update* (June 2017), and *South Parcel Monitoring Plan* (November 2017) all prepared by Aspect Consulting and peer reviewed by Mott MacDonald (see **Appendices B**, **D**, **E**, and **F**).

3.3.1 Affected Environment

Groundwater Hydrology

Groundwater occurs in five primary hydrogeologic units at or near the surface in the site area, which are described in **Table 3.3-1** and depicted in generalized cross section **Figure 2-3** in **Chapter 2**. From top to bottom, these include the Steilacoom Gravel, the Upper Confining Unit, the Vashon Outwash, the Olympia Beds, and the Sea Level Aquifer. The Steilacoom Gravel (Qvs) is coarse-grained and primarily composed of extremely permeable gravel; the Upper Confining Unit is a thin (five to 10 foot thick) silty zone and is not uniformly present across the site area; the Vashon Outwash (Qgog/Qva) is composed of sand and gravel; the Olympia Beds (Qob) are composed of fine-grained silts and clays deposited during an interglacial period; and the Sea Level Aquifer (Qpog) is composed of pre-Olympia sand and gravel glacial drift deposits.

These hydrologic units reflect the glacial history of the Puget Lowland. The oldest geologic deposits of the Sea Level Gravel (Qpog) are the result of earlier (pre-Vashon) glacial advance and retreat. The Olympia Beds (Qob) were deposited above the Qpog sediments during the interglacial period preceding the most recent Vashon glaciation and include fine-grained deposits of low permeability. After the Olympia Beds (Qob) were deposited, the advancing Vashon-era continental glacier carved a valley through the Qob and partially into the underlying Sea Level Aquifer (Qpog), depositing Vashon Outwash sediments within the valley. As the Vashon glacier melted and receded, a lobe of ice blocked the northward drainage of the Puyallup valley, creating a lake. The Steilacoom Gravel (Qvs) is interpreted to have formed when a series of ice dam bursts released the glacially impounded water, which transported coarse-grained sediments into a broad outwash plain in the Sequalitchew Creek area. These flood deposits filled in low areas, created thick deltas, and flowed over the then-existing coastal bluffs within the Olympia Beds and into the glacial valley. The contact between the new Qvs sediment deposits and the former steep bluffs is referred to as the “Olympia Beds Truncation”.

Table 3.3-1
SUMMARY OF HYDROSTRATIGRAPHIC UNITS AND CALIBRATED PARAMETER VALUES

Hydrostratigraphic Unit in DuPont Model	Correlated USGS Hydrogeologic Unit and Partial Description	Principal Layers in DuPont Model	Horizontal Hydraulic Conductivity (feet/day)					Vertical Anisotropy (-)	Specific Yield (-)	Specific Storage (1/foot)	for Horizontal Hydraulic Conductivity (feet per day)	
			Max.	75 percentile	Average	25 percentile	Min.	horizontal: vertical			USGS median	Dupont Works RI
Steilacoom Gravel	A1 – "recessional outwash…sand and gravel deposited by large meltwater streams…"	1,2	3,900	1,600	1,100	350	36	2.7	0.07	6.1E-05	933	18
Upper Confining Unit	A2 – "low-permeability unit composed of Vashon till and lesser amounts of ice-contact, moraine and fine-grained glaciolacustrine deposits…"	3	1.61	0.47	0.33	0.16	0.017	1.0	0.07	5.0E-05	18	
Vashon Outwash	A3 – "aquifer composed of Vashon advance outwash…"	4,5	49	11	7.7	2.4	0.27	15.1	0.09	2.7E-05	122	34
Olympia Beds (Qob)	B – "low-permeability unit composed of fine-grained silts and clays deposited during the Olympia interglacial…"	6,7	0.018 (uniform)					10.0	0.09	1.1E-04	21	
Sea Level Aquifer	C – "aquifer composed of pre-Olympia glacial drift deposits consisting of sand and gravel…"	8,9	690 (uniform)					6.3	0.18	6.0E-05	96	63

Notes:
1 USGS reference: Savoca et al., 2010.
2 Dupont Works RI reference: Hart Crowser, 1994.

Source: Aspect Consulting, 2022.

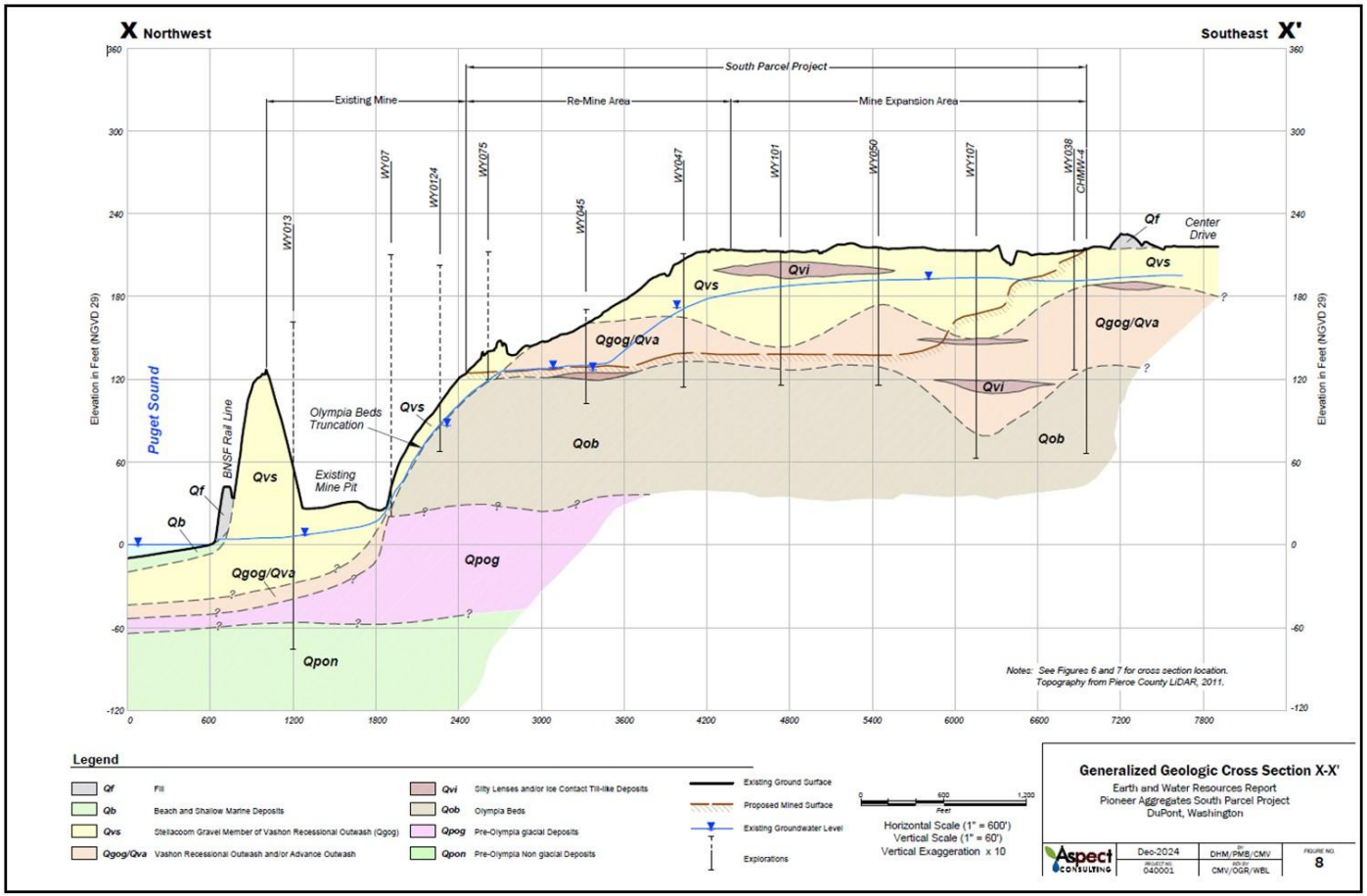
The Steilacoom Gravel (Qvs) and the Vashon Outwash (Qgog) form the uppermost shallow groundwater aquifer underlying the site area (herein referred to as the Vashon Aquifer), which is unconfined. The Upper Confining Unit present within the Vashon Aquifer behaves neither as an aquifer nor a competent aquitard (which is a geologic stratum that restricts but does not prevent movement of water); it nonetheless somewhat separates the uppermost Qvs portion of the Vashon Aquifer from the lower Qgog/Qva portion, and in cross section (**Chapter 2**, **Figure 2-3** and **Figure 3.3-1),** is represented by the dashed line that underlies the Steilacoom Gravel (Qvs) and separates it from the Vashon Outwash (Qgog/Qva). The Qvs is a subunit of the more regionally extensive Vashon Recessional Outwash (Qgog) geologic unit, both of which are shown in **Figure 3.3-1**.

The Vashon Aquifer is separated from the Sea Level Aquifer by the Olympia Beds (Qob), which behaves as an aquitard and is approximately 40 to 80 feet thick in the site area. The Sea Level Aquifer is a highly productive regional aquifer that is generally confined, (i.e. its water is pressurized due to aquitard layers that overlie and underlie the aquifer) except in areas west of the Olympia Bed Truncation, with the approximate location of the truncation shown in **Figure 3.3-2**.

Surface soils overlie the major surficial geologic units. Over most of the site area surficial soils do not appreciably alter the hydrology; however, in wetland areas peaty soils are present and underlain by silty ice-contact deposits, as depicted in **Chapter 2**, **Figure 2-3** and **Figure 3.3-3**. The presence of finer-grained materials beneath the primary wetland complex in the area (e.g., Bell, McKay, Hamer, East Edmond, and West Edmond marshes) affects the relationship between wetland waters and groundwater. Where peaty soils occur, the amount and rate of surface water that can flow into (or out of) the Vashon Aquifer is limited due to their low permeability. In areas where historical activities removed peat and/or fine-grained marsh soils from the wetlands (such as near roadways, the former railway grade that separates East and West Edmond marsh, and channelized areas of Edmond Marsh where former fish hatchery activities removed peat to improve fish passage) surface water and groundwater have a greater degree of hydraulic connection, and therefore the local wetland response to aquifer drawdown is greater (aquifer drawdown is the decrease in groundwater level that occurs due to dewatering).

Groundwater Flow and Water Levels

Groundwater flow occurs primarily in the Vashon Aquifer and Sea Level Aquifer. Surface water features may also reflect aquifer water levels and/or interact with shallow groundwater as locations of groundwater recharge or discharge; therefore, local surface water relationships with groundwater are also discussed in this sub-section.

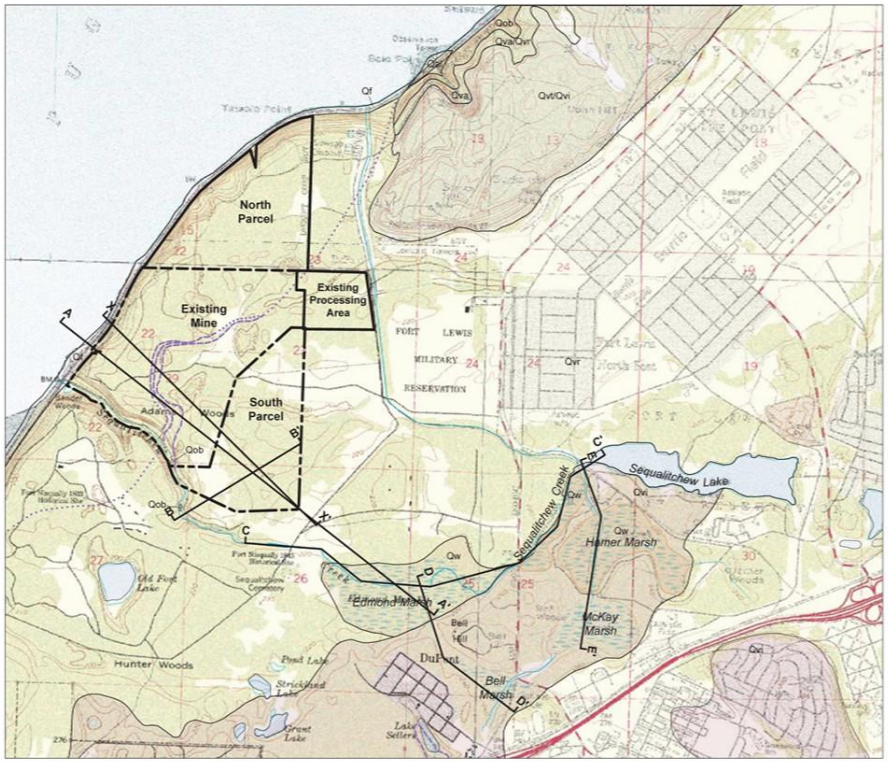


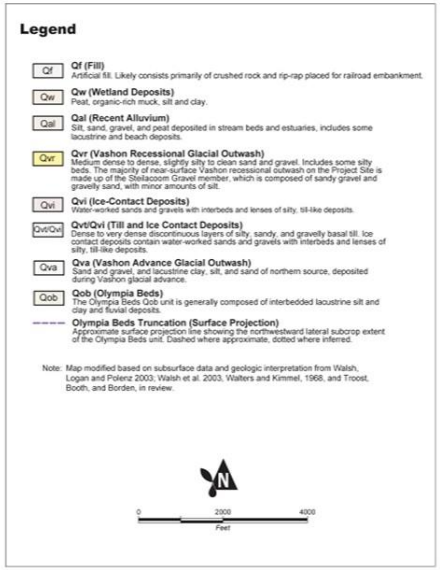
Source: Aspect, 2022.

EA Engineering, Science, and Technology, Inc., PBC

Figure 3.3-1

Generalized Geologic Cross Section

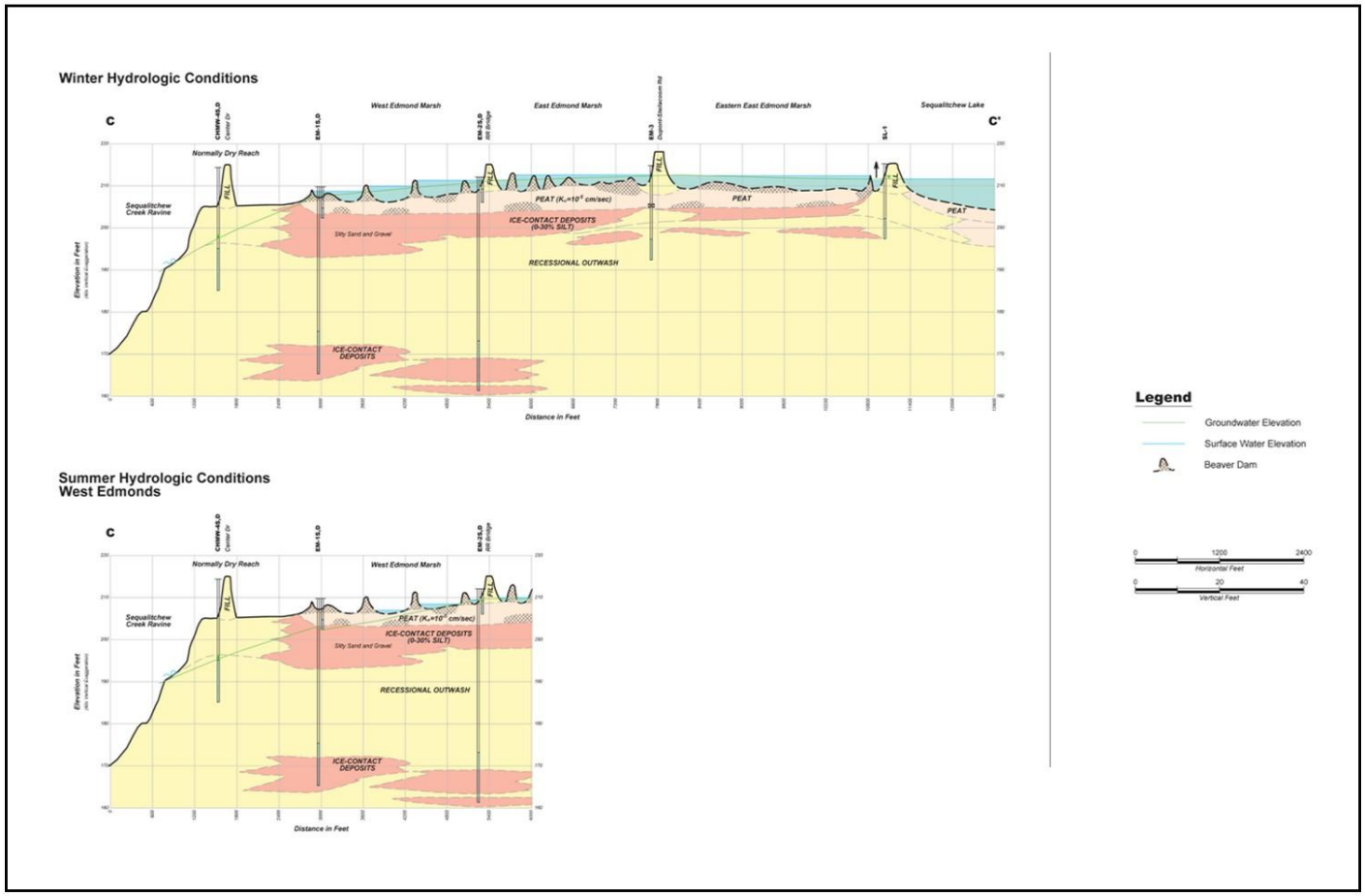




Source: Aspect, 2022.

EA Engineering, Science, and Technology, Inc., PBC

Figure 3.3-2
Regional Geologic Map



Source: Aspect, 2022.

EA Engineering, Science, and Technology, Inc., PBC

Figure 3.3-3

Edmond Marsh Cross Section

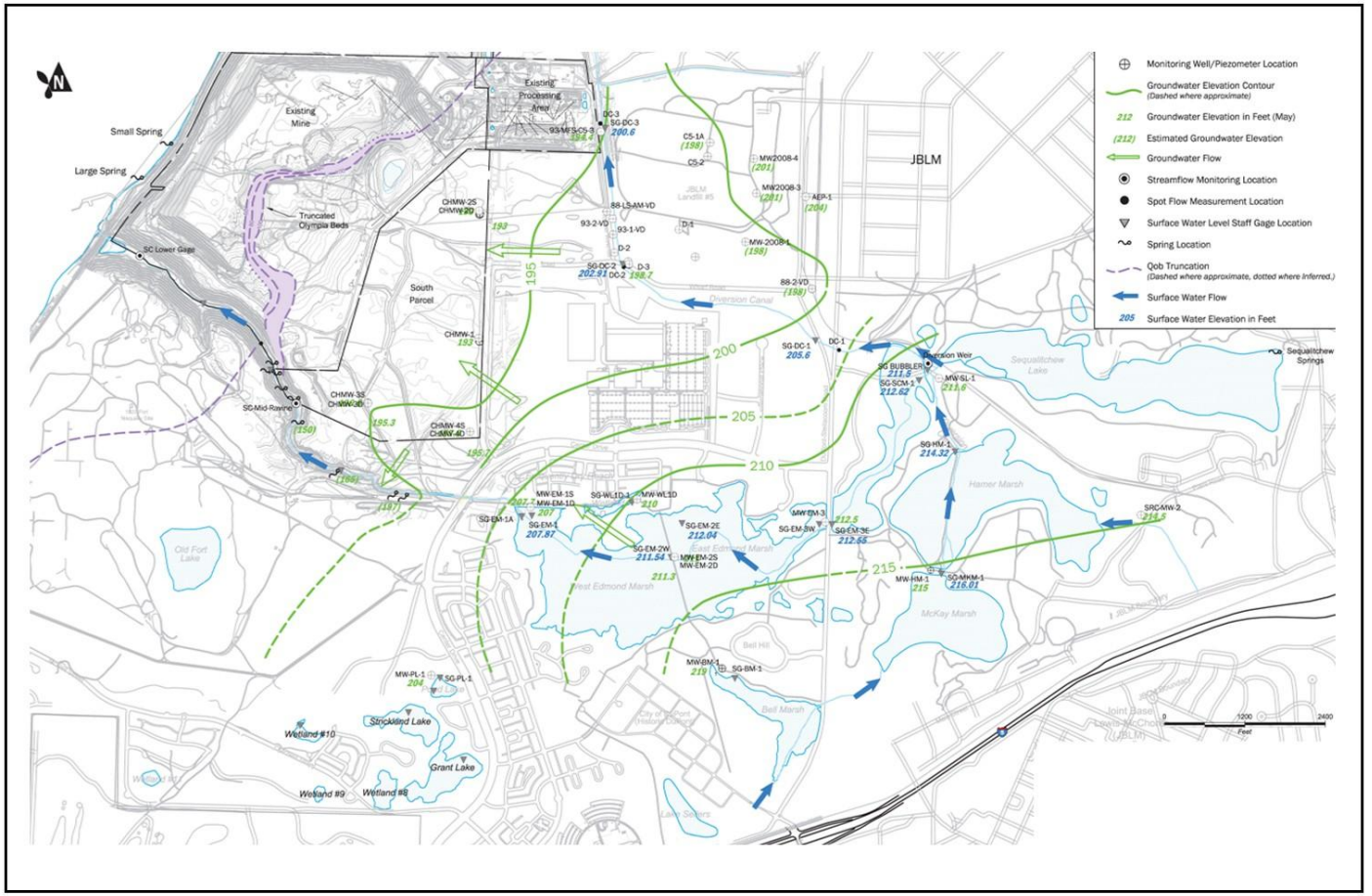
Vashon Aquifer water level monitoring as well as lake and wetland stage monitoring has occurred near the site on a monthly basis since 2003. **Figure 3.3-4** presents observed Vashon Aquifer water levels elevations and surface water elevations from May 2010, which represents approximate average annual conditions. Vashon Aquifer water levels east of the Olympia Bed Truncation are significantly higher (ranging from approximately 190 to 215 feet) than water levels to the west, where groundwater elevations in the merged Vashon-Sea Level Aquifer are approximately 15 feet). As depicted in **Figure 3.3-1**, the water table drops steeply across the truncation and has an elevation close to sea level in the merged Vashon-Sea Level Aquifer.

Vashon Aquifer water level elevations presented in **Figure 3.3-4** indicate that groundwater flow is generally to the northwest. Local variations however occur, with local groundwater flow paths to the southwest near the upper Sequalitchew Creek ravine where groundwater discharge occurs and adds flow to the creek. The JBLM Diversion Canal about a mile to the northeast has some stretches where it gains flow due to groundwater discharge and some reaches where it loses surface water to groundwater.

Seasonal water level fluctuation is variable in the Vashon Aquifer, with groundwater levels varying by two to three feet near Edmond Marsh and by greater than 10 feet at monitoring well CHMW-3S on the South Parcel near the Sequalitchew Creek ravine. Seasonal water level variations are lower near large surface water features that potentially recharge groundwater (such Edmond Marsh) and higher near perennial groundwater discharge locations (such as at the Olympia Beds truncation and the Sequalitchew Creek ravine above the truncation). Groundwater levels are typically highest in early or mid-spring and lowest in fall.

Because the Sea Level Aquifer is separated from the Vashon Aquifer in most of site area by the low-permeability Olympia Beds, where the Olympia Beds are present the vertical flow of groundwater between the Vashon Aquifer and the Sea Level Aquifer is significantly impeded. Because of this, water levels in the Sea Level Aquifer east of the truncation do not require as much monitoring or characterization in as much local detail as the Vashon Aquifer. In the Sea Level Aquifer groundwater flow is generally to the northwest towards Puget Sound based on regional mapping by the USGS.

Water level elevations measured in kettle depression lakes and wetlands can be representative of aquifer water levels if they do not receive significant surface water inflows and/or if fine-grained sediments do not separate the surface water body from the underlying aquifer. However, because these lakes and wetlands are surface water features and future changes in their water levels will not notably impact flow into or out of the Vashon Aquifer, these features and changes in their surface water level elevations are discussed in Section 3.4, **Surface Water**. These surface water features include Old Fort Lake, Pond Lake, Strickland Lake, Grant Lake, Wetlands #8, #9, #10 and #11, Wetland 1-D, and the onsite Kettle Wetland.



Source: Aspect, 2022.

EA Engineering, Science, and Technology, Inc., PBC

Figure 3.3-4

Surface Water System

Aquifer recharge typically occurs if precipitation infiltrates past the root zone in the subsurface. This direct precipitation-based recharge occurs through soils throughout the site area. Groundwater recharge can also occur if the water level elevation of a surface water body is higher than the water level in the aquifer beneath it. The rate of recharge entering groundwater from a surface water body is proportional to the permeability of the sediments (i.e., their ability to transmit water) connecting the two water bodies and the difference in water level elevation between them. The rate of groundwater discharge to a surface water body is controlled by the same relationship but occurs when the groundwater elevation is higher than the surface water elevation. Groundwater recharge and discharge relationships between surface water and the underlying aquifer can vary with seasonal changes in water levels. Areas or features where groundwater recharge or discharge occurs are discussed below.

Lakes

Sequalitchew Lake, the headwater of Sequalitchew Creek, is fed by Sequalitchew Springs (which serve as JBLM's primary water supply) at the eastern end of the lake. Spring discharge not consumed by JBLM flows into Sequalitchew Lake. Sequalitchew Lake has a surface water outlet to Sequalitchew Creek at its western end, which currently flows into the Diversion Canal due to beaver dam blockages. Water levels at Sequalitchew Lake are currently controlled by a weir at its outlet. Sequalitchew Lake water levels likely represent the approximate average groundwater elevation in its vicinity; however, due to its surface water inflows and controlled outlet elevation, lake water levels do not solely reflect aquifer water levels. Additional detail is provided in Section 3.4, **Surface Water**.

As previously mentioned, kettle lake and wetland features that do not have surface water inflows or outflows (and therefore do not cause significant aquifer recharge or discharge) are discussed in Section 3.4, **Surface Water**.

Wetlands

Bell, McKay, Hamer, East Edmond, and West Edmond marshes comprise the large wetland complex southeast of the site. Groundwater-surface water interactions in these wetlands are complex and vary both seasonally and by location. Wetland water level elevations are typically higher than local groundwater elevations and provide net aquifer recharge. However, due to surface water inflows and diversions, beaver activity, seasonality, and the sloping water table, variations in the groundwater/surface water relationship can potentially occur in each wetland and can affect the amount of groundwater recharge/discharge that occurs there. Groundwater recharge and discharge can jointly occur if a wetland overlays a sloping water table, with groundwater discharge occurring on the upgradient side of the wetland and recharge occurring on its downgradient side.

Bell Marsh has the highest elevation of these marshes and receives surface water inflow from JBLM stormwater runoff. It has a surface water outflow to McKay Marsh, and likely supports some shallow groundwater recharge and groundwater flow to the north to Edmond Marsh

(which has a water level elevation typically 6 to 7 feet lower). McKay Marsh receives surface water inflow from Bell Marsh; its primary outflow is surface water flow to Hamer Marsh, though based on surface water elevations some shallow groundwater recharge is likely and may flow west-northwest parallel to a small chain of wetlands toward Edmonds Marsh. Hamer Marsh receives surface water inflow from McKay Marsh and JBLM stormwater. Its primary surface water outflow is to the Diversion Canal and to East Edmond Marsh when its water level elevation exceeds 214 feet (which is the invert elevation of a connecting culvert). Shallow groundwater recharge and subsurface flow west to East Edmond Marsh also likely occurs. Hamer Marsh has been characterized as having greater connection to and receiving more discharge from groundwater than Bell or McKay marshes based on water level monitoring data; however, some seasonal groundwater discharge into Bell and McKay marshes is likely. For current conditions, groundwater modeling for this EIS (introduced in the Groundwater Modeling sub-section below) estimates average annual aquifer recharge from Bell, McKay, and Hamer Marshes combined to be 0.9 cfs.

East Edmond Marsh is separated from the outlet of Sequalitchew Lake and the Diversion Canal by a large beaver dam, which maintains higher water levels within the marsh relative to Sequalitchew Lake. Inflows to East Edmond Marsh (including its areas both east and west of DuPont-Steilacoom Road) are primarily via shallow groundwater flow from the north or east from Bell, McKay, and Hamer Marshes, the culvert previously mentioned from Hamer Marsh, and inflow from a small stormwater system draining a portion of Center Drive runoff on the north side of the marsh. It currently has surface water outflow to the Diversion Canal (via overtopping the beaver dam) and surface water outflow to West Edmond Marsh (via a culvert beneath the railway grade west of DuPont-Steilacoom Road, which separates East and West Edmond Marsh, though it is frequently blocked due to beaver activity). Subsurface outflows include flow to West Edmond Marsh through the railroad grade sediments, or downward into the Vashon Aquifer. Greater downward flow into the Vashon Aquifer likely occurs on the north side of the marsh since the regional water table is lower there (as shown in **Figure 3.3-4**). For current conditions, groundwater modeling (further discussed in the Groundwater Modeling sub-section) estimates average annual aquifer recharge from East Edmond Marsh to be 3.3 cfs.

Surface water levels in West Edmond Marsh are controlled by multiple beaver dams, as shown in **Figure 3.3-3**. The most consequential beaver dam is the westernmost dam, which controls the western extent of the marsh in the wet season. Outflow from this dam to Sequalitchew Creek generally occurs only in winter months, and typically infiltrates to groundwater due to the absence of low-permeability wetland soils (this portion of Sequalitchew Creek immediately east of Center Drive is referred to as the "losing reach" and surface flow rarely extends from the marsh outlet to downstream reaches of Sequalitchew Creek). Subsurface inflows to West Edmond Marsh primarily include groundwater inflow from upgradient (including from Bell Marsh), subsurface inflow from East Edmond Marsh, and possibly shallow subsurface inflow flow from several stormwater infiltration ponds located on the marsh's periphery.

Seasonal surface water level variations are greater in the western portion of West Edmond Marsh compared to elsewhere in the marsh complex, and generally range from four to five feet. During most summers the westernmost portion of the marsh typically goes dry, as shown

in cross section **Figure 3.3-3**. The western two-thirds of West Edmond Marsh typically have "perched" conditions between May and October, meaning the water table is below the marsh bottom elevation. Because surface water and groundwater are seasonally disconnected in this area, decreases in aquifer water levels during summer months would not cause local surface water levels to decrease. However, for the majority of the marsh complex surface water and groundwater levels are similar and hydraulically connected to one another, and therefore aquifer drawdown generally will cause surface water elevations to decrease. These locations are farther from the Site and the decreases in groundwater levels diminish with distance from the mine.

For current conditions, groundwater modeling (discussed in the Groundwater Modeling sub-section) estimates average annual aquifer recharge from West Edmond Marsh to be 0.1 cfs, with the total marsh-complex recharge rate (which includes Bell, McKay, Hamer, East Edmond, and West Edmond marshes) estimated to average approximately 5.3 cfs.

Streams

Vashon Aquifer discharge to Sequalitchew Creek currently occurs in the upper portions of the ravine west of Center Drive, primarily through spring and seep discharges east of the Olympia Beds truncation. Spring-fed discharge along the walls and near Sequalitchew Creek within the ravine provide year-round baseflow to Sequalitchew Creek. Average annual baseflows measured at the mid-ravine monitoring location (**Figure 3.3-4**) are 1.6 cfs, with baseflows ranging from 0.5 cfs in the summer to 2.5 cfs in winter.

Groundwater discharge to the Diversion Canal occurs between the Diversion Weir and SG-DC-1 (**Figure 3.3-4**). Groundwater recharge to the Vashon Aquifer from Diversion Canal stream loss occurs downstream of SG-DC-1.

Groundwater recharge to the combined Vashon-Sea Level Aquifer from Lower Sequalitchew Creek also occurs near where the creek discharges to Puget Sound. These areas where stream loss is interpreted to occur are based on water level data. The associated recharge quantities have not been quantified but are likely small relative to other sources of recharge/inflows to the combined Vashon-Sea Level Aquifer and are not key to understanding the effects of the Proposed Action.

Springs

As discussed above, spring discharge from the Vashon Aquifer occurs at Sequalitchew Springs at the east end of Sequalitchew Lake which has reported discharge rates of up to 9,000 gpm (or roughly 20 cfs), and generally provides more water than JBLM consumes. Excess spring water not used for water supply flows into Sequalitchew Lake, though during dry summers, periods can occur where Sequalitchew Spring discharge is fully consumed by JBLM, causing there to be no surface water flow from Sequalitchew Lake to the Diversion Canal.

Vashon Aquifer discharge also occurs at numerous unnamed seeps and springs within the Sequalitchew Creek ravine, as discussed above. The average annual discharge rate for

combined springs in the Sequalitchew Creek ravine is approximately 1.6 cfs with flows ranging from 0.5 cfs in the summer to 2.5 cfs in winter.

Spring discharge to Puget Sound from the comingled Vashon-Sea Level Aquifer occurs at intertidal and subtitle seeps and springs. The largest of these springs (Large Spring, shown in **Figure 3.3-4**) has observed discharge rates ranging from 9.1 to 18 cfs. It is estimated that approximately 15 to 23% of the freshwater discharge at the intertidal springs comes from the Vashon Aquifer, while the remainder comes from the Sea Level Aquifer. The total average groundwater discharge rate to Puget Sound from the modeled area is estimated to be 131.5 cfs along the approximately 3.5 miles of shoreline modeled.

Groundwater Quality

Groundwater quality sampling from select wells within the mine and completed in the Steilacoom Gravel occurred in 2005, and were tested for pH, specific conductance, and nitrate as nitrogen. No water quality standards were exceeded.

Fort Lewis Landfill 5 is a closed landfill and former Superfund Site located northeast of the South Parcel (see **Figure 3.3-4**, labeled JBLM Landfill 5) and historically has had groundwater quality exceedances for select volatile organic compounds, manganese, and iron. Landfill 5 was removed from the federal National Priorities List of contaminated sites in 1995 because site cleanup was completed, and all cleanup goals were achieved. As further detailed in Appendix B, recent groundwater quality monitoring (through 2022) indicates remaining contaminants of concern (such as iron, manganese, arsenic, and vinyl chloride) have been detected in groundwater monitoring wells between Landfill 5 and the project area (INNOVEX-ERRG Joint Venture, 2023), with concentrations decreasing and approaching applicable groundwater quality standards or background concentrations (if background groundwater concentrations exceed water quality standards). For example, arsenic in wells upgradient of Landfill 5 has been observed at concentrations above the groundwater quality standard, reflecting the regionally high background concentration of arsenic (Ecology, 2022). The nature of observed groundwater contamination for Landfill 5 is consistent with unlined landfills approaching functional stability where little to no leachate generation and/or landfill gas generation is observed. Because Landfill 5 is upgradient of the northern part of the South Parcel, and therefore groundwater with elevated arsenic, iron, manganese, or vinyl chloride concentrations may flow beneath the site under existing conditions within the Vashon Aquifer.

Saltwater intrusion can occur in the comingled Vashon-Sea Level aquifer due to its close proximity and hydraulic connection to Puget Sound. Pumping wells, which commonly cause saltwater intrusion, are not reported to exist in the comingled aquifer west of the site; therefore, only tidally induced mixing between saltwater and freshwater in the immediate vicinity of the intertidal zone currently occurs. Depending on tidal stage and season, the saltwater component of discharge at Large Spring is estimated to range between 36 and 99 %.

The site is also in the Tacoma Smelter Plume area but has soil arsenic concentrations of less than 200 mg/kg. Ecology has determined this soil concentration level as unlikely to pose a threat to groundwater quality.

Water Supply Wells and Springs

The City of DuPont has three water supply wells at its Bell Hill wellfield (located approximately one mile southeast of the South Parcel), with Wells 1 and 3 completed in the Sea Level Aquifer and Well 2 completed in a deeper confined aquifer beneath the Sea Level Aquifer. The City's Hoffman Hill wellfield has two wells located over a mile southwest of the South Parcel which are also completed in the Sea Level Aquifer. The City also has a pending water right application to develop a wellfield sourced from the Sea Level Aquifer in the vicinity of Pond and Grant Lakes near Center Drive. The City's existing and proposed water supply wells produce water either hydraulically upgradient of (Bell Hill and the Pond Lake area) or cross-gradient (Hoffman Hill) to the South Parcel and are completed in confined aquifers which are hydraulically isolated from the Vashon Aquifer.

Prior well inventories in 1991 and 2006 for private residential water supply wells in the site area did not identify any within the Vashon Aquifer in close proximity of the site, nor in the comingled Vashon-Sea Level Aquifer near the active mine site.

As previously mentioned, Sequalitchew Springs provides most of JBLM's water supply.

3.3.2 Impacts of the Alternatives

This sub-section identifies and analyzes the potential for impacts to surface and groundwater resources on and in the vicinity of the site under the EIS Alternatives.

As described in **Chapter 2** of this FEIS, the 2011 Settlement Agreement states that permits for the Pioneer Aggregates South Parcel Project (Proposed Action) shall not be effective until permits for the Sequalitchew Creek Restoration Plan (Restoration Plan)[1], as a separate but related action. The Restoration Plan seeks to restore and enhance streamflow and ecological functions from Sequalitchew Lake through Edmond Marsh into Sequalitchew Creek ravine by sequentially restoring diverted flows back to the creek, improving the sustainability of flows through the system, and restoring aquatic habitat.

Consistent with the 2011 Settlement Agreement, this EIS assumes that mining and reclamation activities under the Proposed Action would not proceed until permits and funding are in place to implement the Restoration Plan. It is assumed that projects associated with the Restoration Plan would be mitigation for certain environmental impacts identified in this FEIS, and that permits for the restoration Plan would be a condition of any City of DuPont approval of the Proposed Action. However, because the Restoration Plan is considered a separate project that would be subject to separate environmental review and could be funded and implemented

[1] *The Sequalitchew Creek Restoration Plan is sponsored and developed by CalPortland, the Environmental Caucus and the South Puget Sound Salmon Enhancement Group (SPSSEG).*

independent of the Proposed Action, the general discussion in the Environmental Impacts sub-section of Groundwater only addresses the impacts of the proposed mining/reclamation and does not include implementation of the Restoration Plan. This is intended to help the reader understand the impacts of the proposed mining/reclamation, and the need for the Restoration Plan with the proposed project. Proposed mining/reclamation in combination with the Restoration Plan is specifically discussed below in the Cumulative Impacts sub-section.

ALTERNATIVE 1 – PROPOSED ACTION

This sub-section describes impacts to groundwater quality and quantity that could occur due to the proposed mine expansion. The primary project impact to groundwater would be decreased Vashon Aquifer water levels due to dewatering activities needed for mining. Ultimately, the gravel deposits which the Vashon Aquifer is comprised of would be removed from the Re-Mine Area and part of the South Parcel. Drawdown of the Vashon Aquifer is anticipated to affect groundwater and surface water features (streams and wetlands) within a one to two-mile radius from the proposed mine site. The extracted groundwater would be conveyed to a constructed wetland system and ultimately infiltration galleries located at the bottom of the current mine, where the Vashon Aquifer and the Sea Level Aquifer are comingled and permeable Steilacoom Gravels are present. Because local surface waters are closely related to groundwater, changes in the groundwater-surface water relationship at nearby surface water features is also discussed.

As previously described in **Chapter 2**, a dewatering plan to accomplish the Proposed Action has been developed and is comprised of four steps (see **Section 2.5** for details). Briefly, these steps include:

- **Step 1:** 10 "Step 1" dewatering wells shown in **Figure 2-4** would be pumped for 60 days to confirm groundwater model predictions and to adjust the dewatering plan (with respect to well spacing, design, and pumping rate) as necessary prior to additional dewatering. This step will be fully reversible since no gravel will be extracted during this step.
- **Step 2:** The 24 Step 1 and Step 2 dewatering wells shown in **Figure 2-4** would be pumped for approximately six months, serving as a larger scale pumping test to confirm groundwater model predictions and to dewater gravels in preparation of mining. This step will be fully reversible since gravel will not be extracted. For Steps 1 and 2, if model predictions significantly differ from the observed hydraulic response, model refinements and/or adjustments to the subsequent dewatering and mining activity plans would be made.
- **Step 3:** This step represents the active dewatering and mining phase of the Proposed Action. Pumping from an estimated 66 dewatering wells (shown as the Step 1, 2, and 3 wells in **Figure 2-4**) may concurrently occur during the step as mining progresses southward toward Sequalitchew Creek. This step is expected to last between five and eight years, is when active gravel mining would occur, and its duration will be dependent on market conditions and successful achievement of groundwater drawdown thresholds. Potential impacts on aquifer water levels are expected to build

slowly over time as wells are added and mining progresses southward. Water level monitoring data would be compared to model predictions, and if more drawdown occurs than predicted, adaptive actions with respect to dewatering and/or mining would be required to ensure that target drawdown levels are not exceeded. Step 3 could be partially reversible (depending on the extent of gravel extraction that occurs prior to a hypothetical mining moratorium or market downturn).

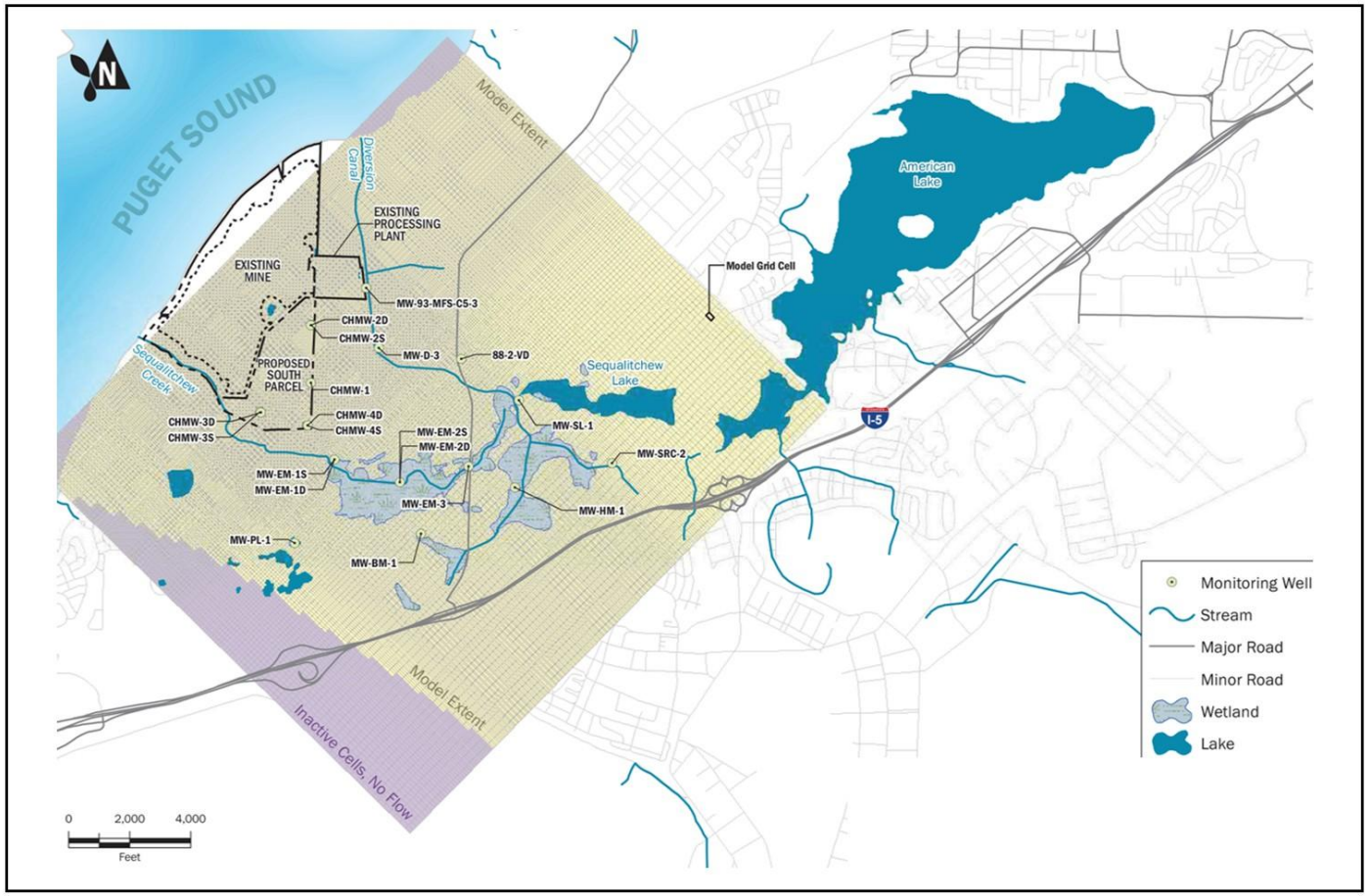
- **Step 4:** This step represents the planned condition for the South Parcel following the completion of active dewatering and would continue in perpetuity. A passive dewatering trough would be constructed at the toe of the eastern mine slope to collect groundwater, and would replace the dewatering wells. Collected groundwater would be conveyed to the mitigation wetland and infiltration facilities at the western margin of the Existing Mine. Gravel mining at locations west of the trough will continue in early phases of Step 4 (following completion of the trough) until all sand and gravel planned for mining has been extracted. Step 4 would be irreversible.

For the following discussion, it is assumed that the Proposed Action would proceed to completion, and therefore Step 3 would be irreversible.

Groundwater Modeling

To estimate likely extraction well pumping rates and groundwater drawdown due to dewatering, a 3-dimensional groundwater flow model of the project area was developed for this EIS. The groundwater model refined and updated previous site groundwater models developed in 2003, 2004, and 2009 to incorporate recent hydrogeologic data and interpretations and was calibrated to recent water level monitoring data. The groundwater model is a set of equations that are inter-related in a way that enables simulation of groundwater levels and flows for the area surrounding the gravel mine (see **Figure 3.3-5** and **Appendix E** for detail). Five different model scenarios were generated:

- An “existing conditions” model was developed to simulate groundwater levels as they currently exist. The existing conditions scenario simulates monthly water levels from 2004 to 2015, using observed surface water body elevations and calculated recharge rates as inputs for each monthly timestep (see **Appendix E** for further detail).
- A “Step 1 future conditions” scenario modified the “existing conditions” scenario by including active pumping from the 10 Step-1 dewatering wells shown in **Figure 2-4** for each monthly timestep. Monthly pumping rates were adjusted to maintain groundwater levels at target elevations that would allow mining to occur.
- A “Step 2 future conditions” model scenario modified the “existing conditions” scenario by including active pumping from the 24 Step-1 and Step-2 dewatering wells (**Figure 2-4**) for each monthly timestep. Monthly pumping rates were adjusted to maintain groundwater levels at target elevations that would allow mining to occur.
- A “Step 3 future conditions” model scenario modified the “existing conditions” scenario by including active pumping from all 66 dewatering wells for Steps 1, 2, and 3 (**Figure 2-4**) for each monthly timestep. Monthly pumping rates were adjusted to maintain



Source: Aspect, 2022.

EA Engineering, Science, and Technology, Inc., PBC

Figure 3.3-5
Existing Monitoring Well Network

groundwater levels at target elevations that would allow mining to occur. The Step 3 model scenario assumes all dewatering wells will actively pump at the same time, while in actuality Step 3 dewatering is planned to occur over five to eight years, with dewatering progressively extending southward as mining activities incrementally extend southward. It is possible that not all Step 3 dewatering wells will pump at the same time as simulated (if possible CalPortland plans to construct a passive dewatering trough in the north part of the site as mining extends southward), however, to evaluate the maximum potential effects of Step 3 pumping, all dewatering wells are simulated as active.

- A "Step 4 future conditions" model scenario modified the "existing conditions" scenario by including a passive dewatering trough to capture groundwater that will emanate from seeps at the base of the finished-grade eastern mine slope of the South Parcel.

The difference between groundwater levels and flows simulated by the different model scenarios are the best available information on groundwater impacts from the proposed dewatering plan. Those impacts are discussed in the sub-sections below. Although all groundwater models are simplified approximations of reality, the model generated in this case is the most comprehensive model developed to date for this area, and therefore the best existing tool for the impacts analysis.

As described in Appendix B and E, applicable elements of the 2011 USGS groundwater model for the Chambers-Clover Creek watershed (Johnson 2011) were incorporated into the DuPont model, including model boundary conditions and hydrogeologic layers at depth. The USGS groundwater model was not fully integrated with the DuPont model because the regional scale of the USGS model does not reflect more detailed local information available in the South Parcel Project area. The DuPont model has several advantages over the USGS Chambers-Clover Creek regional groundwater model (which existed when the DuPont model was developed) and the USGS' subsequent Southeast Sound regional groundwater model (which was published in August 2024). Advantages the local DuPont model has over regional groundwater flow models includes a finer grid spacing (which allows more precise simulation of local features in the model), the local wetland complex is simulated, subsurface data from over 100 onsite boreholes and local testing data are incorporated into it, and more locally-observed groundwater and surface water data are incorporated into it.

Since groundwater and surface water are generally connected, the DuPont model represents these connections quantitatively. Surface water features where groundwater discharge consistently occurs (including Sequalitchew Springs and Sequalitchew Creek and its neighboring seeps in the ravine above the Olympia Beds) are simulated as "drain" cells in the model. Bell, McKay, Hamer, East Edmond, and West Edmond marshes are simulated using "river" cells that allow both groundwater recharge and discharge to occur across low-permeability wetland soils (to reflect the hydraulic connection that exists between surface water and groundwater in the marsh complex). Wetland soil properties were assigned based on field data and through model calibration, and areas where wetland soils have likely been disturbed were simulated with higher permeability than wetland soils that have not been

disturbed. Drain cells are also included in marsh areas to simulate surface water outflow from the marshes during the wet season.

Potential aquifer recharge sources not simulated in the model include the Diversion Canal and Sequalitchew Lake.

Throughout the process of developing, validating and applying the DuPont groundwater model, comprehensive data and conservative assumptions were applied to decrease uncertainty. The major steps in the process are summarized below.

- Extended observations of watershed conditions within the project vicinity: CalPortland has collected data on groundwater levels, marsh water levels, stream flow rates, and precipitation, since 2000. Monthly groundwater and surface water monitoring is ongoing, as described in Section 3.1.1.2 of Appendix B.

- The DuPont model simulates a wide range of precipitation conditions over an 11-year period from 2004 to 2015, a relatively long period of data collection (e.g., compared to a 2-year simulation period for the USGS transient model) which includes both relatively wet and relatively dry years (as shown in Figure 9 of Appendix E) and enhances the predictive reliability of the model results.

- Groundwater model calibration and validation: The background data set described above was used to *calibrate* the DuPont model to ensure that it reasonably replicates existing conditions. After calibration, the model was then *validated* to assess the model's ability to reproduce historical conditions by comparing groundwater elevation predictions for a different set of years (which were not used for model calibration) without modifying the modeled aquifer parameters. Finally, both modeled and predicted water levels were further refined through additional corrections to increase the level of precision. This process is described in detail in Appendix E.

- A spreadsheet-based water balance model was developed for the marsh system, incorporating groundwater and surface water inflows/outflows, precipitation, and evapotranspiration. The water balance model was calibrated by comparing observed marsh water levels with the model predictions for historical conditions. Results of the calibration are shown on Figures 33 and 34 of Appendix B. The model incorporates the following conservative assumptions that are intended to limit uncertainty.
    - The lower 95th percentile values for drawdown predictions were used to calculate conservative groundwater level projections which were used in the water balance for predicting impacts to Bell, Hamer, McKay, and East and West Edmonds Marshes.
    - The existing streamflow in Sequalitchew Creek is assumed to be 100 percent groundwater when estimating the impact of dewatering on streamflows (in actuality, a portion of the streamflow in wetter months derives from surface or shallow subsurface [interflow] flows that would not be impacted by dewatering).

The groundwater modeling approach and methodology used for the EIS is consistent with industry standard hydrogeologic practices, and reasonably simulates a complex hydrogeologic system. Because all hydrogeologic models are simplifications of reality, their predictions are subject to uncertainty (in a similar manner to how weather forecasts are subject to uncertainty). Identified areas where greater model uncertainty may exist for the site model are described in **Appendix E** and can be summarized as follows:

- Based on the model assumptions discussed above, the predicted amount of aquifer drawdown due to dewatering could be overestimated. This potential bias is considered conservative with respect to drawdown because if bias is present, the model most likely will over predict aquifer drawdown.
- The groundwater model was calibrated to Vashon Aquifer water level data alone; therefore, more uncertainty exists for model predictions of Vashon Aquifer discharge to surface water such as in the Sequalitchew Creek ravine.
- Sufficient aquifer water level data from the Sea Level Aquifer were not available for model calibration; therefore, greater uncertainty exists with respect to water level predictions for the Sea Level Aquifer compared to the Vashon Aquifer. However, dewatering activities are not proposed in the Sea Level Aquifer and the Olympia Beds provide relative isolation from the changes in water level in the Vashon Aquifer.

Wetland Water Balance Modeling

The site groundwater model is capable of estimating changes in groundwater level and discharge to springs and Sequalitchew Creek in the upper ravine due to dewatering activities since it simulates the primary physical processes and parameters affecting them. However, the groundwater model cannot predict changes in marsh-complex water levels because surface water inflows to the marshes are not directly simulated in the groundwater model, and monthly marsh surface water levels are input values to the groundwater model. A water balance model was developed for this EIS to predict changes in wetland water levels and flows. The wetland water balance model is discussed briefly here because a groundwater component is simulated by it.

The wetland water balance model first simulated the "existing" condition based on historical water level data and simulation results were improved through model calibration. Changes in groundwater levels (as simulated by the groundwater model) for each dewatering step were then input into the water balance model, and it was used to predict changes in wetland water levels and flows emanating from the wetlands due to changes in the underlying groundwater level. The water balance model was also used to estimate likely effects on the wetlands if the Proposed Action and the Sequalitchew Creek Restoration Plan occur (see the Cumulative Impacts sub-section for details).

The water balance model divided the marsh complex into 1) an upper area consisting of Bell, Hamer, and McKay marshes; 2) a central area comprised of the East Edmond Marsh area; and 3) West Edmond Marsh. Water inflows into each of these areas consisted of precipitation directly on the wetlands, surface water inflows, and discharge of groundwater to the marsh.

Outflows consisted of evapotranspiration from open water and vegetation, surface water outflows, and recharge of groundwater from the marsh. Time steps were monthly. Changes in wetland water elevation were calculated by assessing the change in water storage within each wetland group (total water in minus total water out) and spreading that change in volume over the area of the wetland. A qualitative calibration process was performed where existing condition simulated water levels were compared to historically observed wetland water levels.

The groundwater component simulated in the water balance model is significantly simplified compared to the groundwater model; each wetland has a single soil permeability value assigned, a uniform monthly groundwater elevation beneath each wetland is assigned, and a uniform aquifer permeability adjacent to each wetland is assigned. Additionally, groundwater levels beneath each wetland do not change in response to predicted recharge or discharge flow to/from the wetland. Nonetheless, because significant changes to the hydrology of the wetland complex will occur as part of the Sequalitchew Creek Restoration Plan and their likely impacts on the underlying aquifer system are difficult to quantify, output from the wetland water balance model was used in the EIS to make interpretations regarding the likely aquifer system response to changes in surface water elevations and flows caused by the Restoration Plan. It should be noted that groundwater elevation predictions from the groundwater model were used as input for the wetland water balance model; no wetland water balance model outputs were incorporated into the groundwater model.

Generally, under existing conditions East and West Edmond Marshes recharge groundwater year-round, and Bell, Hamer and McKay Marshes receive discharge from groundwater most of the year and recharge groundwater in the summer and early fall. With Mining all marshes recharge groundwater throughout the year. With Mining and Restoration Bell, Hamer, and McKay Marshes recharge groundwater throughout the year; East Edmond Marsh receives discharge from groundwater year-round, and West Edmond Marsh recharges groundwater year-round. (See the F-series tables in Appendix B.)

The percent contribution of flows to and from the subsurface, which represents the combination of shallow subsurface flows and groundwater recharge from the marsh complex and groundwater discharge to the marsh complex is shown in Table 3.3-2 under existing conditions, with Mining alone, and with Mining and Restoration. These results indicate that Bell, Hamer, and McKay Marshes and East Edmond Marsh have some inflows from the subsurface, but also lose water to the surface and the net result is a loss of water. Under the Mining scenario, this pattern persists.

Table 3.3-2
GROUNDWATER FLOW

Scenario	Percent Contribution to Inflows/ Outflows		
	Bell, Hamer, and McKay Marshes	East Edmond Marsh	West Edmond Marsh
Existing			
Inflows from Subsurface	1%	25%	0%
Outflows to Subsurface	-9%	-41%	-79%
Net	-8%	-16%	-79%
Mining - Low Groundwater			
Inflows from Subsurface	0%	23%	0%
Outflows to Subsurface	-13%	-35%	-89%
Net	-13%	-12%	-89%
Mining and Restoration - Low Groundwater			
Inflows from Subsurface	0%	15%	0%
Outflows to Subsurface	-29%	0%	-7%
Net	-29%	15%	-7%

With mining, both with and without the Restoration Plan, Bell, Hamer, and McKay Marshes losses to the subsurface would be a greater portion of the water balance. The increase in relative importance of losses to the subsurface is driven by the lower water levels in East Edmond Marsh resulting in greater shallow subsurface outflows from Bell, Hamer, and McKay Marshes. If the Restoration Plan is implemented East Edmond Marsh switches to gaining water from the subsurface, because its water level would be controlled at a lower level resulting in greater inflows from Bell, Hamer, and McKay Marshes and the Vashon Aquifer.

No "Subsurface Inflows" were calculated in the water balance for West Edmond Marsh because there is no apparent shallow preferential subsurface pathway from Bell Marsh (the nearest higher-level marsh) and West Edmond Marsh on average loses water to the subsurface every month. The preferential pathway from Bell to East Edmond Marsh follows a topographic low that is not present heading from Bell Marsh toward West Edmond Marsh. Inflows from East Edmond Marsh to West Edmond Marsh are treated as surface water inflows, even though some may occur through the railroad grade trail.

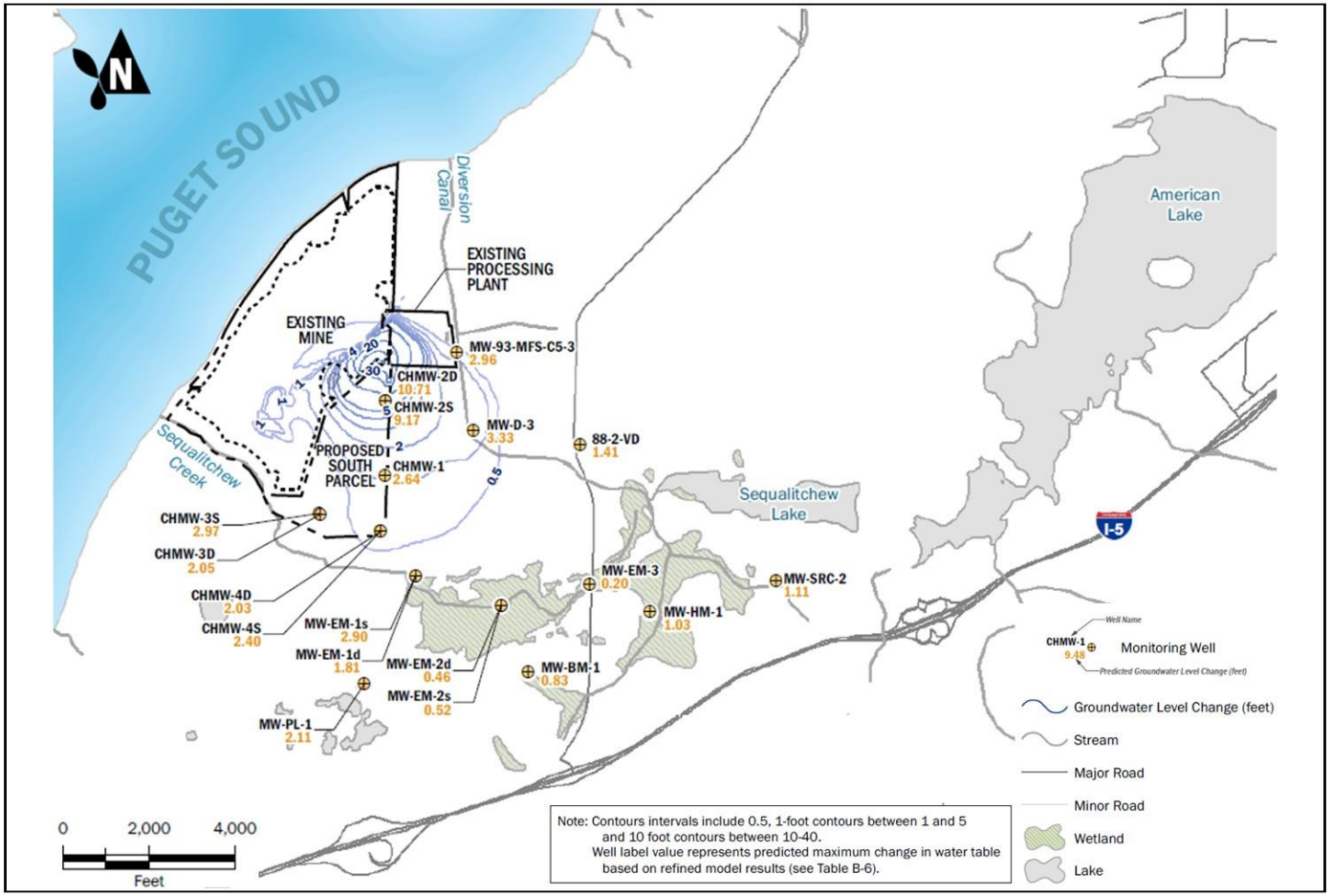
Groundwater Flow and Water Levels

Water levels in the Vashon Aquifer are expected to decline significantly at the project site due to the Proposed Action. Aquifer drawdown is projected to generally decrease with increasing distance from the dewatering area, as discussed in this subsection. As discussed in the Surface Water sub-section, aquifer drawdown would cause surface water level elevations to decrease.

Three types of predicted water levels (and drawdown) based on groundwater model results were calculated and applied in the following ways:

- "Raw" predicted water levels are water levels predicted by the calibrated model, with no additional corrections. Model predicted changes in groundwater recharge and discharge were calculated using "raw" water levels.
- "Refined" predicted water levels are based on "raw" predicted water levels but have been statistically corrected to be more accurate based on field measurements at existing wells. "Refined" water levels are effectively best estimate predictions of expected future water levels near the site, but could only be calculated at site-area monitoring wells where real-world water level measurements exist.
- "Performance threshold" predicted water levels are calculated using "refined" water levels but incorporate additional corrections for model uncertainty relating to seasonal and annual climate variations. "Performance threshold" predicted water levels represent "worst case scenario" predicted water levels and drawdown. Defined through statistical testing with a 95% lower confidence interval, "performance threshold" water levels are expected to have less than a 5% chance of being exceeded due to random chance.

  Raw maximum predicted drawdown contours for each dewatering step are shown in **Figures 3.3-6** through **3.3-9**. Maximum performance threshold predicted drawdown values are listed next to each well in **Figures 3.3-6** to **3.3-9**. The performance threshold maximum drawdown values are greater than the contoured (raw maximum predicted) drawdown values because model and seasonal predictive uncertainties are added to them.
- Maximum predicted raw and performance threshold drawdown values at the South Parcel and the wetland complex are discussed below for each dewatering step:
- Step 1 (10 dewatering wells pumping for 60 days in the northeast corner of the South Parcel): The performance threshold maximum predicted drawdown at a site monitoring well is 10.71 feet at CHMW-2D (approximately 450 feet south of the southernmost Step 1 dewatering well), while in the wetland complex area it is 2.90 feet at MW-EM-1S (located at the west end of West Edmond Marsh). Up to 30 feet of raw drawdown is predicted to occur in the vicinity of the active dewatering wells (**Figure 3.3-6**), while less than 0.5 feet of raw drawdown is predicted to occur beneath the wetland complex and Sequalitchew Creek. Because Step 1 will only last for 60 days, it is possible that measurable aquifer drawdown at more distant features (such as the marsh complex) may not occur if Step 1 commences during the wet season when the wetlands are "full" and provide ample recharge to the water table.

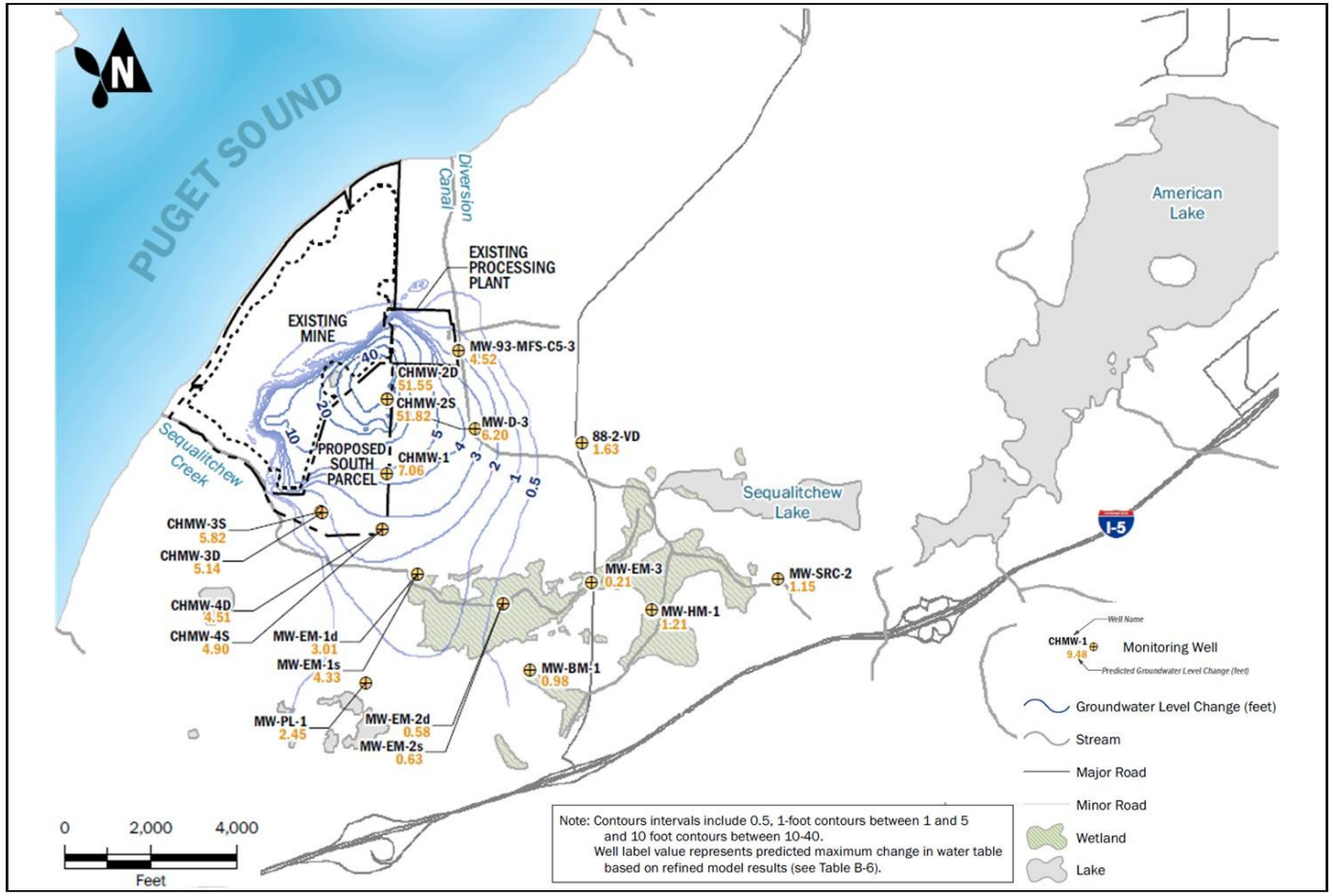


Source: Aspect Consulting, 2017.

EA Engineering, Science, and Technology, Inc., PBC

Figure 3.3-6

Map of Maximum Model Calculated Groundwater Level Changes: Step 1

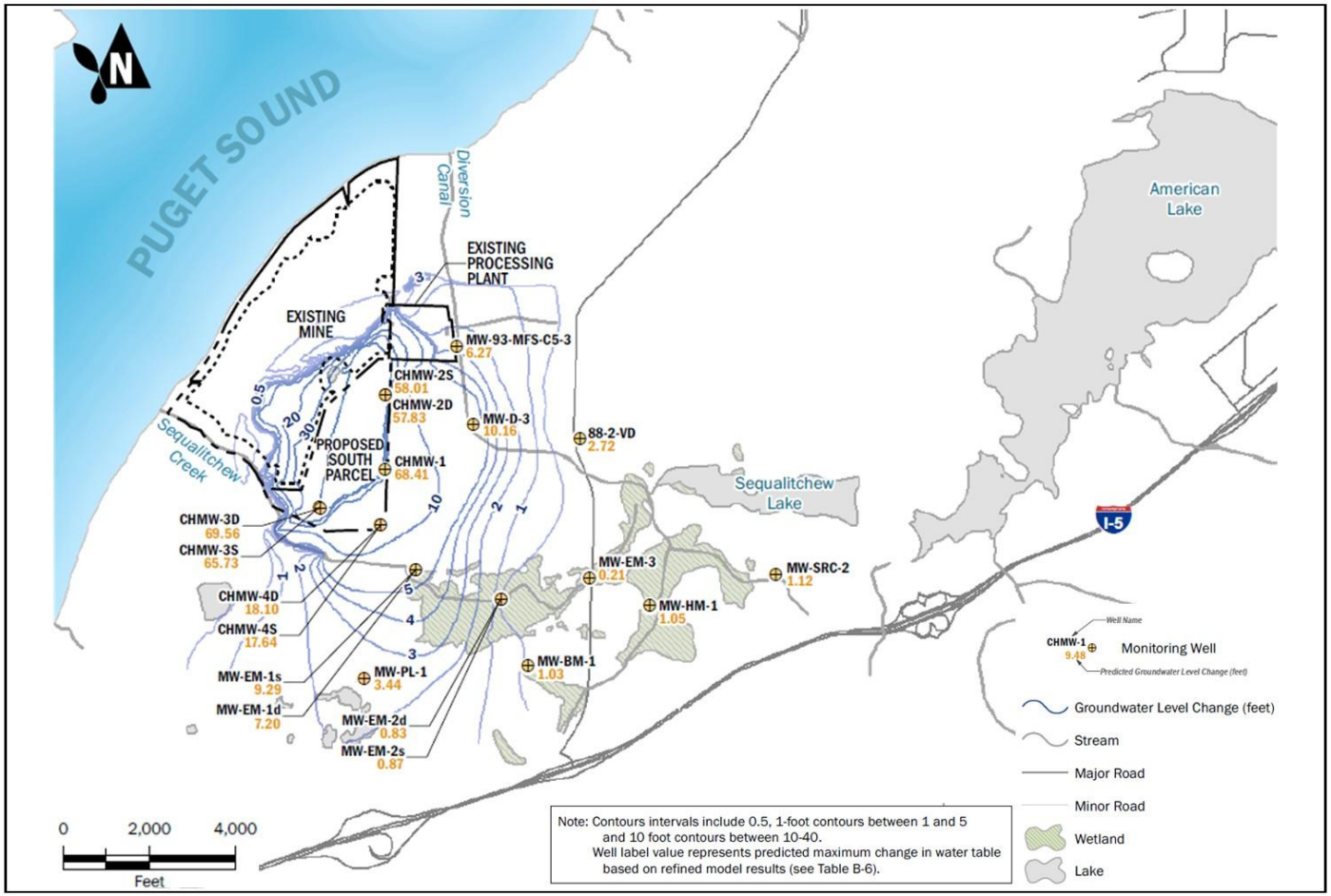


Source: Aspect Consulting, 2017.

EA Engineering, Science, and Technology, Inc., PBC

Figure 3.3-7

Map of Maximum Model Calculated Groundwater Level Changes: Step 2

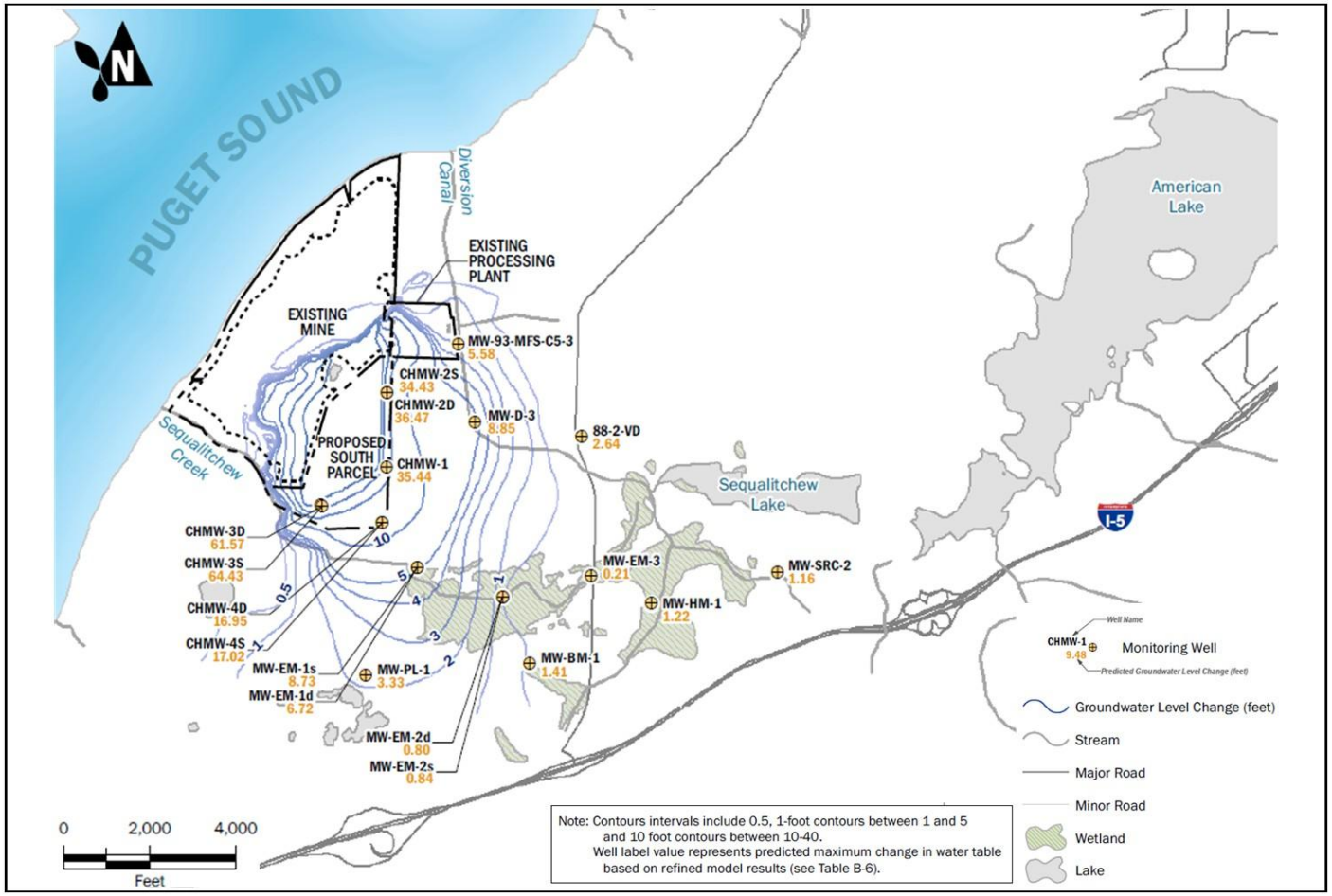


Source: Aspect Consulting, 2017.

EA Engineering, Science, and Technology, Inc., PBC

Figure 3.3-8

Map of Maximum Model Calculated Groundwater Level Changes: Step 3



Source: Aspect Consulting, 2017.

EA Engineering, Science, and Technology, Inc., PBC

Figure 3.3-9

Map of Maximum Model Calculated Groundwater Level Changes: Post Mining

- Step 2 (24 dewatering wells pumping for six months in the northeast and east-central portions of the South Parcel): The performance threshold maximum predicted drawdown is 51.82 feet at CHMW-2S, while in the wetland complex area it is 4.33 feet at MW-EM-1S (at the west end of West Edmond Marsh). A raw maximum predicted drawdown of over 40 feet is predicted for a broad area in the mine vicinity near the active dewatering wells (**Figure 3.3-7**), while less than 0.5 to almost 2 feet of raw drawdown is predicted to occur beneath the wetland complex and Sequalitchew Creek. Similar to Step 1, because Step 2 will only last for six months, aquifer drawdown near the wetlands may be difficult to observe if Step 2 occurs primarily during the wet season when aquifer recharge is higher.
- Step 3 (up to 66 dewatering wells pumping for five to eight years in the eastern and southern sections of the South Parcel). The performance threshold maximum predicted drawdown is 69.56 feet at CHMW-3D (**Figure 3.3-8**) and is up to 9.29 feet beneath the western edge of the marsh complex (at MW-EM-1S). Maximum performance threshold drawdowns farther east in the marsh complex range are approximately one foot or less. Raw maximum predicted drawdown values of greater than 40 feet are predicted across much of the South Parcel, while beneath West Edmond Marsh the raw maximum predicted drawdown ranges from approximately 6 feet to 0.5 feet (and decreases to the east). Between 5 and 10 feet of raw maximum drawdown is predicted beneath Sequalitchew Creek in the upper ravine, while less than 0.5 feet is generally predicted beneath East Edmond, Bell, Hamer, and McKay marshes.
- Step 4 involves passive dewatering via a trough located in the eastern and southern sections of the South Parcel and will be active in perpetuity. The performance threshold maximum predicted drawdown is 64.43 feet at CHMW-3S (**Figure 3.3-9**) and is up to 8.73 feet beneath West Edmond Marsh (at MW-EM-1S). Maximum performance threshold drawdowns farther east in the marsh complex are approximately one foot or less. Relative to Step 3, onsite drawdown will be less with the passive groundwater collection system. Less drawdown is predicted from passive dewatering relative to active dewatering because the excavated mine slope and trough can more efficiently maintain groundwater elevations at levels beneath the proposed mine floor than pumping wells.

With the Proposed Action, the general groundwater flow direction in the Vashon Aquifer is expected to remain to the northwest. However, in the immediate vicinity of the project site, local groundwater flow paths are expected to change and flow toward the dewatering wells (or the groundwater collection trough in Step 4) rather than flowing toward their existing natural discharge points (i.e., the Olympia Beds Truncation or seeps in the Sequalitchew Creek ravine). Changes in local flow direction would likely be greatest during Steps 1 and 2 and during earlier phases of Step 3 (when dewatering would be focused in the northern part of the South Parcel). During later phases of Step 3 and in Step 4 local groundwater flow paths would be similar to current conditions, though local flow paths that currently discharge from the north to the Sequalitchew Creek ravine may be reversed and instead terminate at a dewatering well or seeps that drain to the Step 4 groundwater collection trough.

Predicted water level changes in the Sea Level Aquifer are expected to be negligible beneath the Olympia Beds because it is hydraulically isolated from the Vashon Aquifer by the Olympia Beds. Therefore, no notable change in its northwest groundwater flow direction is expected.

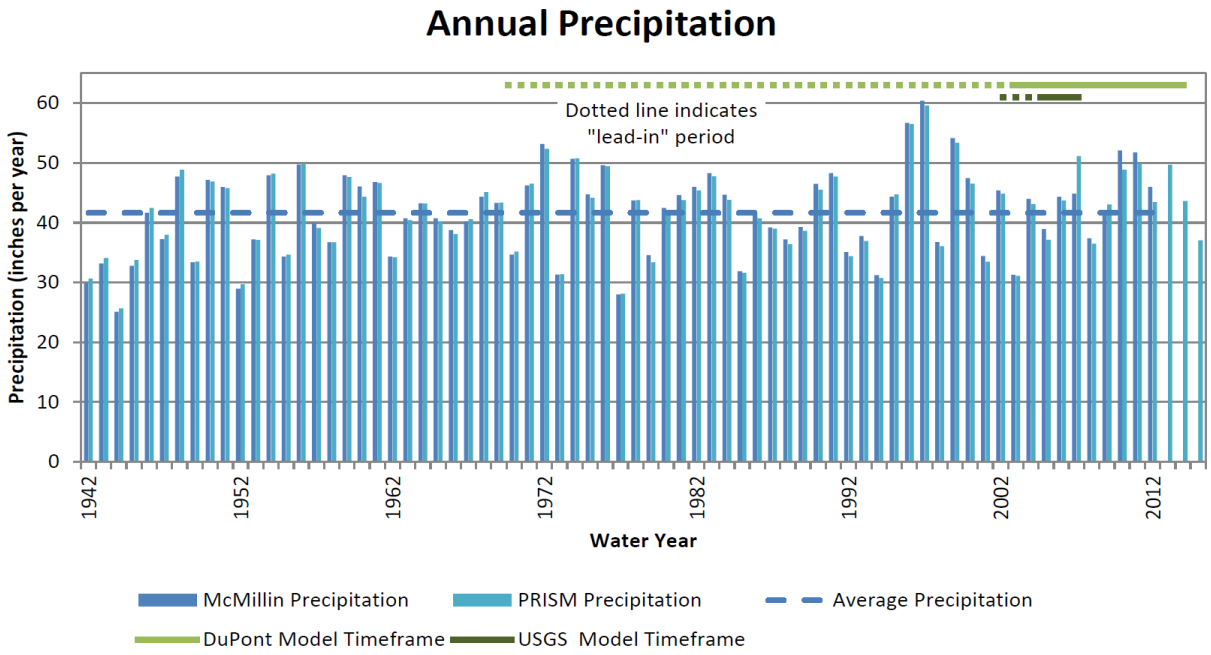
West of the Olympia Beds Truncation where the combined Vashon and Sea-Level Aquifer exists, groundwater flow would generally remain to the west/northwest toward Puget Sound, though localized groundwater paths near the planned infiltration facility at the far west end of the mine could change due to groundwater mounding beneath it. Because the mine dewatering system intercepts groundwater from the Vashon Aquifer that would otherwise enter the comingled aquifer (via downward groundwater flow at the Olympia Beds truncation), the total volume of water entering the comingled Vashon and Sea Level aquifer should not significantly change during Steps 1 and 2. Groundwater levels would likely be higher near the planned infiltration facilities due the more concentrated and higher rate of infiltration expected to occur at those facilities relative to the existing area where groundwater from the Vashon Aquifer enters and provides recharge to the comingled Vashon-Sea Level Aquifer. During Steps 3 and 4 slightly more water is likely to be infiltrated in the comingled aquifer than currently flows into it from the Vashon Aquifer since some groundwater that naturally discharges to Sequalitchew Creek in the upper ravine (above the Olympia Beds) is expected to be captured by the dewatering system and conveyed to the infiltration facilities.

Though the general direction of groundwater flow is not expected to appreciably change following completion of the Proposed Action, lower groundwater levels in the Vashon Aquifer near the site are expected to result in less groundwater discharge to surface water bodies and more aquifer recharge due to surface water losses. Expected changes in groundwater recharge/discharge relationships and aquifer water levels near these features due to the Proposed Action are discussed below. Yearly variation may differ more than currently and individual dry years and series of drier years may occur more often.

The effects on the monitored and modeled conditions during the years between 2004 and 2015 provides the basis for the average year conditions presented. Annual rainfall conditions in the vicinity for the years 1942 to 2015 are shown in Figure 3.3-10. A statistical representation in Figure 3.3-11 indicates that the monitored and modeled years generally fall in the 7th to 73rd chance-of-exceedance percentile of precipitation years, as further discussed below. For the period monitored and modeled Figure 3.3-12 indicates the monthly average precipitation during that period (depicted by the green line) and the variation in those monthly values during the period modeled.

The relative “dryness” of each modeled water year is noted on **Figure 3.3-13** as a measure of “probability of exceeding water year precipitation.” The graphs from the top indicate measured well water levels from five wells shown in **Figure 3.3-4**. The graph at the bottom indicates precipitation during the years monitored from 2004 to 2015. The values at the bottom represent the likelihood that the precipitation for a given year will be exceeded in any other given year (higher values indicate drier years and lower values represent wetter years), based on statistical comparison to the precipitation dataset from 1942 to 2015 represented in Figure **3.3-11**.

This data shows a clear relationship between precipitation and well water levels on both a seasonal basis with a definite pattern of lower water levels in the summer dry season. It also shows a relationship between annual precipitation variation and groundwater levels, although the relationship is not as clear as seasonal variation patterns since there is a buffering effect from year to year from groundwater storage and groundwater/surface water interactions. Some wells show less buffering effect, particularly MW-BM-1 which is at the north end of Bell Marsh and can be expected to be affected by recharge from stormwater inflows to the wetland. Well MW-EM-2S which is located in the middle of East Edmond Marsh also can be expected to be directly affected by recharge from the marsh complex. Wells CHMW-1, CHMW-3S and CHMW-4S are all at a distance from the wetland complex and show clear effects from seasonal and annual precipitation variation, although the effects are delayed by several months in the fall due to the soil system "wetting up" in response to seasonal rains. Some wells with similar locations and influences (e.g., CHMW-1, 3S, and 4) that display similar overall seasonal patterns do not necessarily experience the lowest annual minimum water levels in the same year. These observations highlight the complexity of the hydrologic and aquifer systems while demonstrating the relationship between precipitation and groundwater on a seasonal and annual basis.



Source: Aspect, 2022

Figure 3.3-10
Annual Precipitation

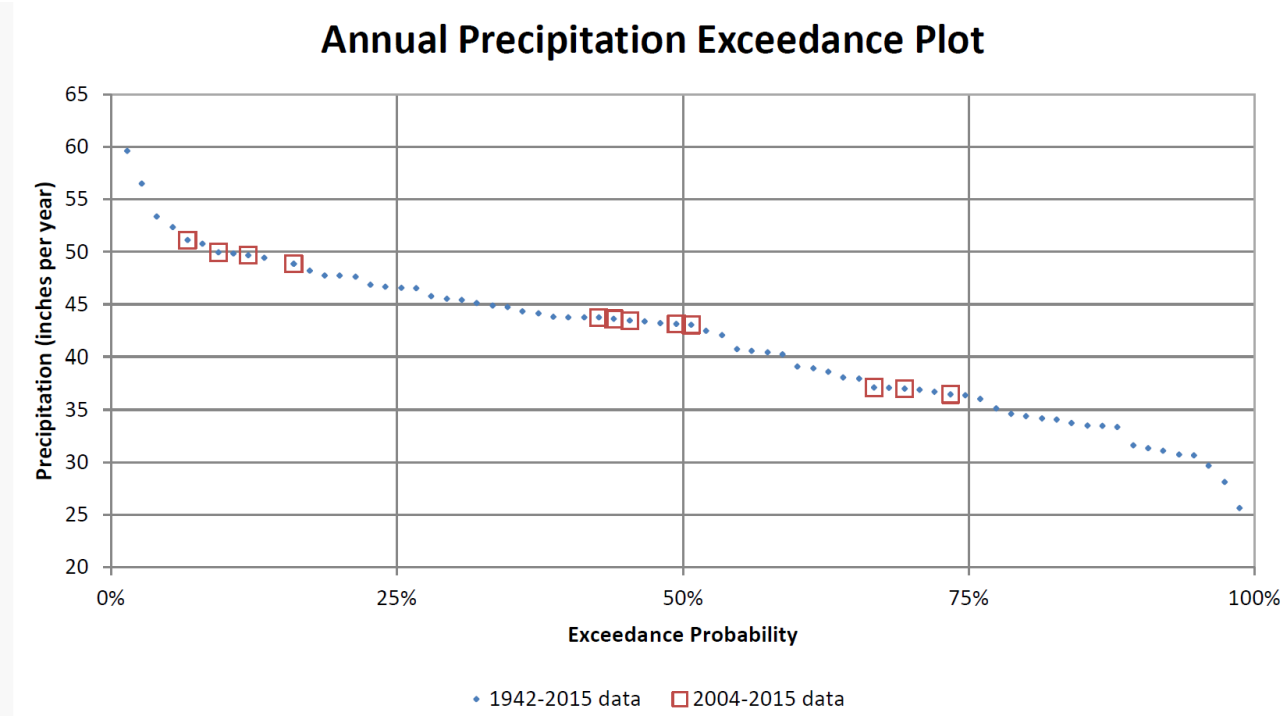
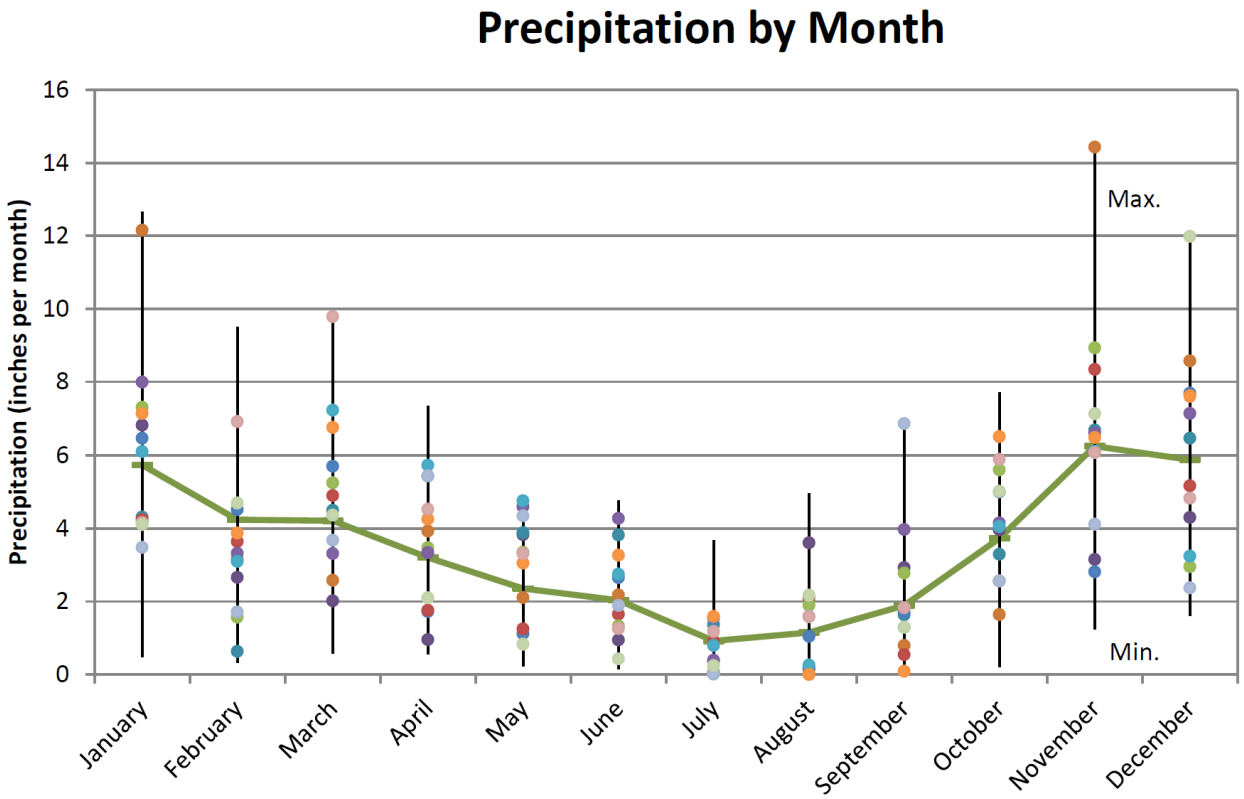


Figure 3.3-11
Annual Precipitation Exceedance Plot



Source: Aspect, 2022

Figure 3.3-12
Precipitation by Month

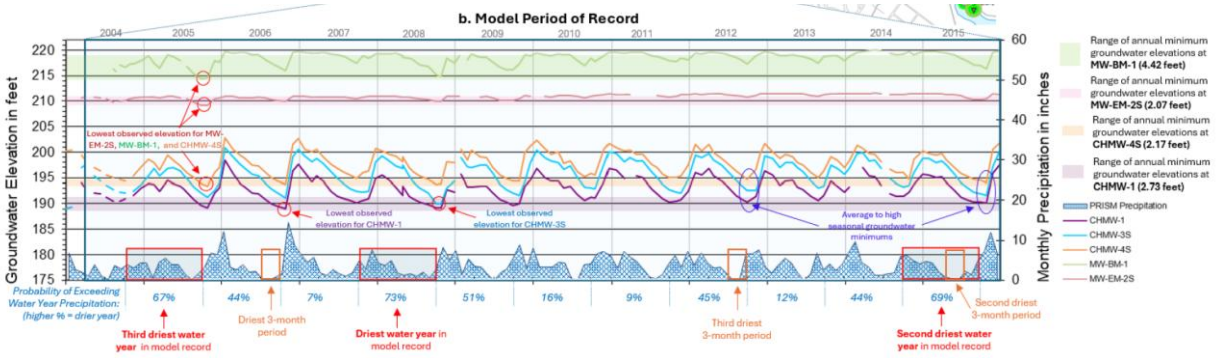


Figure 3.3-13
Model Period of Record

The lowest year of precipitation experienced during the 2004 to 2015 period which is shown as a 73 percent exceedance probability in **Figure 3.3-11** also represents the inverse, which is about a 27 percent probability that lower levels of precipitation will be experienced than those modeled. In the future with or without climate change, the results of the past likely will be within a similar range as historic conditions and will include the effects of lower levels in the 27 percent of cases not represented in the modeled years.

The trends for the Puget Sound Region likely will apply to the DuPont area with similar annual rainfall, a slight increase in springtime rainfall, and summer seasons that may become slightly drier. Because drier conditions are projected to occur largely during the summer months when aquifer recharge is already minimal (as reflected in monitoring data and incorporated into the DuPont model), average groundwater levels are not expected to be negatively impacted as a result of climate-related changes in precipitation; however yearly variation may differ more than currently and individual dry years and series of drier years may occur more often. On average, the impacts projected from the groundwater drawdown of the aggregate mine under the Proposed Action are likely to be similar to the modeled results.

Lakes

Because slightly lower aquifer water levels are predicted near Sequalitchew Lake (less than 0.5 feet of raw aquifer drawdown is predicted for all dewatering steps, while performance threshold maximum drawdown values near Sequalitchew Lake range from 0.21 to 2.72 feet in Step 3), more recharge may occur in its vicinity since the lake typically receives surface water inflows from Sequalitchew Springs.

As mentioned previously, expected changes in surface water levels at kettle lake and wetland features where surface water inflow/outflow does not occur (and therefore groundwater recharge/discharge is not expected) are discussed in the Surface Water sub-section.

Wetlands

Lower aquifer water levels beneath the wetland complex are predicted to cause more surface water inflow to the Vashon Aquifer within the wetlands. Relative to existing conditions, the groundwater model predicts that aquifer recharge from the combined wetland complex would increase by the following average amounts during dewatering:

- Step 1: similar to existing conditions/no significant change
- Step 2: 0.2 cfs greater than existing conditions
- Step 3: 0.6 cfs greater than existing conditions
- Step 4: 0.5 cfs greater than existing conditions

Greater surface water inflow from the wetlands to the aquifer would cause aquifer water levels beneath them to be somewhat buffered and experience less drawdown than would occur in their absence. However, increased groundwater recharge from the wetlands would cause wetland water levels to decrease, as discussed in Section 3.4, **Surface Water**. A brief discussion of predicted changes in aquifer water levels beneath the wetland complex follows.

Bell, McKay, and Hamer Marshes are relatively far from the South Parcel, and less than 0.5 feet of raw aquifer drawdown is predicted beneath all three marshes during all dewatering steps. Performance threshold aquifer drawdown values of approximately one foot are predicted at each marsh for each dewatering step (with a predicted range across all dewatering steps of between 0.83 and 1.41 feet as shown in **Figures 3.3-6** to **3.3-9**). Predicted changes in marsh water level due to aquifer drawdown are discussed in Section 3.4, **Surface Water**, and are less than predicted changes in aquifer water levels primarily because of surface water inflows and the presence of low-permeability marsh sediments (which limit the rate of surface water flow into the aquifer).

Beneath East Edmond Marsh, less than 0.5 feet of raw aquifer drawdown is predicted for Step 1, up to 0.5 feet for Step 2, and up to one foot of drawdown for Steps 3 and 4. Performance threshold maximum drawdown during all dewatering steps ranges from 0.20 to 0.87 feet. Smaller decreases in marsh water levels are predicted relative to groundwater levels, as discussed in Section 3.4, **Surface Water**. Though closer to the project site than Bell, McKay, and Hamer Marshes, lower model uncertainty with respect to aquifer water level predictions exists at East Edmond Marsh, causing it to have lower performance threshold drawdown values than Bell, McKay, or Hamer Marshes.

West Edmond Marsh is the closest large wetland to the site and has more raw drawdown predicted than the other wetlands. As previously discussed, during Steps 1 and 2, raw maximum drawdown of 2 feet or less is predicted beneath the wetland, while performance threshold maximum drawdown values of up to 4.33 feet are predicted. During Steps 3 and 4 between approximately 1 and 5 feet of maximum raw drawdown is predicted (depending on location, as shown in **Figures 3.3-8** and **3.3-9**). In Steps 3 and 4, performance threshold maximum drawdown values of up to 9.29 feet of drawdown are predicted at the west end of the marsh (MW-EM-1S), and while only 0.87 feet is predicted at its east end (MW-EM-2S).

Higher predicted drawdown values at the west end of West Edmond Marsh are likely due to it being closer to site dewatering features, and because only seasonal hydraulic connection exists between surface water and groundwater (due to the fine-grained marsh sediments which cause surface water to be seasonally disconnected or "perched" above groundwater). Existing summer conditions in the western portion of West Edmond Marsh would result in surface water being either perched above the water table or dry (see **Figure 3.3-3**). Where perched conditions exist aquifer drawdown would not cause surface water inflow (i.e., recharge) to the aquifer to increase, and in the absence of buffering surface water inflows, more aquifer drawdown would occur. With lower aquifer water levels, more surface water in West Edmond Marsh would be seasonally perched and disconnected from groundwater. The effects of increased aquifer drawdown on surface water level elevations and wetland function are discussed in Section 3.4, **Surface Water**, and in Section 3.6, **Plants and Animals**.

Streams

The groundwater model predicts significant reductions in Sequalitchew Creek baseflow through the ravine due to decreases in aquifer water level caused by the Proposed Action. In dewatering Steps 1 and 2, spring and seep discharge within the ravine are not predicted to significantly change because the dewatering steps are relatively short (months in duration) and the pumping wells are relatively far from Sequalitchew Creek (approximately 3000 feet or more, as shown in **Figure 2-4**). In Step 3, groundwater discharge to the ravine is predicted to decrease by 83% on average, with the greatest decreases occurring in the dry season. During Step 4, discharge to the ravine is predicted to be on average 79% less than existing conditions, and similarly the greatest decreases are predicted in the dry season. In Step 4, the average annual baseflow (which is fed by groundwater discharge at seeps and springs) of Sequalitchew Creek is projected to be reduced from approximately 1.6 cfs to approximately 0.34 cfs. Step 4 is predicted to have slightly less impact on Sequalitchew Creek baseflows than Step 3 because the passive dewatering trough will induce slightly less aquifer drawdown than the active dewatering wells.

Groundwater recharge from Lower Sequalitchew Creek where it overlays the combined Vashon-Sea Level Aquifer has not been quantified but is expected to decrease with decreasing upstream baseflows in Sequalitchew Creek. The reduction in recharge from Lower Sequalitchew Creek is likely insignificant relative to other inflows and recharge sources to the combined Vashon-Sea Level Aquifer

Aquifer recharge from and discharge to the Diversion Canal also is not quantified. The reach of the Diversion Canal downstream of Sequalitchew Lake and upstream of DC-1 currently receives groundwater discharge. Under the Proposed Action, aquifer drawdown may cause less discharge to the canal in that reach. If so, more water would be retained by the aquifer in that area, which would potentially reduce aquifer drawdown in that vicinity.

Springs

Predicted changes in spring discharge for the Sequalitchew Creek ravine are discussed in the Streams sub-section above.

No change in Sequalitchew Springs discharge to Sequalitchew Lake is expected due to the Proposed Action since aquifer drawdown is not predicted to occur there.

Changes in discharge at the Large Spring and other springs adjacent to Puget Sound which receive water from the comingled Vashon-Sea Level Aquifer have been estimated using the groundwater model at approximately a 2% increase due to the Proposed Action. Since dewatering is expected to capture groundwater that would normally discharge to Sequalitchew Creek, slightly more water would be infiltrated into the Vashon-Sea Level Aquifer than currently discharges to it from the Vashon Aquifer. This additional water entering the aquifer may slightly increase local groundwater elevations and spring discharge rates.

Puget Sound

Marine discharge to Puget Sound from the comingled Vashon-Sea Level Aquifer is not likely to change significantly and may slightly increase (predicted to be less than 2%) since mine dewatering is predicted to capture some Sequalitchew Creek base flow, which would then be infiltrated in the comingled aquifer (as discussed above in the Springs sub-section). However, the total volume of water discharging to Puget Sound in the project area (both groundwater and surface water) should not significantly change.

Groundwater Quality

Groundwater quality beneath and in the area of the South Parcel would largely be unaffected by the Proposed Action. Mining permits require best management practices for groundwater and stormwater pollution prevention, defined spill control and cleanup procedures, and operations management to minimize the use of potential pollutants within the mine. The consistent presence of heavy machinery onsite would enable a rapid spill cleanup response, where contaminated soils can quickly be excavated into and removed by a dump truck.

Groundwater with elevated iron and manganese concentrations flowing beneath Fort Lewis Landfill 5 would continue to flow toward the project site and the Olympia Beds Truncation, though dewatering potentially would cause more to flow toward the dewatering features rather than the Olympia Beds Truncation. The ultimate destination of groundwater captured through dewatering or groundwater flowing over the Olympia Beds Truncation would be the same (the comingled Vashon-Sea Level Aquifer). Lowering groundwater levels in the landfill vicinity will not impact the effectiveness of the existing landfill cover system and will not change or increase the interaction of groundwater with waste material. Therefore, dewatering will not provide a mechanism to increase the rate of landfill leachate production/mobilization. Similarly, groundwater drawdown is not anticipated to affect the rate of landfill gas generation, which is predominately controlled by the age of waste and is currently being mitigated by landfill gas collection engineering controls.

Because the proposed action will lower the elevation of groundwater in the vicinity of the landfill, some shallow groundwater monitoring wells may need to be modified or replaced to

allow for continued monitoring of groundwater adjacent to the landfill. The initial dewatering testing period will assess this condition and address it if necessary. Because dewatering will lower aquifer water levels on the South Parcel property, the hydraulic gradient from the landfill to the South Parcel will be steeper, causing potential contaminants originating at the landfill to more quickly reach the South Parcel site. Under existing conditions this potentially contaminated groundwater would flow beneath the South Parcel, encounter the Olympia Beds truncation, and ultimately enter the comingled Vashon-Sea Level Aquifer to the west. The proposed dewatering action would capture potentially contaminated and uncontaminated groundwater that flows into the South Parcel site and convey it to infiltration basins situated above the unconfined comingled aquifer to the west. Because the final receptor (the comingled Vashon-Sea Level Aquifer) will be the same as under current conditions and landfill-related contaminants will be diluted via mixing with unimpacted groundwater, significant adverse impacts to groundwater quality from the proposed action are not expected.

Greater surface water inflows from the wetlands could affect groundwater temperature and water quality in the immediate vicinity of the wetlands, but because aquifer mixing and dilution would occur, notable changes in groundwater quality at the dewatering site are not expected.

Significant saltwater intrusion impacts are not expected due to the Proposed Action, though less flow in Sequalitchew Creek could result in a slight landward shift of the saltwater-freshwater interface near its mouth. Slight increases in recharge to the comingled Vashon-Sea Level aquifer could cause intertidal springs west of the existing mine to have a slightly greater freshwater component.

Drinking water supplies near the South Parcel (Sequalitchew Springs, DuPont's Bell Hill and Hoffman Hill wellfields) are not expected to be impacted by the Proposed Action since they are either significantly upgradient of the project site (Sequalitchew Springs) or completed in deeper aquifers that are separated from the Vashon Aquifer by confining units.

Water Supply Wells and Water Supply Springs

The proposed project would not directly disturb the Olympia Beds or the deeper aquifers, and therefore indirect impacts on deep-aquifer water levels are expected to be minimal. Model results indicate that the change in water level in the Sea Level Aquifer at the edge of the model boundary in the direction of the City wellfield is less than 0.1 feet. Thus, existing and proposed City wellfields are not expected to be impacted by the Proposed Action.

Aquifer drawdown is not predicted to occur at Sequalitchew Springs, and therefore no effects on JBLM's water supply springs are expected.

No water supply wells are known to exist in the site area which tap the Vashon Aquifer, and therefore none would be impacted by the Proposed Action.

CUMULATIVE IMPACTS WITH PROPOSED ACTION AND SEQUALITCHEW CREEK RESTORATION PLAN

Introduction

As indicated in **Chapter 2** of this EIS, the 2011 Settlement Agreement states that permits for the Pioneer Aggregates South Parcel Project shall not be effective until permits for the Sequalitchew Creek Restoration Plan are in place, as a separate but related action. The Sequalitchew Creek Restoration Plan seeks to restore and enhance streamflow and ecological functions from Sequalitchew Lake through Edmond Marsh into Sequalitchew Creek ravine. Restoration of Sequalitchew Creek seeks to address almost two centuries of human manipulation. The principal goals of the Restoration Plan are to restore flows in Sequalitchew Creek, portions of which are now dry. This goal will be achieved by implementing a series of actions in a coordinated and adaptively managed project. The Restoration Plan is intended to sequentially restore diverted flows back to the creek, improve the sustainability of flows through the system, and restore aquatic habitat by removing flow-related fish passage barriers and increasing the habitat available to aquatic species.

The Restoration Plan is composed of multiple elements and phasing; its general objectives are to achieve year-round surface water flow in Sequalitchew Creek from Sequalitchew Lake to Puget Sound, minimize surface water flow to the Diversion Canal, and improve habitat conditions for native salmonid populations in the Sequalitchew Creek watershed.

Cumulative Impacts

Expected cumulative impacts to the groundwater system with the Proposed Action and Restoration Plan include:

- Lower surface water levels in East Edmond Marsh are predicted to cause the marsh to become a feature where groundwater discharges to the marsh because its planned surface water elevation will be lower than the underlying groundwater elevation. Beneath West Edmond Marsh groundwater recharge from surface water is projected to increase due to the increased surface water flow through it. Surface water levels are not expected to significantly change at Bell, McKay, and Hamer Marshes with the restoration plan, and therefore significant changes in their groundwater recharge/discharge relationships are not expected.
- Greater surface water flows through West Edmond Marsh and the Sequalitchew Creek "losing reach" is likely to increase groundwater recharge in its vicinity. Increased recharge in this area potentially will cause spring discharge in the upper Sequalitchew Creek ravine to increase, particularly if concentrated recharge occurs in the western portion of the "losing reach". However, if substantial streamflow losses in the current "losing reach" section of Sequalitchew Creek occur, a possible action identified in the restoration plan is adding a liner of low permeability materials to the creek bed in this vicinity. If this does occur, less groundwater recharge would occur in the "losing reach" area.

- Streamflow loss from Lower Sequalitchew Creek to the combined Vashon-Sea Level Aquifer should increase (as well as nearby aquifer water levels) due to the higher surface water flows through Sequalitchew Creek.
- During dry summers (when Sequalitchew Springs discharge to Sequalitchew Lake is fully consumed by JBLM), no surface water outflow from Sequalitchew Lake to East Edmond Marsh and Sequalitchew Creek will occur. These dry periods are projected to occur about 10% of the time and are predicted to last for several weeks to months. During these periods the hydraulic system would shift closer to the condition simulated by the groundwater model with no Restoration Plan actions. However, because surface water level elevations in East and West Edmond marshes would be lower due to beaver dam removal, the aquifer would likely receive less recharge from the wetlands. Therefore, during drought periods greater aquifer drawdown could develop beneath Edmond Marsh and/or less groundwater discharge may occur in the Upper Sequalitchew Creek ravine with the Restoration Plan.
- Intertidal spring water quality and discharge rates from the combined Vashon-Sea Level Aquifer are not expected to change with the Proposed Action and the Restoration Plan. Total Spring discharge to Puget Sound from the project modeled area is estimated to be 131.5 cfs along the entire approximately 3.5 miles of shoreline modeled. The average of 6.9 cfs discharged from groundwater diverted from mine dewatering would be inconsequential and within the normal weekly to monthly variation.
- Recharge near the Diversion Canal (if any) would likely decrease since the Restoration Plan aims to minimize surface water flows in the Diversion Canal. Monitoring data and the groundwater model calibration effort suggest that the Diversion Canal is not a significant source of recharge to the aquifer.

ALTERNATIVE 2 – NO ACTION

The No Action Alternative includes two scenarios: Scenario A – Continuation of Existing Site Conditions; and Scenario B – Site Development under Existing Zoning.

Scenario A

Under No Action Alternative Scenario A, the surface and groundwater conditions would remain as under existing conditions.

Scenario B

If the site were to be developed consistent with existing zoning, clearing and grading associated with construction would increase potential for erosion impacts to surface and groundwater resources; with adherence to applicable regulations during construction, significant impacts to these resources are not anticipated. The increase in impervious surfaces on the site with development consistent with existing zoning would increase stormwater runoff; with adherence to applicable regulations related to stormwater quantity and quality, significant impacts are not anticipated.

As indicated above, development of the site consistent with existing zoning includes the potential for the Sequalitchew Creek Restoration Plan to be implemented without the Proposed Action. However, there are no other known substantial funding sources other than CalPortland.

3.3.3 Mitigation Measures

Proposed Mitigation Measures

The following mitigation measures have been included in the Proposed Action to reduce surface water and groundwater impacts.

- Groundwater and surface water level monitoring for features in the site area that could potentially be affected would be implemented (see **Appendix F** for details). Monitoring data would be reviewed throughout the active dewatering period and used in support of the Proposed Action mitigation measures bulleted below. City review of monitoring data should include retention of a qualified hydrogeologist to provide qualified review of both data and projected impacts.

    - Steps 1 and 2 of the aquifer pumping tests would be completely reversible and would allow for confirmation testing of groundwater model predictions. If observed impacts differ significantly from predicted impacts, updates to the groundwater model would be pursued to improve its predictive accuracy for subsequent dewatering steps and/or adjustments to the dewatering and mining activity plans would be made.

    - The dewatering plan would be phased so that dewatering would start at locations farthest from Sequalitchew Creek and the wetland complex, and gradually would proceed closer to the waterbodies only if observed aquifer water levels do not exceed performance threshold values established by city conditions of approval.

    - If performance threshold water levels are established by city conditions of approval are exceeded, adaptive management responses (such as adjusting the dewatering operations and/or the boundaries and depth of mining so that performance threshold exceedances do not occur) would be required before additional mining could occur.

    - Since dewatering Step 3 would be irreversible, increased monitoring vigilance at different phases of Step 3 as dewatering and mining progress southward could be warranted to ensure that performance threshold water levels are not exceeded.

- Erosion and sediment controls and stormwater treatment, which are intended to protect groundwater quality and the long-term performance of the proposed infiltration facilities, would be implemented (see **Appendix D** and Section 3.1, **Earth**, for details).

Other Possible Contingency Mitigation Measures

- As an element of the approval conditions for the Proposed Action, the City of DuPont could require a Monitoring and Response Plan. The Monitoring and Response Plan could include, among other things, definition of monitoring methodology, establishment of performance thresholds, and identification of contingency response measures to the considered for implementation if monitoring indicates exceedance of a performance threshold. The Monitoring and Response Plan could incorporate elements of the adaptive management processes proposed to be established for the Proposed Action and the Sequalitchew Creek Restoration Plan.

The Sequalitchew Creek Restoration Plan is a separate but related action that is intended to be implemented in parallel with the Proposed Action. The mine and the stream restoration project each have their own adaptive management process tailored to achieving the goals and objectives of each specific project. The interaction between the two adaptive management processes could include: 1) project schedules that encourage restoration in advance of the potential impacts from mining; 2) development of performance thresholds for mining that support restoration and 3) coordinated monitoring and open sharing of information. The City, as the permitting authority for both projects would have a key role in assuring consistency between the two adaptive management plans. The adaptive management process included in the Monitoring Plan (see **Appendix F**) includes, but is not limited to, the following potential mitigation actions if the impacts of dewatering on groundwater levels are greater than anticipated including: Installing additional monitoring locations; modifying the dewatering system or approach; revising the mining plan; and providing additional mitigation to impacted surface waters.

- The Sequalitchew Creek Restoration Plan's adaptive management process similarly identifies examples of potential response actions to be implemented if restored flows do not meet the plans objectives that include, but are not limited to: removing beaver obstructions; installing additional beaver exclusion devices; escalating beaver management; installing additional flow paths through the former railroad grade that divides Edmond Marsh; sealing the losing reach; creating connections to Bell and/or McKay marshes; and expediting later elements of the Restoration Plan.

Other groundwater contingency mitigation measures that could be implemented as part of the adaptive management process include:

- Groundwater captured from the mine could be conveyed to the Sequalitchew Creek ravine (either by open channel or micro-tunneling). This approach could provide mitigation for decreased seep discharge within the ravine if the conveyance outfall (or confluence) is located in the vicinity where groundwater discharge currently occurs.

However, this mitigation measure could require revisiting conflicting provisions in the 2011 Settlement Agreement and would not augment streamflow between Sequalitchew Lake and the ravine.

- All or some groundwater captured from the mine could be pumped into Edmond Marsh rather than into the Sequalitchew Creek ravine. Benefits of this mitigation approach would be that cool groundwater (which has a low summer water temperature relative to surface water) would enter the marsh and could enhance Sequalitchew Creek surface water flow and fish and other habitat. A potential drawback of this mitigation action is that groundwater discharge/infiltration to the comingled Vashon-Sea Level Aquifer would decrease. This option would only occur during Steps 1-3 dewatering through pumping which is projected to last 6 to 8 years as passive dewatering water flow could not be routed to the marshes as they are at a higher elevation.

- Water could be actively conveyed to Edmond Marsh during dry periods, while during all other periods captured groundwater from the South Parcel could be conveyed to the lower mine area for infiltration (as is planned in the Proposed Action). As above, this option would only occur during Steps 1-3 dewatering through pumping which is projected to last 6 to 8 years as passive dewatering water flow could not be routed to the marshes as they are at a higher elevation. This could serve as a contingent measure for consideration and/or further study to supplement Sequalitchew Creek flows during dry periods when no outflow from Sequalitchew Lake occurs or if the Restoration Plan provides less environmental benefit than currently expected.

3.3.4 Significant Unavoidable Adverse Impacts

Under the Proposed Action with the Sequalitchew Creek Restoration Plan, unavoidable adverse impacts to the surface water system of the Sequalitchew Creek watershed would likely include:

- The Vashon Aquifer water table would significantly decrease in the vicinity of the proposed mine. Groundwater levels beneath Edmond Marsh, the closest marsh to the site, are predicted to decrease by up to 0.87 feet near its center (at MW-EM-2S) and remain up to 0.84 feet lower following completion of the Proposed Action. At the west end of the marsh (MW-EM-1S), long-term groundwater level declines of up to 8.73 feet could occur.

- Groundwater discharge in the Sequalitchew Creek ravine is expected to significantly decrease (by an annual average of up to 83%) at the peak of active dewatering (Step 3) and is expected to provide on average 79% less baseflow to Sequalitchew Creek during the passive phase of dewatering in Step 4 of mining and following completion of mining. Greater percentage decreases in baseflow are expected during the dry season. Impacts to baseflow quantity could be mitigated by the Sequalitchew Creek Restoration Plan, except during low-flow or no-flow periods when surface water outflow from Sequalitchew Lake does not occur which will occur about 10% of the time.

3.4 WATER RESOURCES - SURFACE WATER

This chapter of the EIS describes surface water features — streams, lakes, the associated marsh system, and artificial channels – on the site and in the site vicinity. Potential impacts associated with the EIS Alternatives are evaluated and mitigation measures identified. This section is based on the *Earth and Water Resources Report* (May 2023), *Stormwater Management Report* (February 2021), *Groundwater Model Update* (June 2017), and *South Parcel Monitoring Plan* (November 2017) all prepared by Aspect Consulting (see **Appendices B**, **D**, **E**, and **F**). Information added or changed subsequent to the Draft EIS, if any, is shaded to ease identification of any added or changed information.

3.4.1 Affected Environment

Surface Water Hydrology

The surface water systems that are relevant to the site and Proposed Action include: Sequalitchew Lake, Sequalitchew Creek, the related marsh system, the Joint Base Lewis-McChord (JBLM) Stormwater Diversion Canal, on-site stormwater system, and the Kettle Wetland. In the Sequalitchew Creek watershed, the natural flow direction is westward from Sequalitchew Lake, through a portion of the marsh system, and into the Sequalitchew Creek ravine before discharging to Puget Sound. Construction of the Diversion Canal on JBLM created a secondary outlet for the water flowing out of Sequalitchew Lake, resulting in water no longer following the natural course to Sequalitchew Creek. Under current conditions, there is a segment of Sequalitchew Creek between the western margin of the marsh system and the steep ravine of the creek that does not typically have flowing surface water; this segment is referred to as the "losing reach" of Sequalitchew Creek. Relevant surface water bodies are depicted on **Figure 3.4-1**.

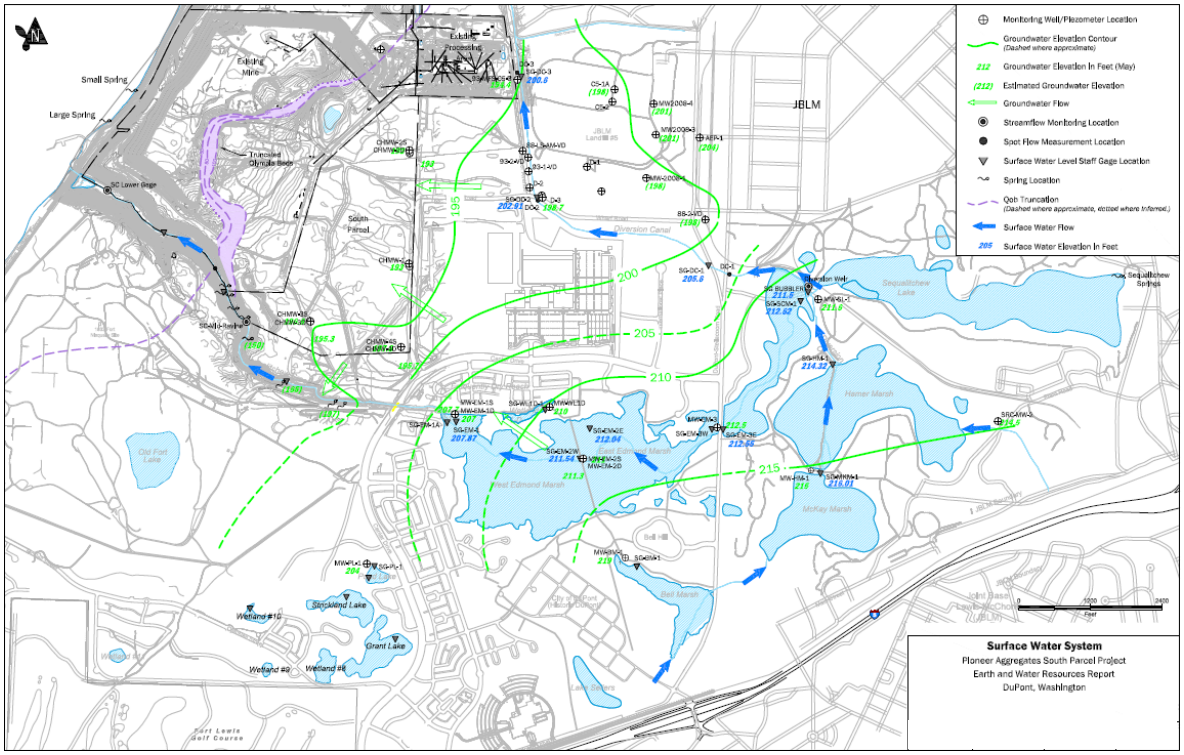
Sequalitchew Lake

Sequalitchew Lake is the headwaters of the Sequalitchew Creek watershed. It is an approximately 85-acre lake located on JBLM. The lake is fed by groundwater springs (Sequalitchew Springs)[1] at the east end of the lake and likely other groundwater discharges and minor surface water inputs. The normal water level of the lake is elevation 211.5 feet (ft) NGVD29.[2] The depth of the lake is approximately 6 ft on average and approximately 11.5 ft at maximum. The outlet of the lake is on the extreme west end of the lake.

[1] *Sequalitchew Springs also provide the primary water supply for JBLM. Sequalitchew Springs represent a discharge from the groundwater system to the surface water system. Groundwater and surface water exchanges are complex and related to water level (or head) differences at any given location. Additional upgradient surface water bodies (e.g., American Lake) likely provide a source of water to the groundwater system that eventually discharges to Sequalitchew Lake.*

[2] *National Geodetic Vertical Datum of 1929.*

Figure 3.4-1
SEQUALITCHEW CREEK WATERSHED AND JBLM STORMWATER SURFACE WATER SYSTEM



Source: Aspect Consulting, 2022, Revised 2023.

Historically, the lake outlet discharged primarily into Sequalitchew Creek and the associated marsh system to the southwest and west, eventually flowing into Puget Sound, though the flows through the marsh system were at times blocked due to beaver activity (i.e., dam-building). Washington Department of Fish and Wildlife (WDFW) operated a salmon rearing facility at the lake from 1976 to approximately 1997. In spring during that period, the fish would migrate out of the lake to Puget Sound via Sequalitchew Creek and the marsh system. To facilitate flows and a migration pathway for the outmigration, WDFW would remove beaver dams and heavy vegetation within the marsh system to create a flowing channel.

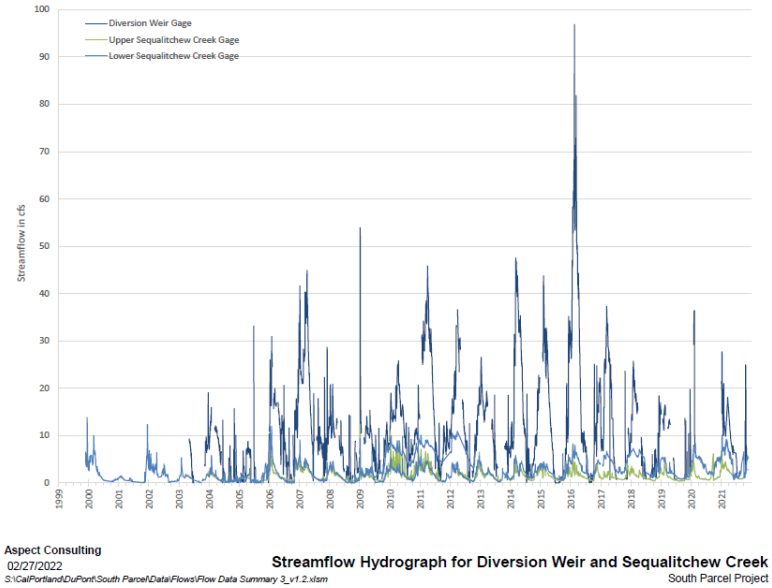
A culvert and weir system at the outlet of the lake was constructed in the 1950s to facilitate both outflow from the lake southwest toward Sequalitchew Creek and stormwater flow from JBLM northwest toward the Diversion Canal. Specifically, four 42-inch-diameter culverts—Sequalitchew Creek Culverts—connect the lake outlet with Sequalitchew Creek and were intended to convey the outflow of the lake southwest to the creek through the marsh system (i.e., to replicate historical conditions). Additionally, an 18-ft-wide concrete structure—Diversion Weir—with wooden stop logs was constructed at the lake outlet just upstream of the Sequalitchew Creek Culverts. The Diversion Weir was intended to control the water level of the lake (to protect JBLM's water supplies from Sequalitchew Springs) by

directing water at high flow conditions to the Diversion Canal. Separately, three 48-inch-diameter culverts—Diversion Canal Culverts—cross under the Sequalitchew Creek Culverts to facilitate the northwest trending flows from Bell, McKay, and Hamer Marshes to the Diversion Canal. The flows from the Diversion Weir join the Diversion Canal just downstream (northwest) of the outlet of the Diversion Canal Culverts. As originally designed, the culvert and weir system would have conveyed the outflow from the lake toward the Sequalitchew Creek and marsh system and the stormwater flow from JBLM (and peak flows from the lake) into the Diversion Canal.

The culvert and weir system are currently in disrepair. Additionally, beaver dam construction within the marsh system increases surface water levels in the marsh to an elevation above the Sequalitchew Lake water level. The current disrepair of the system combined with nearby beaver dam construction within the marsh system results in the majority of outflow from the lake being routed to the JBLM Diversion Canal (i.e., the lake outflow bypasses the Sequalitchew Creek and marsh system). As such, discharges from the lake currently seldom flow into the creek and marsh system. There may be indirect discharges from the lake toward the creek and marsh system via groundwater but that has not been quantified.

Based on data recorded from 2003 to 2021, average monthly flows at the lake outlet weir vary from 2.4 cubic feet per second (cfs) in September to 21.5 cfs in March. During particularly dry years, there are periods during late summer or early fall when no flow is measured over the weir. No (or very low) flows over the diversion weir occur occasionally for limited periods (i.e., short periods in the summers of 2004, 2006, 2008, 2012, 2014, and 2016); extended periods of no-flow conditions occur in particularly dry years (i.e., in later summer and early fall of 2005 and 2015). Peak flows can reach approximately 40 to 50 cfs, with isolated occurrences of even greater flows (i.e., the maximum recorded flow over the diversion weir was approximately 97 cfs in early 2016). A hydrograph of flows measured at the Diversion Weir (representing outflow from Sequalitchew Lake) is shown on **Figure 3.4-2**. Monthly average flow rates recorded at the Diversion Weir from 2003 to 2021 are summarized in **Table 3.4-1**.

Figure 3.4-2
SEQUALITCHEW LAKE OUTFLOW (DIVERSION WEIR) AND SEQUALITCHEW CREEK STREAMFLOW MEASUREMENTS



Source: Aspect Consulting, 2022, Revised 2023.

Table 3.4-1
MONTHLY AVERAGE DIVERSION WEIR (SEQUALITCHEW LAKE OUTLET) AND SEQUALITCHEW CREEK FLOWS

Month	Average Flow in cfs				
	Diversion Weir	Mid-Sequalitchew Creek Ravine	Lower Sequalitchew Creek Ravine		
	2003 to 2021	2004 to 2021	1977 to 1978	1984 to 1987	1999 to 2021
January	15.6	2.5	9.7	5.9	4.0
February	19.6	2.6	12.8	8.5	4.2
March	21.5	2.2	12.2	8.7	3.8
April	19.8	2.0	0.7	9.4	3.2
May	12.7	1.6	1.6	7.8	2.7
June	7.4	1.2	1.5	3.7	1.9
July	3.2	0.9	0.2	1.3	1.3
August	2.8	0.8	0.1	1.0	1.1
September	2.4	0.8	0.1	1.0	1.1
October	3.7	0.8	0.1	1.4	1.4
November	7.1	1.3	2.4	3.7	2.6
December	10.9	1.9	10.5	5.1	3.5
Mean Annual Flow	10.5	1.6	4.3	4.8	2.7

Note: cfs = cubic feet per second

Source: Aspect Consulting, 2022, Revised 2023.

Sequalitchew Marsh System

The Sequalitchew Marsh system includes a complex series of marshes generally located between Sequalitchew Lake and the downstream portion of Sequalitchew Creek. Surface water flow from Bell, McKay, and Hamer Marshes is generally northward eventually draining to the JBLM Diversion Canal and from there into Puget Sound. Surface water flow from the East Edmond Marsh was historically westward to the West Edmond Marsh. At high flow conditions the West Edmond Marsh can discharge to Sequalitchew Creek and from there into Puget Sound. Due to beaver activity (e.g., dam building) in East Edmond Marsh, surface water now typically flows back eastward toward the Diversion Canal (i.e., does not follow its historical course down the creek). In addition, as described in Section 3.3, **Groundwater**, there are complex interactions between the marsh system and underlying groundwater. Namely, groundwater can discharge to surface water when groundwater levels are higher than surface water levels (i.e., in upward gradient conditions).

Conversely, surface water can discharge to groundwater when groundwater levels are lower than surface water levels (i.e., in downward gradient conditions). Indirect flow between the marshes via discharge to and from groundwater—from the south and east (Bell, McKay, Hamer Marshes) toward the west (East and West Edmond Marshes)—is inferred based on groundwater measurement contouring and marsh surface water level measurements. Based on the known surface water flow patterns and inferred groundwater-surface water interactions, Aspect (2022, Revised 2023) developed a spreadsheet-based water balance model of the marsh system, incorporating estimates of groundwater and surface water inflows/outflows, precipitation, and evapotranspiration. The water balance model can be used to estimate the hydraulic impact on certain elements of the system (e.g., water levels in the marshes or flows in Sequalitchew Creek) due to changes in other elements (e.g., lowered groundwater levels). The model provides a tool for assessing the interconnectedness of the groundwater and surface water systems and for predicting impacts to the surface water system from the Proposed Action and/or Sequalitchew Creek Restoration Plan.

East and West Edmond Marshes

East and West Edmond Marshes stretch from the outlet of Sequalitchew Lake to the losing reach of Sequalitchew Creek. East Edmond Marsh—including the eastern portion that is colloquially referred to as "Eastern East Edmond Marsh"—covers approximately 87 acres between the Sequalitchew Lake outlet and Robinson Trail (a former railroad grade converted to a public pedestrian trail). On the east end of Eastern East Edmond Marsh (just west of the Sequalitchew Lake outlet), a large beaver dam complex pools water in the marsh above that of the Sequalitchew Lake outlet, resulting in flow from the marsh eastward into the Diversion Canal (i.e., against the general—and historical—westward flow of water in the watershed). Eastern East Edmond Marsh is connected to East Edmond Marsh via a box culvert beneath DuPont-Steilacoom Road; water can flow east or west through the box culvert, depending on water levels in Eastern East and East Edmond

Marshes. Eastern East Edmond Marsh also receives some surface water flow from Hamer Marsh via a 12-inch culvert and likely shallow subsurface flows indirectly from Hamer Marsh via groundwater. According to the water balance model, East Edmond Marsh receives approximately 0.28 cfs, on average, as surface water inflows from Hamer Marsh and approximately 0.3 cfs, on average, from shallow groundwater inflow. East Edmond Marsh also loses water to groundwater outflow from other areas of the marsh at an estimated average rate of 0.5 cfs, however there are periods of the year when groundwater discharges into the marsh. Groundwater discharges into East Edmond Marsh account for approximately 26 percent of the total water flowing into the marsh in an average year. The average water level in Eastern East Edmond Marsh is approximately 212.4 ft NGVD29 (or about 1 ft higher than the average Sequalitchew Lake level) and the average water level in East Edmond Marsh is approximately 212.2 to 212.4 ft NGVD29, indicating a slight westward gradient, on average. There is an open channel through East Edmond Marsh, which is likely the historical channel but may also have been excavated previously to facilitate flow (i.e., perhaps by WDFW for hatchery fish migration).

West Edmond Marsh covers approximately 80 acres between Robinson Trail and the losing reach of Sequalitchew Creek. West Edmond Marsh is hydraulically connected to East Edmond Marsh via a submerged culvert beneath Robinson Trail and likely subsurface flow beneath the trail. According to the water balance model, West Edmond Marsh receives approximately 0.17 cfs, on average, as surface water inflows from East Edmond Marsh (i.e., via the submerged culvert) and loses approximately 0.24 cfs, on average to groundwater outflow, although there are limited periods when groundwater discharges into West Edmond Marsh. On average, groundwater inflows are estimated to account for about 1 percent of the total water flowing into West Edmond Marsh. Water levels in West Edmond Marsh vary and are controlled by several beaver dams. In the eastern portion of West Edmond Marsh, the average water level is approximately 211.4 ft NGVD29; in the western portion of West Edmond Marsh, the average water level is approximately 207.9 ft NGVD29. Sequalitchew Creek forms a channel along the northern margin of West Edmond Marsh. The western-most portion of West Edmond Marsh becomes dry in the summer of most years.

Bell, McKay, and Hamer Marshes

Bell, McKay, and Hamer Marshes cover approximately 18, 37, and 69 acres, respectively. While natural surface water bodies, they have been impacted by the construction of the Diversion Canal to facilitate drainage of stormwater from JBLM. The three marshes are in series, with surface water flows going from Bell to McKay to Hamer Marsh, facilitated by the Diversion Canal. The average water level in Bell Marsh is approximately 218.6 ft NGVD29. The average water level in McKay Marsh is approximately 215.4 ft NGVD29. The average water level in Hamer Marsh is approximately 214.0 ft NGVD29. The water levels in these three marshes are typically higher than those of East and West Edmond Marshes. As such, a portion of the water (estimated by the water balance model to be approximately 0.3 cfs on average) from Bell, McKay, and Hamer Marshes may infiltrate to ground and flow as

groundwater to discharge to East Edmond Marshes. In addition, some surface water (estimated by the water balance model to be approximately 0.28 cfs on average) flows directly from Hamer Marsh to Eastern East Edmond Marsh via the 12-inch culvert connecting those two water bodies.

Sequalitchew Creek

Sequalitchew Creek is approximately 3.3 miles long, starting from the eastern end of East Edmond Marsh, continuing as a channel through East and West Edmond Marshes as described above, exiting the marsh system on the western end of West Edmond Marsh into the losing reach of the creek between West Edmond Marsh and the steep creek ravine, then through the ravine section to discharge into Puget Sound. Historically, the creek began at Sequalitchew Lake; however, the construction of the Diversion Weir at the outlet of the lake and the beaver dams in the marsh system have largely restricted the direct surface water connection between the lake and the creek. Within East and West Edmond Marshes, the creek is low-gradient/low-velocity and appears as a channel of open water or a channel of less dense vegetation. Within the losing reach of the creek, flows exiting West Edmond Marsh typically infiltrate into ground, leaving the losing reach, including the portion of the creek that passes underneath Center Drive, grassy and without flow most of the time. West of the losing reach, the creek grade steepens into an approximately 1.3-mile-long ravine, where groundwater springs—discharging from the Steilacoom Gravel Member subunit of the Vashon Recessional Outwash aquifer—restore surface water flows to the creek. The creek continues westward through the incised ravine section, gaining flow from additional groundwater springs in the upper portion of the ravine. As the creek continues past the location of the Olympia Beds Truncation, about midway through the ravine section of the creek, west of which the aquitard is no longer present and groundwater levels are lower, additional observable groundwater spring discharges to the creek appear to cease. As the creek nears Puget Sound, the ravine section widens, and the gradient lessens. The creek discharges to Puget Sound via a 5-ft by 5-ft box culvert beneath an active railroad grade. The railroad grade culvert appears to limit the connection between the creek and Puget Sound, resulting in a brackish marsh immediately upstream of the culvert.

Average annual streamflow measured (for the period from 2004 to 2021) at a gaging station located approximately 3,900 ft upstream from Puget Sound is approximately 1.6 cfs (with peak flows typically between 5 and 8 cfs and with low flows of approximately 1 cfs or less). Average annual streamflow measured (for the same period) at a separate gaging station located approximately 700 ft upstream of Puget Sound just upstream of the brackish marsh at the mouth of the creek (the lower gage) is approximately 2.8 cfs (with peak flows typically between 5 and 10 cfs and with low flows of approximately 2 cfs or less).[3] Baseflow in the ravine section of the creek appears to vary from approximately 0.5 cfs in late summer

[3] *The increase in streamflow from the mid-ravine gaging station to the lower gage can be attributed to groundwater inflows from springs and seeps between the mid-ravine station and the Olympia Beds Truncation, additional surface water inflows, and possibly other groundwater discharges adding flow to that section of the creek, potentially directly to the creek bed, which would be difficult to observe.*

to approximately 2.5 cfs in winter. Annual peak daily flow is typically between 5 and 10 cfs, with the maximum peak daily flow recorded as 13.8 cfs (in December 1999 at the lower gage). Hydrograph timeseries of Sequalitchew Creek flows are summarized in **Appendix E**. Sequalitchew Creek and all tributaries (including Sequalitchew Lake) are closed to further consumptive appropriations (i.e., water right permitted diversions) by the Washington State Department of Ecology (Ecology), according to the instream flow rule of Chapter 173-512 Washington Administrative Code (WAC).

On-Site Stormwater

Due to the high permeability of site soils, precipitation falling on the site generally infiltrates at or near where it falls or is conveyed by ditches to small infiltration facilities distributed throughout the existing mine. Infiltration of stormwater on-site is facilitated by a combination of relatively permeable surficial soils (outwash material) remaining within the mined area as well as a depth to groundwater of approximately 10 to 14 ft below ground surface, which allows for a vertical gradient and downward flow. As such, on-site stormwater is contained within the existing mine. Furthermore, there are no documented streams or natural drainage channels conveying surface water to or from the site.

Kettle Wetland

The Kettle Wetland is an existing 1.78-acre natural wetland located in the Expansion Area of the site. The wetland is an example of a kettle lake, a common continental glacier feature that forms from a large block of isolated glacial ice that becomes surrounded by outwash sediments. When the ice melts, a topographic depression forms where water can collect. Based on the elevation of its bottom, the Kettle Wetland appears to be in direct hydraulic connection with the Vashon Aquifer (Steilacoom Gravel Member and/or Outwash).

Other Surface Water Features

There are numerous other surface water features in the vicinity of, but not directly connected by surface water flow to, Sequalitchew Creek. An example of other surface water features is Wetland 1-D, a small (2.1-acre) wetland immediately north of West Edmond Marsh. While Wetland 1-D is not connected to other wetlands or Sequalitchew Creek by surface water, it likely exchanges flow indirectly via groundwater.

Other isolated kettle wetland/lake formations include Pond, Strickland, Grant, and Old Fort Lakes, as well as Wetlands #8, #9, #10, and #11, all of which are located south of Sequalitchew Creek. The kettle wetland/lake formations are not directly connected to Sequalitchew Creek or marsh system by surface water and experience water level fluctuations similar to those of the groundwater system that exists south of Sequalitchew Creek.

Surface Water Quality

This section summarizes the known water quality information related to relevant surface water bodies onsite and within the Sequalitchew Creek watershed.

On-Site Kettle Wetland

Water quality data for the Kettle Wetland is not available. However, because the Kettle Wetland is likely in direct hydraulic connection with—and likely a reflection of—the Vashon Aquifer, the surface water quality of the wetland is likely similar to that of the groundwater.

Sequalitchew Creek Watershed

The relevant water quality standards for the Sequalitchew Creek watershed—including Sequalitchew Lake, East and West Edmond Marshes, and Sequalitchew Creek—are described in Chapter 173-201A WAC. Sequalitchew Lake and Sequalitchew Creek each have a designated aquatic life use of core summer salmonid habitat because they are tributary to Puget Sound, which is designated as an extraordinary aquatic life marine water, per WAC 173-201A-600(1)(a)(iv) and 173-201A-612. The current freshwater quality standards for core summer salmonid habitat, in accordance with WAC 173-201A-200, are summarized in **Table 3.4-2.**

Table 3.4-2
FRESH WATER QUALITY CRITERIA FOR CORE SUMMER SALMOND HABITAT

Parameter	Criterion	Allowable Change
Temperature (7-DADMax)	16.0°C	0.3°C when T ≥ 16.0°C or 28/(T+7) when T < 16.0°C
Dissolved Oxygen (1-Day Minimum)	10.0 mg/L or 95% Saturation	0.2 mg/L
Turbidity	N/A	5 NTU over background when ≤ 50 NTU; 10% increase when > 50 NTU
Total Dissolved Gas	110% of Saturation	--
pH	6.5 to 8.5 Standard Units	<0.2 Standard Units

Source: Chapter 173-201A WAC.

Notes:

°C = degrees Celsius
T = background temperature unaffected by project
mg/L = milligrams per liter
7-DADMax = 7-day average of daily maximum temperatures
NTU = nephelometric turbidity units

Sequalitchew Lake

The water quality in Sequalitchew Lake is generally good. Temperature varies seasonally from above 20 degrees Celsius (°C) in summer to below 6°C in winter. Dissolved oxygen

concentrations are typically greater than 9 milligrams per liter (mg/L), pH is neutral, and turbidity is generally low.

Marsh System

The water quality of the marsh system is representative of a more stagnant, aquatic plant-rich environment. Temperatures in the marsh system vary more than in the lake, with summertime temperatures approximately 22°C (72°F) and wintertime temperatures approximately 3°C (37°F). Dissolved oxygen concentrations are relatively low, typically less than 4 mg/L, and pH is slightly acidic (median value of 6.5 Standard Units). Turbidity is relatively low, or less than 10 nephelometric turbidity units (NTU). Measured iron concentrations are relatively elevated (above 1 mg/L) in East and West Edmond Marshes, particularly near Robinson Trail (an old railroad grade) where groundwater seeps enter the marshes. Concentrations of other metals commonly associated with stormwater runoff (e.g., copper and zinc) are low in the marshes.

Sequalitchew Creek

The water quality of the ravine section of Sequalitchew Creek (west of the marshes and losing reach of the creek) is very good and relatively consistent, likely related to the primary source of surface water flow in the creek being the groundwater seeps. Temperatures in the creek are generally cool, less than 15°C (59°F). Dissolved oxygen concentrations are relatively high, typically greater than 9 mg/L. Turbidity is low, or less than 15 NTU. Metals concentrations in the creek are consistently low.

3.4.2 Impacts of the Alternatives

This section describes the anticipated impacts to the surface water system of the site and the Sequalitchew Creek watershed resulting from the two alternatives.

ALTERNATIVE 1 – PROPOSED ACTION

Under Alternative 1—the Proposed South Parcel Project (Proposed Action)—there would likely be impacts to surface water features both onsite and within the larger Sequalitchew Creek watershed. The impacts to surface water features would be primarily a result of the permanently lowered groundwater levels in the vicinity of the site due to long-term pumping and groundwater drainage at the site.

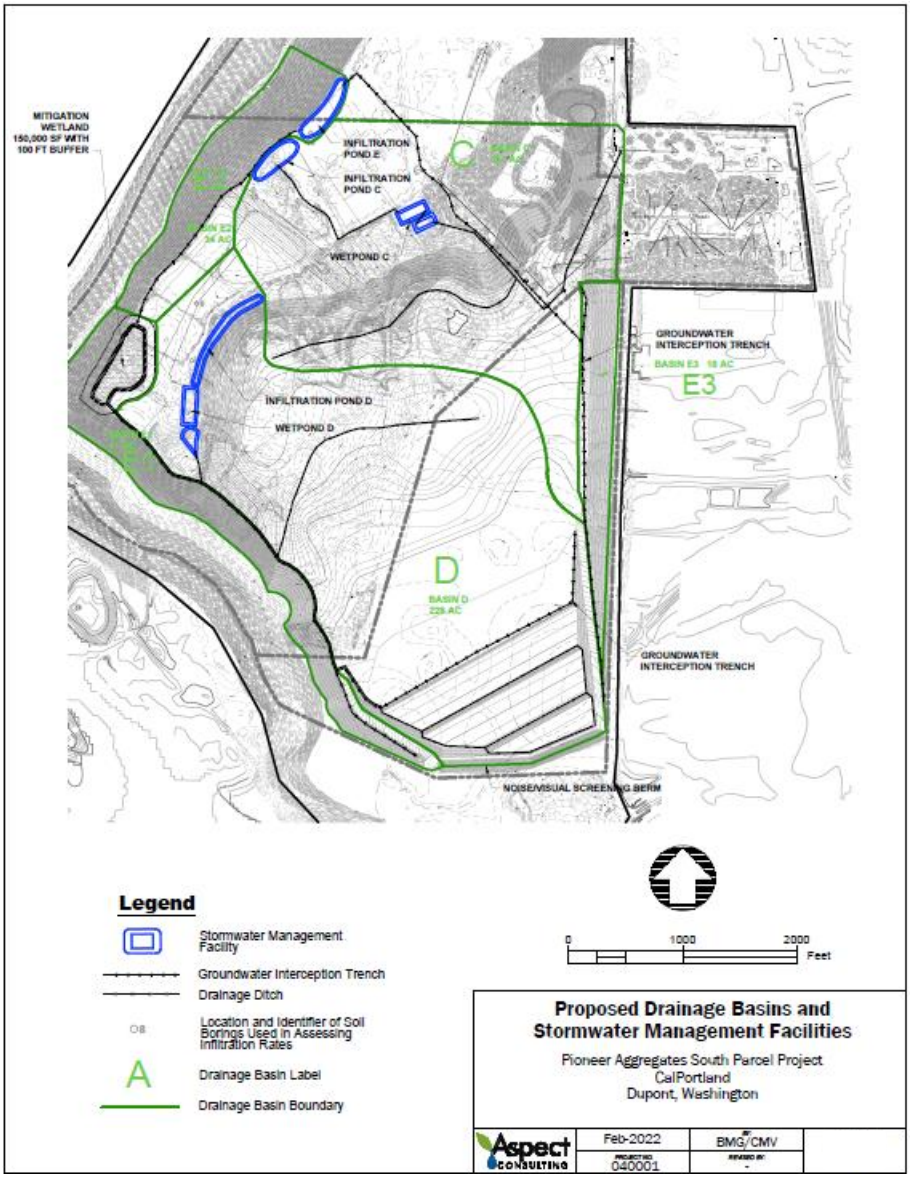
On an overall basis, changes in site grading would affect stormwater flows, but not the overall stormwater balance within the site. Primarily, changes in groundwater levels beneath the site resulting from proposed groundwater lowering are expected to affect flow in Sequalitchew Creek and surface water levels in the marsh system.

Stormwater Management

Under the Proposed Action, stormwater would continue to be managed and infiltrated on-site. As mining activities remove the permeable outwash materials and expose the underlying relatively impermeable Olympia Beds material, conveyance channels would be excavated to direct stormwater flows – and a significant amount of intercepted groundwater flows from the eastern slopes of the expanded mining area – toward three infiltration facilities in the lower (western) portion of the existing mine area of the site. For stormwater management planning purposes, the site has been divided into five contributing areas (or basins). Basins C and D would include 390 acres of the existing mine and expansion area. Basins E1, E2, and E3 would include a total of approximately 92.6 acres of the side slopes of the mined area (existing and expanded). All basins would contribute stormwater flows to be conveyed and infiltrated on-site. Flows from Basin E3 would also include the extracted groundwater from dewatering activities (while active dewatering is taking place) and intercepted groundwater (following active dewatering and mining activities) emanating from the eastern slope of the expanded mining area. A site water balance model was developed by Aspect (2022, Revised 2023) to quantify estimated stormwater and groundwater inflows and outflows from each basin.

Stormwater flows from Basins C and D would pass through one of two pairs of water quality treatment cells to reduce solids content in the water prior to entering the infiltration ponds designated for those basins (i.e., Infiltration Ponds C and D, respectively). Flows from Basin E1 would be conveyed to a constructed mitigation wetland (described below in the Mitigation Measures section and more fully in Section 3.6, **Plants and Animals**, and eventually to the third infiltration facility, Infiltration Pond E, which would also receive direct stormwater flows from Basins E2 and E3. The proposed stormwater basins and water quality and infiltration facilities are shown on **Figure 3.4-3.**

Figure 3.4-3
PROPOSED STORMWATER MANAGEMENT BASINS, WATER QUALITY TREATMENT, AND INFILTRATION FACILITIES



Source: Aspect Consulting, 2022, Revised 2023.

The water quality treatment and infiltration facilities would require performance monitoring and maintenance in order to retain their function. The project Stormwater Management Report (Aspect 2021) does not provide details regarding operation and maintenance (O&M) of the facilities; however, proper operation and maintenance (O&M) of the facilities would be a required element of the Sand and Gravel Permit coverage for the facility and an O&M plan would be developed during the permitting process.
Failure to maintain water quality treatment facilities, particularly for the interception of fine particles could result in particulates reducing the infiltration capacity of the system.

Reduced infiltration capacity of the system, if significant enough, could result in ponding of water in the lower portions of the reclaimed mine under severe storm events. Infiltration capacity could be restored through maintenance of the infiltration facilities or, in the worst case, establishing new infiltration facilities in the permeable gravels that remain on the floor of the existing mine.

Sequalitchew Creek Watershed Impacts

While no direct surface water diversions are proposed as part of the project, indirect impacts to surface waters will likely occur from the permanently lowered groundwater levels caused by dewatering, excavation, and groundwater seepage and stormwater diversion. Groundwater is in direct hydraulic connection with portions of the watershed surface water system; therefore, impacts to groundwater may also affect surface waters. The impact to surface waters will be more severe for those water bodies closer to the site.

Sequalitchew Lake

Sequalitchew Lake is located east of the area anticipated to be impacted by appreciable (i.e., greater than 0.5 ft) groundwater drawdown due to proposed dewatering. The primary water source to the lake is groundwater (spring) discharge at the far eastern end of the lake. The eastern end of the lake is relatively far removed from the anticipated appreciable groundwater drawdown area. In addition, the lake level is controlled artificially by the Diversion Weir. For these reasons, water levels in Sequalitchew Lake are not anticipated to be significantly impacted by the Proposed Action.

Effects of Climate Change

Effects of climate change on the hydrologic processes in the Puget Sound Region are projected to include a suite of long-term changes that are consistent with those observed globally as a result of human-caused climate change. These include:

- Year-to-year variability will continue to cause some periods that are abnormally wet, and others that are abnormally dry. For the foreseeable future, the region will continue to experience years and decades with conditions that temporarily mask or amplify the projected changes in water resources, even as long-term trends continue" (Mauger 2015). Extreme events (droughts, flooding, etc.) may occur with greater frequency, magnitude, and year-to-year persistence (Mauger 2015), Dalton 2013, Ramondi 2013, Hamlet 2007; Pagano 2005).
- Spring precipitation rates are projected to increase in the Puget Sound region (Mauger 2015) and winter precipitation is projected to rise by between 2 percent and 7 percent (Pitz 2016).
- Increases are projected in the frequency and intensity of heavy precipitation including more frequent "atmospheric river" events. (Mauger 2015, Pitz 2016).

In general, as noted in the Groundwater section, the precipitation trends for the Puget Sound Region likely will apply to the DuPont area (e.g., similar annual rainfall compared to historical observations, a slight increase in springtime rainfall, and summer seasons that may become slightly drier) but the groundwater system of the Vashon Aquifer is not expected to change significantly due to climate change, given that the average annual precipitation will likely remain largely unchanged.

The lake receives most of its water from groundwater discharging at Sequalitchew Springs. The aquifer feeding Sequalitchew Springs is likely to be relatively stable in the future and like existing conditions. Climate change is likely to result in greater variability in rainfall events which may increase the recurrence interval of when flows out of the lake are lower than existing Sequalitchew Creek flows, particularly in the summer. Based on the period of flow monitoring (2003 to 2021), this currently occurs about 10 percent of the time. The period of monitoring included a range of precipitation conditions (i.e., annual precipitation in the 27th to 73rd percentile of exceedance), but generally did not include the years of extreme low precipitation encountered within the full period of precipitation records (1942 to 2015). With climate change, summers with extended dry periods will likely continue to be the norm, and those summers may become more frequent or the dry period longer; however, slightly increased precipitation in the wet season, coupled with the size of the aquifer dampening the effects of any single season, may reduce negative effects from single dry summers. Multiple sequential years with low winter/spring precipitation would likely be needed to noticeably lower Sequalitchew Lake water levels and result in more frequent low-flow or no-flow into the Edmond Marsh complex and Sequalitchew Creek.

Marsh System

The anticipated impacts to water levels within the marsh system—including Bell-McKay-Hamer and East and West Edmond Marshes—were estimated using a spreadsheet-based water balance model of the marsh system (described above in the Sequalitchew Marsh System section of Affected Environment). The marsh water balance model is described in more detail by Aspect (2022, Revised 2023).

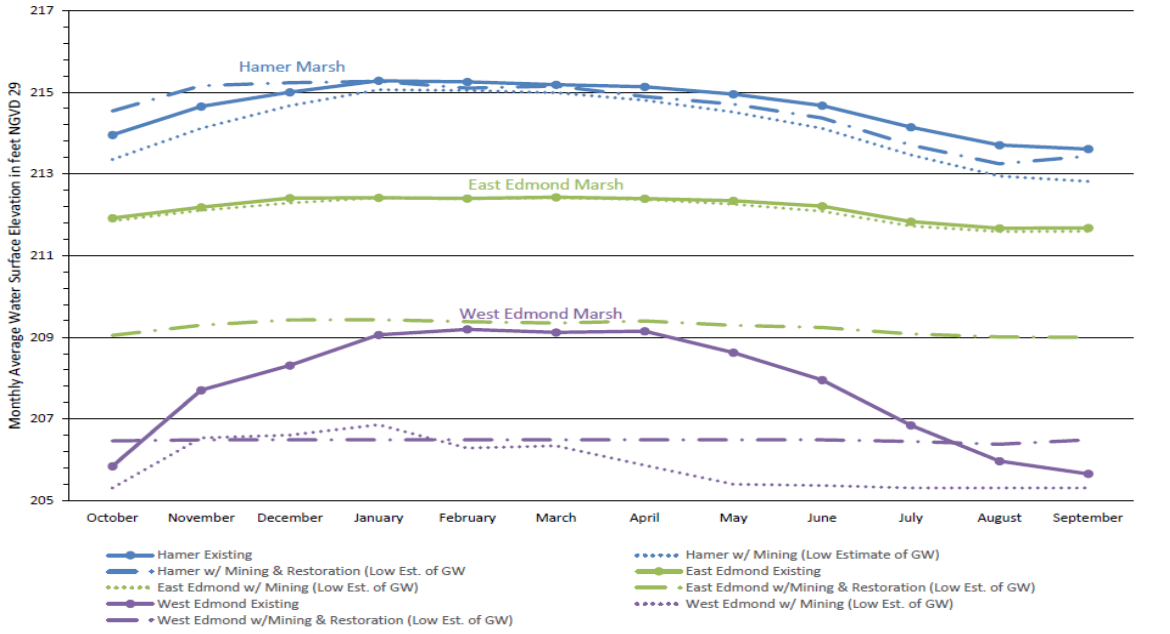
The calibrated marsh water balance model was used to predict the anticipated impact on average monthly marsh water levels due to proposed groundwater-level lowering at the site. The primary driver for the anticipated impacts to surface waters are estimated lowered groundwater levels beneath the marshes (as simulated by the groundwater model, described in Section 3.3, **Groundwater**, which would lead to increased groundwater recharge (or outflow) from the marshes. The results of the marsh water balance model indicate that water levels in the marsh would be expected to be lowered, compared to observed water levels during the simulated period, due to the proposed groundwater lowering. The effect on marsh water levels is anticipated to vary seasonally as well.
In West Edmond Marsh, located closest to the site, the decrease in water levels may vary between 0.35 ft (in late summer, when West Edmond Marsh is often dry under existing conditions) and 3.0 ft (in spring). The average decline was calculated as 1.9 ft. Without

mitigation, the projected lower water levels in West Edmond Marsh would likely result in reduced potential for outflows from the marsh system into the ravine section of Sequalitchew Creek; however, outflows from West Edmond Marsh do not commonly reach the ravine section of Sequalitchew Creek under existing conditions.

In East Edmond Marsh, the decrease in water levels may vary between 0.005 ft (in winter) and 0.13 ft (in early summer). The average decline was calculated as 0.1 ft. These projected lower water levels in East Edmond Marsh are small and would likely not have a significant impact on the potential for surface water outflows from the marsh system to the ravine section of Sequalitchew Creek.

In Bell-McKay-Hamer Marshes, the decrease in water levels may vary between 0.2 ft (in spring) and 0.8 ft (in late summer). The average decline was calculated as 0.3 ft. These projected lower water levels in Bell-McKay-Hamer Marshes would likely lead to less flow – groundwater and surface water – from those marshes to East Edmond Marsh. Hydrographs showing observed (solid line with circular symbols) and predicted (under Proposed Action only conditions; dotted line) monthly average water levels in the marsh system are presented on **Figure 3.4-4**. The dashed-dotted line showing predicted flows under Proposed Action and Streamflow Restoration alternative is discussed below in the Mitigation Measures section.

Figure 3.4-4
OBSERVED AND PREDICTED MONTHLY AVERAGE MARSH WATER LEVELS



Aspect Consulting
11/1/2022
S:\CalPortland\DuPont\South Parcel\Water Balance Analyses\Water Balance -2022 - Mining&Restoration.xlsm

Predicted Marsh Hydrographs with Mining and Restoration
Pioneer Aggregates South Parcel Project

Source: Aspect Consulting, 2022, Revised 2023.

Effects of Climate Change

As indicated in Section 3.3, Groundwater, the DuPont groundwater model quantitatively simulates the range of historical precipitation conditions from 2004 to 2015, including both relatively wet and relatively dry months and years. The monitored and simulated conditions, in terms of annual precipitation, range between the 7th and 73rd percentile of precipitation records from 1942 to 2015 (See Figures 3.3-11 and 3.3-12).

To supplement the discussion above of average conditions, an additional analysis and marsh water balance simulation of a relatively dry year – the 2005 water year – was performed, as shown in **Figure 3.4-5**. Annual precipitation during the 2005 water year was 37.2 inches, which represents the approximately 67% exceedance level (i.e., 67% of years would be expected to be wetter than 2005) based on the period of available precipitation record and a year during which groundwater levels were the lowest observed (during the 2004 to 2015 period) in groundwater monitoring wells adjacent to East Edmond Marsh and Bell Marsh. The 2005 water year, while relatively dry compared to the historical record, would be considered within the normal variability of long-term climate conditions. At a 67% exceedance level, 33% of precipitation years would be lower and the impacts of lower precipitation and lower marsh levels would occur about 33% of years.

In the future, under projected climate change conditions, similar variability would be expected with potential greater probability of occurrence of similar or lower precipitation years due to potential drier springs and summers. While future average conditions are likely to be within the range of historical variability, the frequency of drier years like 2005 (and extreme dry years) may increase.

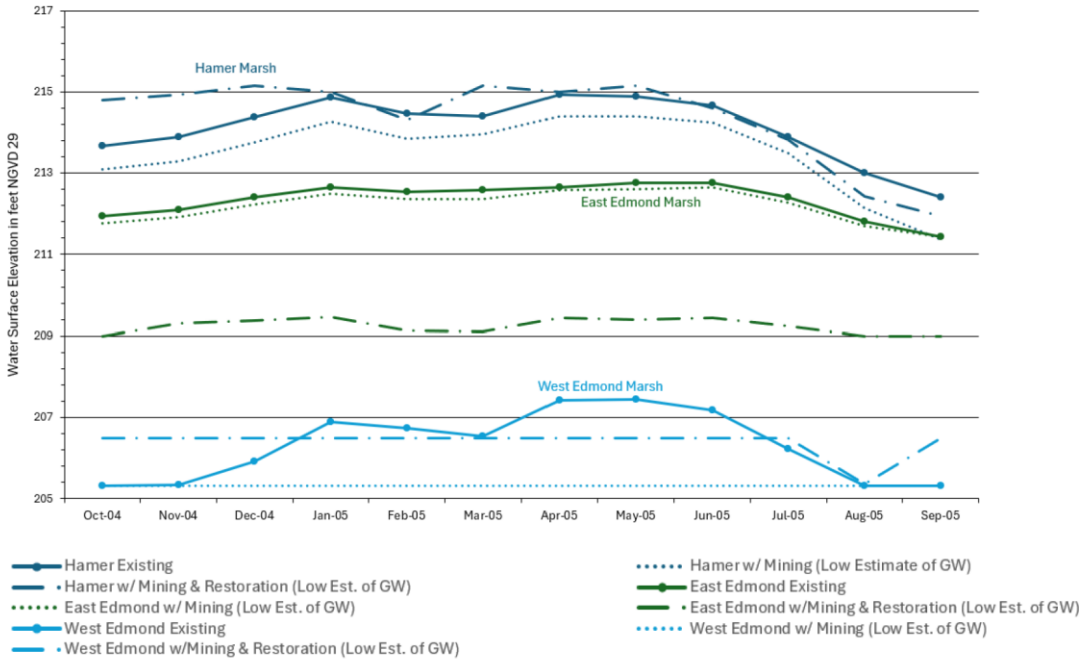
Results for the 2005 water year modeling, depicted on predict marsh water levels with mining, but without additional flows from Lake Sequalitchew. This results in the following differences between the results for an average year shown in **Figure 3.4-4**, include:

- Dry year water levels for Hamer Marsh are expected, during certain times of the year, to be about a foot lower than modeled average conditions
- Dry year water levels in East Edmond Marsh are expected to be at about the same level as indicated by the simulated average conditions
- Dry year water levels in West Edmond Marsh are expected to be about one to two feet lower than simulated average projected conditions between November and April.

Impacts of the lower water levels with lower precipitation (without implementation of the Restoration Plan) on wetlands would be similar to those described in Section 3.3.3.1 of the Plants and Animals Report (Appendix H to the EIS) and generally would result in earlier drying of saturated areas with potential shifts from wetland to upland plant communities and associated habitat.

Figure 3.4-5

PREDICTED MARCH WATER LEVELS FOR WATER YEAR 2005 (RELATIVELY DRY YEAR) UNDER EXISTING CONDITIONS, WITH MINING ONLY, AND WITH MINING AND RESPORATION



If the project and Restoration Plan are implemented, Edmond Marsh wetland levels would be reduced from high winter elevations of about 212.4 to 210.5 feet to the east at Steilacoom- DuPont Road and from high elevations of about 211 to 206.5 feet to the west near Center Drive to accommodate the gradient needed for flows from Sequalitchew Lake through the marsh system. This would result in lower water levels in every month under average conditions as shown in **Figure 3.4-4** and lower levels between January and July in drier years (like 2005). The impacts would be as described in Section 3.3.3.1 of the Plants and Animals Report, but would not include seasonal high inundation and likely result in less wetland area**.**

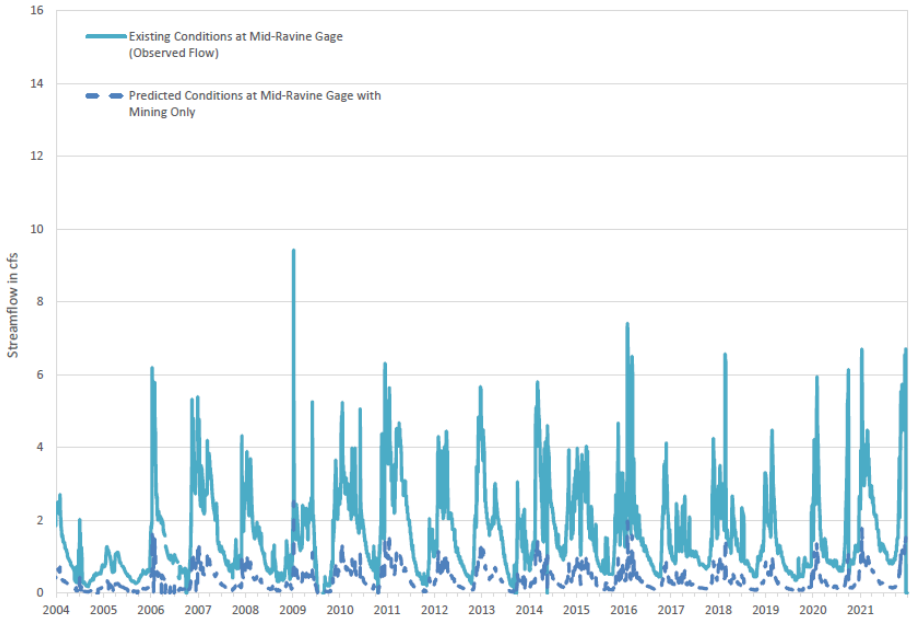
Sequalitchew Creek

The Proposed Action and associated groundwater-level lowering will decrease the number and flow rate of groundwater seeps and springs feeding Sequalitchew Creek within the ravine section. The impact to the groundwater springs and resulting Sequalitchew Creek flows was estimated using the numerical groundwater flow model, as described in Section **3.3, Groundwater**. Under long-term future proposed conditions (i.e., Step 4 of dewatering), reductions in spring flows leading to the creek are anticipated to occur throughout the entire year and to range from 76% (in January) to 86% (in summer). Base flow and peak flow in the creek are accordingly expected to be reduced. The annual average flow in Sequalitchew Creek is anticipated to be reduced from approximately 1.6 cfs to

approximately 0.34 cfs. Hydrographs showing the observed and predicted flows in Sequalitchew Creek based on 2003 to 2021 data are shown on **Figure 3.4-6**.

While the Proposed Action is anticipated to negatively impact flows in Sequalitchew Creek, which is closed to further consumptive appropriations by the instream flow rule of Chapter 173-512 WAC, the Proposed Action does not require a water right from Ecology, as the pumped groundwater will not be withdrawn for the purpose of putting it to beneficial use.

Figure 3.4-6
OBSERVED AND PREDICTED SEQUALITCHEW CREEK FLOW HYDROGRAPHS



Source: Aspect Consulting, 2022, Revised 2023.

Other Surface Water Features

Other surface water bodies—including Wetland 1-D; Pond, Strickland, Grant, and Old Fort Lakes; and Wetlands #8, #9, #10, and #11—may be impacted by the proposed groundwater lowering, based on numerical groundwater flow model results. The magnitude of the impact is dependent on proximity to the proposed groundwater lowering activities at the site. Wetland 1-D water levels are anticipated to be reduced by approximately 3 ft, a relatively large impact, owing to its closer proximity to the site. Water levels in Pond Lake may be reduced by approximately 2 ft, resulting in the pond going dry earlier in the year (it typically goes dry currently in spring to mid-summer). Water levels in Wetlands #8, #9, #10, and #11 are anticipated to be reduced by approximately 1 ft. Old Fort Lake water levels may

be reduced by approximately 0.5 ft. These water features and potential impacts to them are described in more detail in Section 3.5, **Fisheries**.

Kettle Wetland - The Kettle Wetland and its buffer would be cleared under the Proposed Action, and the entire wetland would be eliminated. The Kettle Wetland relies on groundwater to sustain wetland vegetation so even if the Kettle Wetland were to be left in place within the site, the change in groundwater levels would eventually alter the hydrology of the Kettle Wetland, converting the wetland vegetation to upland plant species. Proposed mitigation for these wetland impacts includes creation of a new wetland, as discussed in Sub-Section 3.5.3.

Effects of Climate Change

As indicated above for the Marsh system, the impacts for an average year discussed above in Section 3.3, Groundwater, the DuPont groundwater model quantitatively simulates the range of historical precipitation conditions from 2004 to 2015, including both relatively wet and relatively dry months and years. The monitored and simulated conditions generally fit into the 7th to 73rd percentile of precipitation records from 1942 to 2015 (See Figures 3.3-11 and 3.3-12). As discussed above for the Marsh system, other surface water features are expected to be impacted similarly (i.e., variably, depending on local hydrologic features and hydraulic connections to the groundwater system) during drier than average conditions. While future average conditions are likely to be within the range of historical variability, the frequency of dryer years like 2005 (and extreme dry years) may increase.

CUMULATIVE IMPACTS WITH PROPOSED ACTION AND SEQUALITCHEW CREEK RESTORATION PLAN

As described in Chapter 2 of this EIS, the 2011 Settlement Agreement states that permits for the Pioneer Aggregates South Parcel Project (Proposed Action) shall not be effective until permits for the Sequalitchew Creek Restoration Plan (Restoration Plan) are in place. The Restoration Plan will be evaluated as a separate but related action. The Restoration Plan seeks to restore and enhance streamflow and ecological functions from Sequalitchew Lake through Edmond Marsh into Sequalitchew Creek ravine by sequentially restoring diverted flows back to the creek, improving the sustainability of flows through the system, and restoring aquatic habitat.

It is assumed that CalPortland funding/implementation of projects associated with the Restoration Plan would be mitigation for certain environmental impacts identified in this EIS and would be a condition of any City of DuPont approval of the Proposed Action.

The primary components of the Restoration Plan include:

- Improve hydraulic gradients so water discharges from Hamer and Bell Marshes flow into Edmond Marsh rather than into the Diversion Canal.

- Improve Sequalitchew Lake outlet and the Diversion Weir structure to allow significant flows from the lake into the Edmond Marsh complex to support a functional creek ecosystem and provide for the passage of migratory fish in the Sequalitchew Creek system.
- Rehabilitate East and West Edmond Marshes by removal of sufficient fill and other flow impediments to provide hydraulic gradients and capacity necessary to achieve and maintain adequate flows through the marsh system.
- Rehabilitate Sequalitchew Creek below West Edmond Marsh (i.e., the losing reach) to reduce seepage, improve fish habitat, and help restore year-round flows.
- Actively manage beaver activities (e.g., on-going beaver dam removal, installation and maintenance of beaver exclusion devices, etc.) to maintain hydraulic gradients that provide flows through Hamer, Bell, and Edmond Marshes.

The effectiveness of these elements depends on the independent modification of the diversion structure within JBLM which is proceeding as a separate federal project. JBLM entered a Memorandum of Agreement (MOA) with the Environmental Caucus, the South Puget Sound Salmon Enhancement Group and CalPortland describing the commitments each party is making to enhance flows down the creek. This includes substantial water utility repair and maintenance of the structures on JBLM. Congress has also indicated to the Army that the work on JBLM is a priority by including the following language in the Congressional Committee Report attached to the National Defense Authorization Act:

> "*The committee commends the Army for its work thus far in accomplishing needed environmental restoration projects related to Sequalitchew Creek and its associated canals. The committee notes that the Army made an important first step in this process by executing a memorandum of agreement with stakeholders. The committee encourages the Army to continue its work by following up with agreed-upon water utility repair and developing a maintenance plan per the memorandum of agreement.*"

The Settlement Agreement states that permits for the Restoration Plan must be in place before permits for the Proposed Action are effective. The plan identifies specific objectives and proposes performance thresholds and aspirational goals to be accomplished for each objective, along with an adaptive management plan to adapt to changing conditions and observations during plan implementation. Monitoring during mining is presumed to ensure that groundwater levels remain within the expected range. If groundwater levels are not maintained within the expected range it is specified that corrective actions will be implemented in accordance with the adaptive management plan for mining.

The anticipated combined effect on surface waters of the Proposed Action and the Restoration Plan is summarized in this section.

Marsh System

Water Levels

Water levels in the marsh system under the Proposed Action and Restoration Plan implementation were assessed with the marsh water balance model. The objectives and performance thresholds of the Restoration Plan were proposed to improve flows and habitat to compensate for the impacts to the marsh system from drawdown of groundwater levels and subsequent effects on marsh water levels. Parameters established for the marsh system model to replicate combined effects of the Proposed Action and Restoration Plan included:

- Groundwater levels were lowered in accordance with a conservatively low estimate of simulated long-term groundwater conditions due to proposed groundwater dewatering and mining activity.
- Marsh surface level control structures in East and West Edmond Marshes and Hamer Marsh were assumed functional and effective with modification of the JBLM diversion and beaver management (e.g., selective removal of beaver dam structures and installation and maintenance of beaver exclusion devices). The target water levels were set to ensure east to west movement of water through the marsh system:
    - Eastern East Edmond Marsh: 210.5 ft NGVD29 (compared to the current average of 212.4 ft NGVD29)
    - East Edmond Marsh: 209 ft NGVD29 (compared to the current average of 212.2 to 212.4 ft NGVD29)
    - West Edmond Marsh: 206.5 ft NGVD29 (compared to the current average of 207.9 ft NGVD29 in the western portion of the marsh).
- Flows from Sequalitchew Lake were to be routed to Sequalitchew Creek via Eastern East Edmond Marsh (i.e., not diverted to the Diversion Canal).
- The losing reach of Sequalitchew Creek was assumed to be lined to prevent surface water flows leaving West Edmond Marsh from infiltrating to ground and, rather, continuing as surface water flows into the ravine section of the creek.

The results of the modeling indicate that the target water levels (which are significantly lower than they currently are) in the East and West Edmond Marshes could generally be achieved, resulting in continuous surface water flow from Sequalitchew Lake through to Sequalitchew Creek. The anticipated gradient across the marsh system from the Sequalitchew Lake outlet to the west end of West Edmond Marsh would be approximately 0.0006 feet per foot, or 0.06 feet per 100 feet. The East and West Edmond Marshes water levels are anticipated to be relatively consistent throughout the year. The predicted marsh system water levels under the Proposed Action and Restoration Plan scenario are shown earlier on **Figure 3.3-4.**

Table 3.4-3 provides a monthly summary of predicted flows from the lake to the marsh system, flows from the marsh system to the creek, and gain or loss from the marshes from or to groundwater, precipitation, and evapotranspiration. For comparison, monthly average flows from Sequalitchew Lake (to the Diversion Canal) based on existing observed data are also shown in **Table 3.4-3**.

Water Quality

In general, the water quality within East and West Edmond Marshes would be expected to be improved under the Proposed Action and Restoration Plan scenario, due to increased and consistent surface water inflows from Sequalitchew Lake and flushing out through Sequalitchew Creek. In particular, dissolved oxygen would likely increase and pH would likely become more neutral. Increased flows through the marsh system may also result in lower iron concentrations near Robinson Trail due to increased flushing.

Table 3.4-3
PREDICTED SURFACE WATER FLOWS TO AND FROM THE MARSH SYSTEM

	Existing Conditions	Predicted Conditions for Sequalitchew Marsh System			
				Gain (+) or Loss (-)	
Month	Average Outflow from Sequalitchew Lake (cfs)	Average Inflow from Sequalitchew Lake (cfs)	Average Outflow to Sequalitchew Creek (cfs)	Flow (cfs)	Percent (%)
January	15.6	15.8	18.5	2.7	17%
February	19.6	19.8	22.0	2.2	11%
March	21.5	22.2	24.3	2.1	9%
April	19.8	20.4	21.9	1.5	7%
May	12.7	13.4	14.6	1.2	9%
June	7.4	7.7	8.5	0.8	10%
July	3.2	3.4	3.5	0.1	3%
August	2.8	2.5	2.4	-0.1	-4%
September	2.4	2.2	2.4	0.2	9%
October	3.7	3.7	4.7	1.0	27%
November	7.1	7.1	8.8	1.7	24%
December	10.9	11.0	13.2	2.2	20%
Average:	**10.6**	**10.8**	**12.1**	**1.3**	**12%**

Note: cfs = cubic feet per second

Source: Adapted from Aspect Consulting, 2022, Revised 2023.

Sequalitchew Creek

Creek Flows

Under the Proposed Action and Restoration Plan scenario, flow rates and volumes delivered to – and flowing through – the losing reach segment of Sequalitchew Creek between West Edmond Marsh and the ravine section of the creek are generally expected to increase. Under this scenario, the predicted flows for the losing reach vary by month, from 2.4 cfs in August/September to 24.3 cfs in March, with an average annual flow of 12.1 cfs. Peak flows may reach as high as 65 cfs. Even with the Restoration Plan implemented, there may still be periods of dry, no-flow conditions in the losing reach of the creek, namely during dry periods when flow from Sequalitchew Lake through the Diversion Weir may not occur (i.e., in conditions similar to the low- or no-flow conditions, described in Section 3.3B.1, of the relatively dry years of 2004, 2005, 2006, 2008, 2012, 2014, 2015, and 2016).

Flows in the ravine section of Sequalitchew Creek were predicted based on the sum of predicted losing reach flows under the Proposed Action and Restoration Plan scenario and remaining groundwater discharges in the ravine.[4] The average monthly flows in the ravine section of the creek are predicted to range from 2.5 cfs in August to 26.3 cfs in March, with an average annual flow of 12.9 cfs (compared to the current 1.6 cfs average observed at the mid-ravine gage). These flows would be dominated by surface water from Sequalitchew Creek coming through Edmond Marsh, which would contribute 97 percent of the flow in Sequalitchew Creek ravine with the remaining 3 percent coming from seeps and springs.

Similar to predictions for the losing reach, there may be periods with reduced—or zero—flow in Sequalitchew Creek at the mid-ravine gage despite the Restoration Plan because of no outlet flows from Sequalitchew Lake. Flows in the creek may be lower than under existing conditions approximately 10% of the time. The number of no-flow days at the mid-ravine gage would be expected to increase under the Proposed Action and Restoration Plan scenario compared to existing conditions because of reduced or eliminated groundwater seepage to the ravine section of the creek that would no longer be present to add flows to the creek under low- or no-flow conditions upstream from Sequalitchew Lake. Periods with lower predicted flows in the creek compared to existing conditions are anticipated to occur typically in the period from July through October. The number of no-flow days at the mid-ravine gage also would be expected to increase under the Proposed Action and Restoration Plan scenario compared to existing conditions because of reduced or eliminated groundwater seepage to the ravine section of the creek that would no longer be present to add flows to the creek under low- or no-flow conditions upstream from Sequalitchew Lake. However, no flow days are rare under existing conditions (occurring approximately 0.13% of the time) and would remain rare (0.46% of the time) with the Proposed Action and Restoration Plan.

[4] *The two components summed for this analysis represent: (a) the predicted surface water flows to Sequalitchew Creek from discharges from West Edmond Marsh as a result of the Restoration Plan implementation and (b) the predicted additional contributions to Sequalitchew Creek from remaining groundwater springs and seeps following the Proposed Action.*

Potential impacts on fisheries resources are discussed in Section 3.6, **Plants and Animals**.

Water Quality

The water quality effects in the ravine section of Sequalitchew Creek from the combined Proposed Project and Restoration Plan scenario would be primarily related to temperature. Flows in the creek, currently supplied primarily by consistently cool groundwater discharges, would instead be largely supplied by surface water flows originating in Sequalitchew Lake (which is relatively warm in summer and cold in winter) under this scenario. Temperatures in the creek in the winter are expected to fall to 5 or 6°C (41°F to 43°F). Creek temperatures in the summer—particularly June through August—are expected to rise to 21°C. Exceedances of the 16°C (61°F) 7-day average of daily maximums criterion of Chapter 173-201A WAC could be expected from May through September. These seasonal fluctuations in surface water temperatures in Sequalitchew Creek, however, may be more analogous to historical conditions in the creek prior to the construction of the Diversion Weir and Canal and re-routing of most of the Sequalitchew Lake outflows away from the creek and marsh system into the Diversion Canal. However, temperatures in the creek would be slightly higher than they were historically because of the reduction of groundwater seeps and springs providing groundwater flow to the ravine section of the creek resulting from the Proposed Action.

Other Surface Water Features

Because the other nearby surface water bodies—including Wetland 1-D; Pond, Strickland, Grant, and Old Fort Lakes; and Wetlands #8, #9, #10, and #11—would not benefit directly from the Restoration Plan implementation, they would be expected to be impacted by the proposed groundwater lowering in a similar manner as under the Proposed Action, as discussed above.

Stormwater Management

Because on-site stormwater flows and management would not be affected by implementation of the Restoration Plan, stormwater management would be performed in a similar manner as proposed under the Proposed Action, as discussed above.

ALTERNATIVE 2 - NO ACTION

Under Alternative 2, the No Action Alternative—either Scenario A Continuation of Existing Site Conditions or Scenario B Site Development under Existing Zoning—no significant impacts to surface water are expected. In either scenario, on-site stormwater would continue to be collected, conveyed, and infiltrated onsite (though onsite stormwater flow may increase due to increased impervious land coverage). The Kettle Wetland would remain intact. Flows and water quality in Sequalitchew Creek and surface water levels and

water quality in the marsh system and Sequalitchew Lake would be expected to remain unaffected compared to current conditions.

Separate actions related to the Sequalitchew Creek Restoration Plan and JBLM Diversion Canal may or may not proceed without the Proposed South Parcel Project and CalPortland involvement.

3.4.3 Mitigation Measures

This section describes the measures that CalPortland has proposed to mitigate the impacts to surface water features resulting from the Proposed Action.

Proposed On-Site Impacts Mitigation

- Mitigation for the elimination of the Kettle Wetland will be accomplished by the creation of a new 3.56-acre constructed wetland in the southwest portion of the existing mine's bottom. The constructed wetland will be designed, constructed, maintained, and monitored in accordance with a detailed wetland mitigation plan (Anchor QEA, 2021). This is discussed in further detail in Section 3.6, **Plants and Animals**.

- On-site stormwater flow and groundwater seepage and the associated potential for increased erosion will be managed in accordance with a series of Mine Best Management Practices, as described in the *Preliminary Stormwater Management Report* (2021) and the *Earth and Water Resources Report* (Aspect 2022, Revised 2023).

Proposed Mitigation for Off-Site Resources

As described in **Chapter 2** of this EIS, the 2011 Settlement Agreement states that permits for the Pioneer Aggregates South Parcel Project (Proposed Action) shall not be effective until permits for the Sequalitchew Creek Restoration Plan (Restoration Plan) are in place. The Restoration Plan will be evaluated as a separate but related action. The Restoration Plan seeks to restore and enhance streamflow and ecological functions from Sequalitchew Lake through Edmond Marsh into Sequalitchew Creek ravine by sequentially restoring diverted flows back to the creek, improving the sustainability of flows through the system, and restoring aquatic habitat.

The impacts of this mitigation measure are the same as described above in the subsection Cumulative Impacts with Proposed Action and Sequalitchew Creek Restoration Plan.

As discussed in Section 2.3 (Summary of Previous Planning and Environmental Review, 2011 Settlement Agreement Summary, and Sequalitchew Creek Restoration Plan sub-sections)

and Section 2.5 (Alternative 1 – Proposed Action, Groundwater Management sub-section), a Monitoring Plan (Appendix F) was developed in 2017 by CalPortland and the Environmental Caucus non-governmental organizations and included in application submittals. This applicant-proposed Monitoring Plan provides an adaptive management approach that proposes groundwater performance thresholds which must be met for the project to proceed as planned. Along with the Sequalitchew Creek Restoration Plan, the Monitoring Plan (Appendix F) would, if approved by the City, fulfill both the terms of the 2011 Settlement Agreement and the Monitoring and Response Plan measures described above.

Key points from the applicant-proposed Monitoring Plan (Appendix F) include the following that relate to groundwater. These are reproduced here because groundwater impacts affect both flows in Sequalitchew Creek and in the Edmond Marsh complex.

- The Monitoring Plan provides a detailed adaptive management process based on anticipated and observed groundwater levels that includes an iterative five step process of assessment, design, implementation and monitoring, evaluation, and adjustment.
- The Monitoring Plan would establish groundwater levels at each monitoring well through conditions imposed by the city as part of permit approval during each phase of dewatering as performance thresholds to be maintained. It also would specify the frequency of measurements and comparisons with those thresholds.
- The Monitoring Plan establishes limitations on the rate mining can progress during the active dewatering phase including a minimum time for mining each segment and a commitment that mining will not advance to the next segment or dewatering intensify (such as adding new dewatering wells or increasing pumping rates) if performance thresholds are not met.
- If groundwater levels are below the performance thresholds set by city approval, the Monitoring Plan requires that CalPortland evaluate and implement potential adjustments to the dewatering system, including revising mine phasing, adjusting the dewatering plan (number of wells, spacing, alignment, pumping duration), changing the depth or extent of mining, and other actions including ceasing dewatering and mining.
- The Monitoring Plan also specifies a series of required notifications about dewatering progress, milestones, data collection and response actions, as well as identifying routine reporting requirements.

In addition, the Sequalitchew Creek Restoration Plan identified performance and aspirational thresholds to measure the success – and guide implementation of adaptive management – of the Sequalitchew Creek restoration activities and fulfillment of that plan's objectives. Consistent with the performance thresholds identified in the Restoration Plan for the objective of restoring year-round flow in the creek, the following minimum threshold surface water flows, as measured as average monthly flows at the Sequalitchew

Creek ravine monitoring stations, are proposed as specific criteria for triggering adaptive management, as described in the Restoration Plan:

- Performance thresholds of average monthly surface flows in all monitoring stations in the ravine section of Sequalitchew Creek:
  - December to April - 4.0 cfs
  - May to November - 0.5cfs

These threshold values are based on predictions of the 90th percentile exceedance flow in Sequalitchew Creek after mining and creek restoration activities are implemented. Flows below this threshold would be experienced 10 percent of the time, or with about a 14 percent statistical probability of occurring during the 14 years of projected operation of the mine.

The December to April proposed performance measure of 4.0 cfs is about 20 percent of the projected average monthly flows during that period of 19.5 cfs with the proposed Restoration Plan and 30 percent of the projected lowest monthly flows within that period with the Restoration Plan as shown in **Table 3.4-4**. It also is about 6 percent greater than the existing average monthly flow during that period of 3.7 cfs and is about 25 percent greater than lowest monthly flows within that period as shown on Table 3.3-1.

The May to November proposed performance measure of 0.5 cfs is about 7 percent of the projected average monthly flows during that period of 6.4 cfs with the Restoration Plan and 20 percent of the projected lowest monthly flows within that period with the Restoration Plan as shown in **Table 3.4-4**. It also is about 30 percent of the existing average monthly flow during that period of 1.8 cfs and is about 45 percent of the lowest monthly flows within that period as shown on Table 3.3-1. The applicant proposed standard for initiating adaptive management would generally match the lowest level of flows currently experienced in the upper ravine weir and therefore the proposed Restoration Plan would be held to a standard no higher than existing conditions.

Alternative thresholds for initiating adaptive management might be adopted by the City as approval conditions.

Other Possible Contingency Mitigation Measures

The Sequalitchew Creek Restoration Plan is a separate but related action that is intended to be implemented in parallel with the Proposed Action. The mine and the stream restoration project each have their own adaptive management process tailored to achieving the goals and objectives of each specific project. The interaction between the two adaptive management processes could include: 1) project schedules that encourage restoration in advance of the potential impacts from mining; 2) development of performance thresholds for mining that support restoration and 3) coordinated monitoring and open sharing of information. The City, as the permitting authority for both projects, would have a key role

in assuring consistency between the two adaptive management plans.

The adaptive management process included in the Monitoring Plan (Aspect Consulting, 2017) includes, but is not limited to, the following potential mitigation actions if the impacts of dewatering on groundwater levels are greater than anticipated including: Installing additional monitoring locations; modifying the dewatering system or approach; revising the mining plan; and providing additional mitigation to impacted surface waters.

The Sequalitchew Creek Restoration Plan's adaptive management process similarly identifies examples of potential response actions to be implemented if restored flows do not meet the plans objectives that include, but are not limited to: removing beaver obstructions; installing additional beaver exclusion devices; escalating beaver management; installing additional flow paths through the former railroad grade that divides Edmond Marsh; sealing the losing reach; creating connections to Bell and/or McKay marshes; and expediting later elements of the Restoration Plan.

Other surface water contingency mitigation measures that could be implemented as part of the adaptive management process include:

- As described in Section 3.3, **Groundwater**, a possible contingency mitigation measure not considered in recent CalPortland applications– included in the 2006 mining application and discussed in the 2010 Final Feasibility Study (Anchor QEA 2010) – is to convey at least some of the intercepted groundwater seepage from the eastern slopes of the proposed mine expansion area to discharge to the ravine section of Sequalitchew Creek or West Edmond Marsh. Such mitigation has the potential to provide surface water flows in Sequalitchew Creek to offset the reduced groundwater seepage to the creek due to the Proposed Action and/or to make up for low- or no-flow periods in the creek and marsh system due to low or no flow discharges from Sequalitchew Lake under implementation of the Restoration Plan. If coupled with the Restoration Plan (including lining the losing reach section of the creek), the diversion of the groundwater seepage through pumping during Steps 1 through 3 from the proposed expansion area to West Edmond Marsh would provide flows to the losing reach as well as the ravine section of Sequalitchew Creek. Such diversions, however would not occur during the Step 4 and permanent post mining periods. Step 4 and permanent passive flow diversion to the ravine section of the creek would provide flows to the ravine section where salmon spawning and the most productive rearing habitat is located. It would not provide benefits to the marsh complex or the losing reach. Such mitigation could be adaptively managed, based on flow and temperature conditions in Sequalitchew Creek, and in such a way as to allow for some groundwater seepage from the proposed expansion area to be retained on-site, routed to created wetland mitigation areas and infiltrated to the Vashon-Sea Level Aquifer via the planned infiltration facilities. The significance of potential impacts to the intertidal springs is limited by the small average of 5.2 cfs discharged from groundwater diverted from mine dewatering compared to total

spring discharge to Puget Sound which is estimated to be 131.5 cfs along the entire approximately 3.5 miles of shoreline modeled. Conveying groundwater from the mine expansion area to the ravine may require resolving conflicting provisions in the 2011 Settlement Agreement (see Chapter 2).

- Another possible additional mitigation measure that was considered in the 2010 Final Feasibility Study (Anchor QEA 2010) is raising the level of Sequalitchew Lake to increase the hydraulic gradient of Sequalitchew Creek through the East and West Edmond Marshes in order to better facilitate flows through the marsh system. With Restoration Plan implementation, the anticipated hydraulic gradient across the marsh system is approximately 0.0006 ft/ft. According to the 2010 Final Feasibility Study, the primary limitation to raising the lake level to induce a higher gradient is the protection of the Sequalitchew Springs located on the east end of Sequalitchew Lake. The Sequalitchew Springs are the drinking water source for JBLM and are protected behind a back-flow prevention weir. Reportedly, the lake level could potentially be raised (by modifying the outlet structure at the west end of the lake) by 0.56 ft with a moderate level of effort for modifications to the back-flow prevention weir at the springs. Raising the lake level higher than that is possible but would reportedly require a significant reconstruction of the facilities at the spring.

3.4.4 Significant Unavoidable Adverse Impacts

Under the Proposed Action with the Sequalitchew Creek Restoration Plan, unavoidable adverse impacts to the surface water system of the Sequalitchew Creek watershed would likely include:

- Increasing the surface water gradient between Sequalitchew Lake and the top of the ravine to restore the natural flow regime to the Sequalitchew Creek watershed, in combination with lower groundwater levels resulting from mining, would result in water levels in East and West Edmond Marshes being lowered by up to approximately 3 ft compared to existing conditions.

- Water levels in isolated lakes and kettle wetlands not directly connected by surface water to the Sequalitchew Creek system would be lowered due to lowered groundwater levels from the Proposed Action. The anticipated decrease in water levels would be approximately 3 ft for Wetland 1D; 2 ft for Pond Lake; 1 ft for Wetlands, #8, #9, #10, and #11; and 0.5 ft for Old Fort Lake. Implementation of the Restoration Plan would likely not mitigate these impacts. These isolated wetlands have significant seasonal variability in water levels and are often dry during the summer. For these reasons, changes that result from changes in groundwater level may be difficult to observe.

- Flows in the ravine section of Sequalitchew Creek would likely be lower than under existing conditions an estimated 10% of the time due to the reduction in groundwater seeps and spring discharges to the creek following groundwater lowering. This would have adverse effects on aquatic habitat discussed in Sections 3.5 and 3.6.

- Water temperatures in Sequalitchew Creek from April through September would likely be warmer than under existing conditions and could be expected to exceed 16°C (the 7-day average of daily maximum temperatures water quality criterion provided in WAC 173-201A-200) from May to September.

If the contingency mitigation measure of conveying the intercepted groundwater from the eastern slopes of the proposed expansion area to Sequalitchew Creek and/or West Edmond Marsh is feasible and implemented as part of the adaptive management process for the Proposed Action and Restoration Plan Alternative, the flow and temperature impacts to Sequalitchew Creek would likely be at least partially reduced, if not eliminated, and may result in greater overall improvement of conditions within the creek.

Flows in the JBLM Diversion Canal would be reduced with the redirection of Sequalitchew Lake outlet flows to the historically natural drainage course through Sequalitchew Creek. Because the Diversion Canal was originally constructed to convey stormwater flows from JBLM and provide a watercourse for Sequalitchew Lake outlet flows, the reduced flows in the Diversion Canal are not considered an adverse impact.

Because on-site stormwater flows will be managed in a similar manner as existing conditions (i.e., on-site collection, conveyance, and infiltration) and because the removal of the Kettle Wetland will be mitigated by a new constructed wetland, no significant unavoidable adverse impacts to on-site surface waters are anticipated under the Proposed Action and Restoration Plan scenario.

3.5 FISHERIES

This section of the FEIS describes the existing fisheries conditions in the site vicinity (including the area associated with the Sequalitchew Creek restoration). Potential impacts associated with the EIS Alternatives are evaluated and mitigation measures identified. This section is based on the *Fisheries Technical Report* (February 2023) prepared by Anchor QEA and peer review by Raedeke Associates (see **Appendix G**). Information added or changed subsequent to issuance of the Draft EIS, if any, is shaded to ease identification of the added or changed information

3.5.1 Affected Environment

There are no fisheries resources on the site. Accordingly, the affected environment discussion for fisheries is focused on the lower 1.4 miles of Sequalitchew Creek, and the estuary and brackish marsh near the mouth of the creek. Other affected environments addressed in this analysis include the Puget Sound nearshore north of the Nisqually flats to Tatsolo Point and potential fish habitat in the Edmond Marsh complex. These areas are all outside the site but are subject to potential indirect effects from Proposed Action-related changes to the Vashon Aquifer and the off-site Sequalitchew Creek Restoration Plan.

Sequalitchew Creek

A description of the Sequalitchew Creek watershed and the fisheries habitat characteristics of Sequalitchew Creek is presented below. Refer to Section 3.3, **Groundwater**, and Section 3.4 **Surface Water**, for additional detail on Sequalitchew Creek physical habitat characteristics.

In general, Sequalitchew Creek has undergone a series of alterations over the last approximately 180 years from urban, military, and private development that has reduced fish access and habitat conditions.

Sequalitchew Creek Watershed

Sequalitchew Creek (Water Resource Inventory Area 12-0019) drains a watershed covering approximately 38.4 square miles that discharges into Puget Sound. **Figure 3.5-1** illustrates the characteristics of the Sequalitchew Creek drainage basin (see **Appendix G** for detail on the Sequalitchew Creek basin).



Source: Anchor QEA, 2022.

EA Engineering, Science, and Technology, Inc., PBC

Figure 3.5-1

Existing Aquatic Resources

Physical Habitat of Upper Sequalitchew Creek

Upper Sequalitchew Creek is largely an artificial channel from its source at the Lake Sequalitchew weir to the west end of West Edmond Marsh. This channel is excavated within the existing wetland complex and has extremely low velocity where it flows in a culvert under DuPont Steilacoom Road. Except under extreme high flow conditions, all flow that passes through that culvert either infiltrates or evaporates within the Edmond Marsh Complex (see **Appendix G**, Plants and Animals Technical Report for additional detail).

Physical Habitat of Lower Sequalitchew Creek

Sequalitchew Creek above river mile 1.0 and below Edmond Marsh is typically dry. Only rarely is there a surface water connection between Edmond Marsh and lower Sequalitchew Creek. Most instances of surface water connection appear related to storm events, but some are from humans removing or altering the beaver dam at the west end of Edmond Marsh. The source of water in the lower mile of the creek is groundwater discharged from the Vashon Aquifer as springs in the Sequalitchew Creek ravine. In general, water flows in Sequalitchew Creek are not sufficient to allow fish use throughout much of the year (see **Appendix G** for detail on the physical characteristics of Sequalitchew Creek and fish use).

Biological Habitat of Sequalitchew Creek

The Sequalitchew Creek drainage basin contains both anadromous and resident fish that occur at different times of the year and use different portions of the creek. Documented anadromous fish use is reported for Sequalitchew Creek in the site vicinity, including by coho salmon (*Oncorhynchus kisutch*), chum salmon (*O. keta*), and cutthroat trout (*O. clarkii*) (see Figure 4 of **Appendix G**). The U.S. Fish and Wildlife Service also identifies bull trout (*Salvelinus confluentus*), a threatened species, as occurring in the site vicinity. Native bull trout populations are known to be present in the Nisqually River, whose mouth is located approximately one mile south of Sequalitchew Creek. Although suitable habitat for bull trout does not exist within Lower Sequalitchew Creek, it is likely that this species is present in the nearshore habitat and could enter Lower Sequalitchew Creek estuary to forage during salmon smolt out-migration.

Resident fish reported or expected to occur in Sequalitchew Creek within the site vicinity include cutthroat trout (*O. clarki*), rainbow trout (*O. mykiss*), sculpins (*Cottus* sp.), and western brook lamprey (*Lampetra richardsonii*). Other resident fish reported to occur in the Sequalitchew Creek drainage basin, but outside the site vicinity, include kokanee salmon (*O. nerka*) and spiny ray fish in American Lake and Sequalitchew Lake. Chum salmon have been reported to spawn in the lower 650 feet of Sequalitchew Creek in the past.

Historical Augmentation of the Fishery

WDFW augmented the fishery of Sequalitchew Creek intermittently from 1980 to 2001. Coho salmon smolts were released into Sequalitchew Creek from 1980 to 1994 and again in 2001. The annual number of coho salmon smolts (young salmon that are moving from freshwater to the ocean) released ranged from 2,280 to 987,480 with an average annual release of 238,477. Fall Chinook salmon (O. *tshawytscha*) smolts were also released into Sequalitchew Creek in 1990 and 1991. The annual number of Chinook smolts release ranged from 19,800 to 42,800 with an average annual release of 27,533. Coho salmon, chum salmon, and cutthroat trout are currently reported to utilize Sequalitchew Creek according to the most recent information from WDFW and the *WRIA 12 Salmonid Habitat Limiting Factors Report*.

Coho salmon spawning survey records for Sequalitchew Creek indicate sporadic observations have been made by WDFW in 1962, and between 1982 and 1985. These surveys conducted in the winter (November 6 to December 27) extended from the mouth to RM 1.6. These data indicate that the annual number of adult coho salmon observed ranged from 0 to 145 with an annual average of 22. These surveys occurred during the period when smolts were released in the watershed, and flows were maintained by cutting a channel through Edmond Marsh.

The time of year when anadromous fish are reported to occur in Sequalitchew Creek within the site vicinity is as follows: Coho salmon smolts out-migrate from March to May, while returning adults spawn from late November to early January. Chum salmon spawn between December and February, and the fry (the stage where they begin the process of adapting to salt water) out-migrate immediately after emerging from the gravels, which is usually between March and June. Resident and sea-run cutthroat trout reside in Sequalitchew Creek throughout the entire year. Adults typically spawn in the spring and summer (February to August) and the fry emerge in late summer. Adult bull trout can potentially be present in the lowest portions of Sequalitchew Creek at any time of the year but are most likely to enter the stream to forage on out-migrating salmon smolts between March and June. Bull trout are not expected to use Sequalitchew Creek for spawning purposes due to the limited known distribution in the vicinity and the lack of spawning conditions that bull trout require.

Fish Habitat under Existing Flows

The analysis of salmonid spawning and passage in Sequalitchew Creek prepared for this EIS is based on water depth and flow, and considers conditions for coho salmon, chum salmon, and cutthroat trout (see **Appendix G** for detail on the methodology utilized for water depth and flow).

The analysis indicates that optimal flows for both spawning and rearing in Sequalitchew Creek are higher than provided by current flows in Sequalitchew Creek; i.e. existing low flows in the

creek are not considered suitable for spawning and rearing of coho and chum salmon. Cutthroat trout habitat is also severely limited due to low flows, especially during drier-than-average years. Also note that a 2013 study found that "adult capacity and abundance in Sequalitchew Creek is essentially zero" (see to **Appendix G** for additional detail).

Marine Shoreline

Fish habitat along the marine shoreline at the mouth of Sequalitchew Creek and the barge-loading facility is described below.

Physical Habitat Characteristics of the Marine Shoreline

Mouth of Sequalitchew Creek

The Puget Sound shoreline at the mouth of Sequalitchew Creek is characterized by an armored slope above a gravel beach with minimal estuarine habitat. Farther offshore, a shallow soft sediment bench extends from the Nisqually River delta to just north of the mouth of Sequalitchew Creek. The BNSF railroad tracks paralleling the shoreline in this area are perched on a steep riprap berm. On the Nisqually Reach side of the railroad there are gravel deposits on either side of the mouth of Sequalitchew Creek that extend above the high tide line. These create more complete nearshore habitats, with beach grasses, drift logs, and low angle beaches extending into the subtidal zone. The railroad berm bisects the mouth of Sequalitchew Creek and influences tidal currents, wave action, and sediment deposition along the marine shoreline. There is a brackish marsh associated with Sequalitchew Creek on the upstream side of the railroad berm. Wind waves and tidal flows in the marsh are limited by a culvert under the railroad berm. The culvert draining Sequalitchew Creek through this railroad berm influences tidal exchanges, deltaic sediment deposition, and fish passage. There is limited rearing habitat in the brackish marsh on the upstream side of the railroad berm because this berm does not allow the channel to meander and otherwise naturally braid into multiple tidal channels. The loss of these natural processes limits the quantity and quality of fish habitat in this estuary.

Marine Shoreline West of the Existing Mine

The shoreline on the Puget Sound side of the railroad berm also has limited fish habitat due to steep slope influences on wave action, sediment deposition, and estuarine vegetation. Waves formed by the predominant wind direction (from the southwest) break on the riprap-lined slope during high tides and do not allow for the deposition of fine-grained substrate in most areas. Substrate along the shoreline that is influenced by high-energy waves and wave reflection scouring is dominated by cobbles and gravel. In addition, the steep riprap embankment does not allow estuarine vegetation to grow above the high tide line. This limits the organic export of nutrients and benthic invertebrates (small bottom-dwelling aquatic animals with no backbone) that juvenile salmonids need during their acclimation to estuarine conditions. Within approximately 0.25 mile on either side of the

mouth of Sequalitchew Creek, there is a sand bar at the shoreline. This sandbar reduces wave energy and scour. The sandier substrate off shore of the bar supports patches of eelgrass. The bottom substrate farther offshore that is not influenced by wave scouring consists of fine-grained sediment overlying cobbles.

Barge Loading Facility

The Puget Sound shoreline at the Pioneer Aggregates barge loading facility near Tatsolo Point is located where the BNSF railroad tracks also parallel the shoreline. The railroad tracks are perched on a steep berm composed of riprap that occupies the intertidal zone to nearly mean lower low water (MLLW), meaning there is little intertidal beach present. This railroad berm influences tidal currents, wave action, and sediment deposition along the marine shoreline. Although there is a gravel beach adjacent to the railroad berm approximately 200 feet north of the dock, the area has minimal nearshore habitat value. The shoreline on the Puget Sound side of the railroad berm has limited fish habitat because the steep slope influences wave action, sediment deposition, and estuarine vegetation. Waves formed by the predominant wind direction (from the southwest) break on the riprap-lined slope and do not allow for the deposition or effective transport of fine-grained substrate (see **Appendix G** for additional detail)

Biological Habitat Characteristics of the Marine Shoreline

The Nisqually Reach west of the existing mine and the nearshore from the mouth of Sequalitchew Creek provide habitat for numerous species of fish and marine invertebrates. WDFW Priority Habitats and Species mapping documents the presence of key habitats for cutthroat trout, coho salmon, and chum salmon migration and rearing; and Pacific sand lance (*Ammodytes hexapterus*) and surf smelt (*Hypomesus pretiosus*) breeding. The reach is used by Dungeness crab (*Cancer magister*) and various types of shrimp. Kelp and algae beds are present in the shallow subtidal; there have been limited observations of eelgrass in the vicinity (eelgrass is critical fish habitat).

Mouth of Sequalitchew Creek

Although fish habitat along the marine shoreline at the mouth of Sequalitchew Creek is influenced by the railroad berm, this area is used by a variety of species. These include plants and invertebrates in the intertidal and subtidal zones, as well as the marine and fish species described below.

Prior studies indicate that 75 plant species were found growing on the bottom substrate in the intertidal area (0 to 9 feet above MLLW). Of these intertidal plants, more than half were red algae (Rhodophytes) and green algae (Chlorophytes). The majority of the subtidal plants were found between 0 and -16 feet below MLLW. Small patches of eelgrass in sparse densities were observed near the mouth of Sequalitchew Creek (see **Appendix G** for detail).

Prior studies also identified 270 species of invertebrates in the intertidal area, with the majority of these species occurring near 0 feet MLLW. Several species of limpets, barnacles, and periwinkles were the dominant molluscan groups. The most productive area was the lower intertidal area near the mouth of Sequalitchew Creek. Subtidal invertebrates found in this area include snails (gastropods), worms (polychaetes), sea stars, and amphipod crustaceans.

Marine fish observed along the shoreline in this area include 31 species of bottomfish, 26 species of bottom-dwelling fish, and 11 water-column species. The predominant bottomfish include English sole (*Parophrys vetulus*), rock sole (*Lepidosetta bilineata*), and starry flounder (*Platichthys stellatus*). The dominant bottom-dwelling fish include buffalo sculpin (*Enophrys bison*), Pacific tomcod (*Microgadus proximus*), staghorn sculpin (*Leptocottus armatus*), rockfish species (*Sebastes* spp.), cabezon (*Scorpaenichthys marmoratus*), painted greenling (*Oxylebius pictus*), and pipefish (*Syngnathus griseolineatus*). The water-column fish are represented by shiner perch (*Cymatogaster aggregate*), surfperches (Embiotocidae), and tubesnout (*Aulorhynchus flavidus*).

Salmonid species observed along the marine shoreline include coho, chum, Chinook, and pink salmon. Adult coho salmon were found along the shoreline at the Sequalitchew Creek mouth in September and October, but most of these fish were returning to spawn in the Chambers Creek, McAllister Creek, and Nisqually River watersheds. Returning chum salmon are found along the shoreline at the Sequalitchew Creek mouth in December and January, but most of these fish spawn in the Nisqually River. Chinook and pink salmon observed along the marine shoreline are mainly migrating to the Nisqually River system. Juvenile salmonids are found along the shoreline at the Sequalitchew Creek mouth during the spring out-migration, but many of these fish originate in the Nisqually River. Juvenile coho salmon are typically found between May and June. The peak migration of juvenile chum salmon occurred between mid-February and late July. Juvenile Chinook salmon were observed migrating from late May to July.

As noted previously, a native population of bull trout is known to inhabit the Nisqually River system. Fish from this population may utilize the nearshore environment near the mouth of Sequalitchew Creek and may also enter the lowest portion of the creek to forage on juvenile salmonids.

Barge Loading Facility

Similar to the area described at the mouth of Sequalitchew Creek, the barge loading area is influenced by the railroad berm. However, the barge loading dock area has less diversity than the mouth of Sequalitchew Creek. The following summarizes the plants and invertebrates in the intertidal and subtidal zones; marine fish; and salmonids found in this area.

An intertidal flora and fauna survey conducted approximately 200 yards south of the barge loading dock in 1978 found little macroalgae above +6 feet MLLW. Only rockweed (*Fucus gardneri*) was present at +6 feet MLLW. At lower elevations, several species of red and green algae were common, and at 0 feet MLLW, several species of kelp dominated. Subtidal plants are distributed at various depths and include macroalgae and kelp at around -8 feet MLLW. A narrow band of bull kelp (*Nereocystis leutkeana*) extends along the shoreline in both directions from the barge loading dock. Algae species are restricted to the area above -20 to -30 feet MLLW, and the most prevalent algae species was sea lettuce (*Ulva lactuca*). Ribbon kelp (*Laminaria saccharina*) was the second most common algae in this area. A variety of filamentous and foliose red algae species are present; the most common is *Sarcodiotheca gaucichaudii*. The cumulative percent cover of these algae ranged from 100% in the shallow subtidal zone to less than 5% at -20 to -30 feet MLLW. No eelgrass beds were observed in the vicinity of the dock.

Subtidal animals living within (infauna) and on top (epifauna) of the sea bed are present at various depths. The most common infauna group is polychaete worms, while the epifauna is dominated by shrimp and crab species. Larger animals included cockles (*Clinocardium nuttallii*), sea cucumbers (*Parastichopus californicus*), several species of sea stars, Dungeness crab (*Cancer magister*), rock crab (*Cancer productus*), and geoducks (*Panope abrupta*).

Marine fish observed along the shoreline in this area include shiner perch, Pacific herring (*Clupea harengus pallasi*), sand dab (*Citharichthys sordidus*), English sole, and starry flounder. Four salmon species (coho, chum, chinook, and pink) are expected to occur in this area. However, this area is less productive for juvenile salmon rearing and adult migration than the mouth of Sequalitchew Creek due to its greater distance from the Nisqually River. As noted previously, a native population of bull trout is known to inhabit the Nisqually River system. Fish from this population may utilize the nearshore environment in the vicinity of Sequalitchew Creek, including the barge loading facility.

3.5.2 Impacts of the Alternatives

This section identifies and analyzes the potential for impacts to fisheries in the vicinity of the site under the EIS Alternatives.

As described in **Chapter 2** of this FEIS, the 2011 Settlement Agreement indicates that any approval of proposed mining under the Pioneer Aggregates South Parcel Project (Proposed Action) shall not be effective until permits and approvals needed for implementation of the Sequalitchew Creek Restoration Plan (Restoration Plan)[1], as a separate but related action. The Restoration Plan seeks to restore and enhance streamflow and ecological functions from Sequalitchew Lake through Edmond Marsh into Sequalitchew Creek ravine by

[1] *The Sequalitchew Creek Restoration Plan is sponsored and developed by CalPortland, the Environmental Caucus and the South Puget Sound Salmon Enhancement Group (SPSSEG).*

sequentially restoring diverted flows back to the creek, improving the sustainability of flows through the system, and restoring aquatic habitat.

Consistent with the 2011 Settlement Agreement, this FEIS assumes that mining and reclamation activities under the Proposed Action would require implementation of the Restoration Plan. It is assumed that CalPortland funding/implementation of projects associated with the Restoration Plan would be mitigation for certain environmental impacts identified in this FEIS and would be a condition of any City of DuPont approval of the Proposed Action. However, because the Restoration Plan is considered a separate project that could be funded and implemented independent of the Proposed Action, the general discussion in the Environmental Impacts sub-section of Fisheries only addresses the impacts of the proposed mining/reclamation and does not include implementation of the Restoration Plan. This is intended to help the reader understand the impacts of the proposed mining/reclamation, and the need for the Restoration Plan with the proposed project. Proposed mining/reclamation in combination with the Restoration Plan is specifically discussed under Cumulative Impacts.

ALTERNATIVE 1 – PROPOSED ACTION

Direct Impacts

Potential fisheries impacts to the marine shoreline include direct and indirect effects from the spillage of sand and gravel from the conveyor, overturning of barges during loading, accidental spills of pollutants, shading, and lighting, and are summarized as follows:

- Sand and gravel, if spilled in sufficient quantities, could smother the benthic community where the spill occurs.
- Accidental spills of petroleum products (diesel) and other pollutants (hydraulic oil) could potentially occur during barge loading and maintenance activities.
- Extending the life of the conveyor and barge loading dock by about 14 years would extend any impacts to areas directly beneath the dock by shading the shallow water, as well as impacts associated with dock lighting. These impacts would occur until the dock is eventually removed.

As indicated in Sub-section 3.4.1, periodic surveys to date have not detected substantial material spills. Also, Ecology maintains a record of all reported oil spills of 1 gallon or more since 2015; there were no recorded spills in the vicinity during that time.

Indirect Impacts

The Proposed Action would not directly affect Sequalitchew Creek, but the drawdown of the Vashon Aquifer would indirectly reduce flow in Lower Sequalitchew Creek. Lower Sequalitchew Creek is entirely spring fed. Groundwater discharge to Sequalitchew Creek during active dewatering under the Proposed Action is predicted to be 79% less than

baseline conditions, on average, resulting in a decrease in average flow in Sequalitchew Creek from 1.6 cfs to 0.34 cfs at the mid-ravine gage. The greatest decrease would occur during the wet season.

Without the Sequalitchew Creek Restoration, these indirect impacts would reduce flows during the spawning life stage of chum salmon and the spawning and rearing life stages of coho salmon and cutthroat trout. Impacts during the spawning season would limit the amount of habitat for resident cutthroat trout and eliminate spawning habitat for anadromous species. This would reduce the spatial extent of habitat available and reduce the portion of the year when fish habitat is accessible.

Climate Change

As noted in Section 3.4, the effects of climate change on the hydrologic processes in the Puget Sound region are anticipated to include a suite of long-term changes that are consistent with those observed globally, including year-to-year variability in total precipitation with ongoing fluctuations between wet years and dry years, and greater frequency of extreme events (e.g., droughts and flooding). Climate change is likely to result in greater variability in rainfall events which may increase the recurrence interval of when flows out of the lake are lower than existing Sequalitchew Creek flows, particularly in the summer. Based on the period of flow monitoring identified in Section 3.4 (2003 to 2021), this currently occurs about 10 percent of the time. With climate change, summers with extended dry periods will likely continue to be the norm, and those summers may become more frequent or the dry period longer; however, increased precipitation in the wet season, coupled with the size of the aquifer dampening the effects of any single season, may reduce negative effects from single dry summers.

CUMULATIVE IMPACTS WITH PROPOSED ACTION AND SEQUALITCHEW CREEK RESTORATION PLAN

Introduction

As indicated in **Chapter 2** (Description of proposed Action and Alternatives) of this EIS, the 2011 Settlement Agreement indicates that any approval for mining under the Pioneer Aggregates South Parcel Project shall not be effective until permits and approvals needed for implementation of the Sequalitchew Creek Restoration Plan developed by CalPortland and the Environmental Caucus are in place. The Restoration Plan will be evaluated as a separate but related action. The Sequalitchew Creek Restoration Plan seeks to restore and enhance streamflow and ecological functions from Sequalitchew Lake through Edmond Marsh into Sequalitchew Creek ravine. Restoration of Sequalitchew Creek seeks to address almost two centuries of human manipulation. The principal goals of the Restoration Plan are to restore flows in Sequalitchew Creek, portions of which are now dry. This goal will be achieved by implementing a series of actions in a coordinated and adaptively managed

project. The Restoration Plan is intended to sequentially restore diverted flows back to the creek, improve the sustainability of flows through the system, and restore aquatic habitat by removing flow-related fish passage barriers and increasing the habitat available to aquatic species.

The Sequalitchew Creek Restoration Project would also restore fish passage from Sequalitchew Creek to East and West Edmond Marshes. Two fish barrier culverts would be replaced by fish-passable structures, which in combination with increased flows would allow migratory access above the ravine springs and into Edmond Marsh. Restoration would affect the conditions sufficiently to allow establishment of emergent vegetation in the western extent of the complex where inundation would persist through more of the growing season, providing excellent rearing habitat for juvenile coho salmon and cutthroat trout. These effects would increase the size, diversity, and complexity of available fish habitat types.

The increased flow through Edmond Marsh would also improve water quality conditions by increasing dissolved oxygen concentrations and diluting and flushing an area of elevated iron concentrations in the center of the marsh. Improved water quality would improve fish habitat.

Cumulative Conditions

The combined impacts of mining under the Proposed Action together with implementation of the Sequalitchew Creek Restoration (the 'cumulative condition') on stream habitat would include a re-establishment of flow from Sequalitchew Lake to flow through the marshes and into Sequalitchew Creek ravine, and re-establishing ecosystem processes, specifically, the movement of water, sediment, nutrients, biota, and dissolved gases through the watershed from the headwater springs on Sequalitchew Lake to Puget Sound. The increase in hydrology and stream energy would increase aquatic ecosystem productivity and create and maintain habitat diversity, particularly for target species such as chum salmon and cutthroat trout in the system, as described below (see **Appendix G** for details).

Water Quality

The mining under the Proposed Action and Sequalitchew Creek Restoration Plan projects would introduce surface water from the upper watershed to Sequalitchew Creek. Water currently passing through Edmond Marsh has low levels of turbidity and pollutants. The cumulative condition would impact stream temperature in the Sequalitchew Creek ravine by restoring the flow of surface water in the system at a different temperature. The effects would vary seasonally as the volume of water from Sequalitchew Lake and its associated temperature vary. In summer, the outflow from Sequalitchew Lake is warmer than Sequalitchew Creek; in winter, it is colder.

Sequalitchew Creek would experience warm temperatures in June, July, and August, with temperatures reaching up to 21°C (70°F) and cool temperatures in winter, down to 5°C to 6°C (41°F to 43°F) (see **Appendix G** Figure 6). The predicted stream temperatures would be considerably warmer than the current spring discharge in the creek for most of the year. The surface water quality criterion for temperature applicable to Sequalitchew Creek is 16°C for the 7-day average of daily maximums. This threshold may be exceeded from May to September.

This temperature increase could alter habitat for juvenile fish. Increased stream temperatures have been shown to decrease time to emergence in several salmonid species, including coho salmon. Cutthroat trout, which spawn and rear later in the season, have been shown to hatch earlier as temperatures increase. Although sublethal, this temperature increase could impact growth and survival, with juveniles potentially competing for resources earlier in the year.

The dissolved oxygen levels in Lake Sequalitchew and Lower Sequalitchew Creek are currently high (>9 milligrams per liter [mg/L]). Water quality in the marshes is more typical of stagnant waterbodies exposed to the life cycle of aquatic plants.

Water Quantity

Streamflow was evaluated and streamflows were predicted at two locations under the cumulative condition. These locations are the losing reach near Center Drive, and at the mid-ravine of Sequalitchew Creek.

Flows in the Losing Reach - Under existing conditions, the losing reach experiences no consistent flow passing through the entire reach. The bottom of the losing reach is above the current groundwater levels, so ground infiltration in the losing reach would not be impacted by lowering of groundwater with mining under the Proposed Action.

The cumulative condition is predicted to result in an average flow of 12.9 cfs in the losing reach. The flow would vary seasonally (see Figure 5 of **Appendix G**). Peak flows could be as high as 60 cfs if all water is routed through the wetlands during peak flow events. To avoid flooding during peak flows, the highest flows would be directed to the Diversion Canal or detained in the marshes.

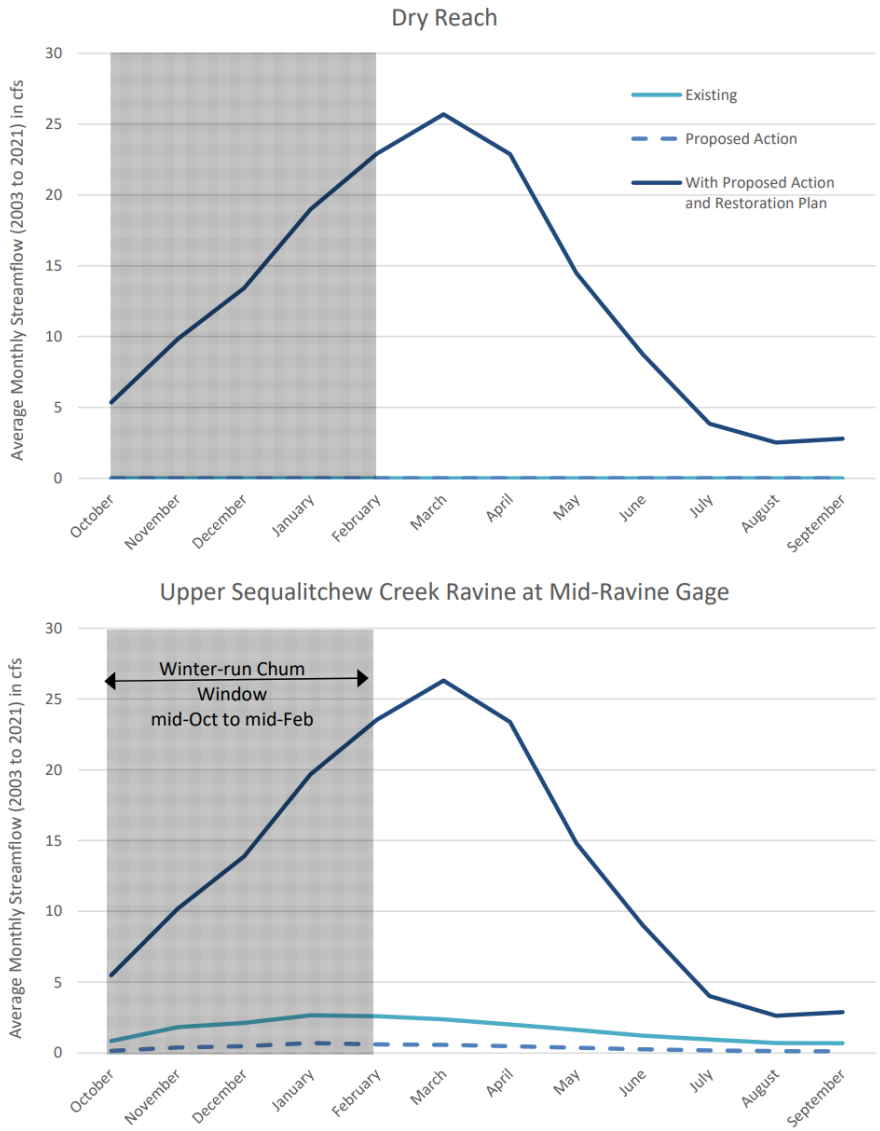
Modeling conducted for this EIS analysis (see **Appendix G**) indicates there would be periods when there would be no outflow from West Edmond Marsh, and thus no flow in the losing reach portion of Sequalitchew Creek in the cumulative condition. The occurrence of dry periods in this reach of Sequalitchew Creek would be reduced or eliminated if beaver management structures are built to store water and release it slowly and consistently during periods when there is no flow from Sequalitchew Lake. Should flow be disrupted, it would temporarily disrupt the habitat and fish migratory functions of the stream reach between the Sequalitchew ravine springs and Edmond Marsh.

Flows at Mid-Ravine - After passing through the losing reach, streamflows would enter the Sequalitchew Creek ravine under the cumulative condition. The vast majority of flow would originate from Sequalitchew Lake, but there would be contribution from springs within the ravine, although the contribution from these springs with mining under the Proposed Action and Sequalitchew Creek Restoration Plan would be lower than it is under existing conditions.

On average, flow in Sequalitchew Creek at the mid-ravine gage would generally be similar to but slightly higher than the flows in the losing reach (i.e., 0.4 cfs greater), reflecting the input of spring flow. Peak flows would be generally the same magnitude (approximately 60 cfs) as in the losing reach.

There would be periods when the cumulative condition would result in a reduction in flows at the mid-ravine gage compared with the existing condition; flows are anticipated to be lower approximately 10.5% of the time. These effects would be mitigated in part or in whole by implementation of the beaver management actions called for in the Restoration Plan. On an overall basis, implementation of the Sequalitchew Creek Restoration Plan would increase the level of fisheries habitat in Sequalitchew Creek compared to existing conditions.

Low flows are the limiting factor for coho and chum salmon and cutthroat trout spawning and rearing in the ravine. Separate studies (Anchor Environmental 2004, and ICF 2013) show that under flow conditions similar to those predicted with mining and restoration would result in increased capacity of the stream to support spawning and rearing of coho and chum salmon Flows during the spawning season of winter-run chum (October – February) would be increased providing passage to more of the creek and conditions suitable for spawning in the ravine. Coho salmon spawn in the Nisqually during the earlier part of the same period.



Edmond Marsh

A goal of the Sequalitchew Creek Restoration Plan is to reintroduce a sustainable population of coho salmon. If re-stocking of coho salmon is successful, the aquatic area of West Edmond Marsh would provide rearing habitat for juveniles. Juvenile coho salmon typically stay in freshwater wetlands and small streams for two years or more after spawning.

Nearshore Habitat

Under the cumulative condition, the additional flow in Sequalitchew Creek would transport more nutrients and fine sediment to the nearshore. The mouth of the creek is near the south end of a drift cell[2] with net transport to the north. The additional sediment would benefit the

[2] *Section of shoreline in which sand and gravel naturally move to create beaches.*

nearshore by replacing some of the sediment that would naturally come from the exposed bluffs above the railroad. Currently this sediment cannot cross the tracks, and the lower shoreline is heavily armored, preventing erosive forces from recruiting sediment below the railroad. Additional nutrients and sediment would also increase biotic productivity on the Puget Sound shoreline at the mouth of the creek, increasing prey resources for fish. Conditions in the brackish marsh are expected to remain stable. Although salinity at the surface could drop, the saltwater that enters the marsh at high tide is anticipated to still cover the entire vegetated surface of the marsh

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ALTERNATIVE 2 – NO ACTION

The No Action Alternative includes two scenarios: Scenario A – Continuation of Existing Site Conditions; and Scenario B – Site Development under Existing Zoning.

Scenario A

Under No Action Alternative Scenario A, the condition of the Sequalitchew Creek fish populations and fish habitat would remain as under existing conditions. Suitable and accessible habitat for all species of fish currently and historically present would continue to be a fraction of what they were a few decades ago. Surface flows from Edmond Marsh into Lower Sequalitchew Creek would continue to occur during extreme precipitation events and would not contribute meaningfully to habitat. The creek would continue be unused or used very little by chum and coho salmon and cutthroat trout.

No-Action Alternative Scenario A includes the potential for the Sequalitchew Creek Restoration Plan to be implemented without the Proposed Action. Funding for alterations to the diversion system is currently programmed by JBLM. For the portions of the plan outside JBLM, other funding sources (e.g., grants) would be required to implement the plan. These alternate funds may or may not be provided, and if provided may or may not be at the same level of funding and/or on the same timeline as under the Proposed Action.

Scenario B

If the site were to be developed consistent with existing zoning, clearing and grading associated with construction would increase potential for erosion impacts to area fisheries resources; with adherence to applicable regulations during construction, significant impacts to these resources are not anticipated. The increase in impervious surfaces on the site with development consistent with existing zoning would increase surface water runoff; with adherence to applicable regulations related to stormwater quantity and quality, significant impacts are not anticipated.

As indicated above, development of the site consistent with existing zoning includes the potential for the Sequalitchew Creek Restoration Plan to be implemented without the

Proposed Action. However, there are no known likely funding sources other than CalPortland at this time.

3.5.3 Mitigation Measures

The following mitigation measures have been included in the Proposed Action to reduce fisheries resources impacts, including impacts to on-site resources and indirect impacts to off-site resources due to changes in groundwater hydrology. Note that specific mitigation measures associated with dewatering and other aspects of the mining project are discussed in Section 3.3, **Groundwater**, of this EIS.

Proposed On-Site Mitigation

- Existing mitigation measures at the barge loading facility at Tatsolo Point that minimize the potential for impacts on fisheries resources would continue. These include:
    - The facility is designed in accordance with adopted federal, state, and local regulations and guidelines to reduce the likelihood of spills of lubricants, fuels, and chemicals employed in the processing and manufacturing proposed for the site;
    - The overwater portion of the conveyor is enclosed to prevent spillage of gravel; and
    - The dock is not used for the delivery of supplies, or chemical or other materials by water; a spill plan has been prepared for all elements and operations of the facility (marine and upland). Appropriate oil spill containment equipment is available at the dock site.

- Mining operations would continue to manage fugitive dust, and forested buffers around Sequalitchew Creek would remain to protect water quality and its support of healthy fisheries resources.

- Site water and stormwater would continue to be recycled and/or infiltrated in the mine, eliminating turbid runoff and its potential to impact fisheries resources.

- During construction of the mitigation wetland and other excavation of soils, construction best management practices would be used to prevent erosion of soils and sedimentation of water resources that support fisheries resources.

Proposed Mitigation for Off-Site Resources

- Implementation of the Sequalitchew Creek Restoration Plan would mitigate for potential impacts to aquatic resources and vegetation resulting from changes to groundwater levels. The Sequalitchew Restoration Plan will be permitted and

implemented contemporaneously with mining of the South Parcel. Among other things, the Restoration Plan would mitigate for the impacts of the mine. Monitoring and mitigation measures, including specific timeframes for monitoring and mitigation efforts, are defined in the Restoration Plan. The goal of the Restoration Plan is to offset potential impacts to aquatic resources within the area subject to changes in groundwater level.

- The Sequalitchew Creek Restoration Plan and proposed mining both include monitoring and adaptive management programs aimed at ensuring the projects achieve their objectives (e.g., to maintain and enhance fisheries resources). A main purpose of ongoing monitoring and adaptive management is to look for detrimental cumulative effects and, if identified, adaptively respond to minimize them.

Other Possible Contingency Mitigation Measures

- As an element of the approval conditions for the Proposed Action, the City of DuPont could require a Monitoring and Response Plan. The Monitoring and Response Plan could include, among other things, definition of monitoring methodology, establishment of performance thresholds, and identification of contingency response measures to the considered for implementation if monitoring indicates exceedance of a performance threshold. The Monitoring and Response Plan could incorporate elements of the adaptive management processes proposed to be established for the Proposed Action and the Sequalitchew Creek Restoration Plan.

  The Sequalitchew Creek Restoration Plan is a separate but related action that is intended to be implemented in parallel with the Proposed Action. The mine and the stream restoration project each have their own adaptive management process tailored to achieving the goals and objectives of each specific project. The interaction between the two adaptive management processes could include: 1) project schedules that encourage restoration in advance of the potential impacts from mining; 2) development of performance thresholds for mining that support restoration and 3) coordinated monitoring and open sharing of information. The City, as the permitting authority for both projects would have a key role in assuring consistency between the two adaptive management plans. The adaptive management process included in the Monitoring Plan (**Appendix F**) includes, but is not limited to, the following potential mitigation actions if the impacts of dewatering on groundwater levels are greater than anticipated including: Installing additional monitoring locations; modifying the dewatering system or approach; revising the mining plan; and providing additional mitigation to impacted surface waters.

  Other groundwater contingency mitigation measures that could be implemented as part of the adaptive management process include:

- Groundwater captured from the mine could be conveyed to the Sequalitchew Creek ravine (either by open channel or micro-tunneling). This approach could provide mitigation for decreased seep discharge within the ravine if the conveyance outfall (or confluence) is located in the vicinity where groundwater discharge currently occurs. However, this previously considered mitigation measure would require revisiting conflicting provisions in the 2011 Settlement Agreement and would not augment streamflow between Sequalitchew Lake and the ravine.

- All or some groundwater captured from the mine could be pumped into Edmond Marsh rather than into the Sequalitchew Creek ravine. Benefits of this mitigation approach would be that cool groundwater (which has a low summer water temperature relative to surface water) would enter the marsh and could enhance Sequalitchew Creek surface water flow and fish and other habitat. A potential drawback of this mitigation action is that groundwater discharge/infiltration to the comingled Vashon-Sea Level Aquifer would decrease. This option would only occur during Steps 1-3 dewatering through pumping which is projected to last 6 to 8 years as passive dewatering water flow could not be routed to the marshes as they are at a higher elevation.

- Water could be actively conveyed to Edmond Marsh during dry periods, while during all other periods captured groundwater from the South Parcel could be conveyed to the lower mine area for infiltration (as is planned in the Proposed Action). This could serve as a contingent measure for consideration and/or further study to supplement Sequalitchew Creek flows during dry periods when no outflow from Sequalitchew Lake occurs or if the Restoration Plan provides less environmental benefit than currently expected. However, this mitigation measure is also likely at best, a temporary action because pumping in perpetuity is not feasible.

3.5.4 Significant Unavoidable Adverse Impacts

The cumulative impacts of the Proposed Action and Sequalitchew Creek Restoration Plan (the cumulative condition) would generally improve all aspects of the freshwater fish habitat in the Sequalitchew Creek watershed compared to current conditions.
The existing low flows do not currently support a fish population. The flows in the ravine section of Sequalitchew Creek under the Proposed Action would likely be lower than under existing conditions an estimated 10% of the time (during drought years) with the reduction in groundwater discharge to the creek.

Increased water temperature in the Sequalitchew Creek system is anticipated to occur in late summer when only resident fish are present. Fish movement and growth could be

limited during the period when water temperature peaks in late summer until temperatures reduce in fall.

Considering the overall increase in freshwater fish habitat conditions in the cumulative condition, in combination with the proposed and potential measures identified in Section 3.5.3, significant unavoidable adverse impacts are not anticipated.

3.6 PLANTS AND ANIMALS

This section of the FEIS describes the existing plants and animals conditions (including wetlands) on the site (including the approximately 188-acre Expansion Area and approximately 125-acre Re-Mine Area), and in the site vicinity (including the area associated with the Sequalitchew Creek Restoration). Potential impacts associated with the EIS Alternatives are evaluated and mitigation measures identified. This section is based on the *Plants and Animals Report* (June 2023), *Landmark Tree Inventory Report* (August 2021), and *Floodplain Habitat Assessment and Mitigation Report* (November 2022) all prepared by Anchor QEA and peer review by Raedeke Associates (see **Appendices H**, **I**, and **J**). Information added or changed subsequent to the Draft EIS is shaded to ease identification of any added or changed information.

3.6.1 Affected Environment

Plants and Habitat

Dominant plant communities and habitats within the site, the off-site Sequalitchew Creek Restoration Area, and the areas subject to changes in groundwater levels (i.e., the aquatic resources of Sequalitchew Creek and the four wetland systems within the Sequalitchew Creek Restoration Area: East Edmond Marsh, West Edmond Marsh, and the Sequalitchew Creek Riparian Wetlands) with proposed mining operations include coniferous forests, shrublands, grassland, and aquatic resources (streams and wetlands), as described below. Rare plants and plant communities are also described.

Conifer Forests

Conifer forests cover most of the Expansion Area portion of the site, including approximately 135 acres of the approximately 188 acres that would be cleared for mining (see **Figure 2-2** of Chapter 2 of this Draft E). Second-growth conifer forests are interspersed with young regenerating stands as a result of previous timber harvest practices. Douglas-fir (*Pseudotsuga menziesii*) dominates the canopy and regeneration in most areas. Western red cedar (*Thuja plicata*) and Oregon white oak (*Quercus garryana*) also occur in smaller numbers within the conifer forest.

Common understory shrub species include beaked hazelnut (*Corylus cornuta*), snowberry (*Symphoricarpos albus*), trailing blackberry (*Rubus ursinus*), Scot's broom, and salal (*Gaultheria shallon*). Other species include twin flower (*Linnea borealis*), low Oregon grape (*Mahonia nervosa*), sword fern (*Polystichum munitum*), bald-hip rose (*Rosa gymnocarpa*), red huckleberry (*Vaccinium parvifolium*), ocean spray (*Holodiscus discolor*), black-cap raspberry (*Rubus leucodermis*), kinnikinnick (*Arctostaphylos uva-ursi*), bracken fern (*Pteridium aquilinum*), St. John's wort (*Hypericum perforatum*), western and hairy honeysuckles (*Lonicera ciliosa* and *L. hispidula*, respectively), wild strawberry (*Fragaria*

vesca), yarrow (*Achillea millefolium*), yerba Buena (*Satureja douglasii*), wood rush (*Luzula parviflora*), velvet grass (*Holcus lanatus*), and colonial bentgrass (*Agrostis capillaris*). The Re-Mine Area portion of the site is an active mining area dominated with grassland, with patches of shrubland and young stands of red alder (*Alnus rubra*). An approximately 5-acre patch of conifer forest is located at the south end of the Re-Mine Area with similar species composition as the Expansion Area (see **Figure 2-2** of **Chapter 2** of this FEIS). Forest vegetation within the off-site Sequalitchew Creek Restoration Area includes riparian habitat associated with Sequalitchew Creek and wetland buffer habitat of wetlands within the Restoration Area. These forested areas are a mixture of coniferous and deciduous trees with a diverse shrub and herbaceous understory. Sequalitchew Creek, wetlands within the Restoration Area, and nearby wetlands are described under *Aquatic Resources* later in this section.

Landmark Trees

A landmark tree survey was performed for the site consistent with DMC Critical Area Chapter 25.10.120.005 criteria. The DMC defines a "landmark tree" as "an existing healthy, well-formed tree which poses no safety hazard due to potential collapse, and that meets minimum diameter measurements. Five species and a total of 116 landmark trees were identified during the survey. Landmark tree species include Douglas-fir, Oregon white oak, Pacific madrone, (*Arbutus menziesii*), Pacific yew (*Taxus brevifolia*), and western red cedar. The species and number of landmark trees within the Expansion Area and Re-Mine Area are shown in **Table 3.6-1**. See **Appendix I** for additional details on landmark trees on the site.

Table 3.6-1
LANDMARK TREES ON THE SITE

Common Name	Scientific Name	Expansion Area Total Trees[1]	Re-Mine Area Total Trees
Douglas-fir	*Pseudotsuga menziesii*	81	1
Oregon white oak	*Quercus garryana*	17	2
Pacific madrone	*Arbutus menziesii*	2	0
Pacific yew	*Taxus brevifolia*	2	0
Western red cedar	*Thuja plicata*	10	1
Total		**112**	**4**

[1] Includes adjacent buffer.

Source: Anchor QEA, 2021.

Shrublands

Shrublands within the Expansion Area portion of the site are dominated by the non-native invasive species Scot's broom. This non-native invasive plant community covers approximately 42 acres of the Expansion Area. Plant coverage beneath this layer is restricted to mosses and small patches of colonial bentgrass. Native shrub species are mostly absent and are present in only a few areas adjacent to patches of native tree

species. The native herbaceous species include Idaho fescue (*Festuca idahoensis*), chocolate lily (*Fritillaria lanceolata*), early blue violet (*Viola adunca*), and Pacific sanicle (*Sanicula crassicaulis*).

As mentioned previously, the Re-Mine Area portion of the site is an active mining area dominated with grassland areas that were hydroseeded during reclamation. The presence of the non-native invasive species Scot's broom and the native species red alder are controlled as part of the reclamation process of the mining.

Shrublands associated with the off-site Sequalitchew Creek Restoration Area (and associated with the nearby wetlands) include wetland buffer habitat that is a mixture of native and nonnative shrub species. Sequalitchew Creek, wetlands within the Restoration Area, and nearby wetlands are described under *Aquatic Resources* below.

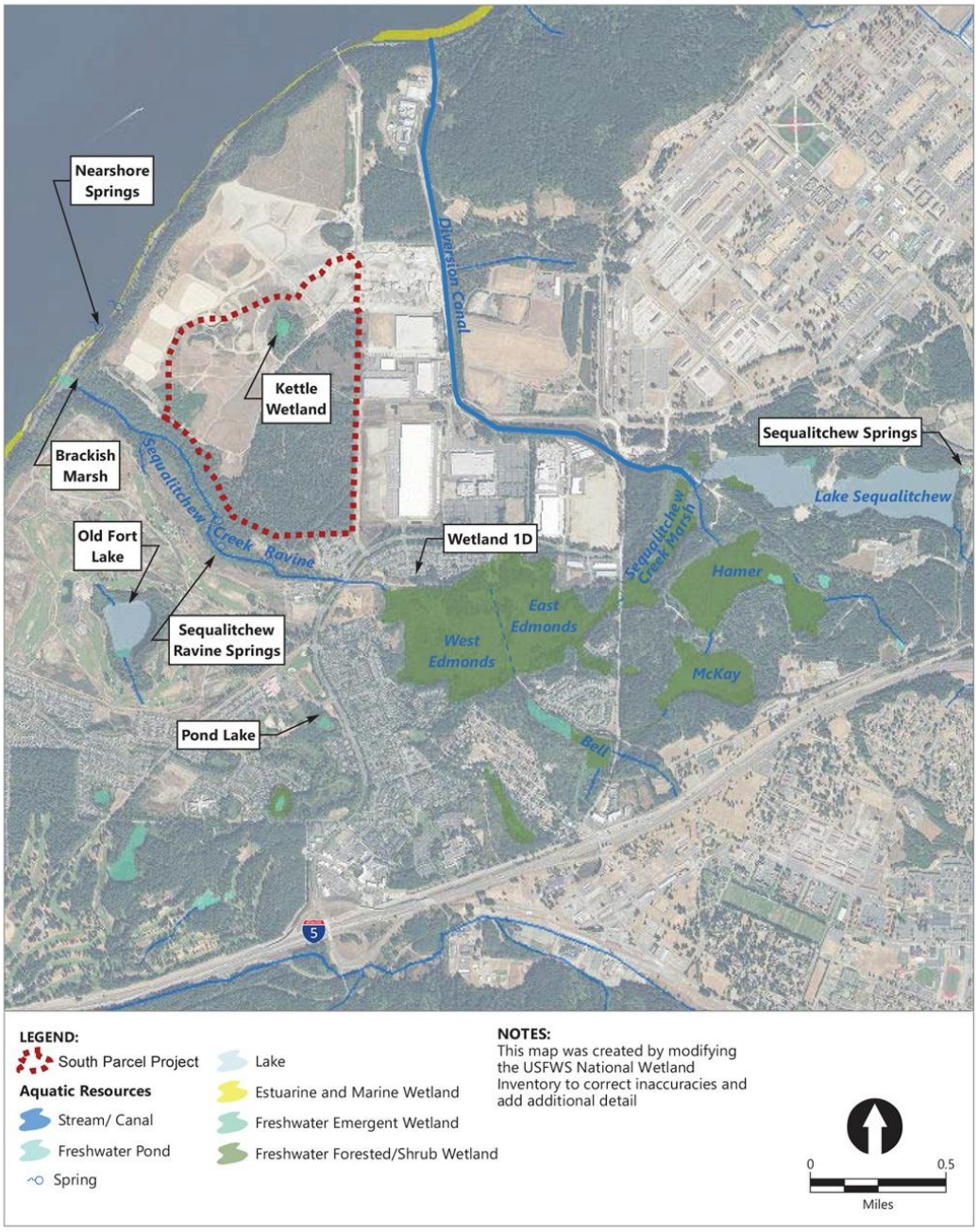
Aquatic Resources

Aquatic resources on the site and in the site vicinity include Sequalitchew Creek, Puget Sound shoreline nearshore springs, and eight wetland communities. No aquatic resources are located within the Re-Mine Area portion of the site. One aquatic resource, the Kettle Wetland, is located within the Expansion Area portion of the site. Sequalitchew Creek and the East Edmond Marsh, West Edmond Marsh, Sequalitchew Creek Riparian Wetlands, and the Brackish Marsh wetland systems are located offsite but within the Sequalitchew Creek Restoration Area and within the area where changes in groundwater levels could occur. Three nearby wetlands are Sequalitchew Creek Ravine Seep Wetlands, Pond Lake, and Wetland 1D (see **Figure 3.6-1**).

Expansion Area Portion of Site Wetlands

Kettle Wetland

The Kettle Wetland is an approximately 1.78-acre, Category III wetland, with a 75-foot required buffer (Per MDC 25.105.050(1)(b)(C). This wetland is located within the Expansion Area portion of the site (see **Figure 3.6-1**). This wetland contains persistent emergent, non-persistent emergent, aquatic bed, and scrub-shrub wetland communities. The dominant hydrologic source for the wetland is the aquifer system. Water levels within the wetland are determined by the seasonal fluctuation in the elevation of the Vashon Aquifer.



Source: Anchor QEA, 2022.

EA Engineering, Science, and Technology, Inc., PBC

Figure 3.6-1

Existing Aquatic Resources

The emergent communities within this wetland consist of common mare's tail (*Hippuris vulgaris*), creeping spike rush (*Eleocharis palustris*), giant bur-reed (*Sparganium eurycarpum*), water parsnip (*Sium suave*), reed canarygrass (*Phalaris arundinacea*), water ladysthumb (*Polygonum amphibium*), mild waterpepper (*Polygonum hydropiperoides*), skunk cabbage (*Lysichiton americanus*), inflated sedge (*Carex vesicaria*), and northern bugleweed (*Lycopus uniflorus*). Aquatic species observed during site visits include pondweed (*Potamogeton* sp.), lesser duckweed (*Lemna minor*), arrowleaf bur-reed (*Sparganium angustifolium*), and floating-leaved pondweed (*Potamogeton natans*). Along the wetland boundary, the scrub-shrub community consists of Pacific willow (*Salix lasiandra*), Scouler's willow (*Salix scouleriana*), sitka willow (*Salix sitchensis*), red-osier dogwood (*Cornus sericea*), and hardhack (*Spiraea douglasii*). Other vegetation along the wetland boundary consists of stinging nettle (*Urtica dioica*), blue elderberry (*Sambucus caerulea*), beaked hazelnut, and Henderson sedge (*Carex hendersonii*).

Buffer vegetation bordering the Kettle Wetland includes tree, shrub, grass, and herbaceous species. Dominant tree species include big-leaf maple (*Acer macrophyla*), red alder, black cottonwood (*Populus trichocarpa*), western red cedar, bitter cherry (*Prunus emarginata*), Douglas hawthorne (*Crataegus Douglasii*), blue elderberry, and Pacific madrone. Dominant shrub species include trailing blackberry, salal, snowberry, Scot's broom, Oregon grape, bald-hip rose, ocean spray, sword fern, Saskatoon serviceberry (*Amelanchier alnifolia*), red huckleberry, and bracken fern. Herbaceous species include velvet grass, western wild-rye (*Elymus glaucus*), and colonial bentgrass (*Agrostis capillaris*). Vine species include manroot (*Marah oreganus*).

Off-Site Wetlands (Sequalitchew Creek Restoration Area)

The below describes off-site wetlands resources in the site vicinity; off-site wetland resources are located within the Sequalitchew Creek Restoration Area. The following describes wetlands in the Restoration Area offsite.

West Edmond Marsh

West Edmond Marsh is an approximately 80-acre, Category II wetland, with a 100- foot required buffer (per DMC 25.105.050(1)(b)(B). West Edmond Marsh is the portion of Edmond Marsh located west of Robinson Trail, a former railroad grade that bisects Edmond Marsh and east of Center Drive (see **Figure 3.6-1**). It has a hydrologic regime dominated by surface water inputs entering East Edmond Marsh to the east and smaller inputs from stormwater infiltration ponds along the north and south. Sequalitchew Creek follows a relatively straight path near the northern boundary of the marsh that results from historical efforts to drain and channelize the marsh.

Water levels in West Edmond Marsh are controlled by multiple beaver dams, the most substantial of which is a large beaver dam at the western boundary just upstream of the normally losing reach of Sequalitchew Creek under Center Drive.

Seasonal high-water levels in West Edmond Marsh range from approximately 210 feet elevation in the westernmost portion to 211.8 feet elevation just downstream of Robinson Trail. The westernmost portion has seasonal variation in water levels of 4 to 5 feet and typically dries up in summer. The portion near Robinson Trail retains water year-round and typically experiences a seasonal range in water levels of 1 to 1.5 feet.

Over time, the hydrology of West Edmond Marsh has been affected by various efforts to maintain an open water channel through dense scrub-shrub wetland. The construction and periodic maintenance of this channel through the marsh-maintained water levels that were lower than currently exist. Subsequent impoundment of water by beaver dams across this channel and elsewhere in the marsh has resulted in water levels of the marsh steadily increasing in recent decades, as is evidenced by the drowning of some mature upland trees. Vegetative communities include scrub-shrub, emergent, and aquatic bed wetland types. The eastern portion of the marsh is shallow to deeply inundated, due to impoundment by beaver dams. Dominant vegetation includes black cottonwood, willows (*Salix* sp.), spiraea (*Spirea douglasii*), water parsley (*Oenanthe sarmentosa*), yellow pond lily (*Nuphar luteum* var. *polysepala*), pond weed (*Lemna minor*), cattails (*Typha latifolia*), and reed canarygrass (*Phalaris arundinacea*). The area includes upland islands that are forested with mature Douglas-fir, black cottonwood, and other native species. The dense, layered vegetation within the marsh, upland islands, and patches of open water provide high-quality wildlife habitat and offer a substantial habitat base for native wetland plant and animal species.

East Edmond Marsh

East Edmond Marsh is an approximately 55-acre, Category II wetland, with a 100- foot required buffer. This wetland is located between the Robinson Trail on the west and DuPont-Steilacoom Road on the east (see **Figure 3.6-1**). East Edmond Marsh continues to the east of DuPont- Steilacoom on Joint Base Lewis-McChord.[1]

Historically, the primary source of water to East Edmond Marsh was the surface water of Sequalitchew Creek flowing out of Sequalitchew Lake. The Creek followed a meandering channel through the marsh that has been excavated and cleared by human activity. However, beaver activity has resulted in water levels in East Edmond Marsh that are higher than in Sequalitchew Lake, and now the hydrology of East Edmond Marsh is dominated by groundwater inflows from multiple sources including regional groundwater, shallow subsurface flow from nearby Bell, Hamer, and McKay marshes, and stormwater from nearby infiltration ponds.

The water level in East Edmond Marsh is controlled by a large beaver dam located just upstream of the primary culvert under Robinson Trail and is relatively uniform throughout the marsh segment. Seasonal high-water levels are typically about 212.5 to 213 ft NGVD 29.

[1] *This segment of the Marsh is not evaluated for this EIS but will be evaluated as part of separate environmental review prepared by others required for the Sequalitchew Creek Restoration Plan.*

East Edmond Marsh retains water year-round, with a typical water level fluctuation of 1 to 1.5 feet seasonally.

Vegetative communities include forested, scrub-shrub, emergent, and aquatic bed wetland types. Dominant vegetation includes black cottonwood, red alder, Oregon ash (*Fraxinus latifolia*), willows, red-osier dogwood, spiraea, sedges (*Carex* spp.), bulrushes (*Scirpus* spp.), water smartweed (*Polygonum amphibium*), water parsley, cattails, and reed canarygrass. Floodwater storage, sediment sequestering, nutrient filtration, and biological support are strong functions of East Edmond Marsh. The area includes upland islands that are forested with mature Douglas-fir, black cottonwood, and other native species. The dense, layered vegetation within the marsh, upland islands, and patches of open water provide high-quality wildlife habitat and offer a habitat base for native wetland plant and animal species.

Sequalitchew Creek Ravine Riparian Wetlands

Sequalitchew Creek Ravine Riparian Wetlands are an approximately 0.5- acre, Category II wetland complex, with a 100- foot required buffer. These wetlands border Sequalitchew Creek west of Center Drive (see **Figure 3.6-1**) and include many areas of braided flow and side-channels, flood terraces, and well-established forested riparian wetland vegetation communities. The canopy species include red alder, big-leaf maple, and western red cedar. Common shrub species include vine maple (*Acer circinatum*), salmonberry (*Rubus spectabilis*), red elderberry (*Sambucus acemose*), black gooseberry (*Ribes lacustre*), and cascara (*Rhamnus purshiana*). Common herbaceous species include mannagrass (*Glyceria elata*), giant horsetail (*Equisetum telmatiea*), American brooklime (*Veronica americana*), slough sedge (*Carex obnupta*), stinging nettle, Cooley's hedge-nettle (*Stachys coolyeii*), and water parsley.

Brackish Marsh

The Brackish Marsh is an approximately 0.5-acre, Category II wetland, with a 100- foot required buffer. Near its mouth, Sequalitchew Creek passes through a concrete box culvert (5 feet wide by 5 feet high and 240 feet long) under the BNSF Railway Company rail line before discharging into Puget Sound. Upstream of this culvert is the brackish marsh (see **Figure 3.6-1**). The Brackish Marsh occupies a series of terraces dissected by dendritic channels. Common plant species in the marsh include Lyngby's sedge (*Carex lyngbeyi*), seacoast bulrush (*Scirpus maritimus*), seashore saltgrass (*Distichlis spicata*), marsh cinquefoil (*Potentilla anserina*), and gumweed (*Grindelia integrifolia*). Significant patches of colonial bentgrass occur along the margins of the Brackish Marsh.

Nearby Wetlands

Sequalitchew Creek Ravine Seep Wetlands

The Sequalitchew Creek Ravine Seep Wetlands are an approximately 0.13-acre, Category IV wetland complex, with a 50-foot required buffer (DMC 25.105.050.(1)(b)_(D). The wetland complex, consisting of two long, very narrow, and non-contiguous wetlands, is located just above the trail along Sequalitchew Creek at about river mile 0.75 to 0.85. The ravine containing Sequalitchew Creek contains seeps and springs that surface from mid-slope to the toe of slope. These seeps and springs provide base flow to Sequalitchew Creek and contribute to species diversity within the area by supporting plant species that require more moisture than is available in surrounding upland areas. The wetland hydrology emanates from seep heads just above the trail and is dominated by groundwater. Dominant vegetation species include willow herb (*Epilobium ciliatum*) and lady fern (*Athyrium filix-femina*). These forested Seep Wetlands are classified as Category IV wetlands.

Wetland 1D

Wetland 1D is an approximately 2.1-acre, Category II wetland, with a 100-foot required buffer. This wetland is located immediately north of West Edmond Marsh and south of Center Drive (see **Figure 3.6-1**). Wetland 1D is shallow and permanently inundated. Water levels in Wetland 1D range seasonally from 208.6 to 211 feet and track closely with nearby groundwater levels. The wetland is dominated by scrub-shrub vegetation including Pacific willow, spiraea, western crabapple *(Malus fusca*), and red-osier dogwood.

Pond Lake

Pond Lake is an approximately 1.8-acre Category II wetland, with a 100-foot required buffer. This wetland is located approximately 0.5 miles south of the Expansion Area portion of the site (see **Figure 3.6-1**). The water level in Pond Lake typically exhibits a seasonal range of about 4 feet and tracks closely with nearby groundwater levels. It is a shallow pond dominated by herbaceous species, with a forested upland edge dominated by red alder and big-leaf maple. The dominant species in the wetland is reed canarygrass. Small pockets of native species including sedges and water-plantain (*Alisma plantago-aquatica*) occur in the wetland.

Nearshore Springs

Nearshore springs located along the shore immediately west of the Existing Mine and north of the mouth of Sequalitchew Creek of Puget Sound, flow directly into Puget Sound (see **Figure 3.6-1**). These springs express from the rip rap protected shore and there is no surface flow associated with these features within the site.

Rare Plants and Plant Communities

Washington Department of Fish and Wildlife Plants and Priority Habitats

No rare plants are identified by Washington Department of Fish and Wildlife (WDFW) in locations where mining could occur in the site or within the areas subject to changes in groundwater levels. No populations of white-topped aster (*Sericocarpus rigidus*), a state sensitive species, have been documented within the limits of the site, although populations do occur in Pierce County and in oak forests elsewhere in the area.

A patch of forested habitat at the south end of the Re-Mine Area where mining is proposed is mapped by WDFW as priority habitat biodiversity areas and corridors, but the physical characteristics within the small portion where mining is planned do not meet WDFW's stated criteria. Specifically, this area is flat, developable land and is not part of the steep, undevelopable ravine side slope. The forested riparian habitat of Sequalitchew Creek and the forested hillside of Puget Sound near where mining is proposed are also mapped as priority habitat biodiversity areas and corridors. The habitat of East and West Edmond Marsh are mapped by WDFW as waterfowl concentration areas. The Priority Habitats and Species (PHS) database does not include any white oak woodlands in or around the site, or within the City of DuPont. Where white oak exist within the site, they are interspersed in a primarily coniferous forest within the Expansion Area and account for less than 5% of the canopy. WDFW defines priority Oregon white oak woodlands as stands of pure oak or oak/conifer associations where canopy coverage of the oak component of the stand is 25%; or where total canopy coverage of the stand is less than 25%, but oak accounts for at least 50% of the canopy coverage present. The latter is often referred to as an oak savanna. In non-urbanized areas west of the Cascades, priority oak habitat consists of stands one acre in size. Therefore, the interspersed oaks on the site do not meet WDFW criteria for priority habitat.

Important habitats in the larger vicinity of the site include the Nisqually Delta, located approximately two miles from the site. This delta is a large, high-quality wetland complex with regionally rare intact estuarine functions and native plant populations, abundant wildlife habitat, and high utilization by wildlife.

U.S. Fish and Wildlife Service Threatened and Endangered Plants

The U.S. Fish and Wildlife Service (USFWS) identifies Endangered Species Act (ESA)-listed plant species and critical habitats under USFWS jurisdiction that occur or may occur within a specific location where a project is proposed on the agency's website. The status of federally listed plant species and critical habitats protected under the ESA that occur or may occur where mining is proposed on the site or within the area subject to changes in groundwater levels is presented in Table 5 of **Appendix H**. The site and site vicinity do not contain any potential habitat for the ESA plant species golden paintbrush (*Castilleja levisecta*) and marsh sandwort (*Arenaria paludicola*).

Animals

Animal species are described below based on the animal types: birds, mammals, and amphibians. Several federally- and state-listed species occur within the site vicinity. Their status and use of the site vicinity are described.

Birds

The site and off-site Sequalitchew Creek Restoration Area provides a range of habitat features that can provide breeding, foraging, resting, and overwintering habitat to support a wide range of bird species. Forested habitats provide foraging and nesting habitat for a wide variety of songbird species such as song sparrow (*Melospiza melodia*), bushtit (*Psaltriparus minimus*), Bewick's wren (*Thryomanes bewickii*), Steller's jay (*Cyanocitta stelleri*), spotted towhee (*Pipilo erythrophthalmus*), Swainson's thrush (*Catharus ustulatus*), winter wren (*Troglodytes hiemalis*), varied thrush (*Ixoreus naevius*), black-capped chickadee (*Parus atricapillus*), dark-eyed junco (*Junco hyemalis*), chestnut-backed chickadee (*Parus rufescens*), golden-crowned kinglet (*Regulus satrapa*), and red-breasted nuthatch (*Sitta canadensis*).

Upland shrublands and herbaceous habitats are used by species like barn swallow (*Hirundo rustica*), tree swallow (*Tachycineta bicolor*) and white-crowned sparrow (*Zonotrichia leucophrys*). Predatory birds like red-tailed hawk (*Buteo jamaicensis*) commonly hunt in these habitat types. Other raptors such as northern harrier (*Circus cyaneus*) and bald eagle (*Haliaeetus leucocephalus*) occur in forested areas near waterbodies. Snags and downed trees in forested habitat and along the forest edges also provide perch sites for these species. Snags in forested habitats also provide potential nest sites for cavity-nesting birds such as great horned owl (*Bubo virginianus*), and species of woodpeckers including downy woodpecker (*Picoides pubescens*), northern flicker (*Colaptes auratus*), and pileated woodpecker (*Dryocopus pileatus*).

Aquatic habitats and wetland habitats provide a variety of habitat for terrestrial birds, waterbirds, and waterfowl. Open water sections of wetlands can be expected to provide habitat for belted kingfisher (*Megaceryle alcyon*) and wintering and migratory waterfowl, including gadwall (*Anas strepera*), American widgeon (*Mareca americana*), mallard (*Anas platyrhynchos*), ring-necked duck (*Aythya collaris*), and American coot (*Fulica americana*). Wetland areas with grass and herbaceous vegetation provide habitat for red-winged blackbird (*Agelaius phoeniceus*), song sparrow, and marsh wren (*Cistothorus palustris*), among other species including waterfowl. Forested and scrub-shrub wetlands are commonly used by similar species as well as wood duck (*Aix sponsa*). Waterbird species such as great blue heron (*Ardea herodias*) also use many of these habitats.

Mammals

Small mammal species associated with forested habitats include shrew mole (*Neurotrichus gibbsii*), Townsend's vole (*Microtus townsendii*), masked shrew (*Sorex cinereus*), and striped skunk (*Mephitis mephitis*). Larger mammals such as black-tailed deer (*Odocoileus hemionus columbianus*) and coyote (*Canis latrans*) also occur throughout the site.

Wetlands and riparian areas provide habitat for North American beaver (*Castor canadensis*), water shrew (*Sorex palustris*), and raccoon (*Procyon lotor*). Beavers are well documented in the wetland habitats of East and West Edmond Marsh. The non-native species Virginia opossum (*Didelphis virginiana*) also occurs in these habitat types. These and similar species depend on water for foraging, breeding, and sometimes, overwintering habitats.

Amphibians

Wetlands and streams provide habitat for amphibian species such as northern red-legged frog (*Rana aurora*), northwestern salamander (*Ambystoma gracile*), Pacific treefrog (*Pseudacris regilla*), roughskin newt (*Taricha granulosa*), and western red-backed salamander (*Plethodon vehiculum*).

Washington Department of Fish and Wildlife Priority Species

Three species are mapped by WDFW as potentially occurring or their habitat present within the site: big brown bat (*Eptesicus fuscus*), little brown bat (*Myotis lucifugus*), and Yuma myotis bat (*Myotis yumanensis*). These bat species occur in forested habitats, typically occupying mature trees. They are not state or federally listed. WDFW lists roosting concentration of these species as priority habitat, but no roosting concentrations of these bats are observed or documented within the site.

The Western gray squirrel (*Sciurus griseus*) was listed as threatened in Washington State in 1993 (WAC 323.12.011). More recently, the Western gray squirrel has been reclassified by the State of Washington from threatened to endangered but remains unprotected by the Federal Endangered Species Act due to the health of the population outside of the Puget Trough. Western gray squirrels are documented within the site vicinity but is not currently identified by WDFW as occurring within the site and surrounding area. There are three known populations in Washington: the southern Puget Trough, north-central Washington, and south-central Washington. This species favors Garry oak (*Quercus garryana*) woodlands as prime habitat. This habitat occurs within areas adjacent to the site, in patches throughout the City of DuPont, and also within the Fort Lewis Military Reservation. This species also forages within coniferous forests that occur near Garry oak woodlands.

Typical Western gray squirrel habitat in the Puget Trough includes a Douglas-fir-Oregon white oak woodland with an understory dominated by snowberry (*Symphoricarpos albus*), California hazelnut (*Corylus cornuta* var. *californica*), Indian plum (*Oemleria cerasiformis*),

and sword fern (*Polystichum munitum*). The typical characteristics of oak woodlands that are important to Western gray squirrels consist of a mix of Douglas-fir (53% on average) with oaks comprising 34% on average. These characteristics were not observed within the site (see **Appendix H** for detail). In addition, WDFW data indicates that all documented Western gray squirrels and suitable habitat are found east of DuPont and south of I-5. WDFW has not reported any verified observations of Western gray squirrels North of I-5 near DuPont in the last 47 years.

One of the primary limiting factors in Western gray squirrel success in the Puget Trough is the lack of genetic diversity through habitat fragmentation. The South Parcel is separated from the primary Western gray squirrel population at Joint Base Lewis-McChord (JBLM) by Interstate 5, as well as several other heavily used roadways. While a small amount of canopy connectivity to JBLM property exists across the Puget Sound Bluff and up Sequalitchew Creek ravine, the lack of connectivity to confirmed squirrel-populated sites contributes to the overall lack of habitat potential on the site for gray squirrels. Accordingly, the site (including Expansion Area) does not provide primary (nesting, breeding) habitat for Western gray squirrel. While the site does possess marginal characteristics of secondary squirrel habitat (e.g., conifer-dominated, moderate canopy and shrub coverage), the factors identified above make the possibility of use of the site by Western gray squirrel remote.

U.S. Fish and Wildlife Service Threatened and Endangered Species

No USFW-listed ESA fish or wildlife species or critical habitats have been identified to be present within the site or vicinity (see **Appendix H** for detail).

3.6.2 Impacts of the Alternatives

This section identifies and analyzes impacts to plants and animals and their habitat on and in the vicinity of the site with proposed clearing, mining (including dewatering), and reclamation under the Proposed Action. Conditions under the No Action Alternative are also identified.

As described in **Chapter 2** of this FEIS, the 2011 Settlement Agreement states that permits for the Pioneer Aggregates South Parcel Project (Proposed Action) shall not be effective until permits for the Sequalitchew Creek Restoration Plan (Restoration Plan) are in place, as a separate but related action. The Restoration Plan seeks to restore and enhance streamflow and ecological functions from Sequalitchew Lake through Edmond Marsh into Sequalitchew Creek ravine by sequentially restoring diverted flows back to the creek, improving the sustainability of flows through the system, and restoring aquatic habitat. Consistent with the 2011 Settlement Agreement, this EIS assumes that mining and reclamation activities under the Proposed Action would not proceed until the permits are in place to implement the Restoration Plan. It is assumed that projects associated with the

Restoration Plan would be mitigation for certain environmental impacts identified in this FEIS, and that permits for the Restoration Plan would be a condition of any City of DuPont approval of the Proposed Action. However, because the Restoration Plan is considered a separate project that would be subject to separate environmental review and could be funded and implemented independent of the Proposed Action, the general discussion in the Environmental Impacts sub-section of Plants & Animals only addresses the impacts of the proposed mining/reclamation and does not include implementation of the Restoration Plan. This is intended to help the reader understand the impacts of the proposed mining/reclamation, and the need for the Restoration Plan with the proposed project. Proposed mining/reclamation in combination with the Restoration Plan is specifically discussed under Cumulative Impacts.

ALTERNATIVE 1 – PROPOSED ACTION

Direct Plants and Habitat Impacts

Conifer Forests

The majority of coniferous forests within the site would be logged prior to initiating mining. The total area of coniferous forest proposed for clearing within the Re-Mine Area portion of the site is approximately 15 acres, and the conifer forest proposed for clearing in the Expansion Area portion of the site is approximately 135 acres. Revegetation would occur throughout the site consistent with the reclamation plan developed for both the existing and proposed mining areas. Reclamation would include the establishment of mixed species, including Oregon white oak, and conifer-dominant forests along the slopes of the mine.

Landmark Trees

Ninety landmark trees would be removed under the Proposed Action including Douglas-fir (74), Oregon white oak (13), Pacific madrone (1), Pacific yew (1), and western red cedar (1). All of these landmark trees are within the Mineral Resource Overlay designated under the City's Comprehensive Plan. Replacement of landmark trees would be provided, consistent with City of DuPont replacement ratio guidance.

Shrublands and Grasslands

The majority of the shrublands and grasslands within the site would be cleared in conjunction with proposed logging activities. The total area of shrublands and grasslands within the Re-Mine Area portion of the site is approximately 60 acres, with most of that area comprised of grassland habitat associated with hydroseeding during reclamation activities. The total area of shrublands and grasslands within the Expansion Area portion of the site is approximately 42 acres. The dominant shrublands species is the non-native invasive species Scot's broom. Scot's broom has been controlled in the Re-Mine Area during reclamation activities and would also be controlled throughout the site during mining and

reclamation. This control of invasive species would benefit the existing adjacent native habitats and the riparian corridor of North Sequalitchew Creek by reducing invasive species pressure. Grassland and shrublands would be created on the site with proposed reclamation, similar to reclamation associated with portions of the Existing Mine.

Aquatic Resources

The 1.78-acre Kettle Wetland is the only aquatic resource located within the site and the only aquatic resource that would be directly impacted by the Proposed Action.

Kettle Wetland - The Kettle Wetland and its buffer would be cleared under the Proposed Action, and the entire wetland would be eliminated. The Kettle Wetland relies on groundwater to sustain wetland vegetation so even if the Kettle Wetland were to be left in place within the site, the change in groundwater levels would eventually alter the hydrology of the Kettle Wetland, converting the wetland vegetation to upland plant species. Proposed mitigation for these wetland impacts includes creation of a new wetland, as discussed in Sub-Section 3.6.3.

Rare Plants and Plant Communities

The Proposed Action would not directly impact rare plants or rare plant communities.

Indirect Plant and Habitat Impacts (Offsite)

Conifer Forests

No indirect impacts to coniferous forest habitats (i.e. loss of forest area) outside the site associated with the Proposed Action are anticipated.

Shrublands and Grasslands

No indirect impacts to shrublands and grasslands habitats (i.e. loss of shrublands or grasslands) outside the site associated with the Proposed Action are anticipated.

Aquatic Resources

The aquatic resources of Sequalitchew Creek and the four wetland systems within the Sequalitchew Creek Restoration Area: East Edmond Marsh, West Edmond Marsh, and the Sequalitchew Creek Riparian Wetlands are within the area where wetland hydrology could be affected by changes in groundwater levels under the Proposed Action. The wetland hydrology of aquatic resources identified as nearby wetlands, except for the Seep Wetlands (Sequalitchew Creek Ravine, Pond Lake, and Wetland 1D) could also be affected by changes in groundwater levels, but any effects are anticipated to be minor. The indirect effects of the Proposed Action on the Seep Wetlands are anticipated to have a greater potential for

impact. Groundwater seeps that support the hydrology of these wetlands would be reduced, resulting in a reduction or loss of wetland hydrology. The Brackish Marsh is not anticipated to be affected by changes in groundwater levels due the dominance of tidal hydrology on that resource. The potential hydrologic impacts on these wetlands are described in greater detail below.

West Edmond Marsh and Wetland 1D - West Edmond Marsh and Wetland 1D are the two resources that are most likely to be affected by the proposed groundwater drawdown without implementation of the Sequalitchew Creek Restoration Plan (see Section 3.3, **Groundwater**, and Section 3.4, **Surface Water**). Earlier drying of saturated and inundated areas could have detrimental effects on the existing plant community. Wetland plant communities (and soils) are shaped by saturated and inundated conditions during the growing season (averages from March 1 to October 31). Exotic plant invasion (particularly reed canarygrass) favors this type of alteration when winter saturation and inundation are not sufficient to maintain existing plant communities or preclude noxious weed invasion.

It is likely that a slow conversion of wetland habitats would occur; the changes could result in some conversion of aquatic wetland habitat to emergent wetland habitat and emergent wetland habitat to shrub-scrub wetland habitat (see **Appendix H** for detail).

East Edmond Marsh - Under the Proposed Action the drawdown effects on East Edmond Marsh would result in an average decrease in water level of 1.2 inches (see Section 3.3, **Groundwater**, and Section 3.4 **Surface Water**). The decrease would be greatest in June at about 1.5 inches and lowest in February at less than 0.1 inch. East Edmond Marsh would continue to follow the same seasonal pattern of fluctuation with the highest water levels in January through March and seasonal lows in August and September. It is not anticipated that this change would have any measurable effect on the wetland given that this decrease would occur within a seasonal fluctuation in water level of more than 20 inches. Ultimately, continued beaver activity would be anticipated to have a greater impact on water levels in the marsh.

Pond Lake - Pond Lake is an isolated water body, hydrologically connected to groundwater with little surface water inflow and no outflows. With the Proposed Action, the surface water level in Pond Lake is conservatively projected to decrease by about two feet, based on the amount of groundwater drawdown estimated in its vicinity. The surface water level in Pond Lake currently varies seasonally by up to eight feet but more typically around four feet. Pond Lake goes dry in summer. With the Proposed Action, the seasonal variation would be two feet, and the lake would go dry a month earlier and rewet slightly later. Herbaceous vegetation in Pond Lake varies from year to year depending on when the water levels recede. With the Proposed Action, the conditions observed during driest years would become common, with more emergent vegetation and less aquatic vegetation establishing. A sustained reduction in peak water levels could allow the establishment of scrub-shrub wetland species along the wetland

boundary and greater cover of reed canary grass within the higher parts of the wetland. The relatively steep slopes around the wetland would prevent the wetland size from substantially changing.

Sequalitchew Creek and Riparian Forest Wetlands - Without restoration, Sequalitchew Creek west of Center Drive would experience reduced base flows as a result of reduction in seep and spring discharge caused by the drawdown of the Vashon Aquifer. A reduction of aquatic life would be expected to occur in the upper ravine without implementation of the Sequalitchew Creek Restoration Plan activities (see Section 3.5, **Fisheries**, for additional detail).

Without implementation of the Restoration Plan, the change in groundwater levels would eliminate the hydrologic support provided to the Sequalitchew Creek riparian forest wetlands and some loss of the existing wetland vegetation would occur.

Sequalitchew Creek Ravine Seep Wetlands - Dewatering of the aquifer under the Proposed Action is likely to indirectly impact the Seep Wetlands along the Sequalitchew Creek trail by disrupting the hydrology of these wetlands. These indirect impacts would result in the loss of wetland vegetation and function of the wetlands. The resulting loss in wetland area could be up to 0.13 acre of wetland habitat being converted to upland habitat due to insufficient saturation during the growing season.
Indirect impacts from changes in the aquifer would also affect the springs in the Sequalitchew Creek bed.

Brackish Marsh - The reduction in flows in Sequalitchew Creek resulting from dewatering of the Vashon Aquifer without implementation of the Sequalitchew Creek Restoration Plan are estimated at 1.3 cfs. While this is a substantial fraction of the freshwater in the marsh, it is anticipated to have little impact to the Brackish Marsh. The reduction in freshwater input would result in only a negligible increase in salinity in the marsh during high tides. No effect on the existing wetland is anticipated as a result of salinity alterations (see **Appendix H** for detail).

Nearshore Springs - The springs that flow directly into Puget Sound express from the shore near the toe of slope at the beach and there is no surface flow associated with these features within the site. No measurable change in groundwater flow from these springs is expected, and no impacts to these springs are expected as a result of the Proposed Action.

Effects of Climate Change

As noted in Section 3.4, the effects of climate change on the hydrologic processes in the Puget Sound region are anticipated to include a suite of long-term changes that are consistent with those observed globally, including year-to-year variability in total precipitation with ongoing fluctuations between wet years and dry years, and greater

frequency of extreme events (e.g., droughts and flooding). Climate change is likely to result in greater variability in rainfall events which and greater average annual total precipitation Based on the period of flow monitoring identified in Section 3.4 (2003 to 2021), this currently occurs about 10 percent of the time. With climate change, summers with extended dry periods will likely continue to be the norm, and those summers may become more frequent or the dry period longer; however, slightly increased precipitation in the wet season, coupled with the size of the aquifer dampening the effects of any single season, may reduce negative effects from single dry summers.

Impacts of the lower water levels (without implementation of the Restoration Plan) on wetlands would generally result in earlier drying of saturated areas with potential shifts from wetland to upland plant communities and associated habitat (See section 3.3.3.1 of the Plants and Animals Report [Appendix H to the EIS] for details).

Direct Impacts to Animals

Birds

The Proposed Action would reduce and degrade existing foraging and breeding habitat for some bird species that use habitats within the site. The clearing of vegetation would increase the fragmentation and isolation of remaining habitats. The components of the Proposed Action with the greatest potential to impact bird habitats are the clearing of vegetation which would eliminate the existing foraging and breeding habitats for birds. Reclamation of the mine slopes would continue to progress. After mining activities are completed, the Proposed Action would increase the acreage of reclaimed and reforested areas on the mine slopes, and their associated potential habitat for birds, by approximately 177 acres.

The removal of the Kettle Wetland could disrupt bird habitat and reduce breeding, wintering, and migration habitat for bird species until habitat in the mitigation wetland is fully functional. Although different from wetland buffer habitat, restored forests on reclaimed slopes are currently maturing and would continue to provide new habitat to offset this impact.

Mammals

The Proposed Action would alter habitat for mammal species within the site for reasons similar to those described for above for birds. The majority of individual mammals would disperse into adjoining habitats; however, some of the individual mammals could perish. The proximity of the site area to similar intact habitats would provide dispersal routes as proposed clearing begins. Clearing would occur segmentally which may provide small mammals with an opportunity to relocate and disperse into newly reclaimed areas.

Amphibians and Reptiles

Within the Kettle Wetland, any existing amphibians would perish during the clearing of the surface vegetation and soils. New habitat with similar hydrology would be created in the mitigation wetland to compensate for these impacts; see Sub-section 3.6.3 for detail.

Washington Department of Fish and Wildlife Priority Species

Removal of mature trees in the coniferous forest could reduce habitat for big brown bat, little brown bat, and Yuma myotis bat priority species. Clearing of forested areas within the site would reduce habitat that is thought to have once been within the historical range of gray squirrels but is unlikely to be occupied by the current population. As noted previously, current data indicates that all documented Western gray squirrels and suitable habitat are found east of DuPont, and WDFW has not reported any other verified observations of Western gray squirrels North of I-5 near DuPont in the last 47 years. Existing development including Interstate 5, Dupont Steilacoom Road, Center Drive, residential neighborhoods of DuPont, warehouses and light industrial areas of DuPont and JBLM Landfill 5 have already isolated the site from existing Western Gray Squirrel population.

U.S. Fish and Wildlife Service Threatened and Endangered Species

No ESA-listed animals species habitat would be altered directly as a result of the Proposed Action. Refer to Section 3.4, **Fisheries**, of this EIS for analysis of the potential effects on fish species.

Indirect Impacts to Animals

Birds

The alteration of wetland systems within the off-site area with the changes in groundwater level without Sequalitchew Creek Restoration, particularly East and West Edmond Marsh, could disrupt bird habitat and reduce breeding, wintering, and migration habitat for bird species. These areas are documented to regularly attract concentrations of waterfowl. However, the potential impacts to wetland area associated with changes in groundwater level is anticipated to be minor relative to the size of the wetland systems, particularly in combination with the Sequalitchew Creek Restoration Plan activities (see *Cumulative Impacts* below for detail).

Mammals

The alteration of Edmond Marsh and other wetland systems that could be modified by the changes in groundwater without mitigation could disrupt the existing wetland mammal habitat by removing existing water and food sources and sheltering vegetation, thereby reducing the available breeding and foraging habitat for aquatic habitat dependent mammal species (e.g., beaver). However, the potential reduction in wetland areas due to

changes in groundwater level are expected to be minor relative to the size of the wetland systems, particularly in combination with the Sequalitchew Creek Restoration Plan activities (see *Cumulative Impacts* below for detail). Use of the Seep Wetlands by mammals is unlikely, and a reduction in the size or the loss of the Seep Wetlands would have minimal impacts due to the proximity of the much larger Sequalitchew Creek and its associated riparian areas, which provide mammalian habitat.

Amphibians and Reptiles

Loss of wetland area, alterations to seasonal inundation patterns, and subsequent changes in plant communities would reduce the area of habitat that support amphibians. These changes could indirectly disrupt amphibian habitat and reduce breeding, wintering, and foraging habitat for amphibian species.

The early drying of normally inundated areas could adversely affect amphibian breeding by lowering surface water levels during the breeding and rearing seasons. This could result in the loss of available habitat, leading to exposure of egg masses and rearing juveniles from reduced water levels. Tadpoles, juveniles, and adults may disperse to areas that remain inundated during early drying periods. However, the existing amphibian population likely uses all available habitats. Thus, unoccupied amphibian habitats are likely to be unavailable to individuals dispersing from drying portions of the wetlands. However, the potential reduction in wetland area associated with the changes in groundwater level is expected to be minor relative to the size of the wetland systems, particularly in combination with the proposed Sequalitchew Creek Restoration Plan activities (see *Cumulative Impacts* below for detail).

CUMULATIVE IMPACTS WITH PROPOSED ACTION AND SEQUALITCHEW CREEK RESTORATION PLAN

Introduction

As indicated in **Chapter 2** (Description of Proposed Action and Alternatives) of this EIS, the 2011 Settlement Agreement indicates that any approval for mining under the Pioneer Aggregates South Parcel Project shall include a provision that prohibits mining until permits are in place to implement the Sequalitchew Creek Restoration Plan developed by CalPortland and the Environmental Caucus, as a separate but related action. The Sequalitchew Creek Restoration Plan seeks to restore and enhance streamflow and ecological functions from Sequalitchew Lake through Edmond Marsh into Sequalitchew Creek ravine. The Restoration Plan seeks to address almost two centuries of human manipulation. The principal goals of the Restoration Plan are to restore flows in Sequalitchew Creek, portions of which are now dry. This goal will be achieved by implementing a series of actions in a coordinated and adaptively managed project. The Restoration Plan is intended to sequentially restore diverted flows back to the creek,

improve the sustainability of flows through the system, and restore aquatic habitat by removing flow-related fish passage barriers and increasing the habitat available to aquatic species.

The Sequalitchew Creek Restoration Plan has the potential to restore an annual average of 12.9 cfs to a 1,200-foot reach of Sequalitchew Creek that currently experiences little to no consistent flow. Seasonally, the flows in this reach following restoration are predicted to be between 2.5- cfs in August up to just over 26 cfs in March. Flows of this magnitude would re-establish a functioning stream in the now frequently dry channel, providing new aquatic and riparian habitat and a connection between the Sequalitchew Creek ravine and the marshes. This would provide a corridor for both aquatic and terrestrial species and would provide new opportunities for species expansion and recovery.

Cumulative Conditions

The combined impacts of mining under the Proposed Action together with implementation of the Sequalitchew Creek Restoration (the 'cumulative condition') on stream and wetland habitat is discussed below.

Sequalitchew Creek

The combined impacts under the cumulative condition on stream habitat would include re-establishing flow from Sequalitchew Lake to flow through the marshes and into Sequalitchew Creek ravine. The cumulative condition would also result in re-establishing the ecosystem process, specifically, the movement of water, sediment, nutrients, biota, and dissolved gases through the watershed from the headwater springs on Sequalitchew Lake to Puget Sound. The increase in hydrology and stream energy are anticipated to increase aquatic ecosystem productivity and create and maintain habitat diversity. See Section 3.3, **Fisheries**, for discussion on cumulative conditions associated with stream flow and creek water quality.

Wetlands

The Sequalitchew Marsh wetland complex has increased in size by more than 30 acres since the late 1990s when efforts to maintain a channel through the system were abandoned, and beaver dams began to raise water levels, preventing flow from reaching the ravine and redirecting nearly all flow to the Diversion Canal (see **Figure 3.6-1**). A fundamental goal of the Sequalitchew Creek Restoration Plan is to direct flows from the Diversion Canal back down Sequalitchew Creek. This requires restoring the historical gradient from the outlet of Sequalitchew Lake to the top of the ravine, which would require a lowering of water levels in some parts of the wetland complex resulting in a reduction of wetland acreage.
Some wetland and lake fringe habitats would be gained with the Sequalitchew Creek Restoration Plan. Raising water levels in Hamer Marsh would compensate for some wetland

loss. Removing fill from Edmond Marsh would also compensate for some wetland loss and more connectivity and function in the wetland.

Marsh Water Levels

As outlined in the Sequalitchew Creek Restoration Plan, reconnecting flow from Sequalitchew Lake to the Sequalitchew Creek ravine will require lowering water levels in some areas of the marshes in order to establish a consistent downhill gradient (refer to **Appendix H** for additional detail).

A water balance model analysis was conducted to evaluate the combined effects of the Sequalitchew Creek Restoration and mining under the Proposed Action, includes an assumption that there would be little variation in wetland water levels in the cumulative condition, as there would almost always be more than enough flow from Sequalitchew Lake to keep the wetlands full to their target elevations. However, there would likely be some summers when water levels in Eastern East Edmond Marsh would dip below the target elevations for a month or more. East and West Edmond Marshes would also experience occasional dips below the target elevation, but of lesser magnitude and much less frequently. These impacts could be reduced or eliminated by managing water level behind the beaver dams to store water and release it slowly during periods of low flow. The hydraulic gradient through the marshes would always be maintained, however, as the water level in Eastern East Edmond Marsh never dips below the water level in East Edmond Marsh allowing water stored in the marsh to flow downstream to the ravine.

The model results indicate that most months of the year (September through June), the wetland system would contribute a small amount of additional water to the flow from Sequalitchew Lake, ranging from a 8% gain in April up to a 26% gain in October. However, in the driest months (July and August) some flow (up to 3%) would be lost in the wetlands from evaporation and losses to groundwater. (see **Appendix H** for additional details).

Wetland Water Quality

The cumulative condition would benefit the water quality in Eastern East Edmond Marsh and Edmond Marsh by providing a large amount of high-quality water. The residence time in the wetlands would be less than at present, decreasing from weeks or months to days. Water quality in the wetlands would be dominated by the input from Sequalitchew Lake. As a result, dissolved oxygen would be higher, and the pH would be slightly more neutral. Temperature and turbidity have been about the same in the lake and marshes, so little change is anticipated in these parameters. It is also anticipated that the elevated iron concentrations observed in the center of Edmond Marsh would be resolved through flushing and dilution with Sequalitchew Lake water (see **Appendix H** for detail).

Conifer Forest

The restoration of the watershed under the cumulative condition would allow the re-establishment of conifer forests around the perimeter of Edmond Marsh. These forests have been recently lost due to raising water levels, particularly on the northern boundary of East Edmond Marsh. Other impacts would be similar to those described for the Proposed Action.

Landmark Trees, Shrublands, and Grasslands

Landmark tree, shrubland and grassland conditions would not be affected by the cumulative condition, and conditions would be similar to described for the Proposed Action.

Aquatic Resources

West Edmond Marsh - The marsh would be more frequently and continuously inundated in the deeper areas of the wetland, and seasonal fluctuations in water levels would decrease in the cumulative condition. This would occur as a lower and more stable outlet hydrology is established in place of the existing beaver dam. The beaver dam currently prevents flow out of West Edmond Marsh, but it is occasionally breached. Reducing or eliminating these rapid changes in hydrology under the cumulative condition would help to stabilize the vegetation communities which are currently susceptible to hydrologic fluctuations.

East Edmond March - Water levels in East Edmond Marsh are currently higher than in Eastern East Edmond Marsh and West Edmond Marsh. This reverses the gradient of Sequalitchew Creek preventing surface flow to the ravine from West Edmond Marsh. The cumulative condition (specifically the Sequalitchew Creek Restoration Plan) would lower water levels in East Edmond Marsh to restore a gradient from Lake Sequalitchew to the ravine. This would impact habitats, particularly along fringes of the wetland where forested areas would be able to re-establish. Forested wetland and wetland buffer has been lost over the past decades as water levels have risen. Rising water levels have also been responsible for the loss of scrub-shrub vegetation and detritus from those communities has prevented establishment of an emergent vegetation community.

Sequalitchew Creek Ravine Wetlands - Changes in groundwater flow under the Proposed Action in combination with the Sequalitchew Creek Restoration Plan would be anticipated to still result in a disruption of Ravine (seep) Wetland habitat (as described for the Proposed Action). In addition, the Sequalitchew Creek Ravine Wetlands would be impacted as flows in the creek are restored in the cumulative condition. This would cause a change in the bankfull width of Sequalitchew Creek as well as the sediment load being actively transported downstream. Over the subsequent several decades, the riparian and floodplain wetland communities would be affected by deposition of new floodplain terraces, channel migration, increased wet season flows and other natural stream processes.

Brackish Marsh - Due to the increased base and peak flows in Sequalitchew Creek in the cumulative condition (particularly with the Sequalitchew Creek Restoration Plan), the Brackish Marsh at the mouth of Sequalitchew Creek is likely to be affected by increased sediment inputs and decreased salinity due to increased volumes of fresh water discharging into the wetland.

Increased sediment inputs into the Brackish Marsh due to increased flows in Sequalitchew Creek could modify the existing wetland topography, and as a result, the existing vegetation. Sedimentation would be minimized by controlling the discharge into Sequalitchew Creek during implementation of the Restoration Plan to prevent a rapid mobilization of sediments in the stream reaches upstream of the Brackish Marsh. Stream flows would be slowly increased to allow the channel and stream bank vegetation to adapt to the increased flow rates. With appropriate upstream mitigation, changes in sediment loading to the Brackish Marsh are expected to be minimal and would be further minimized by tidal flushing.

Salinity in the Brackish Marsh would continue to be driven by tidal inflows and decreases in salinity associated with freshwater flows would only be expected during high flow events in winter months. Increased flow in Sequalitchew Creek with cumulative conditions is not expected to affect existing Brackish Marsh vegetation or functions.

Other Wetlands - The cumulative condition is not anticipated to impact the Nearshore Springs or Nearby Wetlands.

Birds

The cumulative condition (specifically the Restoration Plan) would reverse the changes in bird habitat in East and West Edmond Marsh that have occurred over the last three decades. This would include a reorganization of some specific habitats to include scrub-shrub wetlands and forested wetlands. It would increase the area of forested wetland buffer as water levels in some areas of East Edmond Marsh drop and increase the amount of and persistence of emergent wetland habitat in the west end of West Edmond Marsh.

Mammals

Beaver in the Edmond Marsh complex would be actively managed under the cumulative condition (specifically the Sequalitchew Creek Restoration Plan). The intent is to maintain the beaver population while managing water levels to restore flow. Other mammal species are expected to see increases in available habitat, particularly where water levels drop providing additional denning opportunities in the wetland banks and increasing the size of upland islands within the wetland complex.

Amphibians and Reptiles

Amphibian reproduction can be adversely affected by sudden, non-seasonal changes in water levels. This occurs in West Edmond Marsh when the large beaver dam above the losing reach is breached. Amphibian eggs attached to the stalks of emergent vegetation would suddenly be above water, causing complete mortality. Areas of reduced wetland area under the cumulative condition in the Edmond Marsh complex could reduce the area of habitat for some amphibian species, while others would benefit from the re-establishment of the forested riparian buffer.

ALTERNATIVE 2 – NO ACTION

The No Action Alternative includes two scenarios: Scenario A - Continuation of Existing Conditions; and Scenario B - Site Development under Existing Zoning.

Scenario A

Under Scenario A the Proposed Action would not occur and clearing and mining activities, and resulting impacts to plants and habitat, would not occur. The site would not undergo remediation from Tacoma Smelter Plume impacts leaving high concentrations of lead and arsenic in the soils which could impact animals.

The Sequalitchew Creek Restoration Plan would not receive funding from the Pioneer Aggregates South Parcel Project applicant without the Proposed Action, although it is possible that funding for the Plan could be provided from another source. Under the No Action Alternative, the improvements and benefits to habitat and impacts to groundwater with implementation of the Sequalitchew Creek Restoration Area may not occur. Also, If the Sequalitchew Creek Restoration Plan is not implemented, wildlife species within the Sequalitchew Creek Restoration would not benefit from improved aquatic resource habitat conditions.

Scenario B

Development could occur on the site consistent with underlying zoning. Future development is assumed to be consistent with the DMC Critical Areas chapter (DMC 25.105), which could allow for development within 50 feet of the top of the Sequalitchew Creek ravine. In contrast, DuPont City ordinance 95-521 prohibits mining within 100 feet of the top of Sequalitchew Creek ravine so any future development following the proposed action would be at least 100 feet from the top of the ravine, whereas future development under Scenario B could occur 50 feet from the top of the ravine. Existing coniferous forest within the Expansion Area portion of the site could be cleared with future development, with landmark trees retained in accord with DMC requirements. There would be no changes in the use of the areas of the South Parcel zoned for Open Space; these areas currently

include the naturally vegetated slope of the Sequalitchew Creek ravine and the Sequalitchew Creek pedestrian trail.

Development on the site consistent with underlying zoning would also result in clearing of forested and shrub habitat, reducing habitat for wildlife species that use these habitats. Direct impacts associated with future development under existing zoning to animals would be similar to those described for the Proposed Action.

There would be no change in use of the areas within the existing mine. However, once the Re-Mine Area is reclaimed, it would likely be redeveloped according to its underlying zoning, similar to the South Parcel. The Kettle Wetland is within the existing mine and is assumed to remain intact, the buffers would remain vegetated, and mining operations would continue in other portions of the existing mine. The Kettle Wetland, its buffer, and other mine-related buffers could be reduced to the minimum width in the DMC.
The Sequalitchew Creek Restoration Plan would not receive funding from the Pioneer Aggregates South Parcel Project applicant without the Proposed Action, although it is possible that funding for the Plan could be provided from another source. Under the No Action Alternative, the improvements and benefits to habitat and impacts to groundwater with implementation of the Sequalitchew Creek Restoration Area may not occur.

3.6.3 Mitigation Measures

The following mitigation measures have been included in the Proposed Action to reduce impacts to plant and animal communities, including impacts to on-site resources and indirect impacts to off-site resources due to changes in groundwater hydrology.

Proposed On-Site Mitigation

- Revegetation of cleared and mined area on the site would occur as part of segmental reclamation under the Reclamation Plan reviewed and approved by the Washington State Department of Natural Resources.

- Mitigation for impacts for the removal of the Kettle Wetland are identified in the Project *Wetland Mitigation Plan*. The design of the mitigation wetland complex is intended to create aquatic, wetland, riparian, and upland forest habitat by using groundwater intercepted within the mine. Specific Kettle Wetland mitigation goals include the following:
    - Create a constructed palustrine depressional wetland complex consisting of forested, scrub-shrub, emergent, and aquatic bed wetland areas at least 3.56 acres in size.
    - Provide adequate wetland acreage, functions, and values to mitigate all Project-related wetland impacts to the Kettle Wetland.

    - Construct a vegetated buffer at least 100 feet around the boundary of the wetland.
    - Create a larger complex of seep wetlands and springs within the mine.

- Springs and seeps will generally emanate on the eastern and southeastern slopes of the proposed mine in the South Parcel. Generally, seeps and springs will form within the lower one-third of the mine slope, approximately 20 to 30 vertical feet above the Olympia Beds. These areas will be colonized or planted with pioneer wetland species, such as horsetail *(Equisetum* sp.), buttercup (*Ranunculus* sp.), and miner's lettuce (*Montia fontana*). Additional species would be introduced later, once the soils have developed sufficiently to support seral grasses such as foxtails, rushes, sedges etc. The buffers around these new seeps will be subject to the City of DuPont's Critical Areas Ordinance (DMC 25.105.050) and protected. The minimum buffer size is 50 feet. These buffers would be planted in accordance with the mine reclamation plan and monitored in accordance with the Wetland Mitigation Plan. Control of Scot's broom, reed canarygrass, Himalayan blackberry (*Rubus armeniacus*), and other noxious weeds within areas affected by the proposed Project would also be included as part of the Project mitigation activities.

- The Applicant (CalPortland) has provided a tree replacement proposal as part of its application and will coordinate with the City of DuPont regarding the appropriate strategy for replacement of removed landmark trees through proposed mine reclamation plans.

Proposed Mitigation for Off-Site Resources

- Implementation and monitoring of the Sequalitchew Creek Restoration Plan would provide mitigation to minimize potential impacts to aquatic resources and vegetation resulting from changes to groundwater levels. As described in Chapter 2 of this FEIS, the Sequalitchew Creek Restoration Plan will be permitted and implemented contemporaneously with mining of the South Parcel. Conditions associated with this mitigation measure are the same as described above in the subsection Cumulative impacts with Proposed Action and Sequalitchew Creek Restoration Plan.

Other Possible Contingency Mitigation Measure

- As an element of the approval conditions for the Proposed Action, the City of DuPont could require a Monitoring and Response Plan. The Monitoring and Response Plan could include, among other things, definition of monitoring methodology, establishment of performance thresholds, and identification of contingency response measures to the considered for implementation if monitoring indicates exceedance of a performance threshold. The Monitoring and Response Plan could incorporate elements of the adaptive management processes proposed to be established for the Proposed Action

and the Sequalitchew Creek Restoration Plan.

The Sequalitchew Creek Restoration Plan is a separate but related action that is intended to be implemented in parallel with the Proposed Action. The mine and the stream restoration project each have their own adaptive management process tailored to achieving the goals and objectives of each specific project. The interaction between the two adaptive management processes could include: 1) project schedules that encourage restoration in advance of the potential impacts from mining; 2) development of performance thresholds for mining that support restoration and 3) coordinated monitoring and open sharing of information. The City, as the permitting authority for both projects would have a key role in assuring consistency between the two adaptive management plans.

3.6.4 Significant Unavoidable Adverse Impacts

Development of the Proposed Action would result in the loss of existing conifer forest/shrublands, the existing kettle wetland, and associated animal habitat on the site. The proposed site reclamation plan and wetland mitigation plan would mitigate loss of on-site resources. These impacts would be unavoidable but not considered significant with mitigation described above in Sub-section 3.6.3.

The Proposed Action would indirectly impact the off-site Seep Wetlands associated with the Sequalitchew Creek Ravine by disrupting the hydrology of these wetlands. This impact would be unavoidable and mitigated by the creation of a larger complex of seep wetlands on the eastern slope of the reclaimed mine, resulting in a net impact that is considered insignificant.

Cumulatively, implementation of the Sequalitchew Creek Restoration Plan would further mitigate for the loss of wetland acreage associated with reduction in groundwater levels. The intent of the proposed mitigation measures described in Sub-section 3.6.3 with the Sequalitchew Creek Restoration Plan, is to reduce these unavoidable adverse impacts to a non-significant status. If implementation of the proposed mitigation measures fails to mitigate these unavoidable adverse impacts, the City will consider implementing other possible contingency mitigation measures listed in Sub-section 3.6.3 as part of the adaptive management process.

3.7 NOISE

This section of the FEIS describes existing noise conditions on the site and in the site vicinity. Potential impacts associated with the EIS Alternatives are evaluated and mitigation measures are identified. This section is based on the *Noise Study* (September 2022) prepared by Ramboll U.S. and peer reviewed by BRC Acoustics (see **Appendix K**). Information added or changed subsequent to issuance of the Draft EIS, if any, is shaded to ease identification of the added or changed information.

3.7.1 Affected Environment

Noise is sometimes defined as unwanted sound; the terms noise and sound are used more or less synonymously. The human ear responds to a very wide range of sound intensities. The decibel scale (dB) used to describe sound is a logarithmic rating system which accounts for the large differences in audible sound intensities. This scale accounts for the human perception of a doubling of loudness as an increase of 10 dB. Therefore, a 70-dB sound level will sound about twice as loud as a 60-dB sound level. People generally cannot detect differences of 1 dB; in ideal laboratory situations, differences of 2 or 3 dB can be detected by people, but such a change typically would not be detectable in an average outdoor environment. A 5-dB change would typically be perceived under normal listening conditions.

When addressing the effects of noise on people, it is useful to consider the frequency response of the human ear. Sound-measuring instruments are therefore often programmed to weight measured sounds based on the way people hear. The frequency-weighting most often used is A-weighting because it approximates the frequency response of human hearing and is highly correlated to the effects of noise on people. Measurements from instruments using this system are reported in "A-weighted decibels" or dBA. All sound levels in this evaluation are provided in A-weighted decibels.

Regulatory Context

Section 9.09.040 of the DuPont Municipal Code (DMC 9.09.040) specifies noise limits based on the limits set in the Washington Administrative Code (WAC 173-60). DMC 9.09.040 establishes limits on sounds crossing property boundaries based on the Environmental Designation for Noise Abatement (EDNA) of the sound source and the receiving properties. Section 9.09.040(b) of the DuPont City Code identifies Class A EDNAs as residential areas, Class B EDNAs as commercial areas, and Class C EDNAs as industrial areas. The allowable noise level limits are displayed in **Table 3.7-1**.

Table 3.7-1
DUPONT MAXIMUM PERMISSIBLE SOUND LEVELS (DBA)

EDNA of Source Property	EDNA of Receiving Property		
	Class A Day/Night [a]	Class B	Class C
Class A	55/45	57	60
Class B	57/47	60	65
Class C	60/50	65	70

Source: DMC 9.09.040.

[a] The limits for noise received in Class A EDNAs are reduced by 10 dBA during nighttime hours (10 PM to 7 AM).

The city noise rule allows the limits presented in Table 3.7-1 to be exceeded for certain periods of time: 5 dBA for no more than 15 minutes in any hour, 10 dBA for no more than 5 minutes of any hour, or 15 dBA for no more than 1.5 minutes of any hour. These allowed increases can be described in terms of the percentage of time a certain level is exceeded, using statistical noise descriptors (Lns). For example, L25 represents a sound level that is exceeded 25% of the time, or 15 minutes in an hour. Similarly, L8.33 and L2.5 are the sound levels that are exceeded 8.33 and 2.5% of the time, or 5 and 1.5 minutes in an hour, respectively. At no time can the allowable sound level be exceeded by more than 15 dBA, represented by the Lmax.

DMC Section 9.09.040(c) provides a map that specifically designates the EDNA's for various properties within the City (Appendix A of Ordinance 208). The EDNA boundaries shown in this map identify a small Class A (Residential) EDNA on both sides of Barksdale Avenue in the historic village of DuPont, a small Class B (Commercial) EDNA between the historic village and I-5, and the remainder of the DuPont area as a Class C (Industrial) EDNA. DuPont Ordinance 208 and the associated map in Appendix A were adopted in 1978; they are no longer representative of current zoning and comprehensive land use plan designations. Furthermore, the 1978 map of EDNA designations does not adequately represent the basic uses identified in 9.09.040(b) that define EDNAs. It is, therefore, unclear whether the EDNA designations shown in the 1978 map or the EDNA identifications based on land uses in 9.09.040(b) should apply.

For this noise analysis, land use zones (as identified in DuPont's Zoning Map) are used to determine the appropriate noise limits for the various receiving properties. This approach is consistent with the more modern language and identification of EDNA designations based on actual uses and represents a more accurate reflection of current and expected future conditions. But applying either method for identifying the appropriate EDNAs, the site would be considered a Class C EDNA, and the applicable Ln noise limits for a Class C EDNA noise source affecting different types of receiving properties are displayed in **Table 3.7-2.**

Table 3.7-2
APPLICABLE LN NOISE LIMITS FOR CLASS C EDNA NOISE SOURCES

EDNA of Source Property	Ln Limits			
	L25	L8.3	L2.5	Lmax
Class A [a]	60/50	65/55	70/60	75/65
Class B	65	70	75	80
Class C	70	75	80	85

Source: DMC 9.09.040 (d).

[a] The limits for noise received in Class A EDNAs are reduced by 10 dBA during nighttime hours (10 PM to 7 AM) and are shown for Day/Night.

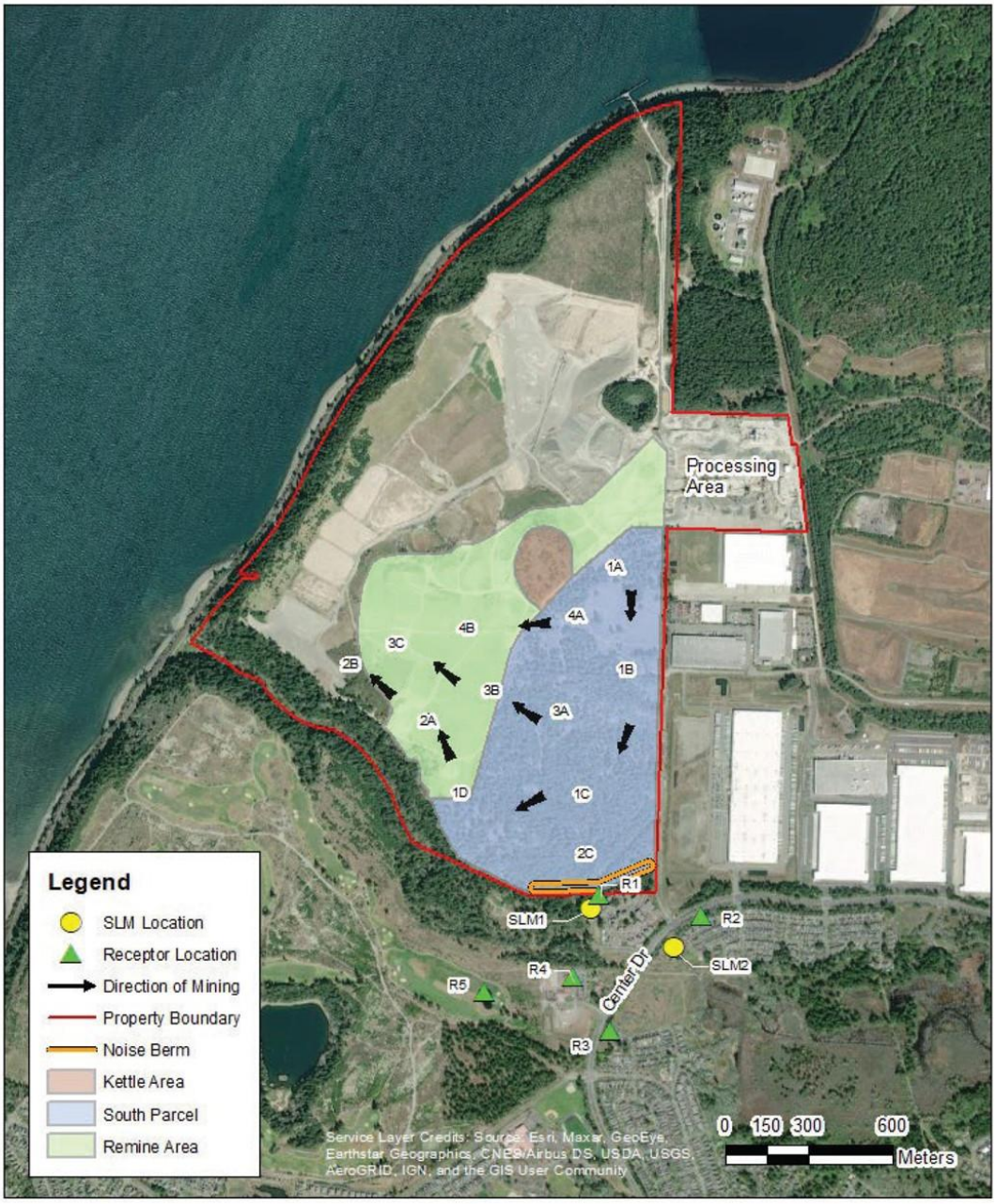
Because noise generated by mining would typically be fairly consistent over an hourly period, the allowances for short-term increases in the noise level limits would rarely apply. Therefore, the most stringent/conservative noise limit for mining activities (a Class C source) would be an L25 of 70 dBA at nearby Class C EDNAs, an L25 of 65 dBA at nearby Class B EDNAs, or an L25 of 60 dBA between 7 AM and 10 PM and 50 dBA between 10 PM and 7 AM at nearby Class A EDNAs.

DMC 9.09.050 exempts the following sources from the above noise limits:

- Temporary construction noise, except when received in Class A EDNA properties between the hours of 10 PM and 7 AM;
- Sounds created by motor vehicles when regulated by the state noise limit (Chapter 173-62 WAC), adopted by reference in DMC 9.09.040; and
- Sounds created by motor vehicles, licensed or unlicensed, when operated off public highways, except when such sounds are received in Class A EDNAs.

Existing Sound Levels

As part of the noise study prepared for this EIS, sound level measurements were taken from two locations (see **Figure 3.7-1** for a map of the locations). SLM1 was chosen to represent the nearest residences south of the mine on the north side of the Creekside Apartment complex. SLM2 represents the residential community across Center Drive from the Expansion Area portion of the site. At both measurement locations, noise from the existing Pioneer Aggregates facility was not audible and did not substantively contribute to the measured levels. A summary of the sound level measurement results is displayed in **Table 3.7-3**.



Source: Ramboll, 2022.

EA Engineering, Science, and Technology, Inc., PBC

Figure 3.7-1

Sound Level Measurement and Receptor Location Map

Table 3.7-3
RANGE OF EXISTING MEASURED HOURLY SOUND LEVELS (DBA)

Location	Time [a]	Leq [b]	Lmax	L2	L8	L25	L90	Ldn [b]
SLM1	Day	39-48	52-72	43-56	42-49	37-47	33-45	47
	Early Morning	42-44	56-58	46-47	45-46	43-45	40-43	
	Night	35-44	48-58	39-47	37-46	35-45	33-43	
SLM2	Day	49-54	61-83	55-61	53-57	50-56	41-51	56
	Early Morning	52-55	69-700	57-59	56-58	53-56	45-49	
	Night	42-55	57-70	48-59	45-58	41-56	38-49	

Source: Ramboll, 2022.

[a] Daytime hours are defined as between 7 AM and 10 PM, early morning hours are between 5 and 7 AM, and nighttime hours are between 10 PM and 7 AM.

[b] The Leq is an energy-average sound level defined over a specified period of time, often one hour. It is useful for representing the energy of a fluctuating sound with a single number. The Ldn is a similar to a 24-hour Leq, except the Ldn includes an additional 10 dBA added to sound levels in each hour between 10 PM and 7 AM to account for increased sensitivity to noise at night.

SLM1 – Located behind the Creekside Apartment complex. Noise sources included JBLM and civilian aircraft, including helicopters. The noise environment at the apartment complex was relatively quiet during deployment and retrieval of the meters.
SLM2 – Located at the Edmond Village Park to represent the residential setbacks from Center Drive. The primary noise source was traffic along Center Drive. Sporadic noise sources included aircraft noise, both military and civilian.

3.7.2 Impacts of the Alternatives

This sub-section identifies and analyzes noise impacts on and in the vicinity of the site under the EIS Alternatives, including with proposed clearing and mining.

ALTERNATIVE 1 – PROPOSED ACTION

Construction Impacts

Construction directly related to the Proposed Action would be limited to logging, preparation of new mining phases/segments for excavation, expansion of the on-site conveyor system to connect the expanded mining area to the existing processing facility, and the construction of the berm on the south side of Phase 2C for noise attenuation. Much of the construction activity would entail heavy equipment similar to, or the same as, the equipment required during excavation. Therefore, the sound levels of construction are expected to be similar to the modeled operational sound levels identified below. The

exception would be sound levels associated with construction of the berm on the south side of Phase 2C. During construction of the berm, sound levels at nearby receivers may be noticeable and, at times, intrusive. This could result in temporary and short-term noise impacts at nearby properties. Construction activity is exempt from DuPont's noise regulations during daytime hours (7 AM to 10 PM).

Operational Impacts

Noise Sources

Equipment required for mining under Alternative 1 includes two front-end loaders, a bulldozer and conveyors and an electric conveyor drive motor. This equipment would work in tandem; the bulldozer would push material down the mining face to the loaders, which would load the material onto a conveyor going to the existing processing plant. The bulldozer and loaders would be the dominant noise sources at the nearest sensitive receivers to the Expansion Area portion of the site.

Noise from the excavation equipment was considered in noise modeling to estimate future noise associated with the facility. Noise from most equipment was characterized using measurements of equipment operating at the existing Pioneer Aggregates facility. The measurement of the electric conveyor drive motor was measured at a different facility and is from source sound level archives.

Because the noise from a sand and gravel operation is typically fairly constant over the course of an hour, the noise standard that would be most limiting would be the hourly L_{25} limit. In order to relate the calculated sound levels more closely with the applicable noise limits, the measured L_{25} of each source was used when this information was available. in instances where L_{25} data were not available, the Leq was used to represent an L_{25}.

Noise Model

The CadnaA noise model was used to estimate sound levels expected to be generated by the expansion equipment under the Proposed Action. CadnaA is a computer program that calculates sound levels after considering the noise reductions or enhancements caused by distance, topography, ground surfaces, atmospheric absorption, and meteorological conditions. The modeling process included the following steps: (1) characterizing the noise sources based on frequency-specific measurements of representative equipment; (2) creating three-dimensional maps of the site and vicinity to enable the model to evaluate effects of distance and topography on noise attenuation, (3) assigning the equipment sound levels to the appropriate locations on the site, and (4) placing model "receptors" at several model receptor locations to represent places where the noise will be received (see **Appendix K** for details).

Noise Modeling Results

As part of the noise assessment conducted for this EIS, the model-calculated sound levels were first compared with the applicable City noise limits to assess potential compliance with the limits. Sound levels from proposed excavation activities were modeled at six receptor locations representing three residential areas, a civic center, and a golf course nearest the Expansion Area portion of the site. The receptor locations are shown in **Figure 3.7-1**. The predicted future sound levels and detailed descriptions of each receptor location are provided in **Table 3.7-4**. Noise from the existing Pioneer Aggregates operations does not substantively contribute to the sound levels at the receptor locations considered in this assessment, and the predicted sound levels provided in **Table 3.7-4** can be considered representative of the entire operation with mining under the Proposed Action.

Table 3.7-4
MODEL-CALCULATED SOUND LEVELS (LEQ/L25, DBA)

Model Receptor Location	Modeled Sound Level				Noise Limit [a]
	Phase 1B	Phase 2C	Phase 2C (No Bulldozer)	Phase 3B	
R1a	42	55	48	43	60/50
R1b	41	46	42	40	60/50
R2	40	45	43	37	60/50
R3	36	40	37	36	60/50
R4	37	39	36	38	65
R5	36	38	37	39	65

Source: Ramboll, 2022.
Receptor Locations:
R1a – Upper floor of the Creekside Apartments nearest the South Parcel
R1b – Ground floor of the Creekside Apartments nearest the South Parcel
R2 – Residences in Edmond Village
R3 – Residences in Palisade Village
R4 – Dupont Civic Center
R5 – The Home Course Golf Course
(a) The noise limits shown for residential locations are for daytime/nighttime hours, where daytime hours are from 7 AM to 10 PM and nighttime hours are from 10 PM to 7 AM.

As indicated in **Table 3.7-4,** sound levels from the Proposed Action would comply with the applicable noise limits during daytime hours (i.e., 7 AM to 10 PM) at all locations. However, sound levels at the upper floors of the Creekside Apartments facing the site may exceed the noise limits if full mining activity occurs in Phase 2C during early morning hours (i.e., between 5 and 7 AM).

Because the dominant noise source at the Creekside Apartments during Phase 2C excavation is the bulldozer, the noise benefits of restricting bulldozer use in this phase to daytime hours only was considered. Prohibition of bulldozer use during the early morning hours results in modeled sound levels below the nighttime noise limits applied between 5 and 7 AM at all receptor locations (see **Appendix K** for details).

Receptor location R1b provides modeled sound levels at the location closest to the Sequalitchew Creek trail. Sound levels during mining phase 2C, which is closest to the trail and to recreational users, is modeled to be within applicable noise limits and is not anticipated to result in a significant adverse impact to trail users.

Increases over Existing Sound Levels

In addition to evaluating the potential compliance of on-site sources associated with Proposed Action activities, potential noise conditions associated with project-related increases over existing baseline sound levels are also considered. This assessment was restricted to residential receptor locations potentially affected by increases over existing levels under the Proposed Action.

For Proposed Action sound levels during daytime hours, the worst-case modeled levels expected during all phases of excavation were used. For sound levels during early morning hours, the worst-case modeled sound levels during all phases of excavation were used assuming no bulldozer in Phase 2C. Because mining activities in Phase 2C may exceed the nighttime noise limit of 50 dBA at the upper floors of the Creekside Apartments with all equipment in operation, use of the bulldozer in Phase 2C would be restricted to daytime hours only. The resulting increases over existing levels are displayed in **Table 3.7-5**.

The sound levels when a bulldozer is working very near the Expansion Area portion of the site boundaries in Phase 2C are substantially higher than the baseline sound levels at the upper floors of the Creekside Apartments (R1a), resulting in potential increases of 8 to 16 dBA. If these sound levels were experienced throughout the life of the project, they would represent a substantial increase. However, the modeled levels at the Creekside Apartments are dominated by noise from a bulldozer working on the slope of 2C very near the southern site boundary. This worst-case condition would only occur during Phase 2C excavation. Even during Phase 2C excavation, the bulldozer would split its time between excavation in Phase 2C and excavation in the existing mining areas farther north and west, and sound levels much of the time would be substantially lower than the worst-case levels identified. The variation in sound levels over the life of the mine and the variation in day-to-day bulldozer activities would reduce the reported potential noise impacts at the Creekside Apartments due to increases over baseline levels.

Table 3.7-5
CALCULATED INCREASES OVER EXISTING SOUND LEVELS (LEQ, DBA)

Model Receptor Location	Time of Day [a]	Measured Existing Levels	Level with South Parcel Expansion		
			Project Only [b]	Cumulative [c]	Increase [d]
R1a	Day	39-48	55	55-56	8-16
	Night	42-44	48	49-50	5-7
R1b	Day	39-48	46	46-50	2-8
	Night	42-44	42	45-46	2-3
R2	Day	49-54	45	51-55	0-1
	Night	52-55	43	52-55	0
R3	Day	49-54	40	50-55	0
	Night	52-55	37	52-55	0

Source: Ramboll, 2022.
Notes:
(a) Daytime hours are from 7 AM to 10 PM. Nighttime hours for the purpose of this evaluation are from 5 to 7 AM, when early morning excavation may occur.
(b) The daytime project levels shown are the highest modeled sound levels from all phases of South Parcel activities considered in this assessment. The nighttime levels shown are the highest levels from all modeled phases except 2C.
(c) Cumulative levels represent the existing measured sound levels + the modeled project-related sound levels.
(d) Apparent discrepancies in any calculated increases are artifacts of rounding the displayed sound levels to the nearest whole number.

At the more distant residential locations (R2 and R3), increases over background sound levels are 1 dBA or less during even the worst-case Phase 2C activities. Such increases would not be discernable in an active outdoor environment and would result in no impact (see **Appendix K** for details).

CUMULATIVE IMPACTS

The annual amount of mining activity, and associated noise conditions, with the Proposed Action in combination with mining at the Existing Mine would not exceed current levels, and cumulative mining noise impacts are not anticipated. In addition, noise impacts associated with mining would be temporary in nature and would occur some distance from potential future development that could occur in the vicinity, and no significant cumulative noise impacts are anticipated.

ALTERNATIVE 2 – NO ACTION

There are two No Action Alternatives- Scenario A Continuation of Existing Conditions; and Scenario B Site Development Under Existing Zoning.

Scenario A

Under Scenario A, mining activities associated with the Re-Mine Area of the site and the Existing Mine would continue as currently permitted. Mining and reclamation would continue within the currently permitted footprint of the existing mine and would continue to generate noise, similar to existing conditions. The Existing Mine has an estimated remaining life of 6 to 10 years with mining currently limited to 10 feet above groundwater. The Expansion Area portion of the site is assumed to remain undeveloped and would continue in its vegetated condition.

Scenario B

Under Scenario B, the proposal would not occur. The site would be developed for urban uses consistent with the City's Future Land Use Map. The majority of the area affected is currently designated by the City of DuPont Comprehensive Plan as Manufacturing and Research, with a smaller area designated for residential uses. The corner of the property near Center Drive is designated as Residential 12, which would allow higher density residential development where multifamily density averages 12 units per acre. Urban development, as permitted under current planning and zoning designations, is assumed to occur east of the lease line demarcating existing mining operations. The timing and nature of any such development would be driven by market forces.

Development of individual parcels would result in construction-related noise impacts. Operation of development on individual parcels would also generate noise from operational activities, depending on the type of development on the site.

3.7.3 Mitigation Measures

The following mitigation measures have been included in the Proposed Action to reduce noise impacts.

Proposed Construction Measure

- Construction activities (i.e., logging and construction of the southern berm) would be conducted during daytime hours only (7 AM to 10 PM) to minimize noise impacts.

Proposed Operation Measures

- The plans for the site include construction of a 20-foot high berm on the south side of Phase 2C to reduce noise at off-site locations, especially at the Creekside Apartments. With such a berm, modeled sound levels of worst-case mining activities are well below the applicable daytime noise limits at all receptor locations.

- Excavation in Phase 2C during early morning hours (i.e., between 5 and 7 AM) may exceed the stricter nighttime limit of 50 dBA applicable at the Creekside Apartments. Restriction of the bulldozer to daytime hours only within Phase 2C reduces the modeled sound levels at the Creekside Apartments to 48 dBA or less, which would comply with DuPont's nighttime noise limit.

3.7.4 Significant Unavoidable Adverse Impacts

With construction of the proposed berm as noted above and with restriction of hours of bulldozer operation in Phase 2C to daytime hours only, the project is expected to comply with City of DuPont noise limits. Furthermore, potential noise impacts at the Creekside Apartments (R1) can be mitigated by the proposed mitigation measures, although short-term unavoidable noise impacts may be expected. Due to the short-term nature of the impacts at R1, any such impacts would not be considered significant.

3.8 LAND USE

This section of the FEIS describes the existing land use patterns and conditions occurring on the Pioneer Aggregates South Parcel Project site and site in the site vicinity. This section evaluates how development under the EIS Alternatives would affect existing and future land uses on and in the vicinity of the site, either directly or indirectly, and identifies any needed mitigation. Information added or changed subsequent to issuance of the Draft EIS, if any, is shaded to ease identification of the added or changed information.

Methodology

The land use analysis was prepared based on a land use reconnaissance of the site and vicinity conducted in October 2021 as well as review of available digital information. This section also includes review of pertinent land use plans, policies, and regulations, including the Washington State Growth Management Act, and City of DuPont Comprehensive Plan and Land Use Code.

3.8.1 Affected Environment

The City of DuPont is located in southwestern Pierce County (see **Figure 2-1** in **Chapter 2**). The City is generally bounded by Puget Sound to the west, Joint Base Lewis McCord (JBLM) to the north, the Fort Lewis Golf Course and I-5 on the south, and DuPont-Steilacoom Road and JBLM to the east. The nearest incorporated communities are Steilacoom and Lakewood, which are located approximately five miles to the north and northeast of the City of DuPont, respectively.

The City of DuPont contains approximately 3,770 acres. Based on Comprehensive Plan data, land use in the City at buildout will be as follows: approximately 22% will consist of critical areas/buffers and open space; 32% will be used for housing; 35% for business and employment uses; 3% for public use; and 7% for military, roads and other uses.

The South Parcel site (site) is located in the northern portion of the City of DuPont. The characteristics of the site are described below in the context of land use patterns, Comprehensive Plan and zoning designations, and surrounding development.

DuPont Land Use Plan

The City of DuPont Comprehensive Plan (2015 Periodic Update) indicates that DuPont is a master planned community, with its first community plan established around the DuPont Chemical Company's operations at the turn of the last century, and Northwest Landing (a concept of the Weyerhaeuser Company) emerging approximately 80 years later.

Northwest Landing is an approximate 3,000-acre mixed-use master planned community being developed over a 15- to 30-year period; it encompasses most of the City. The Master Plan is embodied in the City's Comprehensive Plan Land Use Map, shown on **Figure 3.8-1**, and Zoning Map, shown on **Figure 3.8-2**. Overall, the City of DuPont's land area is allocated among residential neighborhoods (1,214 acres); open space and sensitive areas (829 acres), public and civic uses, including parks, trails and recreation areas (95 acres); commercial and industrial uses (1,341 acres); and, military use (290 acres). In general, the land use plan reflects a planned balance among residential, business and open space/parks uses. Based on current estimates, the City is expected to accommodate 12,100 people and 21,400 workers at buildout, which is estimated to occur around 2040. Existing population (April 1, 2020) is estimated at 10,151, and employment is estimated at 3,619.

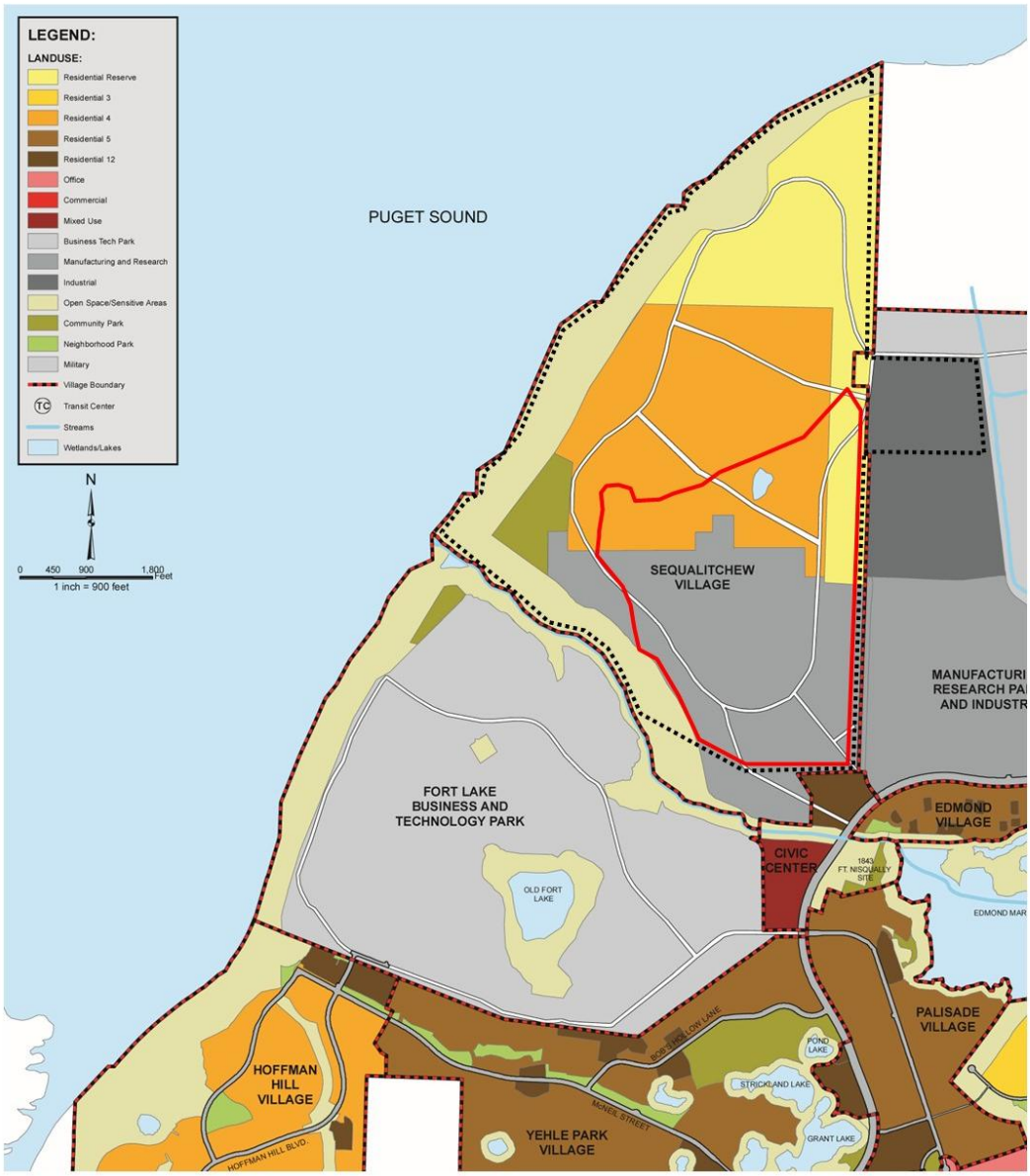
A brief discussion on the various City neighborhoods in proximity to the site, as defined in the Comprehensive Plan, follows.

Sequalitchew Village

The site is located within Sequalitchew Village. The Sequalitchew Village area consists of approximately 845 acres and is primarily designated for residential use: Residential Reserve (RR) in the northern one-third and northeastern border, which includes the North Parcel portion of the Pioneer Aggregates Mine; Residential 4 in the central one third, which contains the Existing Mine and processing facility; Manufacturing and Research Park (MRP) in the southern one-third, which includes the South Parcel portion of the site; and Industrial at the eastern boundary of the Village (includes the mining processing area). The area along Puget Sound on the western boundary of the Village, and the area adjacent to Sequalitchew Creek on the southern boundary of the Village, are designated for open space and a community park. A Mineral Resource Overlay, also applies to most of Sequalitchew Village (excluding the open space areas) and allows mining in addition to the underlying land use designations. Mining and undeveloped land are currently the major land uses in the Sequalitchew Village area.

Old Fort Lake Business and Technology Park

The Old Fort Lake area, which consists of approximately 654 acres located south of Sequalitchew Creek, is designated for Business and Technology Park. The Home Course golf course currently occupies approximately one-third of the area, and the balance is primarily undeveloped. Designated open space is located along the Puget Sound bluffs, adjacent to Sequalitchew Creek and around Fort Lake. A number of historic sites are located in a portion of the Old Fort Lake Business and Technology Park and a portion of the adjacent Sequalitchew Village.

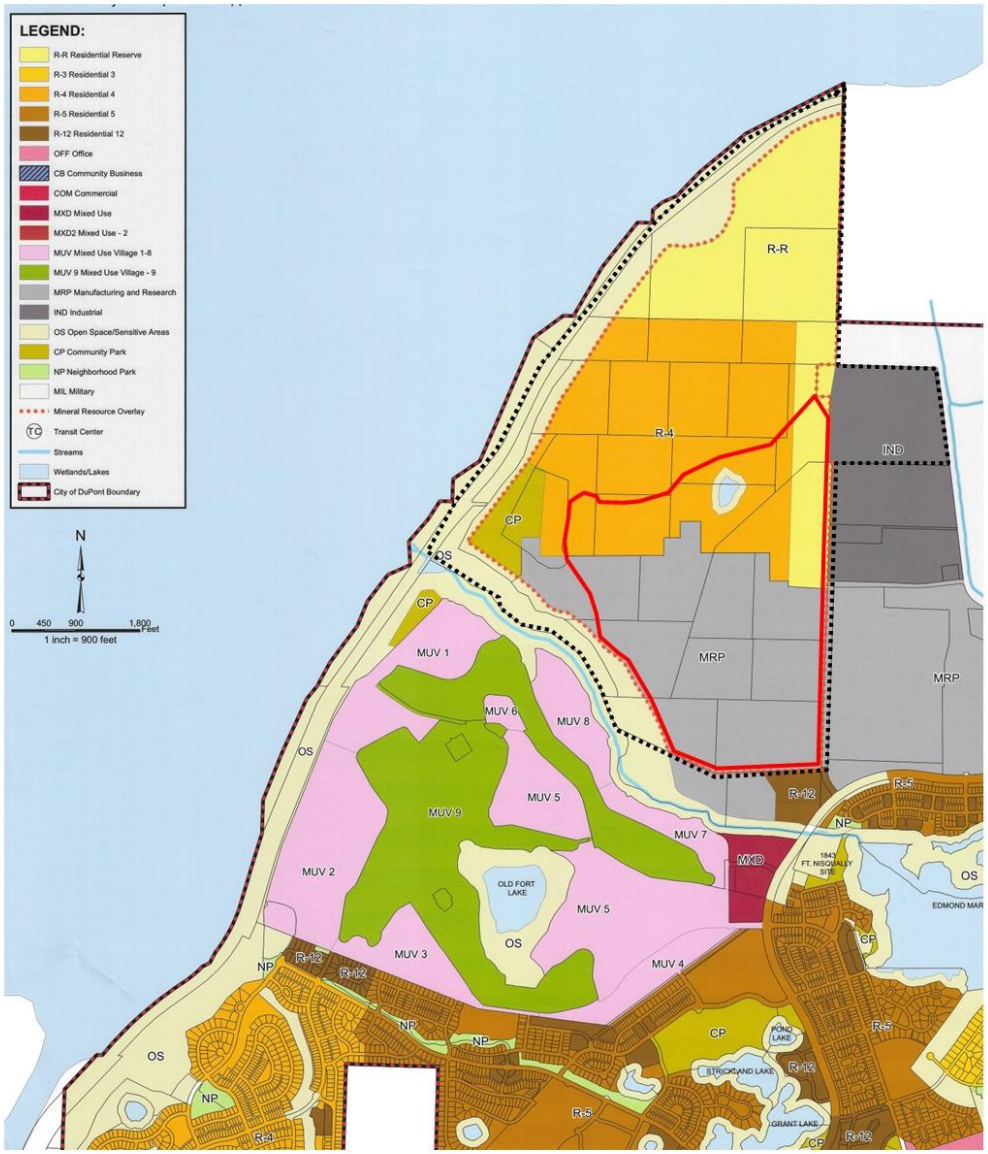


Source: City of DuPont, 2022.

EA Engineering, Science, and Technology, Inc., PBC

Figure 3.8-1

City of DuPont Comprehensive Plan Map



Source: City of DuPont 2022.

EA Engineering, Science, and Technology, Inc., PBC

Figure 3.8-2

City of DuPont Zoning Map

Civic Center and Edmonds Village

The Civic Center consists of approximately 56 acres and is located in the approximate center of the City of DuPont, on the eastern border of the Fort Lake Business and Technology Park, bisected by Center Drive. It contains City Hall and Police and Fire Department facilities, and the Historic Fort Nisqually site. The Civic Center also contains a mixed-use area and a residential area. Edmond Village, which contains approximately 54 acres, is developed for residential use, is located to the east of the Civic Center and is bounded by Center Drive on the north and Edmond Marsh on the south. Creekside Village, a multi-family residential development is located west of Center Drive and north of the Civic Center.

Manufacturing, Research Park and Industry

The northeastern portion of the City – generally between Powerline Road, Center Drive and DuPont-Steilacoom Road – consists of approximately 903 acres and designated for Manufacturing and Research Park and Industrial use. This area is planned to accommodate most of the City's employment growth. Existing larger uses include the Amazon Fulfillment Center, FedEx Distribution Center, and the Costco Logistics building and CalPortland's processing facility.

Other Neighborhoods

Commercial land uses in DuPont, including retail, office and service uses, are concentrated near the two I-5 interchanges, in the approximately 135-acre DuPont Station and the approximately 166-acre Historic Village. These areas are approximately 0.5 mile from the site.

Other neighborhoods in the City of DuPont include the approximately 390-acre Hoffman Hill Village (primarily in residential and open space use), the approximately 321-acre Yehle Park Village (primarily in residential and park use), the approximately 164-acre Palisade Village (primarily in residential use), the approximately 63-acre Bell Hill (primarily in residential use), and the approximately 18-acre El Rancho Madrona Village (primarily in residential use).

Comprehensive Plan and Zoning Designations

City of DuPont Comprehensive Plan designations for the site are illustrated in **Figure 3.8-1** and include Manufacturing and Research, Community Park, Residential 4, and Open Space. Reflective of the Comprehensive Plan designations, City of DuPont zoning designations for the site include Manufacturing and Research (MRP), Residential 4 (R-4), and Community Park (CP). See **Figure 3.8-2** for an illustration of site zoning designations.

Mineral Resource Overlay Area

The site is located within the Comprehensive Plan's designated Mineral Resource Overlay, which applies to approximately 700 acres of land in the northern portion of the City (see **Figure 3.8-1**). The Mineral Resource Overlay area is generally bordered on the north by Tatsolo Point and the City's corporate boundary; to the east by Powerline Road and JBLM; to the south by Sequalitchew Creek; and to the west by Puget Sound.

The purposes of the Mineral Resource Overlay, as stated in the DuPont Municipal Code (DMC 25.60.010), are to identify mineral resource lands of long-term commercial significance; to protect these sites from conflicting uses while resources are being extracted; to protect surrounding sites from adverse effects of mineral extraction activities; and to establish a no duplicative permit process for considering mineral extraction proposals. Mining is a permitted use within the Mineral Resource Overlay, subject to site plan review.

Current Mining Operations

CalPortland's original approximately 355-acre sand and gravel mine was permitted in 1996 and is referred to as the "Existing Mine".

In 2013 CalPortland applied for permits to allow mining of approximately 142 acres within the North Parcel; the North Parcel mining expansion was permitted in 2014.[1]

Current activities at the Pioneer Aggregates Mine include mining, processing, transport of sand and gravel, and manufacturing of concrete. The processing area is located adjacent to the mine site on a 52-acre parcel owned by Glacier Northwest ("Glacier"). Sand and gravel is removed from the mine by bull dozers and wheel loaders and transferred to the processing area by conveyor belts. At the processing facility, the material from the mine is crushed, washed, and separated into different size gradations. Aggregate products are stored in stockpiles in the processing area for distribution.

After completion of the production process, the majority (approximately 80%) of the finished aggregate products are transported from the plant area by conveyors and placed onto barges at Glacier's dock and barge-loading facility at Tatsolo Point on Puget Sound (see **Figure 2-1** in **Chapter 2**). The remainder (approximately 20%) is sold as aggregate or used to make concrete onsite; in both cases it is transported by truck.

Water used to wash gravel during processing is recycled through a clarifying process to remove silt and clay. The fine sediments are then run through a belt press to remove excess water and transported by truck and placed in holding cells in the mine where it is allowed to dry for up to three years. After drying, fines may be used to raise the floor of the mine by

[1] *Consistent with applicable provisions of the 2011 Settlement Agreement (see Section 2-3 of **Chapter 2** for detail).*

placing the material in cells separated by rock curtains to facilitate drainage. The material is placed in approximately 6-inch lifts and compacted. Once filled to the desired height with fines from the belt press in this manner, a gravel cap of not less than 10 feet is placed over the compacted fines to mitigate potential for settlement and facilitate drainage.

Historic Land Uses

The site is the location of past industrial activities, which have resulted in concentrations of heavy metals in some portions of the Expansion Area. These include the Former DuPont Works which was a commercial explosives and munitions factory that operated from 1909 to 1976. Cleanup activities were completed in 1993 and resulted in a Consent Decree with the Department of Ecology and recording of a restrictive covenant limiting future land use to industrial uses. This restriction resulted in the MRP zoning that applies to much of the Expansion Area portion of the site. This area is also located within the 1,000-square mile area affected by airborne pollution from the Asarco smelter. Affected soils would be cleaned up pursuant to Ecology's Voluntary Cleanup Program (VCP). CalPortland submitted a proposed Cleanup Action Plan (CAP) to Ecology; the agency subsequently issued an opinion letter that "no further action" would likely be necessary at the property after implementation of the CAP and described the possibility of removing the restrictive covenant after arsenic and lead concentrations in soil are reduced on the property.

Existing Land Uses

Site Land Uses

The South Parcel Project site includes areas previously undisturbed by mining deemed the Expansion Area. The 188-acre Expansion Area includes portions of the 168-acre South Parcel, the 10.8 acre kettle wetland and surrounding buffer and a 9.2-acre buffer strip between the existing mine and the south parcel property boundary. The South Parcel Project also includes a plan to mine deeper within a portion of Existing Mine, referred to as the "Re-Mine Area". The Expansion Area is located southeast of the existing mine. The Existing Mine Area and the Expansion Area are included within the Mineral Resource Overlay in the City of DuPont's adopted Comprehensive Plan. The Re-Mine Area consists of 125 acres in the southeastern portion of the Existing Mine where current mining activities are permitted above current groundwater levels. See **Table 3.8-1** for a breakdown of existing land uses on the site; also refer to **Figures 2-1** and **2-2** for an illustration of these areas.

The Re-Mine Area is primarily in previously mined and active mine areas. In general, the northern portion of the Re-mine Area is in active mining, with the central portion of the Re-mine Area in previously mined area in initial reclamation. The southwest corner of the Re-mine Area is in reclaimed area with established vegetation.

The Expansion Area is primarily in vegetation, including previously logged and replanted area on the South Parcel (including trees meeting the definition of Landmark trees (DMC 25.10.120.005) such as Oregon white oak, Douglas fir, western red cedar, Pacific madrone, and Pacific yew), unmined area associated with the Existing Mine with shrubs, and wetland and buffer area associated with the Kettle Wetland. Logging roads traverse the site.

Table 3.8-1
EXISTING SITE CONDITIONS

Land Use	Area [1] in Acres				
	Existing Conditions				
	Expansion Area			Re-Mine Area	Total
	South Parcel	Kettle Area	Buffer Strip		
Buildings	--	--	--	--	0.00
Roads, Access, and Parking	--	--	0.4	9.2	9.55
Processing Areas	--	--	0.2	17.9	18.08
Active Mining	--	--	--	--	0.00
Active Reclamation	--	--	0.2	20.5	20.62
Cleared for Mining	--	--	--	--	0.00
Water Management Ponds	--	--	--	--	0.00
Total Built Areas	**0**	**0**	**0.8**	**47.5**	**48.26**
Natural & Reclaimed Areas					
Areas Reclaimed as Forest	--	--	--	3.3	3.3
Areas Reclaimed as Grass	--	--	--	68.5	68.5
Wooded Areas	146.2	5.6	7.4	5.8	165.1
Grass Areas	21.3	--	1.0	0.21	22.5
Wetland	--	1.78	--	--	1.78
Wetland Buffer	--	3.4	--	--	3.4
Total Natural & Reclaimed Areas	**167.5**	**10.8**	**8.4**	**77.7**	**264.5**
Total	**167.5**	**10.8**	**9.2**	**125.2**	**312.7**

Source: CalPortland, 2022.

Notes: -- Indicates no area of this type.

1) Totals may not exactly equal the sum of their components due to rounding.

Site Vicinity Land Uses

The land use character of the area in the vicinity of the site is varied and contains mining, warehouse/distribution, military joint base, open space, recreation, municipal and

residential. **Figure 3.8-3** provides an aerial photograph illustrating land uses in the immediate vicinity of the site. Land uses in the vicinity of the site include:

- **To the North** – Existing Mine operation including active mining, processing facilities, and reclaimed area located to the immediate north. Joint Base Lewis McCord (JBLM) North Lewis, the JBLM Solo Point Wastewater Treatment Plant, and Solo Point recreational open space are located farther to the north and northeast.

- **To the West** - Existing Mine operation including active mining and reclaimed area to the immediate west. Puget Sound is located farther to the west.

- **To the South** – Sequalitchew Creek and associated ravine, vegetation and public trail to the immediate south. Creekside Village Apartments complex is located adjacent to the southeast corner of the site. Farther to the south, across the Sequalitchew Creek ravine, are the Sequalitchew Creek Trail Head, The Home Course golf course, and the City of DuPont Civic Center (City Hall and Police Department buildings).

- **To the East** – Powerline Road is located to the immediate east of the site. Farther to the east, across Powerline Road, are the DuPont Community Garden, and warehouse/distribution uses (including the Amazon Fulfillment Center, FedEx Distribution Center, and the Costco Logistics building).

3.8.2 Environmental Impacts

Potential land use impacts are generally described as direct, indirect or cumulative. Direct land use impacts can generally include development of undeveloped lands, conversion to more intensive uses, displacement of existing uses, conflicts between different types of uses, and changes in the character of the area. Indirect land use impacts are those that could be associated with peripheral development resulting from changes or intensification of land use at the site. Cumulative land use impacts are those that could occur as a result of the proposal in combination with other foreseeable development.

ALTERNATIVE 1 – PROPOSED ACTION

Conversion of Land Use

The Washington State Growth Management Act and the DuPont Comprehensive Plan/Mineral Resource Overlay identify conversion to mining as an appropriate interim use of the site. Reclamation of the site, consistent with a DNR approved reclamation plan, and subsequent potential redevelopment under existing zoning would follow mining under the Proposed Action.

Pioneer Aggregates South Parcel Project
Final EIS



Source: EA Engineering, 2023.

EA Engineering, Science, and Technology, Inc., PBC

Figure 3.8-3

Existing Land Uses Map

Under the Proposed Action mining activities would continue on the approximately 125-acre Re-mine Area where proposed mining would deepen a portion of the Existing Mine, and expansion of mining in the approximately 188-acre Expansion Area currently undisturbed by mining (**Table 3.8-2)** provides a summary/comparison of existing land uses of the site and site land uses under the Proposed Action.

As indicated in **Table 3.8-2**, proposed mining and reclamation activities at the site would convert approximately 188 acres of wooded, grass, wetland and wetland buffer area on the Expansion Area portion of the site to mining area that would be reclaimed subsequent to the completion of mining activities.

The existing approximately 125-acres of mining use on the Re-mine Area portion of the site would continue as mining use under the Proposed Action, with this area reclaimed after completion of mining activities (see **Table 3.8-2**).

Conversion to More Intensive Land Use

No existing uses would be displaced by proposed mining under the Proposed Action. Proposed continuation of mining activities in the Re-mine Area of the site would continue the levels of mining activity as under current activities, including levels of dust and noise, and mining in this portion of the site would not represent an increase in the intensity of land use. Mining activities on the Re-mine Area portion of the site would lower the surface elevation and mining would occur approximately 14 years longer than under the No Acton Alternative, although the levels of mining activity on this portion of the site would be similar to previous mining.

Proposed extension of mining to the currently undeveloped Expansion Area portion of the site would increase the intensity of land use. Logging, and phased clearing and mining activities in this portion of the site would increase the levels of dust and noise compared to current conditions. Mitigation measures would be employed to limit these potential impacts (see Section 3.2, **Air Quality**, and Section 3.7, **Noise**, for detail on impacts and mitigation measures).

Relationship to Surrounding Uses

As described in the Affected Environment portion of this section, The Re-mine Area portion of the site has been, or currently is, in mining activity, is not proximate to off-site land uses, and mining under the Proposed Action on this portion of the site would not be anticipated to directly impact any surrounding land uses.

Portions of the Expansion Area are proximate to surrounding sensitive uses off the site and has the potential to impact surrounding uses, including recreational and residential land uses.

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Proposed logging and phased mining activity under the Proposed Action would occur in proximity to Sequalitchew Creek ravine and trail; mining phases 1C, 1D, 2A and 2B would occur along the southern edge of the site and in proximity to the Sequalitchew Creek ravine and trail. Clearing, mining and reclamation would be phased, thus minimizing the duration of these activities at any specific area. A minimum 100-foot wide vegetated setback from the top of the ravine slope, coupled with a 20-foot high berm where the trail is not in the ravine, would be provided to limit the potential for visual, dust and noise impacts to users of the trail.

The natural buffer provided by the Sequalitchew Creek ravine, distance, proposed on-site buffer and berm, and proposed noise and air quality mitigation measures would limit the potential for direct land use impacts to uses farther to the south such as the Home Course golf course and DuPont Civic Center.

The southeast corner of the Expansion Area portion of the site is proximate to the Creekside Village apartment complex and phase clearing and mining (Phase 2C) would occur in proximity to this off-site residential use and would increase to the potential to increase levels of dust and noise in the area. Along with specific measures to limit air quality and noise impacts, the approximately 100-foot wide vegetated buffer, with a 20-foot high berm, would be provided along the southern boundary of the site and limit the potential for visual, dust and noise impacts to residents of the Creekside Village apartment complex.

Potential changes in character to the Sequalitchew Creek Ravine were also reviewed under the Proposed Action. As identified in the view simulations included in Section 3.9 (Aesthetics) of this EIS, visual changes to the South Parcel site and of the mining operation itself, would not be visible from key view locations in the site vicinity and would not itself change or provide views of the mine. In particular, as shown in **Figure** 3.9-7, vegetation in the ravine and the difference in topography between the ravine trail and the South Parcel mining site would not permit views of the mining site from the Sequalitchew Creek Ravine. As indicated in the discussion for Key Topic 4.6 (Plants & Animals) groundwater does not contribute to soil moisture under existing conditions with the exception of areas near seeps and wetlands that have a water table near the ground surface. Dewatering under the Proposed Action is not anticipated to significantly affect vegetation along the ravine of Sequalitchew Creek and the ravine would maintain its vegetated state similar to the current conditions.

TABLE 3.8-2
SITE CONDITIONS COMPARISON

Land Use	Area [1] in Acres									
	Existing Conditions					Proposed Action - Post-Reclamation				
	Expansion Area			Re-Mine Area	Total	Expansion Area			Re-Mine Area	Total
	South Parcel	Kettle Area	Buffer Strip			South Parcel	Kettle Area	Buffer Strip		
Built Areas										
Buildings	--	--	--	--	0.00	--	--	--	--	0.00
Roads, Access, and Parking	--	--	0.4	9.2	9.55	--	--	--	--	0.00
Processing Areas	--	--	0.2	17.9	18.08	--	--	--	--	0.00
Active Mining	--	--	--	--	0.00	--	--	--	--	0.00
Active Reclamation	--	--	0.2	20.5	20.62	--	--	--	--	0.00
Cleared for Mining	--	--	--	--	0.00	--	--	--	--	0.00
Water Management Ponds	--	--	--	--	0.00	--	--	--	--	0.00
Total Built Areas	**0**	**0**	**0.8**	**47.5**	**48.26**	**0**	**0**	**0.00**	**0.00**	**0.00**
Natural & Reclaimed Areas										
Areas Reclaimed as Forest	--	--	--	3.3	3.3	29.4	0.6	0.6	35.8	66.4
Areas Reclaimed as Grass	--	--	--	68.5	68.5	138.2	10.2	8.6	89.4	246.4
Wooded Areas	146.2	5.6	7.4	5.8	165.1	--	--	--	--	0.0
Grass Areas	21.3	--	1.0	0.21	22.5	--	--	--	--	0.0
Wetland	--	1.78	--	--	1.78	--	--	--	--	0.0
Wetland Buffer	--	3.4	--	--	3.4	--	--	--	--	0.0
Total Natural & Reclaimed Areas	**167.5**	**10.8**	**8.4**	**77.7**	**264.5**	**167.5**	**10.8**	**9.2**	**125.2**	**312.7**
Total	**167.5**	**10.8**	**9.2**	**125.2**	**312.7**	**167.5**	**10.8**	**9.2**	**125.2**	**312.7**

Source: CalPortland, 2022.

Notes: -- Indicates no area of this type.

2) Totals may not exactly equal the sum of their components due to rounding.

The potential for noise to affect the character of the Sequalitchew Creek Ravine and trail was also identified under the Proposed Action. As indicated in Section 3.7 (Noise) of this EIS (page 3.7-8), "Receptor location R1 (located at the ground floor of the Creekside Apartments near the upper portion of the Sequalitchew Creek Trail) provides modeled sound levels at the location closest to the Sequalitchew Creek trail. Sound levels during mining phase 2C, which is closest to the trail and to recreational users, is modeled to be within applicable noise limits and is not anticipated to result in a significant adverse impact to trail users." In addition, the trail is lower topographically than the mining site, is not within line--of--sight of mining operations, and is separated by a dense vegetated buffer. Therefore, the potential for noise associated with mining activities under the Proposed Action to affect the character and experience of users of the Sequalitchew Creek Trail is considered to be low.

On an overall basis, proposed mining under the Pioneer Aggregates South Parcel Project is not expected to indirectly affect future land uses at the site or in the surrounding area. Proposed mining activities are considered a transitional use, and any potential impacts would not prevent planned future use of the area, consistent with the underlying Comprehensive Plan and zoning designations. It is not anticipated that the Proposed Action would generate any spin-off uses in the area, such as commercial or residential uses.

CUMULATIVE IMPACTS

The change in the undeveloped nature of the site and use for mining would be consistent with the Mineral Resource Overlay Area designation, and the future land uses planned for the site under the underlying zoning (Residential and Manufacturing/Research Park). Following mining, the site would be developed for residential and employment uses.

No existing uses would be displaced. Potential impacts to surrounding land uses resulting from mining would not interfere with, preclude, or significantly conflict with existing or planned land use of the surrounding areas, and mining would not compete with or preclude other uses in the near term. Impacts from construction and operation of the mining facility – primarily dust-, visual-, and noise related impacts – could potentially affect operations of current and planned uses in the short term, JBLM as well as surrounding development. However, mitigation measures would be employed to limit these potential impacts on the surrounding area (please see Section 3.2, **Air Quality**, 3.7, **Noise**, and 3.11, **Transportation**, for detailed information concerning these mitigation measures). Mining impacts would also be temporary, and would occur some distance from and be buffered from surrounding development. As discussed in Section 3.9, **Aesthetics*,*** of this EIS, the site is not visible from most surrounding locations. Overall, impacts to land use on and immediately adjacent to the site would be transitory and relatively minor. No significant long-term impacts are anticipated.

Indirectly, mining is not expected to affect future land uses on the in the surrounding area. Mining operations are a transitional use, and any potential impacts would not interfere with

or prevent the planned future land use of the area, consistent with the underlying Comprehensive Plan and zoning designations. It is noted that industrial uses have continued to develop adjacent to the existing mining operation, so mining apparently has not been a deterrent or caused significant conflicts with planned growth. Proposed mining would not be likely to generate any spin-off uses in the area.

ALTERNATIVE 2 – NO ACTION

There are two No Action Alternatives- Scenario A Continuation of Existing Conditions; and Scenario B Site Development Under Existing Zoning.

Scenario A

Under Scenario A, mining activities associated with the Re-Mine Area of the site and the Existing Mine would continue as currently permitted. The mining operation would retain a vegetated buffer at its perimeter, and dust, noise, traffic conditions that currently exist would continue. The Existing Mine has an estimated remaining life of 6 to 10 years with mining currently limited to 10 feet above groundwater. The Expansion Area portion of the site is assumed to remain undeveloped and would continue in its vegetated condition.

Scenario B

Under Scenario B, the proposal would not occur. The site would be developed for urban uses consistent with the City's Future Land Use Map. The majority of the area affected is currently designated by the City of DuPont Comprehensive Plan as Manufacturing and Research, with a smaller area designated for residential uses. The corner of the property near Center Drive is designated as Residential 12, which would allow higher density residential development where multifamily density averages 12 units per acre. Urban development, as permitted under current planning and zoning designations, is assumed to occur east of the lease line demarcating existing mining operations. The timing and nature of any such development would be driven by market forces.

In general, development of manufacturing/research park and housing would change the land use character of the site (including the Expansion Area) from an undeveloped property to manufacturing park and suburban residential area. Construction would occur over an extended period of time and would generate impacts related to traffic, noise, dust and surface water runoff. Upon completion of construction, the traffic and public service demands typical of the manufacturing park and residential neighborhoods would occur, including increased demand on the Sequalitchew Creek Trail.

3.8.3 Mitigation Measures

No significant adverse land use impacts have been identified. However, the following mitigation measures have been identified to further reduce the potential for land use impacts associated with the proposed South Parcel Project.

Proposed Mitigation Measures

- Maintain a vegetated buffer along Powerline Road. Trees will be planted densely to establish screening during mining operations. After mining is completed, selective thinning may be necessary to facility a healthy future forest within the buffer.

- Mitigation measures identified throughout the EIS would minimize impacts to land use from mining activities, consistent with City regulations (see Section 3.1, **Earth**, Section 3.2, **Air Quality**, Section 3.6, **Noise**, and Section 3.10, **Transportation**).

3.8.4 Significant Unavoidable Adverse Impacts

The proposed Pioneer Aggregates South Parcel Project would result in an unavoidable change to the land use character of the existing landscape within the Expansion Area portion of the site. The extraction of mined material would result in a permanent change in the land use character of the site. However, the Proposed Action is not expected to result in a significant adverse impact to land uses of the surrounding community. Mining is a transitional use of the site; although mining would alter the site for a number of years, after mining is complete, the site would likely be developed to another permitted use.

3.8.5 Relationship to Plans and Policies

Washington State Growth Management Act

Summary: The Growth Management Act (GMA) was originally enacted in 1990 and contains a comprehensive framework for managing growth and coordinating land use planning activities. The GMA contains thirteen planning goals, which provide direction to cities to create local plans that express their own visions for growth but which are also consistent with the GMA goals. Cities must also adopt development regulations that implement and are consistent with their plans. Most relevant to the current proposal, jurisdictions must identify, designate and regulate resource lands of long-term commercial significance, including mineral resource lands. Development regulations must assure the conservation of identified resource lands, and that adjacent land uses will not interfere with the continued use of designated resource lands. As established by state rules, “conservation” means

measures designed to assure that resource lands will remain available to be used for commercial production (WAC 365-196-815(b)).

Discussion: The City has designated mineral resource lands on its Comprehensive Plan Land Use Map and has adopted Mineral Resource Overlay regulations, which are discussed below.

City of DuPont Comprehensive Plan

Mineral Resource Overlay

Summary: As noted above, the GMA requires that cities and counties identify, designate and adopt regulations to conserve resource lands of long-term commercial significance, including lands containing mineral resources. The intent is to ensure that designated resources remain available for commercial production. WAC 365-195-815(1)(a)-(b).

The DuPont Comprehensive Plan provides a Mineral Resource Overlay designation, which is applied to the Manufacturing/Research Park and Residential Reserve land use categories north of Center Drive and Sequalitchew Creek (LU-40), within the planned Sequalitchew Village. This area is underlain by commercially significant mineral resources. The Plan acknowledges that phased mining and reclamation may occur in the Overlay area subject to City review of a site-specific proposal.

*Discussion: The Pioneer Aggregates South Parcel Project proposal is consistent with Comprehensive Plan policies and procedures applicable to mineral resource lands. As shown on the Comprehensive Plan Land Use Map (**Figure 3.8-1**), the site is within the designated Mineral Resource Overlay area. The City will consider the site-specific mining proposal for the Pioneer Aggregates South Parcel project using its site plan review process, as set forth in the Land Use Code (DMC 25.150).*

Summary: Sequalitchew Village includes the area of the City bounded by Puget Sound to the north and west, the manufacturing research park and industrial areas to the east and Sequalitchew Creek on the south. This village is planned as a mixture of residential types and densities in the northern two-thirds of the area, and manufacturing and research park uses in the southern one-third. It is named for the creek and canyon which form its southern border. Nearly this entire village is within the mineral resource overlay boundary. Gravel extraction by Glacier Northwest is currently underway in this area and is expected to proceed over a long term. Development is not likely to begin within this area within the foreseeable future. As a result of mineral extraction, the surface elevation of this village will be many feet lower than the present height. No mining is permitted within 100 ft of the top of Sequalitchew Creek Ravine. Mining is also set back from the top of the bank along the western side of the property to preserve the bluffs overlooking Puget Sound. The Sequalitchew Creek Ravine and Puget Sound bluffs are designated open space.

Discussion: The Pioneer Aggregates South Parcel Project proposal is consistent with the DuPont Comprehensive Plan goals for Sequalitchew Village applicable to the Proposed Action. Mining under the Proposed Action would be setback further than 100 feet from the top of Sequalitchew Creek ravine and would not directly impact open space associated with Sequalitchew Creek or the Puget Sound bluffs.

City of DuPont Land Use Code

Mineral Resource Overlay (DMC 25.60)

Summary: The Mineral Resource Overlay designation in the Land Use Code is intended to implement the GMA, the Surface Mining Act (RCW 78.44), and the DuPont Comprehensive Plan. Permitted uses in the Overlay include mineral extraction, along with associated structures and equipment. The regulations state that potential impacts relating to traffic, lighting, visual screening, vegetation, noise and sensitive areas shall be examined, while recognizing that impacts to other elements of the environment, including air and water quality are within the jurisdiction of federal, state or regional agencies. Site plan approval (Type III/Hearing Examiner Process) is required for all mining proposals.

Discussion: The site is located within the designated Mineral Resource Overlay area, and mining is a permitted use. A site plan application for mining (Pioneer Aggregates South Parcel Project) was submitted to the City and was determined to be complete. The Pioneer Aggregates South Parcel Project EIS is considering potential impacts relating to traffic, lighting, visual screening, vegetation, noise and sensitive areas, as well as other issues (e.g., air and surface water/groundwater) that are within the jurisdiction of federal, state or regional agencies.

Residential Reserve Zoning District (25.20)

Summary: The underlying zoning classification for a small portion of the South Parcel is Residential Reserve. The purpose of the Residential Reserve district is to designate property not needed to meet the City's 20-year growth projections. The district applies a 5-acre minimum lot size as an interim measure, so as to provide time for further planning, evaluation and eventual redesignation when additional residential land is needed.

Discussion: As noted above, mining is a permitted use in the Mineral Resource Overlay notwithstanding the underlying zoning classification. The Residential Reserve designation indicates that the subject property was not needed to meet the 20-year growth projection. Subsequent to completion of mining activities and completion of reclamation, the site would be suitable for residential development.

3.9 AESTHETICS

This section of the FEIS describes existing aesthetics conditions on the site and in the site vicinity. Potential impacts associated with the EIS Alternatives are evaluated and mitigation measures are identified. This section is based on the *Visual Impact Analysis* (December 2022) prepared by ESA with peer review by EA Engineering (see **Appendix L**). Information added or changed subsequent to issuance of the Draft EIS, if any, is shaded to ease identification of the added or changed information.

3.9.1 Methodology and Viewpoints

Methodology

The visual impact methodology employed for this EIS is intended to document the nature of the existing landscape, and to identify impacts to visual resources that would result from alteration of the landscape from proposed mining and reclamation. The assessment relies on the preparation of computer-based visual simulations of the landscape that would result from mining of the Expansion Area. Simulations are a generally accepted means to evaluate the nature of proposed visual change.

A number of key viewpoints were identified from a variety of locations around the site. The selected viewpoints are intended to be representative of viewpoints where public views toward the site are available, and to illustrate the potential for significant visual impacts to the public from the Proposed Action (see discussion of *Key Viewpoint Selection below)*. At each of these locations, existing conditions were photographed, and these photographs are used as a basis of comparison against simulated conditions at the same viewpoints.

The visual impact assessment is based on a combination of identifying potential for public views, evaluating existing visual quality, identifying viewer sensitivities, and evaluating degree of visual change resulting from a proposed project. For this analysis, levels of visual quality and viewer sensitivity are estimated based on criteria that establish ratings of "high," "medium," and "low." Visual change is qualitatively evaluated based on the visual simulations. By qualitatively combining rankings of visual quality, visual sensitivity, and the direct visual change identified in the simulations, an overall determination can then be made regarding the potential impact on a given viewpoint. For example, mining-related actions at a particular viewpoint may show a high level of impact in the simulations, but when combined with a low visual quality and sensitivity ranking, would be considered to have little overall impact to visual quality in that area.

Visual quality for this analysis is evaluated using the following criteria:

- **Low**: Landscape is common to the region and exhibits few, if any, memorable features, or patterns that provide visual diversity. A prevalence of encroaching human elements or landscape modifications exists, which do not compatibly blend with the natural surroundings. Human alterations exhibit low maintenance, design quality, or siting sensitivity.

- **Medium or Moderate**: Landscape exhibits generally attractive natural and man-made features/patterns, although they are not visually distinctive or unusual within the region. The landscape integrity of the area provides some positive visual experiences such as natural open space with some existing disturbance or well-maintained development.

- **High**: Landscape exhibits distinctive and memorable visual features and patterns that are largely intact and undisturbed – usually a rural or open space setting. Development or visual disturbances, if present, are well planned to integrate with natural landscape materials or character.

Viewer sensitivity is considered dependent on viewer types and exposure to a proposed activity, number of viewers, availability of views to the proposed activity, view orientation and duration, and viewer expectation. Levels of viewer sensitivity are evaluated by the following criteria:

- **Low**: Viewer types represent viewers of low visual sensitivity including workers who are involved in their work and not focused on the landscape. Viewer numbers and view duration are low. Viewers have low expectations of experiencing high quality views and are not typically in search of a quality visual experience. Views are often screened or limited.

- **Medium or Moderate**: Viewer types represent viewers of medium visual sensitivity including recreationists and passing motorists. Viewer numbers and view duration are moderate in scope. Viewers have only a moderate expectation of experiencing high quality views and may or may not be engaged with the passing visual experience.

- **High**: Viewer types represent viewers of high visual sensitivity including tourists and homeowners. Viewer numbers and view duration are high, with views oriented towards a specific landscape or vista. Viewers have every expectation of experiencing high quality views and are often in search of a quality visual experience. Views are often wide and sweeping, or from a superior vantage point.

(See **Appendix L** to his FEIS for detail on visual analysis methodology.)

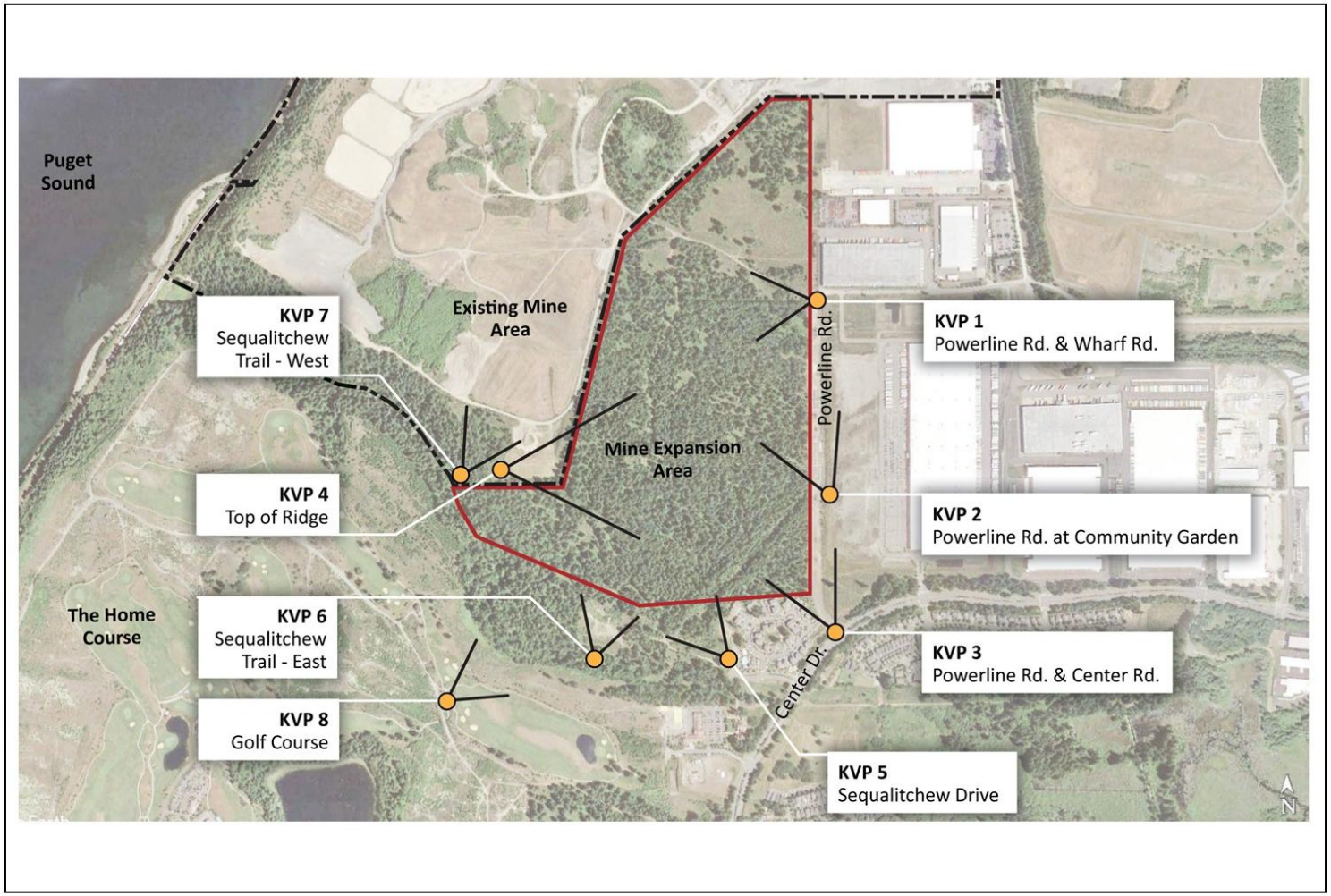
Viewpoint Selection

Due to existing topography and vegetation, there are very few locations outside the site from which existing operations are now visible or would be visible in the future. Natural topographic relief in the area is minimal, outside the Sequalitchew Creek Canyon, which is a relatively deep ravine. Although views into the site from the vicinity is minimal, proposed mining operations would remove some of the existing vegetation, which would affect some off-site views.

A viewshed analysis using Google Earth (2022) demonstrated that there are no surrounding areas of higher ground that afford views of the site. Aerial photos show that current mining operations have maintained vegetated buffers along the west and south sides of the mine. As a result, there are no views into the site from Puget Sound or the Sequalitchew Creek canyon. Views into the site from the north are only available from the existing mine. There are no public viewpoints of the site to the west, due to the presence of the vegetated bluff at the west perimeter of the mine along Puget Sound. No public viewpoints are available from the northwest; the only views are from the mining access road and the abandoned Fort Lewis landfill. Therefore, the viewpoints chosen for simulations are limited to locations to the south and east of the site.

Key Viewpoints (KVPs) were selected to illustrate the greatest or "worst case" potential for visual impact to the public from the Proposed Action. Visual simulations were developed from the four KVPs around the proposed mine site where a view to the proposed mining activity is available (KVPs 1, 2, 3 and 4), as identified in **Figure 3.9-1**. A summary description and selection criteria for these four KVPs is provided in **Table 3.9-1**. These viewpoints were chosen to provide representative depictions of the future landscape that would best illustrate proposed project changes from a variety of viewpoints. To the degree possible, "sensitive" viewpoints were selected from locations accessible to the public; these were believed to potentially impact the greatest number of people.

The four other viewpoints (KVPs 5, 6, 7 and 8) were considered but simulations were not considered necessary because the site is blocked from view by vegetation and/or topography and would remain so during and after proposed mining at the site (both Re-mine Area and Expansion Area portion of the site). This included a view at the west end of Sequalitchew Drive (KVP 5); a public road that is expected to be eventually extended but currently serves as an access point to a public trailhead; a typical view looking northwest towards the site along Sequalitchew Trail (KVP 6); and a view from a semi-public viewpoint – The Home Course golf course south of Sequalitchew Creek (KVP 7). For these viewpoints, photos are included showing the approximate location of the site beyond the vegetation and topography that obstructs views of the site (see **Appendix L** for additional detail on selected viewpoints).



Source: ESA, 2022.

EA Engineering, Science, and Technology, Inc., PBC

Figure 3.9-1

Key View Point Location Map

Table 3.9-1
SUMMARY DESCRIPTION OF SIMULATION KEY VIEWPOINTS (KVPS)

Key Viewpoint Description	Location and Viewers	Selection Rationale
1: Powerline Rd. at Wharf Rd. This viewpoint lies along Powerline Road at the point where there is a 90-degree bend in the road. The camera angle is looking in a westerly direction, down into the basin of the new creek bed.	Private Road: Vehicle passengers	Wharf Road is used primarily by trucks turning around for the adjacent warehouses, but Wharf Road is open to the public. Pedestrians and cyclists using Powerline Road can access this intersection. Views of vegetation along this road would be heavily affected.
2. Powerline Rd. at Community Garden. This viewpoint lies on the east side of Powerline Road near the south entrance to the community Garden. The camera angle is looking in a northwesterly direction.	Private Road: Garden users, cyclists, pedestrians.	Community garden users can drive to the community garden on Powerline Road. Pedestrians and cyclists also use Powerline Road.
3: Powerline Rd./Center Dr. This viewpoint lies on the northwest side of the intersection of Powerline Road and Center Drive. The camera angle is looking in a northwesterly direction.	Public: Vehicle passengers, DuPont residents	This represents a key public viewpoint. The public traveling along Center Drive can look into the site along the proposed access road and have a glimpse of the site alteration that is taking place. The view would be affected by removal of existing vegetation as part of mining operations...
4: Top of Ridge This viewpoint sits on top of the ridge between the active mining site and Sequalitchew Creek, at the southwest edge of the Expansion Area. The camera angle is looking in east northeast direction, giving an overview of the mine site after mining and restoration are complete.	Private: CalPortland employees	This viewpoint models a view that is located on the privately-owned site and is not available to the public. There currently is no public road or trail providing access to this spot. An observer must climb from the existing mine road up a small brush-covered knoll to reach it. Although not public, the viewpoint offers an extensive view of the project from above, which is intended to help the reader understand the character of the project landscape after reclamation.
Key Viewpoints considered but not simulated		
5: Sequalitchew Drive. This viewpoint lies at the current west end of this road, where public trail users frequently park. The camera angle is looking in a northwesterly direction.	Public: Trail users	This viewpoint shows where the project site stands in relation to this popular public trailhead along Sequalitchew Creek. Vegetation and topography block views of the project site.
6: Sequalitchew Trail - East This viewpoint lies on the public trail leading down to the Sound. The camera angle is looking in a northerly direction.	Public: Trail users	This viewpoint shows where the project site stands in relation to this popular public trail along Sequalitchew Creek. Vegetation and topography along Sequalitchew Creek block views of the project site.
7: Sequalitchew Trail - West This viewpoint lies on the public trail leading down to the Sound. The camera angle is looking in a northwesterly direction.	Public: Trail users	This viewpoint shows the lower portion of Sequalitchew Creek Trail at approximately the closest point on the trail to the project site. Because the site is directly uphill from this location, the view is not facing the site but shows the slope along the trail's north side. Vegetation and topography along Sequalitchew Creek block views of the project site and would not be affected.
8: The Home Course (Golf Course). This viewpoint lies near the edge of the golf course, near the edge of the Sequalitchew Creek ravine. The camera angle is looking in a northerly direction, toward Sequalitchew Creek and the project site.	Semi-Private: Golfers/Recreationists	This viewpoint shows where the project site stands in relation to the golf course. Vegetation within the golf course and along Sequalitchew Creek block views of the project site.

Source: ESA 2023.

3.9.2 Affected Environment



The visual character of the site is varied. The Expansion Area portion of the site includes a mixture of open grassland and mature, open prairie forest dominated primarily by Douglas fir. This forest cover varies in density throughout the Expansion Area, typical for a south Puget Sound prairie landscape, but is comparatively dense on the eastern edge, along Powerline Road and Center Drive. The Re-mine Area portion of the site is primarily disturbed by previous mining activity, with some undisturbed natural area. Forested evergreen buffers provides a measure of visual opaqueness to the site, such that passersby currently cannot view the existing mining operations.

As noted previously, due to existing topography and vegetation, there are few locations where the public can view the site, and there are no views to the site from Puget Sound or Sequalitchew Creek ravine.

Existing Conditions at Viewpoints

KVP 1 – Powerline Road at Wharf Road



KVP 1 is located at the centerline of Powerline Road, immediately south of the right-angle bend, looking directly westward into the future mining Expansion Area. The gravel road on the right-hand side of the photo is an active service road for the existing mining operations. These operations are currently screened by existing mature vegetation that is typical of south Puget Sound prairie forests. The dense forest seen on the left side of the photo is typical of the dense buffer of Douglas fir that is found along the west side of Powerline Road from KVP 1 south to Center Drive.

The visual quality is judged to be moderate. No extended views are present. Existing vegetation is a mixture of disturbed and undisturbed vegetation. Some visual clutter is present, such as fences and gates.

Viewers are expected to be of a low sensitivity, including the occasional local motorist, bicyclist, or pedestrian. The landscape is common to the region and a prevalence of encroaching human elements or landscape modifications exist, which do not compatibly blend with the natural surroundings

KVP 2 – Powerline Road at Community Garden

KVP 2 is located on Powerline Road at the existing Dupont Community Garden between Wharf Road and Center Drive, looking northwest towards the site. Paved roadway, gravel shoulder, Community Garden entrance, and forest area are visible in the foreground. Existing overhead wires and transmission line poles are visible in the background. The visual quality is judged to be moderate. No extended views are present. Existing vegetation is a mixture of disturbed and undisturbed vegetation. Some visual clutter is present, such as fences, gates, and signage. The east side of Powerline Road is dominated by large transmission line poles and overhead wires.

Viewers are expected to be of a low to moderate sensitivity and be more numerous than for KVP 1. Viewers include the community garden users, and the occasional local motorist, bicyclist, or pedestrian, and City staff accessing a plant nursery. The landscape is common to the region and a prevalence of encroaching human elements or landscape modifications exist, which do not compatibly blend with the natural surroundings.

KVP 3 – Powerline Road and Center Drive



KVP 3 is located on the berm on the east side of Center Drive (facing directly toward the Expansion Area portion of the site), directly in line with the centerline of Powerline Road as it intersects Center Drive. The existing power transmission towers following Powerline Road are clearly visible in the middle-ground of the photo. The dense forest of mature Douglas fir in the background is typical of the forest buffer along the eastern border of the Expansion Area portion of the site. It is a continuation of the forest seen in the left-hand side of the photo seen in KVP 2 Existing. This forest continues with similar density to the west. The density of the forest in the far-left hand side of the photo continues west along the existing Sequalitchew Creek to Puget Sound.

The visual quality is judged to be moderate. The view is a mixture of mature second-growth forest in the background contrasting with a developed arterial collector road in the foreground, the Creekside Village Apartments on the left side of the view, and a high-tension power transmission line in the middle-ground.

Viewers are expected to be of medium sensitivity, including workers or residents of DuPont, as well as visiting recreationists driving along Center Drive.

KVP 4 – Top of Ridge



KVP 4 is located on a high point on the ridge between the Sequalitchew Creek canyon and the existing mine area. The viewpoint is on the Existing Mine site, in an isolated, inaccessible location, requiring a hike through unmarked forest, and members of the public would not typically see this view[1]. The grassy field in the foreground consists of reclaimed area from the existing mining operations that was re-contoured and hydroseeded.

Visual quality is classified as medium, with sweeping open views of the landscape and mature forests in the background. The middle ground view is dominated by the newly reclaimed mine area, showing evidence of recent vegetation growth.

Viewer sensitivity was not classified, as this view is on private property where public access is prohibited by safety regulations enforced by the Mine Safety and Health Administration (MSHA).and would remain inaccessible until mine reclamation is complete.

KVP 5 – Sequalitchew Drive



KVP 5 is located on the west end of Sequalitchew Drive, looking in a northwesterly direction towards the Expansion Area portion of the site. Sequalitchew public trail users frequently park near this location. The photo shows the gravel trail entrance with residential structures in the background. The existing vegetation is comprised of evergreen native conifers and invasive scotch broom, which has overtaken the understory and open areas along the trail. The foreground includes a wooden fence, sign and concrete slab with wooden bollards indicating the entrance to Sequalitchew public trail.

[1] *The viewpoint was selected as one of the simulation viewpoints because it gives an unobstructed view of the Expansion Area mining area.*

KVP 6 – Sequalitchew Trail - East



KVP 6 is located on the center of the existing historic railroad bed to the southwest of the Expansion Area portion of the site. The photo shows the density of existing vegetation in the creek canyon, which obscures any clear view of the steep canyon walls. Viewers would be expected to be of high sensitivity, principally hikers, and other recreationists using the proposed trail system based on the existing old narrow gauge railway path. Visual quality is judged to be high, with a view of a mature second-growth forest surrounding the viewer.

KVP 7 – Sequalitchew Trail - West



KVP 7 is located on the lower portion of Sequalitchew Creek Trail at approximately the closest point on the trail to the project site. The site is directly uphill from this location, so the view is not facing the site but shows the slope along the trail's north side on the right-hand side of the photo. Existing vegetation and topography along Sequalitchew Creek currently block views of the site. Viewers are expected to be of high sensitivity, principally hikers and other recreationists. Visual quality is judged to be high, with an unbroken view of the forest and Sequalitchew Creek Trail

KVP 8 – The Home Course



KVP 8 is located on the top of a high knoll at the north side of the Home Course, a privately owned golf course immediately south of Sequalitchew Creek. This knoll is the highest point of land along the north side of the golf course. The tree line marks the top of the slope leading into the canyon. Viewers are expected to be of high sensitivity, principally users of the golf course. Visual quality is judged to be high, with an unbroken view of an attractive mature second growth forest viewed across an open grassy meadow.

3.9.3 Impacts of the Alternatives

This section identifies and analyzes impacts to existing aesthetic character and views associated with the EIS Alternatives.

Introduction

Visual simulation of conditions under the proposed Pioneer Aggregates South Parcel Project requires depiction of vegetation removal and changes in topography, as well as revegetation of the landscape at a future point in time (see **Appendix L** for detail on visual simulation methodology). For the purposes of this analysis, simulations were prepared at three future points in time, referred to as Year X, *Year X+* and Year Y. Where the proposed mining is not visible behind trees or another obstruction, the mine/portion of mine is shown with hatching, brackets, or another method (see KVP 5, KVP 6, KVP 7 and KVP 8).

For KVP 1, 2 and 3, Year X simulates the view when the visual impact of the project would be the greatest. This is expected to occur in approximately two years from the beginning of mining). At KVP 2, an additional simulation, Year X+ simulates the view approximately five years after the trees along Powerline Road have been planted, establishing a dense conifer screening that is expected to reach heights between eight and twelve feet by Year X+. *For all KVPs,* Year Y is chosen to depict conditions ten years after the end of mining, when revegetation of the site is well established. Mining of the South Parcel is assumed to take approximately 14 years. Therefore, Year Y would be approximately 24 years after project inception. By that time, it is assumed that the temporary power lines along the east perimeter of the Expansion Area portion of the site would be removed and woody vegetation such as trees and shrubs would be established on the slopes.

Year X and Year Y simulations were prepared for KVP 1, 2, and 3. KVP 4 is from a location where the public would not be permitted to be present, so a simulation was only prepared for the Year Y condition.

ALTERNATIVE 1 – PROPOSED ACTION

As indicated in **Chapter 2** of this FEIS, the Proposed Action includes horizontal expansion of mining on approximately 188 acres of undisturbed forested area (Expansion Area) and vertical expansion on approximately 125 acres of mostly disturbed area where re-mining would deepen a portion of the existing mine (Re-Mine Area). Prior to initiation of mining operations, logging and clearing of existing vegetation on the majority of the Expansion Area portion of the site and on a portion of the Re-mine Area portion of the site, which would change the existing aesthetic character of the site. As proposed mining progresses, completed mine phases would be reclaimed, including regrading and revegetation.

Changes in the aesthetic character of the site under the Proposed Action are anticipated to occur incrementally over an approximately 14-year period.

As indicated earlier, a number of key viewpoints (KVPs) were selected to illustrate the potential for visual impact to the public. Visual simulations were developed for the four KVPs where a view to proposed mining would be visible. For KVPs where no view to

proposed mining would be available, the intervening vegetation and/or topography is illustrated.

KVP 1 – Powerline Road at Wharf Road

Figure 3.9-2 illustrates the existing view and proposed Year X and Y conditions from KVP 1. The deep excavation resulting from new mining operations of the Proposed Action would eliminate the mature trees that screen the existing mining operations from/and along Powerline Road. The beginnings of reforestation efforts are visible in the Year X simulation, which would eventually allow new trees to grow up and screen the views again. However, it would take five to seven years to develop a full screen and longer for a more mature forest to develop. While visual change is evident, the Proposed Action would not have a significant adverse visual impact at KVP 1. This is due to the lack of sensitive viewers and the relative rapidity with which the landscape is expected to recover. Most of the unobstructed view from the road is expected to be screened within a five-year period due to vegetation regrowth.

KVP 2 – Powerline Road at Community Garden

Figure 3.9-3 illustrates the existing view and proposed Year X, X+ and Y conditions from KVP 2. Evergreen trees will be planted along the property line adjacent to Powerline Road; estimated to be planted in fall/winter of 2022/2023, depending on weather conditions and the availability of trees. Prior to the beginning of proposed mining the existing chain link fence would be moved to the property line.

Shrubby vegetation and large evergreen trees currently block views of the site. That vegetation would be removed at the beginning of mining at the Expansion Area portion of the site. An access road would parallel the east property line and would have temporary overhead power lines to power dewatering wells. Removal of the second growth conifers and groundcover would contrast sharply with current conditions and would temporarily open up views of the Expansion Area, an industrial use that is currently not visible from this location. Overhead lines would add an element of visual clutter. Given the sensitivity of viewers, this is considered a moderate impact on visual quality; the impact would be mitigated by the evergreen screening that would limit the duration of this impact.
In Year X, the site would be partially screened by densely planted evergreens along the fence line. By Year X+, the trees are expected to grow to approximately 8 to 12 feet in height. By Year Y, mining would be complete along this section. The power poles used for dewatering shown in Year X and Year X+ would be removed. Additionally, the fence along the perimeter would be removed in Year Y. The trees may be thinned as required for overall health.

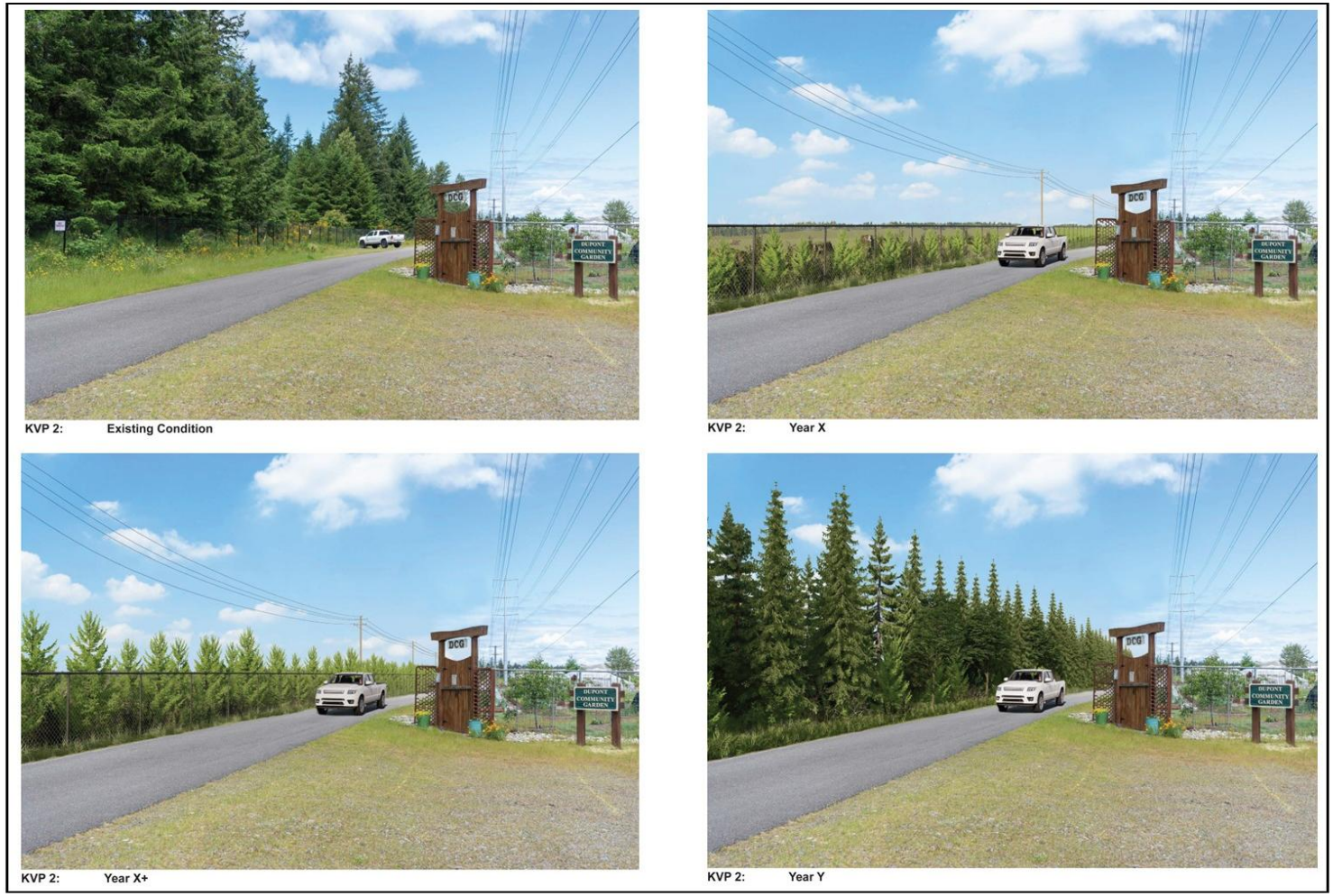


Source: ESA, 2022.

EA Engineering, Science, and Technology, Inc., PBC

Figure 3.9-2

Key View Point Location 1



Source: ESA, 2022.

EA Engineering, Science, and Technology, Inc., PBC

Figure 3.9-3

Key View Point Location 2

KVP 3 – Powerline Road and Center Road

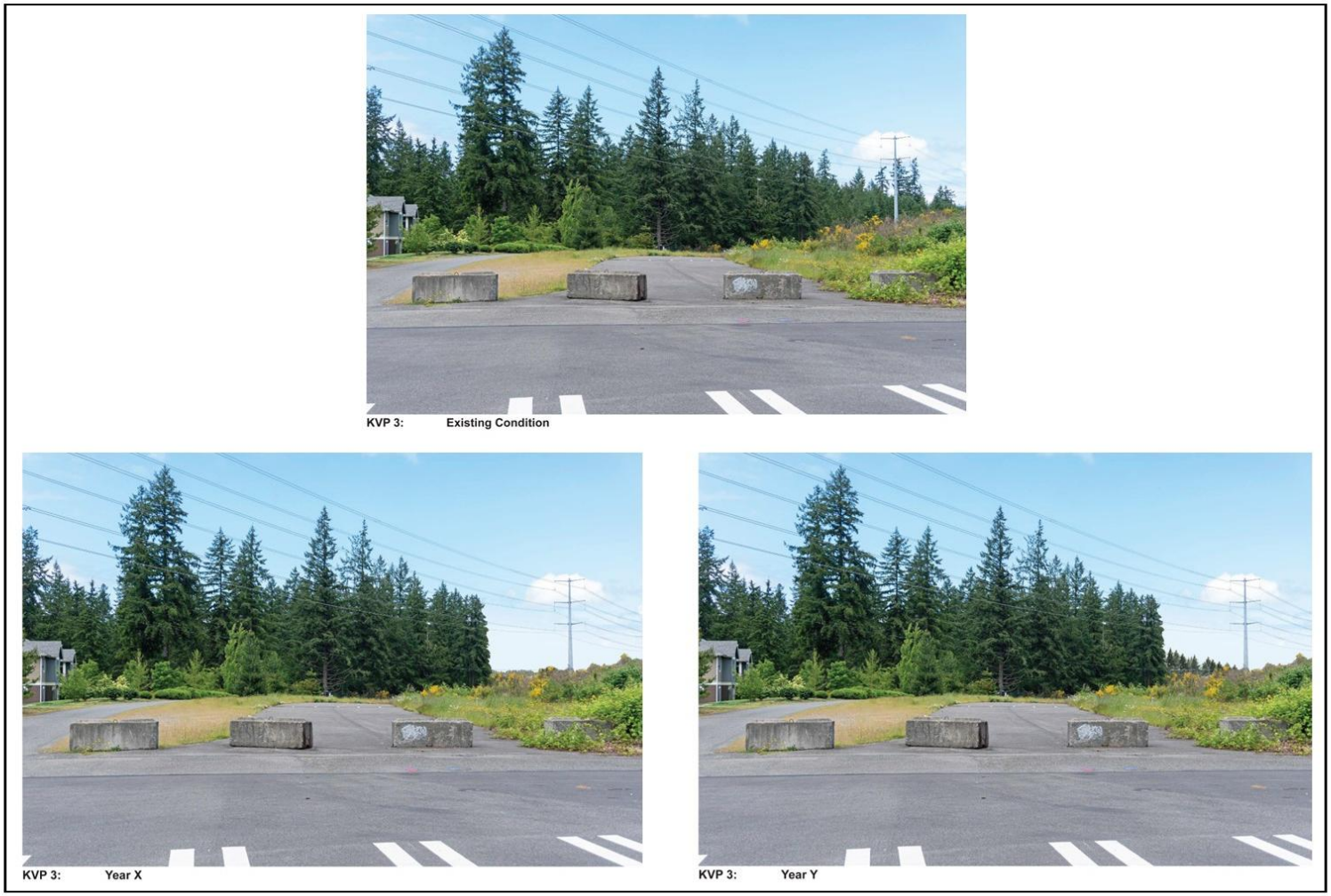
Figure 3.9-4 illustrates the existing view and proposed X and Y years from KVP 3. As shown in the simulation of KVP 3 at Year X, the cut through the forest would be clearly visible on the right-hand side closest to the power pole. The simulation demonstrates that the mining operation would not be visible from KVP 3. This is due to the grading, which would cause the land to fall away quickly from the viewer. Additionally, a 20-foot-high berm planted with trees and other native landscape vegetation would be placed in this area to shield residents in Creekside Village Apartments from potential visual and auditory impacts resulting from mining activities in the Expansion Area. The proposed Project is not anticipated to have a significant adverse visual impact at this KVP due to a low degree of visual change combined with the moderate existing visual quality and viewer sensitivity. The trees, which are cleared at Year X, would show regrowth by Year Y, although it would take many more years beyond Year Y before the trees would reach the same height as existing trees.

KVP 4 – Top of Ridge

Figure 3.9-5 illustrates the existing view and proposed Year Y from KVP 4. The scene in the Year Y simulation depicts the interior of the proposed mine following the completion of mining activity and restoration. In the foreground, the ground plane is relatively level with only minor variations in terrain. In the background, plateau benches step up towards the south end of the site to anticipate and facilitate future development. All side slopes are shown with dense tree plantings whereas the floor of the mine is relatively open having only been hydroseeded with native ground cover. Along the distant horizon, the screening vegetation effectively obstructs Powerline Road beyond. Although the visual environment has been altered in this viewpoint, the impact is not judged to be significant. This is due to the inaccessibility of the viewpoint and total absence of sensitive viewers on the west and south sides of both the existing and proposed mining sites.

KVP 5 – Sequalitchew Drive

Figure 3.9-6 illustrates the existing view and future view from KVP 5. As shown, the proposed mining area would be screened by existing vegetation. Vegetation and topography block views of the project site, which is generally indicated by the shaded band. All trees visible from this viewpoint are off-site and would not be affected. This view has not been simulated as the visible trees are privately owned. Viewers would be expected to be of high sensitivity, principally hikers and other recreationists using the trail system. Visual quality is judged to be high because this is an established hiking trail.



Source: ESA, 2022.

EA Engineering, Science, and Technology, Inc., PBC

Figure 3.9-4

Key View Point Location 3



KVP 4: Existing Condition



KVP 4: Year Y

Source: ESA, 2022.

EA Engineering, Science, and Technology, Inc., PBC

Figure 3.9-5

Key View Point Location 4



KVP 5: Existing Condition



KVP 5: Proposed Action

Source: ESA, 2022.

EA Engineering, Science, and Technology, Inc., PBC

Figure 3.9-6

Key View Point Location 5

KVP 6 – Sequalitchew Trail - East

Figure 3.9-7 illustrates the existing view and future view from KVP 6. All trees are located offsite and would not be affected by proposed mining, therefore no change to visual quality would occur as a result of proposed mining. Sequalitchew Creek is below the trail to the left and the viewer is surrounded by undisturbed vegetation.

KVP 7 – Sequalitchew Trail - West

Figure 3.9-8 illustrates the existing view and future view from KVP 7. As shown, the proposed mining area would be screened by existing topography and vegetation. The site is directly uphill from this location and is not visible; the view provided shows the slope along the trail's north side (right-hand side of **Figure 3.9-8**). Vegetation and topography along Sequalitchew Creek block views of the project site and would not be affected. All disturbance associated with proposed mining would be outside of Sequalitchew Creek ravine and set back a minimum of 100 feet from the top of the slope associated with Sequalitchew Creek. All trees are offsite and would not be affected under the Proposed Action. Visual quality would not change as a result of the proposed mining.

KVP 8 – The Home Course

Figure 3.9-9 illustrates the existing view and future view from KVP 8. As shown, the proposed mining area would be screened by existing topography and vegetation. All trees visible from this viewpoint are off-site and would not be affected. Similarly, viewer sensitivity and visual quality would not be affected.

CUMULATIVE IMPACTS

Cumulative impacts to views could, hypothetically, occur due to clearing that has taken place on the Existing Mine together with proposed mining under the Proposed Action. From viewpoints around the site, including KVPs 1, 2, and 3, however, there are no views of the Existing Mine. When clearing of the site occurs as part of the Proposed Action, views of the Existing Mine would be temporarily opened up. The screening that is proposed for the Proposed Action along the east perimeter would screen these views after the plantings reach a height of six feet or greater which is expected to occur by *Year X+ or sooner.* Views from KVP 5, 6, 7, and 8 would not be affected by clearing of the Expansion Area portion of the site given that screening trees from these viewpoints are located offsite. As such, cumulative impacts would be limited to the first few years prior to Year X. No other cumulative view impacts are anticipated.



Source: ESA, 2022.

EA Engineering, Science, and Technology, Inc., PBC

Figure 3.9-7

Key View Point Location 6



Source: ESA, 2022.

EA Engineering, Science, and Technology, Inc., PBC

Figure 3.9-8
Key View Point Location 7



KVP 8: Existing Condition



KVP 8: Proposed Action

Source: ESA, 2022.

EA Engineering, Science, and Technology, Inc., PBC

Figure 3.9-9

Key View Point Location 8

ALTERNATIVE 2 – NO ACTION

There are two No Action Alternatives- Scenario A Continuation of Existing Conditions and Scenario B Site Development Under Existing Zoning.

Scenario A

Under Scenario A, mining activities associated with the Re-Mine Area of the site and the Existing Mine would continue as currently permitted. The mining operation would retain a vegetated buffer at its perimeter with no lighting, and the interior of the mine would likely not be seen from existing public places. The Existing Mine has an estimated remaining life of 6 to 10 years with mining currently limited to 10 feet above groundwater. The Expansion Area portion of the site is assumed to remain undeveloped and would continue in its vegetated condition.

Scenario B

Under Scenario B, the proposal would not occur. The site would be developed in urban uses consistent with the City's Future Land Use Map. The majority of the area affected is currently designated by the City of DuPont Comprehensive Plan as Manufacturing and Research, with a smaller area designated for residential uses. The corner of the property near Center Drive is designated as Residential 12, which would allow higher density residential development where multifamily density averages 12 units per acre. Urban development, as permitted under current planning and zoning designations, is assumed to occur east of the lease line demarcating existing mining operations. The timing and nature of any such development would be driven by market forces.

In general, future structures would rise above the ground level and would likely be more visible within the surrounding landscape than under the Proposed Action. Light and glare from buildings, the street, and security lighting would extend these effects into the nighttime hours. Future development would draw a greater number of daily users and viewers into the site than currently have access to it, both physically and visually. The degree of visual change outside of the site could be similar to or greater than under the Proposed Action, depending on buffer vegetation and the visual intensity and bulk of structures.

3.9.3 Mitigation Measures

The following mitigation measure have been included in the Proposed Action to reduce aesthetics impacts.

Proposed Mitigation Measures

- A vegetated buffer would be maintained along Powerline Road. Trees would be planted densely to establish screening during mining operations. After mining is completed, selective thinning may be necessary to facility a healthy future forest within the buffer.

- As mining progresses, completed mine segments would be reclaimed to a vegetated condition. The reclamation plan would be reviewed by the Washington State Department of Natural Resources ("DNR") for consistency with the Surface Mining Act (RCW 78.44). In general, reclamation would consist of regrading, replacement of topsoil, and revegetation.

3.9.4 Significant Unavoidable Adverse Impacts

The Proposed Action would result in an unavoidable change to the visual character of the Expansion Area portion of the site. The extraction of mined material would result in a permeant change in the visual character of the site. However, the Proposed Action is not expected to result in a significant adverse impact to the visual environment of the surrounding community. The mining operation is expected to be only minimally visible to the general public from outside of the property boundary. In addition, mining is a transitional use of the site; although mining would alter the site for a number of years, after mining is complete, the site would be reclaimed and ultimately it would be available for development to another permitted use.

3.10 CULTURAL RESOURCES

This section of the FEIS describes existing cultural resources conditions on the site and in the site vicinity. Potential impacts associated with the EIS Alternatives are evaluated and mitigation measures are identified. This section is based on the updated *Cultural Resources Analysis* (May 2025) prepared by Historical Research Associates (HRA) with peer review conducted by Cultural Resource Consultants (). HRA's 2025 study has been submitted to DAHP and is considered confidential. Information added or changed subsequent to the Draft EIS is shaded to ease identification of any added or changed information.

3.10.1 Affected Environment

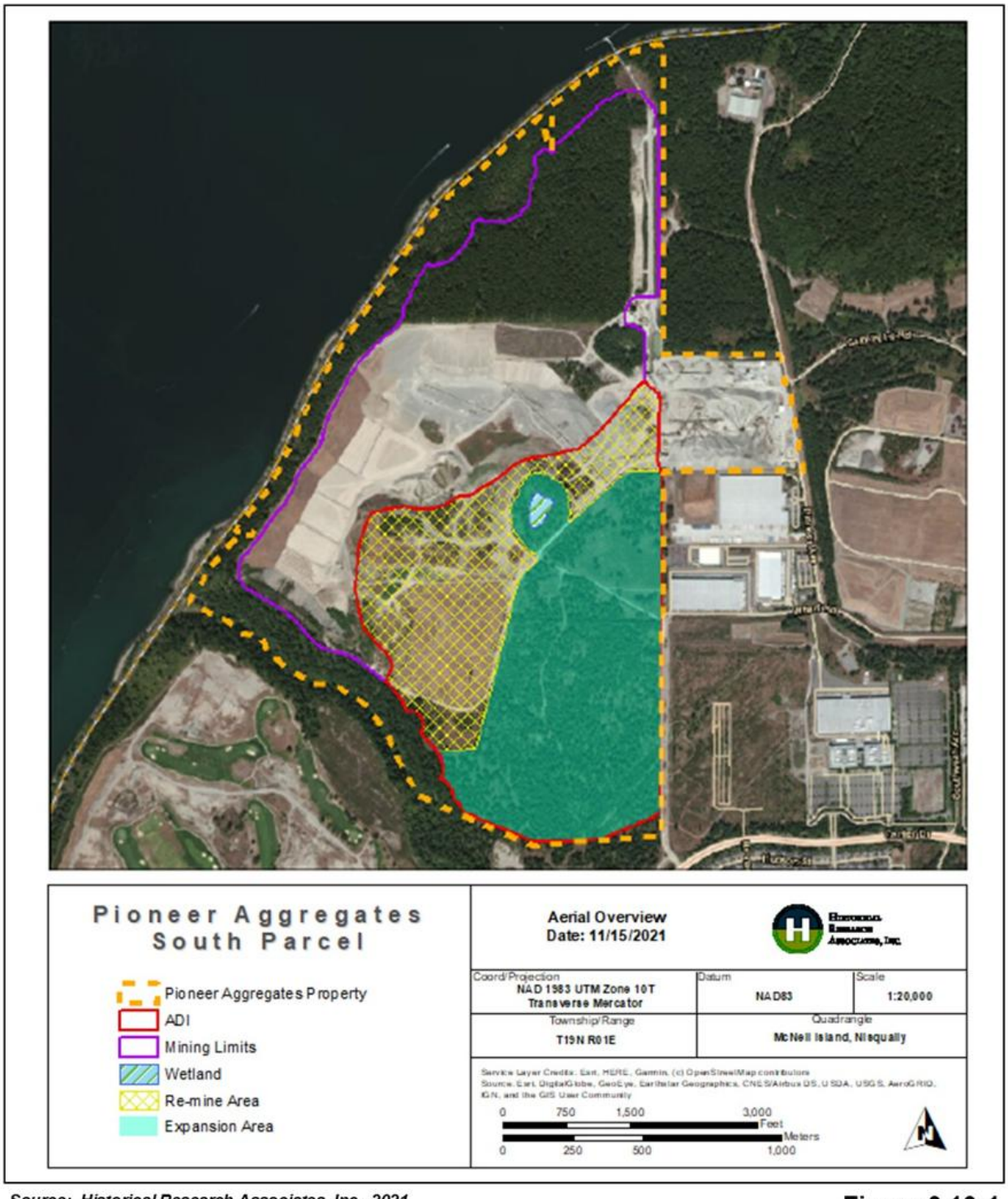
Methodology

Background research was conducted as part of the Cultural Resources Analysis for information pertaining to a search radius of 1 mile (mi) from the Area of Direct Impacts (ADI); the study area, which is shown graphically in HRA's 2025 study, was expanded substantially from that used in the Draft EIS to reflect comments on the Draft EIS. The ADI, which is shown in **Figure 3.10-1**, encompasses approximately 313 acres of land north of Sequalitchew Creek. Mining related activities would not occur outside of the ADI and there is a large enough amount of data within the radius to provide adequate background information. An updated review of the Washington Information System for Archaeological and Architectural Records Data (WISAARD) -- which is maintained by the Washington Department of Archaeology and Historic Preservation (DAHP) for archaeological site records, cultural resources survey reports, historic register information, and cemetery records – was completed. Historic plats and maps dating from 1854 to 1960, were also reviewed, along with the DAHP predictive model.

Existing Conditions

Previous Cultural Resource Studies

The ADI and its expanded study area are rich in archaeological resources. As a result of 63 studies and evaluations since 1970, this large area is now known to contain 83 archaeological sites and cultural isolates. They represent both Native American and non-Native occupation of the area. Although the majority of these sites have been disturbed by prior industrial activities and clean up actions, a number of them still retain intact cultural deposits and several have been determined eligible for listing in the National Register of Historic Places (NRHP). A summary of previous cultural resources studies in the ADI and its general vicinity is included in HRA's 2025 report.



Source: Historical Research Associates, Inc., 2021

EA Engineering, Science, and Technology, Inc., PBC

Figure 3.10-1

Area of Direct Impacts Map

Work in the vicinity of the ADI has included a number of studies involving recordation of now demolished buildings within Site 45PI70, archaeological sites, site testing, and data recovery excavations, as well as the recordation of cultural isolates. The site records for Site 45PI70 were recently updated.

Previous Archaeological Sites

Table 3.10-1 provides a summary of known archaeological sites in or near the ADI and the status of determinations of eligibility for listing in the NRHP.

Table 3.10-1
PRECONTACT AND HISTORIC-PERIOD SITES WITHIN OR NEAR THE SOUTH PARCEL ADI

Site No.	Site Name	NRHP Status	Period	Location / Comments
45PI54	Sequalitchew Archaeological Site/Nisqually House	Listed in NRHP and WHR*, 1979	Precontact/early historic	South of the mouth of Sequalitchew Creek/Disturbed by tidal action and railroad construction
45PI62	Railroad dump #2	Not eligible	Old town	In ADI/Small disturbed scatter of nondiagnostic DuPont-period artifacts
45PI63	Railroad dump #3	Not eligible	Old town	In ADI
45PI64	Burning ground dump site	Not eligible	DuPont	South of ADI/Highly disturbed by DuPont soil remediation
45PI66	Methodist Episcopal Mission	Eligible	HBC**/PSAC***	South of ADI/Has been tested and soil remediation has taken place at it
45PI67	Wilkes Observatory	Eligible	Former location of observatory	Southwest of ADI
45PI70	DuPont Company plant	Not eligible	DuPont	Only remains of black powder portion, which was razed in the 1940s, are located in the ADI
45PI75	Crystallizer	Not eligible	Precontact	South of ADI/Above south side of Sequalitchew Creek, extensive damage from DuPont-period construction
45PI71	Sawmill	Not eligible	Historic	—
45PI76	Nisqually burials	****Undetermined	Historic/precontact	Southwest of ADI above north side of Sequalitchew Creek mouth
45PI401	Hudson's Bay Company employees' house	Undetermined	HBC/PSAC	South of ADI/Data recovery conducted, largely destroyed by the construction of Center Drive
45PI405	Hudson's Bay Company employees' house	Undetermined	HBC/PSAC	South of ADI/Data recovery conducted, largely destroyed by the construction of Center Drive
45PI453	Inskip Observatory	Undetermined	Historic marker	Southwest of ADI/Site destroyed, historical marker in place

Site No.	Site Name	NRHP Status	Period	Location / Comments
45PI455	9th U.S. Cavalry Bivouac Buffalo Soldiers Occupation	Undetermined	HBC/PSAC	South of ADI/Has been tested, partially intact
45PI485	Historic refuse dump	Undetermined	HBC/PSAC	South of ADI/Limited damage from DuPont-period construction
45PI576	Lithic scatter	Undetermined	Precontact	South of ADI/Apparently not intact
45PI1225	Concrete loading platform	Undetermined	Historic	South of ADI
45PI1226	Bridge abutment—narrow-gauge railroad	Undetermined	Historic	South of ADI
45PI1272	N. Fort Lewis Demolition Training Area/Gas Chamber	Not eligible	Historic	North of ADI
45PI1296	Three excavation pits from Pioneer (Seattle) Sand and Gravel Company	Undetermined	Historic	Northwest of ADI

Source: HRA, 2022.

*WHR – Washington Heritage Register

**HBC – Hudson's Bay Company

***PSAC – Puget Sound Agricultural Company

****Undetermined means the site has not been evaluated for the NRHP

Precontact occupation sites are located near Sequalitchew Creek: 45PI54, 45PI75 and 45PI76. Site 45PI54 represents the remains of Sequalitchew Village and the Hudson's Bay Company (HBC) Nisqually House, located south of the creek mouth. Site 45PI75 was a lithic scatter destroyed by the construction of a DuPont-period facility located upstream. Site 45PI76 is a gravesite destroyed by the construction of the railroad along the bluffs of Puget Sound. These sites represent relatively recent late precontact activities. Site 45PI485, a small shell deposit originally thought to be precontact and later interpreted to be associated with the HBC era, was identified and recorded during remediation activities. Site 45PI576, a lithic scatter of undetermined age, is located south of the site.

Archaeologists have examined the immediate vicinity of Site 45PI576 on several previous occasions. None of these researchers reported the presence of precontact lithic materials here. In 2004, Gary Wessen excavated 60 shovel test pits and two 1 by 2 m test units yet failed to find intact cultural deposits. The cultural deposits had been profoundly disturbed by DuPont Works developments.

In 2007, data recovery excavations at Site 45PI777 were conducted, a precontact lithic site located on the south side of Hoffman Hill about 2 mi south of the ADI. The site appeared to have been used as a field camp approximately 1889 to 1775 years before present (B.P.) and 505 to 331 B.P. for cooking and the production and maintenance of stone tools.
Within or close to the ADI, recorded Sites 45PI62, 45PI63, 45PI64, 45PI66, 450l455 and 45PI70 are recorded (see **Table 3.10-1** and HRA's 2025 report).

Archaeological Sites In or Near the ADI

Multiple precontact occupation sites are located near Sequalitchew Creek, including Site 45PI54, 45PI75 and 45PI76. Site 45PI54 represents the remains of Sequalitchew Village and the Hudson's Bay Company (HBC) Nisqually House, located about 150 meters (m) south of the creek mouth. Site 45PI75 was a lithic scatter destroyed by the construction of a DuPont-period facility, about 0.5 mi upstream. Site 45PI76 is a gravesite destroyed by the construction of the railroad along the bluffs overlooking Puget Sound. These sites represent relatively recent late precontact or early historic activities (Blukis Onat 1977). Site 45PI485, a small shell deposit originally thought to be precontact and later interpreted to be associated with the HBC era, was identified and recorded during remediation activities (Daugherty and Condon 2000a; Wessen 2003). Site 45PI576, a lithic scatter of undetermined age, is located approximately 600 ft from the ADI.

Sites 45PI62, 45PI63, and part of 45PI70 are located within the ADI, while Site 45PI66 is located just to the south of the ADI.

Site 45PI62, Railroad Dump #2 is a small scatter of DuPont-period artifacts associated with a narrow-gauge railroad grade in the vicinity of the former DuPont Works magazine #4. This site was determined not eligible for listing in the NRHP.

Site 45PI63, Railroad Dump #3 consists of artifacts comprising almost exclusively ceramic fragments from common and inexpensive items, primarily table ware, and glass from bottles, canning jars, and glasses. A few nails and fragments of fabric also were recovered. The dump appears to date mainly between 1910 and 1930. The site is located at the junction of two narrow-gauge railroad tracks that had been part of the DuPont Plant network. A dirt road, developed after the track was abandoned, crossed it and may have divided a once continuous deposit. Thus, two loci, PI63a and PI63b, have been distinguished. This site was determined not eligible for listing in the NRHP.

Site 45PI66, the Methodist Episcopal Mission Monument Site included apparent hearth area around the monument. Other remains near the hearth included square nails, bottle glass fragments, window glass shards, and two pieces of ceramics. Eleven artifacts found within 45 m of the monument included brick fragments and clay, square nails, a transfer-print ceramic fragment, two pieces of copper, a piece of green bottle glass and some scattered shell and bone. It was concluded that the mission site had been identified. The State Historic Preservation Office (SHPO) determined that this site is eligible for listing in the NRHP (see HRA's 2025 report for details).

Site 45PI70. The DuPont Company razed the Black Powder Area Plant buildings and structures in 1945. The plant itself has not been treated as an archaeological site. Previous recording includes documentation of 18 features located within the Black Powder Area,

which is within the Expansion Area portion of the site. The features were demolished, and eight of the features were removed under Consent Decree 91-2-01703-1 in the early 1990s; other features were subsequently removed (refer to HRA's 2025 report).

The Nisqually Point Defense Fund prepared an NRHP nomination form for the proposed Nisqually-Sequalitchew Historic District. The proposed district covers about 360 acres along both sides of Sequalitchew Creek, with 13 archaeological sites. The district's northern boundary passes around the Methodist Episcopal Mission Monument Site (45PI66) and the 9th Cavalry Bivouac Site (45PI455) and extends into part of the Expansion Area portion of the site. The listing of the district is noted as pending fulfillment of several terms provided for in a Memorandum of Agreement among several parties interested in the district and the land on which it is located. According to DAHP, the district nomination was never ratified. Weyerhaeuser was the primary landowner within the district, and they objected to the nomination; per NRHP guidelines, if the primary landowner objects, the district cannot proceed.

As noted earlier, pedestrian survey within the Expansion Area portion of the ADI and limited shovel probing in the southwest portion of the ADI was conducted. During the survey, ground visibility was poor; however, it was indicated that there were disturbed areas where mineral soils were visible (refer to HRA's 2025 report).

Archaeological Sites 45PI62 (Railroad Dump #2), 45PI63 (Railroad Dump #3), and 45PI70 (Black Powder Area of the Dupont Company Plant), which are located within the Expansion Area of the ADI were revisited. Sites 45PI62 and 45PI63 have been determined not eligible for listing in the NRHP. Site 45PI70 was razed in 1945, and an Historic American Building Survey (HABS) that included the site was prepared in 1990. The site was recommended as not eligible for the NRHP in 2008. Additional survey work was performed in 2025 and the site record has been updated. DAHP subsequently concurred that the site is not eligible for the NRHP (refer to HRA's 2025 report).

Cemeteries

There are no recorded cemeteries within the ADI. However, eight cemeteries/burials are located within 1 mi of the ADI, generally to the south, some of which are near kettle lakes (see HRA's 2025 report, Table 2-3).

Archaeological Expectations

The occurrence in the site vicinity of precontact sites dating up to 6000 B.P. and Euroamerican sites dating up to 1832/1833 suggests that both types of sites and isolated artifacts could be present in the site area. Precontact sites could contain artifacts and features relating to domestic and hunting, fishing, and gathering use. Euroamerican sites might yield artifacts and features relating to structures, trade, agricultural, and industrial use. Both types of sites could contain floral and faunal remains. Precontact and historic-

period burials could be present. The probability of identifying precontact sites is assumed to increase closer to Sequalitchew Creek.

Traditional Cultural Places

The ADI is within the traditional territory of the Nisqually peoples, who inhabited the lands along the Nisqually River, from its mouth in southern Puget Sound to locations nearly 30 mi upriver. HRA's 2025 report contains additional ethnohistorical information.

No Traditional Cultural Places (TCPs) were identified in WISAARD for the ADI and 1-mile radius research buffer. However, the Nisqually Tribal Historic Preservation Officer (THPO) has stated by letter that the ADI and 1-mile study area has a very high potential to contain TCPs, including Landscapes, Districts, and individual resources. Documentation is limited to a comment letter.

The THPO states that the ADI intersects with the Sequalitchew Ancestral Village Landscape, which, he stated, is a TCP potentially eligible for listing in the NRHP. The boundaries of the resource are not mapped,[1] but "largely mirror those of the greater Sequalitchew Creek watershed and its environs" (Beach 2024a:4). The TCP is described as follows:

> The Sequalitchew Ancestral Village Landscape TCP is a single historic property that is itself comprised of numerous historic properties and cultural resources of archaeological historical, cultural, and spiritual significance to the Nisqually Tribe, consisting of both previously recorded and unrecorded precontact and historic era archaeological and ethnographic sites and landscapes. Among these are seasonal and permanent village sites; resource gathering locations; locations of spiritual and ritual practice and prayer; places associated with important people and events; ancestral burial locations and cemeteries; and locations associated with spiritually powerful and culturally central entities.
>
> The vast majority of the cultural resources contained within the larger Sequalitchew Ancestral Village Landscape TCP are, themselves, NRHP-eligible historic properties, owing to their archaeological and/or traditional cultural significance, as well as simultaneously contributing to the significance of the overarching Sequalitchew Village Ancestral Landscape TCP. Because of the cultural and spiritual teachings and practices, important people, and historical patterns and events with which it is associated, the significance of the Sequalitchew Ancestral Village Landscape TCP and its constituent archaeological sites, TCPs, and landscapes to contemporary members of the Nisqually Tribe cannot be overstated [Beach 2024a:4-5].

Sequalitchew Creek is also a potentially NRHP-eligible TCP. The ADI is located on the terraces above and just northeast of this. He described the resource this way:

> One of the many archaeologically, culturally, and spiritually significant cultural resources at the heart of the Sequalitchew Ancestral Village Landscape TCP . . . is Sequalitchew Creek, the mouth of which is the subject of an oral tradition known as the "Giant of Sequalitchew," a Nisqually fisherman who use this beach for seine fishing. Sequalitchew Creek is, itself, an NRHP-eligible TCP owing, in part, to its historic spiritual use by practitioners of *Seowin*, the ancient and enduring lifeways of the Nisqually and other Coast Salish people, still vibrant today [Beach 2024a:4].

The Nisqually THPO also states that the tribe considers glacial kettle lakes and wetlands to be cultural resources and are potentially NRHP-eligible TCPs, as "these types of geophysical locations being integral to a specific ancestral cultural practice central to Coast Salish identity and well-being. A number of these kettle lakes are associated with culturally important non-human beings, rendering them further eligible for listing on the NRHP as TCPs."

The South Parcel, especially the expansion area, is stated to have been a tribal gathering area for *Camassia quamash* at one time, and the tribe considers those areas to be potentially NRHP-eligible TCPs.

As of this writing, the Nisqually Indian Tribe has not provided any documentation of the TCPs, including any evaluations, maps or reports depicting their locations and boundaries. Only one small kettle wetland is located within the ADI, with interconnected wetlands outside the mine area. There is no documentation available to cultural resource professionals in WISAARD and a determination of eligibility by the Washington SHPO is unavailable. In order for a TCP to officially qualify for eligibility or listing in the NRHP it must have a defined boundary and eligibility must be concurred upon by the authorized certifying agency (in this case the SHPO) (NPS 2024:84 & 91).

Culturally Modified Trees

Culturally modified trees (CMTs) are trees that were purposely modified by Indigenous peoples through time. The trees mark villages, burials, and other places of significance to Indigenous peoples. A CMT survey has never been undertaken within the ADI, and no culturally modified trees have been identified within it to date. Given past human activity on the property—selective cutting, industrial use and remediation—the potential for their presence and identification is considered moderately low.

3.10.2 Impacts of the Alternatives

This section identifies and analyzes impacts to cultural resources on and in the vicinity of the site under the EIS Alternatives. For purposes of the analysis, a significant impact, whether direct or indirect, is defined as damage or an irrevocable loss of information pertaining to

history that is related to a cultural resource that has been determined to be eligible to the NRHP.

ALTERNATIVE 1 – PROPOSED ACTION

Potential Indirect or Direct Impacts

Archaeological Sites 45PI62 and 45PI63

Archaeological site 45PI62, Railroad Dump #2, which has been determined not eligible for listing in the NRHP, is within the Expansion Area portion of the site and may be disturbed or removed during proposed mining operations. Archaeological site 45PI63, Railroad Dump #3, which also has been determined not eligible for listing in the NRHP, lies within the Expansion Area portion of the site; this site may be disturbed or removed by the Proposed Action. Because neither of these sites have been determined eligible for listing in the NRHP, their removal would not be considered a significant indirect or direct adverse impact.

Archaeological Site 45PI66

Archaeological site 45PI66, the Methodist Episcopal Mission Monument, lies outside of the Expansion Area portion of the site. Section 4.7 of the 2011 Settlement Agreement for Dupont Mine, Restoration of Sequalitchew Creek Watershed, and Preservation of Puget Sound Shorelands and Adjacent Open Space states that, "the parties agree that CalPortland will not conduct mining within 189 ft of the Mission Marker as defined herein" (Washington State Department of Ecology et al. 2011). As long as this agreement is enforced, there would be no significant indirect or direct impact to this resource.

Archaeological Site 45PI70

As noted in Sub-Section 3.10.1, archaeological site 45PI70, DuPont Company Plant, was recommended not eligible for listing in the NRHP in 2008 and following additional survey work and updating of the site record for both the South Parcel and Fort Lake components, DAHP concurred with the recommendation of non-eligibility. In view of DAHP's concurrence that the site is not eligible, the removal of the remains of this site would not be considered a significant indirect or direct adverse impact (refer to HRA's 2025 report).

Traditional Cultural Properties

Sequalitchew Ancestral Village Landscape

The Sequalitchew Ancestral Village Landscape, as described in the Nisqually Tribe's comment letter, is a potentially NRHP-eligible TCP. The ADI intersects with this watershed-based resource. Although the importance of this resource to the Nisqually is not questioned,

limited information is available at this time, its boundary and character-defining features are not currently known and its potential NRHP eligibility has not been determined. Without more details regarding the boundary, and the character-defining features, it is impossible to assess exactly whether and what direct, indirect, or cumulative physical impacts the project would have on the resource

SEPA is focused on impacts to the physical environment and does not address impacts to spiritual values, which are intangible, and cannot be objectively measured or assessed.

Sequalitchew Creek

Sequalitchew Creek, as it is generally described by the Nisqually Tribe, is a potentially NRHP-eligible TCP that is the heart of the Sequalitchew Ancestral Village Landscape. The ADI is located on the terrace directly above and northeast of the creek. Like the Sequalitchew Ancestral Village Landscape, limited information is available regarding this potential resource, its boundary and its character-defining features; therefore, this resource's NRHP eligibility cannot be determined at this time. Without more detailed information, however, it is impossible to accurately assess what significant physical impacts the project would have on the resource. Direct impacts to resources that contribute to the TCP may not occur from mining activities, however if the boundary is outside of the ADI. Indirect impacts to physically present resources may not occur because there will be no extreme noise from operations or vibration.

SEPA is focused on impacts to the physical environment and does not address impacts to spiritual values, which are intangible. Such impacts cannot be objectively measured or assessed.

Kettle Lakes and Wetlands

There is one kettle wetland located within the expansion area. Kettle lakes and wetlands are important areas to the Nisqually Tribe for physical and spiritual reasons. Archaeological resources and burials are often located near these areas. Mining activities could cause a direct adverse impact to these areas.

As noted previously, SEPA is focused on impacts to the physical environment and does not address impacts to spiritual values, which are intangible and cannot be objectively measured or assessed.

Camas Gathering Areas

The Nisqually Tribe states that locations within the ADI were historically used for gathering camas (Beach 2024a, 2024b). However, given that the ADI has been used for industrial purposes and remediated, the potential for these resources to occur within the ADI is remote and the current presence of these types of resources within the ADI is unknown.

INDIRECT AND CUMULATIVE IMPACTS

Potential indirect and cumulative impacts could hypothetically include changes to the visual environment that change the context of historic resources. However, a change to the visual environment of the site and adjacent mining sites, is considered an unavoidable impact of mining. In addition, based on the *Aesthetics* analysis in the EIS, the interior of the site and mining activity would not be visible from off-site key viewpoint locations due to topography and retained vegetation. The significance of any such impacts, therefore, is uncertain. As noted previously, mining is a transitional use and any change would be temporary, lasting until mining is completed.

As previously stated, no historically significant cultural resources have been identified within the site to date; therefore, no indirect or cumulative impacts would occur to known resources. If a previously unidentified cultural resource is discovered within the ADI, there is a potential for indirect or cumulative impacts to occur if the resource is determined to be eligible for the NRHP (refer to HRA's 2025 report.).

ALTERNATIVE 2 – NO ACTION

The No Action Alternative assumes no mining on the South Parcel within the context of existing conditions (Scenario A). The No Action Alternative also assumes possible future development of the site in accordance with existing zoning (Scenario B). This would permit development for business park and residential uses. Because the site does not include sites determined eligible for listing in the NRHP, cultural resources impacts would not be anticipated under Scenario A or Scenario B.

3.10.3 Mitigation Measures

The following mitigation measures have been included in the Proposed Action, or in a prior decision applicable to the property, to reduce cultural resources impacts.

Mitigation for Potential TCPs, Kettle Lakes and Wetlands, and Resource Gathering Areas

The City, CalPortland and property owner acknowledge and respect tribal sovereignty and have consulted and worked cooperatively with the Nisqually Tribe for decades. The City and applicant have made repeated efforts to consult with the tribe in regard to the South Parcel proposal; those efforts continue. The City and applicant express their commitment to honor existing and on-going commitments and continuing consultation and collaboration with the Nisqually Tribe.

If it is determined that any resources are eligible for listing in the NRHP and that mining activities would constitute a significant adverse impact to them, then DAHP and the affected

Tribes should be consulted for guidance regarding appropriate mitigation measures. Mitigation measures may include but are not limited to data recovery and/or interpretation (e.g., displays, exhibits).

Proposed Mitigation Measures

- Mitigation requirements that address archaeological monitoring and inadvertent discovery of cultural resources or human remains prior to ground disturbance or during mining as required as a result of the 2004 Settlement Agreement between Quadrant Corporation, Weyerhaeuser real Estate Company, the City of DuPont and the Nisqually Tribe. These mitigation requirements apply to all Weyerhaeuser properties in the City of DuPont, and have been recommended, applied as conditions of approval, and implemented as ongoing management practices in all Glacier NW/CalPortland mining projects in the City. These mitigation measures should continue to be implemented as applicable to the South Parcel Project. These measures include the following (paraphrased from North Parcel conditions No. 28-30):
    - Notification of Nisqually Indian Tribe resource representative in advance of any clearing or topsoil stripping for each mine segment; and employment of the tribal Archaeologist to write a closing report to DAHP documenting coordination with the Nisqually Indian Tribe and observed conditions.
    - Notification of DAHP and the Nisqually Indian Tribe if any Native American remains are unearthed.
    - Monitoring of clearing activities by the Nisqually Indian Tribe to identify any historic resources and appropriate notice and treatment of any resources discovered.

- If any archaeological sites are identified under the Proposed Action, and they are determined to be eligible for the NRHP, and that proposed mining activities would constitute a significant adverse impact to them, then DAHP and the affected Tribes should be consulted for guidance regarding appropriate mitigation measures. Mitigation measures may include, but not be limited to data recovery and/or interpretation (e.g., displays, exhibits).

3.10.4 Significant Unavoidable Adverse Impacts

No historically significant cultural resources have been previously identified within the site to date; therefore, no significant adverse impacts would occur to known resources. However, if a previously unidentified cultural resource is discovered within the ADI, there is potential for a significant adverse impact to occur if the resource is determined to be eligible for the NRHP.

3.11 TRANSPORTATION

This section of the FEIS describes existing transportation conditions on the site and in the site vicinity. Potential impacts associated with the EIS Alternatives are evaluated and mitigation measures are identified. This section is based on the *Traffic Impact Assessment* (July 2022) prepared by Heffron Transportation and the *Parking Narrative* (November 2020) prepared by Anchor QEA, both peer reviewed by Transpo Group (see **Appendices N** and **O**). Information added or changed subsequent to the Draft EIS, if any, is shaded to ease identification of any added or changed information.

3.11.1 Affected Environment

Existing Conditions

The existing Pioneer Aggregates mine, processing plant, and barge loading dock at Tatsolo Point have been in operation since 1997. The expansion of the mine to the 142-acre North Parcel (described in the 2013 FEIS) assumed extraction of approximately 2.8 million cubic yards of sand and gravel annually. It also assumed that 80% of that aggregate would be transported by barge, the same rate that had been historically barged. The remaining 20% was assumed to be exported from the site by truck, either as mined aggregate or as part of processed concrete.

Existing Mine-Generated Traffic Volumes

The 2013 FEIS included detailed trip generation estimates for the mine, which were based on historic operations and annual extraction rates. The trip generation estimates assumed that 20% of the mined aggregate would be transported from the site by truck (the remaining 80% would be by barge and not affect roadways). **Table 3.11-1** summarizes the trip generation estimates from the 2013 North Parcel FEIS and is presented below.

Table 3.11-1
SUMMARY OF PROJECT-GENERATED OFF-SITE TRIPS – 2013 NORTH PARCEL FEIS

			AM Peak Hour			PM Peak Hour		
Trip Type	**Vehicle Type**	**Daily**	**In**	**Out**	**Total**	**In**	**Out**	**Total**
Typical Day								
Employee Commute	Automobile	126	3	0	3	0	3	3
Service & Deliveries	Light Truck	18	2	2	4	2	2	4
Product Transport	Heavy Truck	246	9	9	18	1	1	2
Logging[1]	Heavy Truck	0	0	0	0	0	0	0
TOTAL		**390**	**14**	**11**	**25**	**3**	**6**	**9**
Peak Day								
Employee Commute	Automobile	200	7	3	10	0	4	4

			AM Peak Hour			PM Peak Hour		
Trip Type	**Vehicle Type**	**Daily**	**In**	**Out**	**Total**	**In**	**Out**	**Total**
Service & Deliveries	Light Truck	30	5	2	7	3	3	6
Product Transport	Heavy Truck	710	25	25	50	5	5	10
Logging[1]	Heavy Truck	24	0	0	0	0	0	0
TOTAL		**964**	**37**	**30**	**67**	**8**	**12**	**20**

Source: FEIS for CalPortland DuPont North Parcel Mining, 2013.

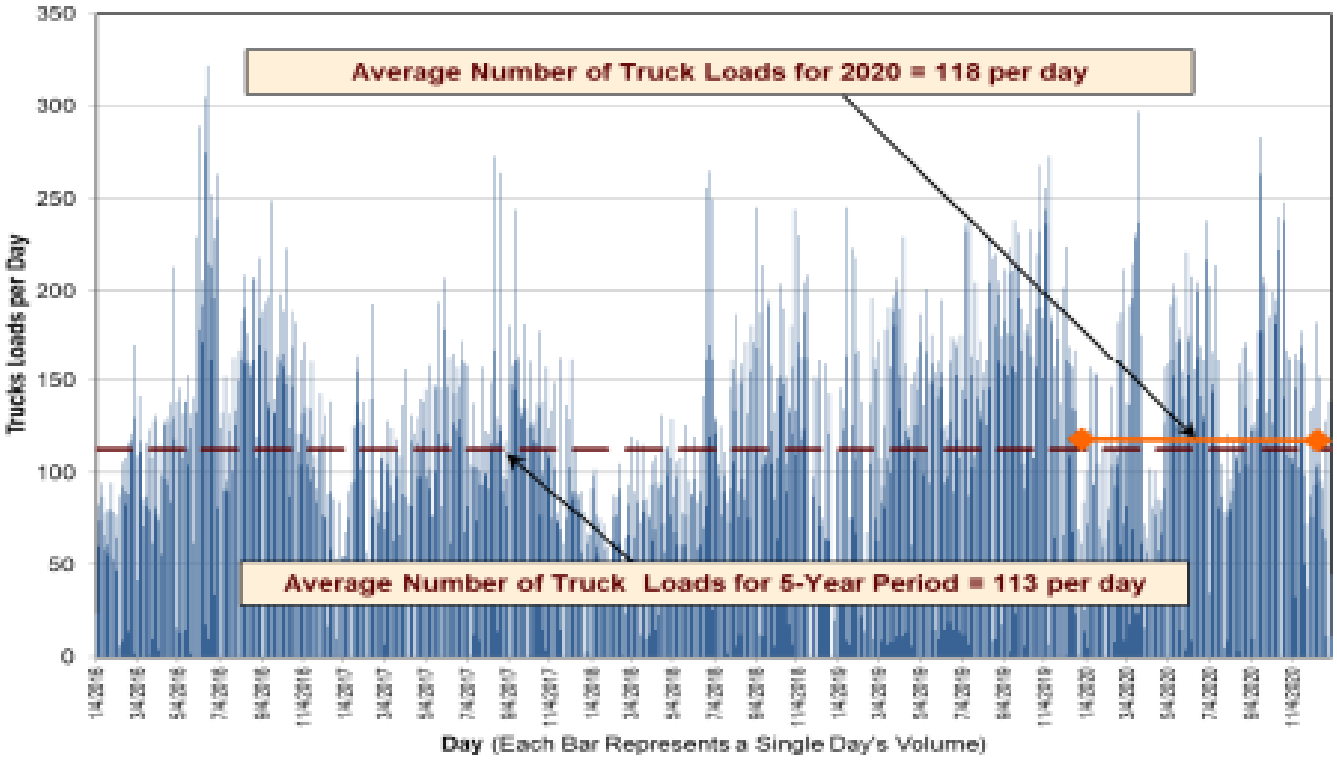
[1] Logging the North Parcel would occur only during the first year of operation.

The FEIS had estimated that the mine would generate an average of 390 trips per day (195 trips entering the site and 195 trips exiting the site). Of these, 264 trips per day (132 inbound and 132 outbound) would be truck trips. On the peak day, daily trips were expected to increase to 964 trips per day (482 inbound and 482 outbound) of which 764 would be truck trips (382 inbound and 382 outbound). Trips during each of the commuter peak hours—AM and PM—were also determined. More traffic was expected to occur during the AM peak hour when product is typically transported out to construction sites. During the peak day, the mine was expected to generate 67 AM peak hour trips (37 inbound and 30 outbound). The PM peak hour would have much lower volumes, expected to be 20 trips on the peak day (8 inbound and 12 outbound).

Actual Truck Trips – 2016 through 2020

CalPortland tracks all trucks that exit the site with a load of material (e.g., truck loads). Five full years of data (from January 1, 2016, through December 31, 2020) were obtained from CalPortland and compiled to show the number of truck loads that exit the site each day. It is noted that each truck load reflects an outbound trip (an inbound trip is made by an empty truck and is accounted for later in the analysis). **Figure 3.11-1** below shows each day's concrete and aggregate loads (trucks exiting the site).

Figure 3.11-1
DAILY TRUCK LOADS (OUTBOUND TRUCK TRIPS): 2016 – 2020



More detailed information was compiled for 2020. While the COVID-19 pandemic affected activity during some weeks of the year, the total aggregate mined was 2,776,615 cubic yards, just below the 2.8 million cubic yards anticipated by the 2013 FEIS. The average truck loads per day over the five-year span (113 truck loads per day) were very similar to the average for the year 2020 (118 truck loads per day). Further analysis was performed for the full year of 2020 data to derive average truck loads by time of day. **Figure 3.11-2** shows the percentage of each day's trucks for each hour.

Figure 3.11-2
PERCENT TRUCKS BY HOUR – WEEKDAY (2020)

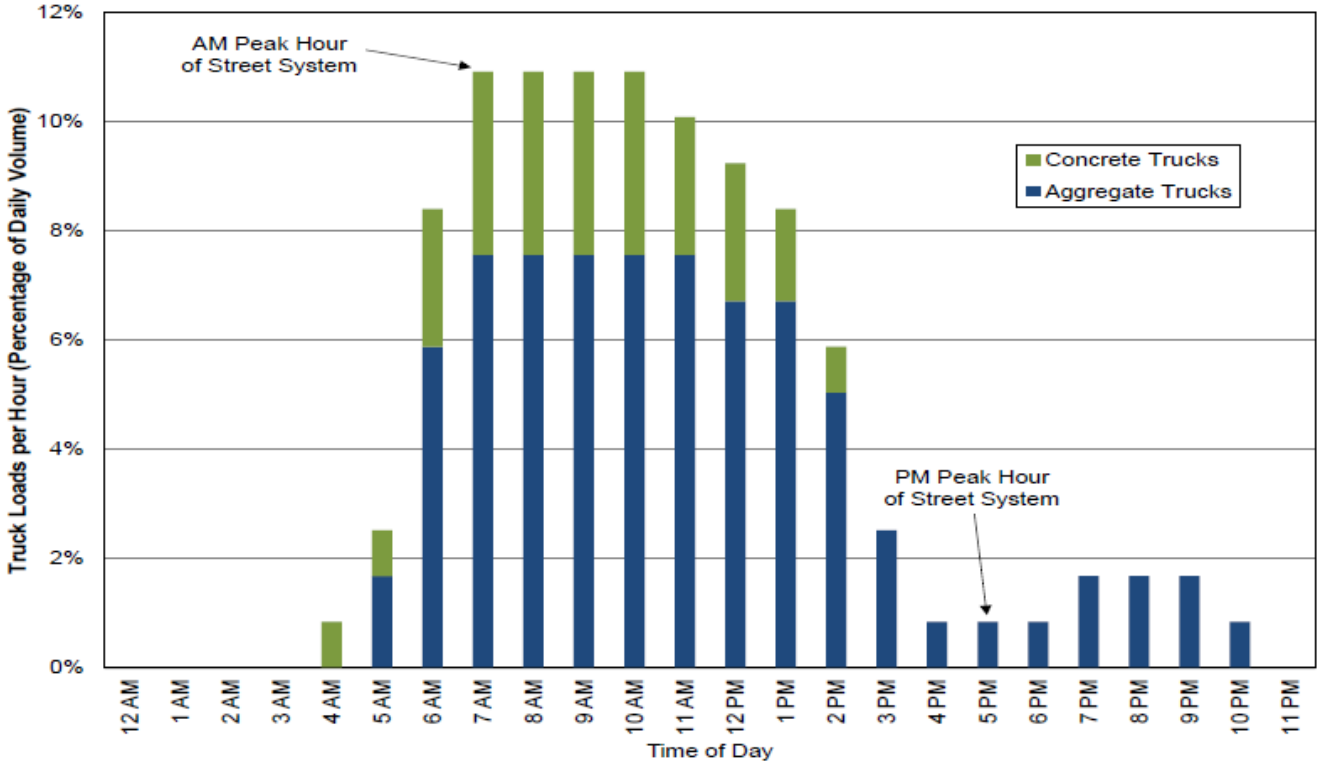


Table 3.11-2 compares the daily and peak hour truck trips from 2020 to those assumed in the FEIS. A total of 118 truckloads were processed on the average day in 2020, which results in 236 truck trips (empty truck inbound plus loaded truck outbound). The peak day of the year had 297 truckloads, equaling 594 truck trips. The total daily trips were below the level estimated in the FEIS. Actual AM peak hour trips were slightly higher for an average day (26 trips compared to the estimated 22 trips), but lower on the peak day (52 trips compared to the FEIS level estimated 57 trips). PM peak hour trips were lower for the average day and the same as expected for the peak day.

Table 3.11-2
COMPARISION OF FEIS TRUCK ESTIMATES TO ACTUAL TRUCK VOLUMES

		AM Peak Hour			PM Peak Hour		
Trip Type	**Daily**	**In**	**Out**	**Total**	**In**	**Out**	**Total**
FEIS Estimated Truck Trips							
Average Day	266	11	11	22	3	3	6
Peak Day	740	30	27	57	8	8	16
Actual Truck Trips – Year 2020							
Average Day[1]	236	13	13	26	1	1	2
Peak Day[2]	594	26	26	52	8	8	16
Absolute Peak Day in Five-Year Period (6.15.2016)[3]	**644**	**13**	**49**	**62**	**10**	**2**	**12**

Source: CalPortland North Parcel FEIS, 2013 and Heffron, 2022.

[1] Based on average loads per hour for all of year 2020.

[2] Based on actual loads for the Peak Day in 2020 (March 18, 2020).

[3] Highest day in five-year period between 1/1/2016 and 12/31/2020. This day had substantial concrete truck activity associated with a continuous pour operation.

As shown above on **Figure 3.11-1**, the absolute highest volume in the past five years (June 15, 2016) generated 322 truck loads or 644 truck trips per day. This day had a very high number of concrete truck trips associated with a continuous-pour operation. The actual trips for that day were compiled to determine the peak hour volumes. The daily and PM peak hour trips were below the values assumed in the FEIS, but the AM peak hour was slightly higher due to the high number of outbound trips in the morning for the continuous pour. That type of event is very rare, and those volume levels were only observed once in the five-year period.

3.11.2 Impacts of the Alternatives

This section identifies and analyzes impacts to transportation on and in the vicinity of the Pioneer Aggregates South Parcel Project site with proposed clearing and mining.

ALTERNATIVE 1 – PROPOSED ACTION

Future Traffic

The proposed Pioneer Aggregates South Parcel Project would allow for continued mine operations that are similar to those already permitted. The processing plant would remain in the same location, and the market area and travel patterns are expected to remain the same. Trip generation is expected to continue at current levels and would remain below the peak day estimates that had been evaluated in the 2013 North Parcel FEIS., which considered cumulative impacts with the South Parcel project. Expansion to the South Parcel

would have a short period when logging trips are added to the traffic stream. The FEIS had estimated up to 24 logging truck trips per day (12 loads). This is likely to be conservatively high since the timber to be logged on the South Parcel is of poorer quality than for the previously logged North Parcel.

The 2013 North Parcel FEIS had evaluated traffic operations at area intersections for the future horizon year of 2035. The year 2035 conditions had accounted for substantial growth in traffic due to a dozen major development projects and background growth and were consistent with assumptions in the I-5 Joint Base Lewis-McChord (JBLM) Transportation Analysis.[1] Impacts of the project were evaluated for the peak day condition, which as shown above, reflect a higher trip condition than occurred during the peak day in 2020. The North Parcel FEIS traffic operations analysis found that, "*…project-generated trips are expected to constitute 3% or less of total trips through the LOS E and F intersections in the AM peak hour, and less than 1% in the PM peak hour. This reflects projected conditions on a day of peak mining operations; on days of more typical mining operations, these proportions would be even lower.*" It goes on to conclude, "*Because the project-generated trips would represent a small proportion of traffic volumes at the study area intersections and would have negligible effect on the levels of service at the I-5 ramps and city intersections, no adverse level of service impacts are projected to result from the South Parcel proposal*." The conclusion is still reasonable given that the trips are expected to remain similar to or less than those evaluated in the 2013 FEIS, and that the horizon year evaluated (2035) is reasonable to capture the extended life of the mine with expansion to the South Parcel.

The proposed Pioneer Aggregates South Parcel Project is not expected to exacerbate transportation conditions in the study area. Trip generation is expected to continue at current levels and would remain below the peak day estimates that had been evaluated in the 2013 FEIS. Traffic operations were evaluated in the 2013 North Parcel FEIS for the anticipated South Parcel traffic and extended mine life and concluded that the South Parcel would not adversely affect traffic operations in the site vicinity. This conclusion is still reasonable and significant transportation impacts would not be anticipated.

ALTERNATIVE 2 – NO ACTION

There are two No Action Alternatives- Scenario A Continuation of Existing Conditions; and Scenario B Site Development Under Existing Zoning.

Scenario A

Under Scenario A , mining activities associated with the Re-Mine Area of the site and the Existing Mine would continue as currently permitted. The mining operation would retain a vegetated buffer at its perimeter, and traffic conditions that currently exist would continue.

[1] *Washington State Department of Transportation (WSDOT) and the Tranpso Group, I-5 Transportation Alternatives Analysis & Traffic Operational Model, from Mounts Road to SR 512. Prepared for the City of Lakewood, September 2010.*

The Existing Mine has an estimated remaining life of 6 to 10 years with mining currently limited to 10 feet above groundwater. The Expansion Area portion of the site is assumed to remain undeveloped and would continue in its vegetated condition.

Scenario B

Under Scenario B, the proposal would not occur. The site would be developed for urban uses consistent with the City's Future Land Use Map. The majority of the area affected is currently designated by the City of DuPont Comprehensive Plan as Manufacturing and Research, with a smaller area designated for residential uses. The corner of the property near Center Drive is designated as Residential 12, which would allow higher density residential development where multifamily density averages 12 units per acre. Urban development, as permitted under current planning and zoning designations, is assumed to occur east of the lease line demarcating existing mining operations. The timing and nature of any such development would be driven by market forces.

In general, development of manufacturing/research uses and housing would result in construction-related activity that would occur over an extended period of time and would generate an increase in construction-related traffic. Upon completion of construction, traffic would be generated that would be typical of other manufacturing/ research uses and residential neighborhoods.

3.11.3 Mitigation Measures

No transportation-related mitigation measures are necessary, and no additional transportation-related measures are provided.

3.11.4 Significant Unavoidable Adverse Impacts

The proposed Pioneer Aggregates South Parcel Project is not expected to result in significant transportation impacts in the study area. Trip generation is expected to continue at current levels and would remain below the peak day estimates that had been evaluated in the 2013 FEIS.

3.12 FISCAL CONDITIONS

This section of the FEIS examines the tax revenues and costs of services that can be attributed to the site at an assumed base year (2022) under the EIS Alternatives. The section is based on the *Fiscal Condition Assessment* (February 2024) prepared by ECONorthwest (see **Appendix P**). Information added or changed subsequent to the Draft EIS, if any, is shaded to ease identification of any added or changed information.

3.12.1 Affected Environment

Fiscal conditions presented below provide background about the revenues, expenditures, and tax bases of the City of DuPont. This analysis is focused on general government funds primarily include the City's General Fund which accounts for services to the public including public safety, street maintenance, land use, parks and recreation, and administrative functions. These services are largely supported by taxes, fees and charges, and intergovernmental revenues (i.e., state and federal contributions). This analysis is specifically focused on the taxes used to support the city's public services.

The analysis does not include the enterprise funds related to operating the Water Utility and Stormwater Utility. These enterprises are operated like a stand-alone business where with customer user fee are used to support all operating costs. Resources of the utilities cannot be used to subsidize general government functions.

City Tax Revenue Sources

Below is a discussion of the city of DuPont's primary tax revenue sources and trends from 2011 to 2021. Unless cited otherwise, informing this memorandum is data from Washington state's Local Government Financial Reporting System for the City of DuPont. As with many cities in Washington State, the three largest revenues sources for the City of DuPont are (1) property taxes, (2) sales and use taxes, (3) utility taxes, and (4) business and occupation taxes (B&O). Taxes made up 74% of the city's overall revenue in 2021.

Current Expense Property Taxes

Initiative 747 limited local property tax increases to 1.0% each year, resulting in an erosion of the tax's purchasing power over time. Because of the method for calculating DuPont's property tax levy (equal to the 101% of the previous year's levy plus new construction add-on value), new construction is important to the city's ability to limit the erosion of the purchasing power of the property tax and to grow the levy beyond the statutory limitations. In 2023, property tax levy was $2,014,558.

EMS Property Taxes

The city also collects a regular property tax for emergency medical services provided by the city. In 2023, property tax levy was $877,716.

Local Option Retail Sales and Use Taxes

One of the key revenue sources that cities rely on is the retail sales tax. Of the 9.4% sales tax currently collected in the city on general retail purchases, a 1% "local" share of the tax accrues to local jurisdictions. The city receives 85% of the 1% local tax and Pierce County gets 15%. The current rate accruing to the city is 0.85%. The local option sales tax generated $2,353,599 in local sales tax revenues for the city in 2021. This tax is levied not only on businesses in the area, but also on construction activity and some transactions that are related to housing, such as certain online purchases. The city also receives a population pro-rata share of 90% of the city allocation of Pierce County's 0.1% criminal justice sales tax.

Business and Occupation Taxes

This category of revenue includes monies received from business and occupation taxes (B&O tax) on general business activities. The B&O tax rate in DuPont is 0.1%. The B&O tax generated $746,828 in tax revenues for the city in 2021.

Utility Taxes

The city levies a business and occupation tax on utilities; however, this tax is passed on to users of the utilities as part of their periodic bills. The city levies the following rates to the gross receipts of the utility providers: Electricity 6%; Water 12%; Sewer 6%; Stormwater 10%; Telephone 6%; Natural Gas 6%; and Solid Waste 8%.

The utility tax generated $ $1,647,377 in tax revenues for the city in 2021.

Other Revenue Sources

The City of DuPont collects revenues from a range of other local sources, including:

- Hotel/Motel Tax: The city receives a sales tax credit against the state portion of the sales tax of 2% on accommodations purchases. The proceeds of the tax are dedicated to economic development purposes supporting the tourism sector.

- Real Estate Excise Tax (REET). Real estate transactions are subject to a 0.50% local tax on the value of the transaction. REET revenues are restricted to finance capital projects. REET revenues are uncertain, given the volatility in the real estate market. Since REET is based on the total value of real estate transactions each year, the

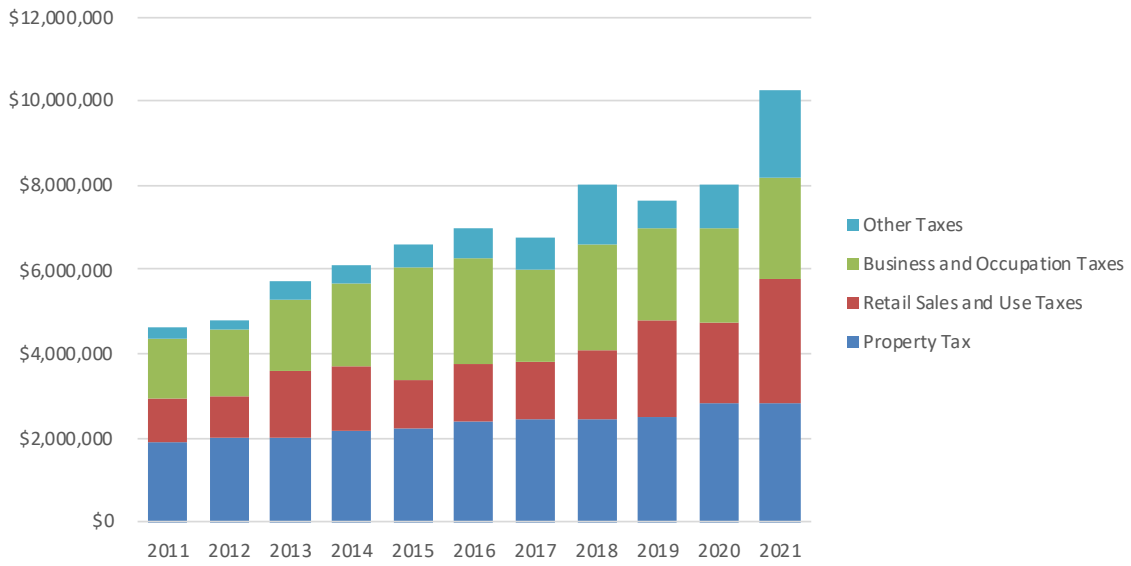
amount of REET revenues the city receives can vary substantially from year to year based on the normal fluctuations in the real estate market.

- Admission Tax. The city charges a tax on the value of transactions on admissions to a place or event. The admissions tax rate in DuPont is 5%.

City Tax Revenue Trends

Figure 3.12-1 presents a summary tax revenue for the city from 2011 to 2021. B&O tax revenues include both the tax on business gross receipts and utility providers (utility taxes). Property taxes have been a consistent and growing source of revenue for the city over the time. Sales taxes have also grown but a more volatile source of funding. The city has seen stronger relative growth in its B&O taxes (gross receipts and utility taxes). Other taxes are primarily consisted of the REET.

Figure 3.12.1
SUMMARY TRENDS OF MAJOR TAXATION SOURCES, CITY OF DUPONT: 2011 - 2021



City Expenditures

This section discusses the City of DuPont's primary expenditures and trends from 2011 to 2021. Unless cited otherwise informing this memorandum is data from Washington state's Local Government Financial Reporting System for the City of DuPont. The City of DuPont's major expenditures are described below.

Public Safety

This category of expenditures includes costs for law enforcement, fire and emergency medical, detention/corrections, protective inspection services, and dispatch services. As of 2021, expenditures for public safety accounted for 55% of total city-wide expenditures.

General Government

This category of expenditures includes costs for personnel and centralized services; legislative, and executive activities; financial, recording, and election activities; and legal. As of 2021, expenditures for the general government accounted for 21% of total city-wide expenditures.

Transportation

This category of expenditures includes roads/streets maintenance, roads/streets administration and overhead. As of 2021, expenditures for transportation accounted for 7% of total city-wide expenditures.

Culture and Recreation

This category of expenditures includes library and park facilities costs. As of 2021, expenditures for culture and recreation accounted for 10% of total city-wide expenditures.

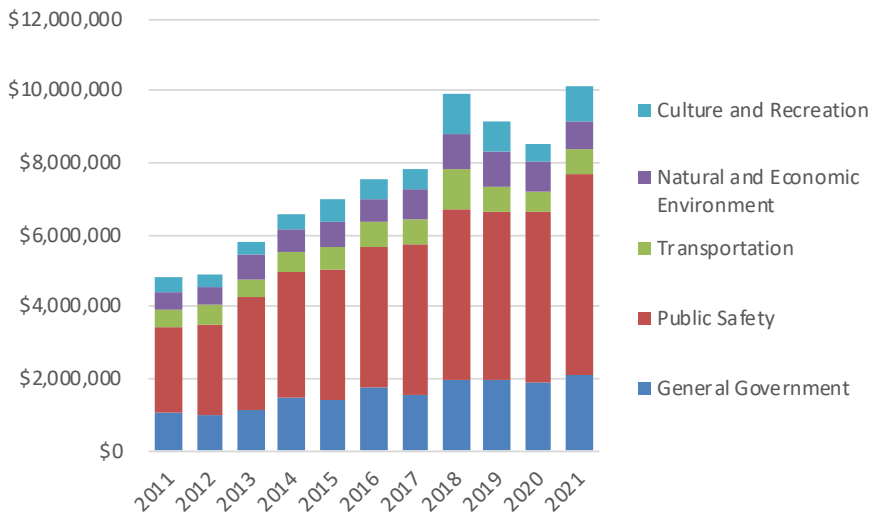
Natural and Economic Environment

This category includes work in community and economic development. As of 2021, expenditures for culture and recreation accounted for 7% of total city-wide expenditures.

City Expenditure Trends

As indicated in **Figure 3.12-2**, expenditures in the City of DuPont totaled $10.1 million in 2021, up from $4.9 million in 2011 (104% change).

Figure 3.12-2
SUMMARY TRENDS OF EXPENDITURES, CITY OF DUPONT: 2011 - 2021



Selected City Tax Bases

Selected tax bases described below include: Assessed value and new construction; and, taxable retail sales.

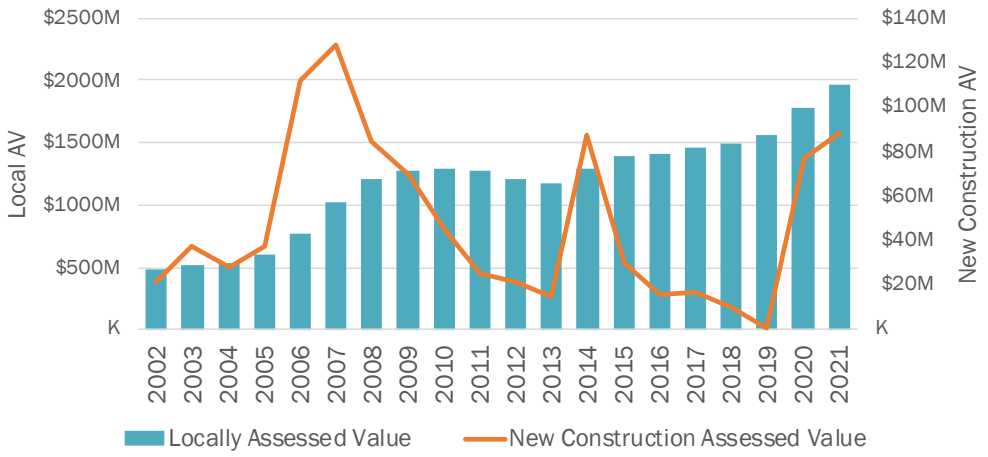
Assessed Value and New Construction

The Pierce County Assessor assesses the land and improvement value of all properties in the county for the purpose of levying property taxes. The assessor also values the amount of new construction for calculating the amount of "add-on" value to property tax collections. The trends for the city follow.

- In 2011, DuPont's local assessed value (AV) was $1.9 billion, about $1.5 billion more than local assessed value estimates in 2002.

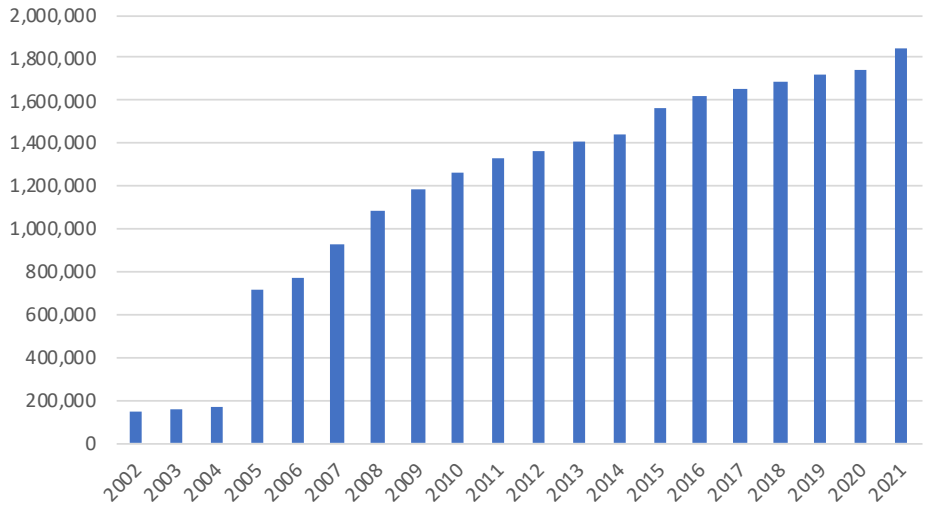
- Valuation from new construction added substantially to DuPont's base from 2006 through 2009. The Great Recession did, however, cut this trend short. In 2010. New construction levels have picked up in the last several years but continue to be at levels lower than they have in the past (see **Figure 3.12-3**).

Figure 3.12-3
ASSESSED VALUE AND NEW CONSTRUCTION, CITY OF DUPONT: 2002 - 2021



Most taxing jurisdictions in Washington state must ensure that the amount of revenue they levy in the current year will not exceed the amount levied in the preceding year (plus additional funds for new construction, improvements to property, newly constructed wind turbines, solar, biomass, geothermal facilities, if the facility is not state assessed, increases in the value of state-assessed property, annexations, and refunds). In 2021, DuPont's highest lawful levy was $1,971,024 prior to the additional funds for new construction (see **Figure 3.12-4**).

Figure 3.12-4
HIGHEST PRIOR LEVY, CITY OF DUPONT REGULAR LEVY: 2002 - 2021



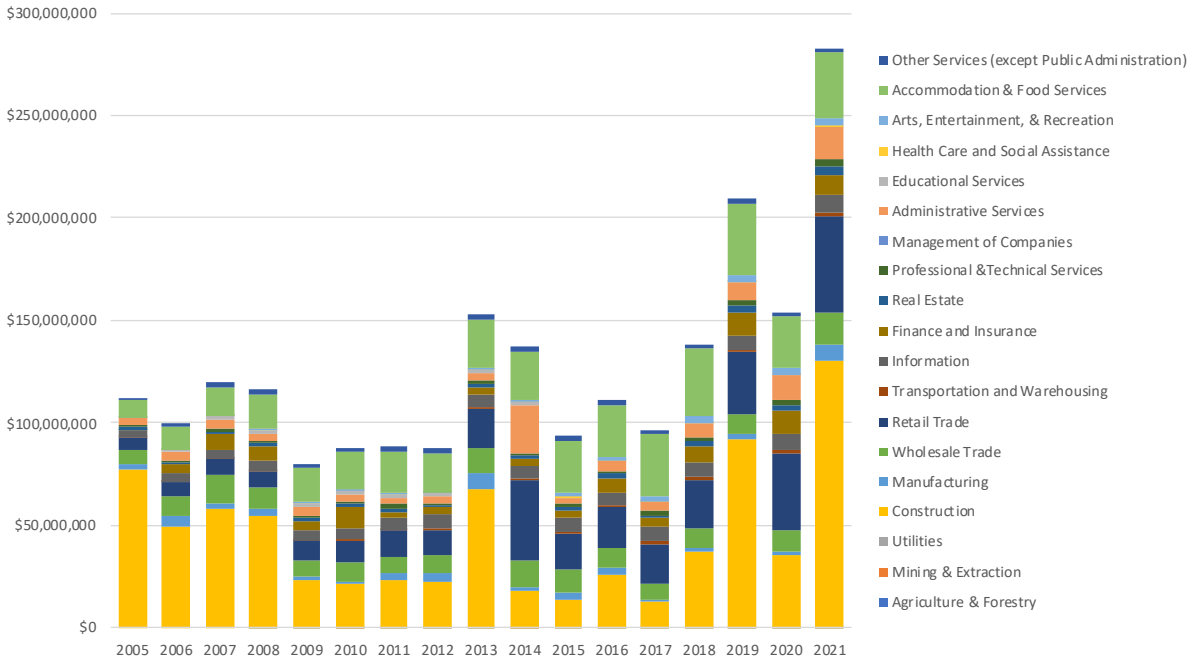
Taxable Retail Sales

Retail sales reflect spending that occurs within the city and is a significant source of tax revenue for the city (see **Figure 3.12-5**).

- Taxable retail sales (TRS) have grown steadily over the last several years. Total sales (particularly for the construction sector) dipped following the onset of the recession (around 2009), but sales have since increased.

- The retail trade sector and accommodations & food services accounts for most of the remaining growth.

Figure 3.12-5
HIGHEST PRIOR LEVY, CITY OF DUPONT REGULAR LEVY: 2005 – 2021



3.12.2 Environmental Impacts

This section identifies and describes fiscal conditions under the EIS Alternatives.

ALTERNATIVE 1 – PROPOSED ACTION

Fiscal conditions under Alternative 1 – Proposed Action is primarily a function of tax revenues to the City of DuPont generated by the Pioneer Aggregates South Parcel Mining Project, and City of DuPont services costs associated with the project.

Tax Revenues

Tax revenues most relevant to Alternative 1 include Property Taxes, Sales & Use Taxes, Business & Occupation Taxes, and Utility Taxes.

Property Tax

Property tax revenues are estimated using the parcel list of the site and associated 2022 certified taxable assessed values (for 2023 property taxes). The assessed values are then multiplied by the tax rate for the city's regular levy and EMS levy. Based on this summary, the site currently generates approximately $58,000 in property taxes ($40,000 for the regular levy and $17,600 for the EMS levy); see **Table 3.12-1**.

Table 3.12-1
SUMMARY OF ASSESSED VALUE AND LEVY ESTIMATES

	Assessed Total	Taxable Total	Tax Rate (2023 taxes)	City Regular Levy	City EMS Levy	City Total
South Lease Area	$3,142,100	$3,142,100	$1.14924	$2,515	$1,096	$3,611
Existing Mine Lease Area	$5,845,200	$5,845,200	$1.14924	$4,679	$2,039	$6,718
Processing Area	$39,406,900	$39,406,900	$1.14924	$31,544	$13,743	$45,288
North Area	$2,075,700	$2,075,700	$1.14924	$1,662	$724	$2,385
Total	$50,469,900	$50,469,900		$40,400	$17,602	$58,002

Source: Pierce County Assessor, 2022.

The site also pays property taxes for personal property. Personal property includes machinery, equipment, furniture, and supplies of businesses and farmers. It also includes any improvements made to land leased from the government (leasehold improvements); see **Table 3.12-2**.

Personal property taxes are estimated to generate $3,600 in taxes in 2022.

Table 3.12-2
SUMMARY OF PERSONAL PROPERTY VALUE AND LEVY ESTIMATES

	Personal Property Assessed Total	Personal Property Taxable Total	Tax Rate (2023 taxes)	City Regular Levy	City EMS Levy	City Total
Personal Property	$13,300,000	$13,300,000	$1.14924	$2,515	$1,096	$3,611

Source: CalPortland, 2022.

Sales and Use Tax

Of the 9.4% sales tax currently collected in the city on general retail purchases, a 1% "local" share of the tax accrues to local jurisdictions. The city receives 85% of the 1% local tax and

Pierce County gets 15%. The current rate accruing to the city is 0.85. Sales tax collected at the site can vary substantially from year to year depending on level of purchases. For example, CalPortland may purchase a new Caterpillar 992 loader (the largest wheel loader that Caterpillar makes) is scheduled in the 2023 year and will substantially impact local sales tax revenue from the mine due to its location of delivery within the city's taxing boundaries. It also makes annual capital improvements at the site that would be taxable construction expenditures. Likewise, sales tax revenue from customers making retail purchases at the site can also vary depending on the size of projects locally. CalPortland estimates that in a typical year the following taxable retail sales are made:

- Capital purchases: $100,000 - $300,000.
- Customer purchases: $10,000 - $30,000.

The analysis uses the mid-point for these categories: capital purchases: $200,000 and customer purchases: $20,000. Using these values produces a sales tax estimate of $1,870 in 2022 (see **Table 3.12-3**).

Table 3.12-3
SALES TAX ESTIMATES

	Estimated Taxable Retail Sales	City Sales Tax Rate	Estimated City Tax Due
Taxable Retail Sales	$220,000	0.0085	$1,870

Source: CalPortland and ECONorthwest calculations, 2022.

Business and Occupation Taxes

This category of revenue includes monies received from business and occupation taxes on general business activities. The B&O tax rate in DuPont is 0.1%. CalPortland estimates from its B&O tax filing that in a typical year it reports a local gross receipt of $40,000,000. Using these values produces a B&O tax estimate of $75,690 in 2022 (see **Table 3.12-4**).

Table 3.12-4
B&O TAX ESTIMATES

	Estimated Gross Business Income	City B&O Tax Rate	Estimated City Tax Due
City B&O Tax Contribution	$40,000,000	0.0010	$40,000

Source: CalPortland and ECONorthwest calculations, 2022.

Utility Taxes

The city levies a business and occupation tax on utilities; however, this tax is passed on to users of the utilities as part of their bills – in this case, payable by CalPortland. The city levies the following rates to the gross receipts of the utility providers: Electricity -6%; Water - 12%; Sewer - 6%; Stormwater - 10%; Telephone - 6%; Natural Gas - 6%; and, Solid Waste: 8%.

CalPortland estimates from its previous spending that the following purchased are made in a typical year: Cell Phone - $7,200; Phone - $10,500; Electricity - $1,130,000; Water - $46,000; Sewer (private) - $1,240; and, Solid Waste - $15,500.
Using these values produces a utility tax estimate of $75,690 in 2022 (see **Table 3.12-5**.

Table 3.12-5
UTILITY TAX ESTIMATES

	Estimated Utility Purchases	City Utility Tax Rate	Estimated City Tax Due
Water	$46,000	12%	$5,520
Sewer	$1,240	6%	$70
Electricity	$1,130,000	6%	$67,800
Solid Waste	$15,500	8%	$1,240
Phone	$17,700	6%	$1,060
Total	$1,210,440		$75,690

Source: CalPortland and ECONorthwest calculations, 2022.

Summary of Taxes Generated

Table 3.12-6 summarizes the taxes generated by the mine in 2022. The analysis estimates that the existing mining operation generated $180,000 in taxes to the city. This figure represents 2.4% of the city's overall collections of these taxes.

Table 3.12-6
SUMMARY TAX ESTIMATES

Tax	Tax Estimate
Property Tax	$61,613
Sales Tax	$1,870
B&O Tax	$40,000
Utility Tax	$75,690
Total	$179,173

Source: CalPortland and ECONorthwest calculations, 2022.

Public Services

Cost Allocation Approach

Public agencies do not typically allocate the costs of their general services (e.g., those supported by general taxes) to individual or classes of taxpayers. These services are all differentially consumed not just between different classes of taxpayers, but are also consumed by non-taxpayers as well (such as a visitor requiring public safety services). However, all taxpayers derived at least some indirect benefit in the form of things like crime deterrence, economic stability, and quality life that accrue a very local, city-specific level. Given this complex issue, this analysis uses two different approaches (average value and use approach) to assign some cost "responsibility" to CalPortland's operations to provide some context on this issue. The first approach reasons that residents and businesses derive roughly equal value from city services regardless of how much they may use those services. The second approach uses more specific data proxies to estimate the amount of public service use.

The average value approach to estimating a cost allocation to the mine uses the 2022 DuPont Adopted Budget costs divided by number of people and covered employees in the city. The rationale for this approach, while not perfect, provides a simple measure of constituent demand for services, namely that the main recipients of a city's public services (those that are in the general fund) are its resident population and employees of its businesses.

However, this approach may overstate public service demand and costs associated with non-residential development/employees relative to residential land uses. To the extent that service demand and costs related to non-residential development generally or to mining operations specifically can be overstated, the projected fiscal surplus to the City could be increased. The analysis uses the 2022 estimated population by the state's Office of Financial Management (10,180 people) and the Puget Sound Regional Council's estimate of covered employment in the city for 2021(5,123). Combined, a population-employment factor of 15,303 is used for this analysis.

The second approach (use approach) uses more specific data in two key service areas where data is available. The city has been able to provide data on police calls for service near the mine as well as heavy vehicle traffic on the roads.

The cost allocation of approach (use approach) for the Police Department creates a cost-per-call for service metric by tabulating the average number of calls for service over the five-year time period (2016-2021) across the city. This metric is then applied to calls for service within a police service area that includes the site.

The cost allocation approach for Street Maintenance portion of the Public Works department is allocated differently. It assumes that 90% (accounting for the pavement related costs) are attributable to vehicle traffic and almost all the roadway wear and tear is attributable to heavy vehicles. The cost allocation of the Street Maintenance uses roadway counts for heavy vehicles and apportions them based on average daily trips from CalPortland of heavy vehicles.

Cost Allocation Metrics

Using this cost allocation metrics (use approach), the cost per population-employee and cost per use (for police and public works) is derived as illustrated in **Table 3.12-7**. This is done by dividing the budget item by 15,303, the population-employment factor for those elements. For police and public works, they are derived on a calls for service basis for police and heavy vehicle trips for streets.

Cost Allocation to Alternative 1

Based on the analysis contained in the Traffic Impact Assessment prepared for this EIS (see **Appendix P**), it is noted that 2013 FEIS estimates that a typical day would have 126 employee commute trips (assumed in this analysis to be 63 employees making inbound and outbound trips to the site). Given that this analysis was done in 2013, employee numbers have been estimated at 80 in 2022 for this report. This figure represents 0.5% of the city's overall costs in these areas.

Table 3.12-7
COST ALLOCATION FOR CITY OF DUPONT PUBLIC SERVICES

	2022 Adopted Budget	Cost Allocations Per Population-Employee	Cost Allocations Per Use (Police and Public Works)
Mayor/Council	$140,214	$9	$9
Executive	$211,051	$14	$14
City Clerk	$248,611	$16	$16
Human Resources	$274,481	$18	$18
Legal	$129,722	$8	$8
Finance	$303,941	$20	$20
Central Services	$47,900	$3	$3
Information Technology	$80,860	$5	$5
Police Department	$2,643,834	$173	$407
Fire Department	$2,300,405	$150	$150
Community Development	$904,241	$59	$59
Parks, Facilities, and Greenways	$1,104,844	$72	$72
Public Works - Streets*	$616,992	$40	$544

Note: * Streets are allocated on heavy vehicle basis. Police are allocated on calls for sevice.

Source: City of DuPont, 2022.

Table 3.12-8 that follows summarizes the cost allocation to mine using the two different methods. Overall, the average cost approach allocates a smaller cost to the mine than the use approach. However, while the police cost under the use approach allocates a smaller amount than the average approach, the use approach allocates a relatively larger amount to streets than the average approach.

Table 3.12-8
COST ALLOCATION – AVERAGE / USE APPROACH COMPARISON

	Average Approach	Use Approach
Mayor/Council	$700	$700
Executive	$1,100	$1,100
City Clerk	$1,300	$1,300
Human Resources	$1,400	$1,400
Legal	$700	$700
Finance	$1,600	$1,600
Central Services	$300	$300
Information Technology	$400	$400
Police Department	$13,800	$2,200
Fire Department	$12,000	$12,000
Community Development	$4,700	$4,700
Parks, Facilities, and Greenways	$5,800	$5,800
Public Works - Streets	$9,500	$128,400
Total	$53,300	$160,600

Tax and Cost Allocation Balance

Table 3.12-9 compares tax revenues against public service costs. Based on this analysis, in 2022 revenues generated outpace costs and generate an annual surplus in the range of $18,400 to $125,700. These surpluses represent a cross subsidy to other taxpayers, which by itself, is not an atypical result when looking at narrow land uses[1].

It should be noted that this analysis reflects a single year and taxes and costs can vary from year to year – a surplus in a single year (here, 2022) does not guarantee a surplus in another year when taxes or costs might be different. Also, different measures to allocate costs could produce different cost allocations to the mine. Ultimately, the information provided in this analysis is intended to shed light on the nature of taxation and public services in the city of DuPont and how the specific conditions under Alternative 1 are anticipated to contribute to the city's fiscal bottom line.

[1] *These calculations are intended for generalized analysis and are not considered absolute*.

Table 3.12-9
ANNUAL ESTIMATED SURPLUS

	Estimate	Estimate
Taxes Generated	$179,000	$179,000
Allocated Costs	$53,300	$160,600
Surplus/Deficit	$125,700	$18,400

Source: ECONorthwest, 2023.

ALTERNATIVE 2 – NO ACTION

There are two No Action Alternatives- Scenario A Continuation of Existing Conditions; and Scenario B Site Development Under Existing Zoning.

Scenario A

No Action Alternative Scenario A assumes no mining on the South Parcel within the context of existing conditions. In this case, the short-term fiscal effects would be similar to those discussed in this analysis since there would be no change in operations and the output of the facility. However, over the longer-term the fiscal effects downstream of mining output limits on the site are difficult to gauge. On the cost side, less mining output would likely impact the largest cost driver to the city (i.e., less wear and tear on city operated streets) but it would also likely impact city revenues as sales taxes, utility taxes, and B&O taxes would decline.

Scenario B

No Action Alternative B reflects a condition where the Expansion Area of the site may be developed under existing zoning. Generally, it is understood that zoning of the site could allow approximately 75% Manufacturing/Research Park and approximately 25% Single-Family Residential. The fiscal impact in this scenario would be different than with mining in a couple respects. The longer-term downstream fiscal effects of this development would be hard to gauge without a specific proposal. On the revenue side, both manufacturing/ research and residential uses represent a more intense use of the land that would lead to more property, sales, and utility, and other taxes on a per square foot basis. However, on the cost side these uses also generate more needs for public services such as public safety services for residential uses and public works needs to support manufacturing uses.

3.12.3 Mitigation Measures

No significant adverse fiscal impacts have been identified. Beyond the payment of required payment of applicable property tax, sales & use tax, business & occupation tax, and utility taxes, no additional mitigation is identified.

3.12.4 Significant Unavoidable Adverse Impacts

The fiscal analysis conducted for this EIS indicates that expected revenues to the City of DuPont would exceed expected costs. Therefore, no significant unavoidable adverse are anticipated.

Chapter 4

KEY TOPICS AND COMMENT RESPONSES

CHAPTER 4
TOPIC AREA DISCUSSIONS AND COMMENT RESPONSES

Introduction

The *Pioneer Aggregates South Parcel Project* Draft EIS was published on June 14, 2024 with a 30-day public comment period provided; based on a request, the City of DuPont extended the comment period from July 15, 2024 to July 22, 2024. Various ways to provide comments on the Draft EIS were provided, including: Draft EIS Comment forms provided on the City's website; comments provided via email; and comments provided via letter. In some cases, both website comments and email/letter were received from the same agency/organization/individual, with each comment submittal counted as a separate comment submittal. All the comments that were received from agencies, tribes, organizations, and individuals during the comment period are contained in **Appendix Q** of this Final EIS (or FSEIS). A total of 251 written comment letters/emails were received, consisting of seven from public agencies, six from organizations, and 238 from individuals (individual submittals consist of approximately 218 completed or partially completed website forms and approximately 20 emails/letters)[1].

How Comments and Responses are Organized

Many comments that were received on the Draft EIS identified common topics, and these are referred to as "**Key Topic** areas" in this Final EIS. This approach to organizing and responding to comments is intended to reduce repetition and to provide a single comprehensive response to identical or similar comments that share a common theme. This Chapter of the Final EIS lists the topic areas and provides collective responses to the substantive comments.

Below are the topic and sub-topic areas discussed in this Chapter of the Final EIS and their location in the chapter. The topic areas are generally organized similar to the order of analysis of the environmental elements in Chapter 3 of the Draft EIS.

The **Matrix Comment Responses Section** follows the Key Topics discussions and provides tables of all the indexed (numbered) comments received from agencies, organizations and individuals; a summary of the comment; and a response that either cross-references to applicable key topic categories (e.g., Earth) or provides a response to the individual comment.

Comments Reflecting Statements of Opinion and Preferences

A substantial number of comments on the Draft EIS were received that provided opinions regarding a category or type of environmental impact, or opinion regarding opposition or support for the Proposed Action (Alternative 1).

[1] *Note that the total number of comment letters/emails/forms received reflects a number of repeats from the same commentor.*

SEPA requires that a Final EIS must respond to substantive comments submitted on a Draft EIS (WAC 197-11-560). Comments that provide expressions of support or opposition to the Proposed Action, including reference to an environmental impact or condition, are provided a response or a reference to a Key Topic discussion. Comments that provide expressions of support or opposition to the Proposed Action without reference to an environmental impact or condition, or that do not provide sufficient information on which to base a substantive response, are noted for the record but no further discussion is provided. Comments that state a general concern about a category or type of environmental impact but do not include specific information are addressed within each key topic area as substantially as possible and reasonable.

Refer to the Matrix Response section of this chapter for a listing of comments received along with responses, including responses related to expressions of support or opposition to the Proposed Action.

Key Topic Table of Contents

4.1 Earth - Geotechnical Conditions with Proposed Mining and Dewatering

4.1.1 Settlement, Sinkholes/Subsidence, and Associated Property Impacts 4-5

4.1.1.1 JBLM Landfill 4-5

4.1.1.2 Infrastructure (Sewer Lines) 4-6

4.1.2 Potential for Increased Erosion and/or Landslide 4-7

4.1.3 Potential for Compaction, Drying and/or Cracking 4-8

4.1.4 Earthquake Related Hazards 4-8

4.1.5 Potential for Soil Compaction Due to Mining 4-9

4.2 Air Quality

4.2.1 Potential for Air Quality Impacts Associated with Mining Activities 4-10

4.2.2 Compliance with Federal/State/Local Regulations 4-11

4.2.3 Greenhouse Gas Emissions and Climate Change 4-12

4.3 Groundwater

4.3.1 Groundwater Modeling Methodology 4-13

4.3.1.1 Technical questions/comments about model robustness/validity and modeler credentials 4-13

4.3.1.2 Questions/comments about whether/how climate change was incorporated 4-16

4.3.2 Dewatering Effects – General Comments/Concerns 4-18

4.3.3 Groundwater Quality 4-19

4.3.3.1 Potential impacts to groundwater quality or related impacts on the environment, Puget Sound, or nearby wells/water sources (general) 4-19

4.3.3.2 Potential mobilization of contaminants from JBLM Landfill 5 or the former DuPont Works site 4-20

4.3.4 Drinking Water Supply – Quality, Quantity, and Protection of the Vashon Aquifer as a Drinking Water Supply 4-21

4.3.5 Mining Alternatives 4-21

4.3.6 Incorporation of Previously Approved Monitoring Plan into EIS 4-22

4.4 Surface Water

4.4.1 Current Conditions of Sequalitchew Creek 4-23

4.4.2 Sequalitchew Creek and Springs Impact from Dewatering 4-24

4.4.3 Wetlands/Marshes Impacts from Dewatering 4-24

4.4.4. Old Fort Lake and Pond Lake Impacts from Dewatering 4-25

4.4.5 Surface Water Quality Impacts 4-26

4.4.6 General Surface Water Impacts 4-26

4.4.7 Sequalitchew Creek Restoration Plan 4-27

4.4.8 Sequalitchew Creek Restoration Without Dewatering 4-27

4.5 Fisheries

4.5.1 Mining Dewatering & Fisheries Conditions Relationship to City Values 4-28

4.5.2 Potential for Dewatering to Impact Sequalitchew Creek Fisheries 4-28

4.6 Plants & Animals

4.6.1 Site Clearing Impact to Plants & Animals Habitat 4-30

4.6.2 Potential for Mining Noise to Impact Animals 4-31

4.6.3 Potential for Dewatering to Impact Animal Habitat 4-31

4.6.4 Potential for Dewatering to Increase Wildfire Risk 4-32

4.6.5 Potential to Impact Gray Squirrel 4-33

4.6.6 Potential to Impact Oregon White Oak & Oak Prairie Habitat 4-33
4.7 Noise
4.7.1 Noise Analysis Methodology, Findings and Mitigation..... 4-35
4.7.2 Adequacy of City of DuPont Noise Regulations..... 4-36
4.7.3 Noise Impacts from Mining Activities..... 4-36
4.7.4 Cumulative Noise Conditions 4-36
4.8 Land & Shoreline Use
4.8.1 Proposed Action's Incompatibility with Surrounding Uses 4-38
4.9 Aesthetics
4.9.1 Potential for Changes to Aesthetic Character of Sequalitchew Ravine 4-39
4.10 Cultural Resources
4.10.1 Tribal Sovereignty and Consultation..... 4-40
4.10.2 Methodology and Scope of Analysis 4-40
4.10.3 Sequalitchew Ancestral Village Landscape..... 4-41
4.10.4 Cumulative Impacts of Mining and Restoration 4-43
4.10.5 General Impacts to Tribes..... 4-43
4.11 Transportation
4.11.1 Concerns about Increased Truck Traffic..... 4-44
4.11.2 Potential for Increased Truck Traffic to Increase Road Maintenance 4-45
4.12 Sequalitchew Creek Character Conditions
4.12.1 Geotechnical Impacts Along the Ravine, including Erosion/Landslides.... 4-46
4.12.2 Changes to Visual Character of Ravine, including Along Trail 4-47
4.12.3 Mining Noise Audible within the Ravine, including Trail..... 4-47
4.13 Other Topics
4.13.1 Alternatives Considered but Not Carried Forward 4-48
4.13.1.1 Limit effects to mine area or above water table only 4-48
4.13.1.2 Previously proposed interception channel(s) alternatives..... 4-49
4.13.1.3 Environmental Coalition of Pierce County suggested alternative.... 4-49
4.13.2 Sequalitchew Creek Restoration without Proposed Action 4-51

Matrix Comment Responses

State Agency Comment Matrix..... 4-53

Other Agencies Comment Matrix 4-58

Organizations Comment Matrix..... 4-63

Individuals Comment Matrix 4-68

4.1 Key Topic: Earth – Geotechnical Conditions with Mining and Dewatering

Comments on the Draft EIS were received that relate to the potential for proposed dewatering and mining at the South Parcel site to impact geotechnical conditions at the site and in the site vicinity. These comments relate to several topics of analysis conducted in support of Draft EIS Section 3.1 (Earth) as well as to some issues not previously analyzed in the Draft EIS. Key geotechnical topics of interest include:

- 4.1.1 – Potential for Settlement, Sinkholes/Subsidence, and Associated Property Impacts
  - 4.1.1.1 – JBLM Landfill
  - 4.1.1.2 – Infrastructure (Sewer Lines)
- 4.1.2 – Potential for Increased Erosion and/or Landslide Hazard
- 4.1.3 – Potential for Compaction, Drying and/or Cracking
- 4.1.4 – Earthquake Related Hazards
- 4.1.5 – Potential for Soil Contamination Due to Mining

4.1.1 - Potential for Settlement, Sinkholes/Subsidence, and Associated Property Impacts

Land subsidence, sinkholes, and differential settlement are hazards that can occur under certain conditions within certain geologic environments (including soft fine-grained or highly organic compressible soils, karst terrain, soluble evaporites, etc.). In general, the area that will be affected by the proposed dewatering is underlain by soils that are not prone to this type of hazard. As discussed in Appendix B to the DEIS and shown in Figure 6 of that document, geologic units in the project vicinity consist primarily of near-surface recessional glacial outwash deposits or ice contact deposits underlain by older, glacially-consolidated glacial/non-glacial deposits. Due to their grain size characteristics and relative density, these types of soils do not pose a settlement risk for structures or underground utilities. Discussion of soil characteristics and their potential for settlement have been added to the DEIS and Appendix B.

Compressible, organic-rich peat soils are present in limited areas of the site vicinity; however, these soils are well-constrained to the marshes and immediately areas (see Figure 3 of Aspect, 2004[2]). Furthermore, such soils are generally not suitable for development and the areas around the marshes where these soils are present are restricted for development by the City of DuPont. There is one segment of Pierce County sewer line within the Robinson Trail berm that crosses between East and West Edmond Marshes which warrants additional consideration because it overlies peat soils; for discussion of this feature see the discussion under 4.1.1.2 for additional discussion on soil settlement.

4.1.1.1 JBLM Landfill

Proposed dewatering and associated groundwater level drawdown are not anticipated to significantly affect the fate and transport of groundwater contaminants, leachate, or gas from JBLM Landfill 5. These concerns are addressed in the response to Key Topic Area 4.3 (Groundwater). Dewatering is similarly not anticipated to affect the rate of differential settlement at the landfill, create ponding, or otherwise cause damage to foundations, landfill liners, or cover systems, as further discussed below.

[2] Aspect Consulting, 2004. Surface Water and Groundwater System with Predictions on Effects to Wetland Hydrology Upstream of Proposed North Sequalitchew Creek. Technical Memorandum. July 21.

Landfill settlement, dominated by the process of waste decomposition (transformation of material states from solid to liquid to vapor), has historically occurred at JBLM Landfill 5, as visually observed and documented by Tacoma-Pierce County Health Department annual reporting. However, due to the age of waste, burned condition of older waste in the landfill, and stabilization of microbiological activity from the recent transition from active to passive landfill gas collection, JBLM Landfill 5 materials are likely nearing functional stability, as demonstrated by little to no settlement, little to no landfill gas generation, and little to no leachate generation. Because of the age and condition of waste materials and relatively minor extent of dewatering (a maximum of approximately 9 feet at the southeast corner of the landfill area), the proposed dewatering is anticipated to have little to no effect on the rate of approach of JBLM Landfill 5 toward functional stability.

Other potential settlement mechanisms for landfill materials are also unlikely. Structural settlement (collapse of void space) is unlikely due to a general lack of remaining void space/structure in the materials due to the length of load time since placement and the burned state of the oldest material. The potential for settlement of underlying native gravels is also not anticipated as this type of soil is not prone to settlement (see response to Key Topic Area Comment 4.1.1).

4.1.1.2 Infrastructure (Sewer Lines)

A review of Pierce County utility mapping[3] indicates that nearly all sewer mains within the proposed dewatering area are underlain by soil types that do not pose a risk for settlement (see Key Topic Area 4.1.1), with one potential exception: an 8-inch sewer main (installed under the Robinson Trail in a former railroad berm that bisects West and East Edmond Marsh. As-built drawings (ESM, 1989[4]) indicate that this sewer line is buried approximately 3 to 8 feet below ground surface within fill soils that overlie potentially compressible organic marsh soils/peat (DEIS Appendix B Figure 28; Anchor, 2023[5]). These type of soft, organic-rich soils can compress when physically loaded (e.g., by construction of an overlying berm or structure). Dewatering can also "load" such soils by reducing pore pressures (either in the compressible soil itself or in overlying soils), thereby increasing the effective load carried by the soil.

The DuPont groundwater model indicates that maximum groundwater drawdown at Robinson Trail location will be less than 1 foot (Table 8, Figure 24 of Appendix B). Marsh surface water levels on either side of the berm are also anticipated to lower by as much as approximately 3 feet in both East and West Edmond Marsh as a combined result of dewatering and restoration plans (DEIS Figure 3.4-4 or Figure 35 of Appendix B). Groundwater elevations currently fluctuate by about 2.5 feet, between approximately 5 and 7.5 feet in depth, at this location.

The Robinson Trail berm has likely been settling over time due to ongoing biodegradation and secondary compression of the peat from berm loading (and historical use of the previous rail line) over the past ~80+ years since the berm was constructed in the 1940s (or earlier). Due to the loading (timing and magnitude) history of the berm, the majority of potential peat compression may have already occurred. However, the peat will continue to compress at a very slow rate, with or without the proposed project. Due to initial compression plus ongoing long-term biodegradation, it is

[3] Pierce County PublicGIS: https://matterhornwab.co.pierce.wa.us/publicgis/.

[4] ESM, 1989. Gravity Sewer Plan and Profile, Sheets 15 and 16. City of DuPont Local Improvement District No. 1. As-built certification dates 12/15/1992 and 1/6/1992.

[5] Anchor QEA, 2023. Sequalitchew Creek Watershed Ecosystem Restoration Project Geotechnical Engineering Report. Prepared for South Puget Sound Salmon Enhancement Group. May.

possible that the sewer line has already experienced measurable settlement since it was installed over three decades ago. Though unlikely, the proposed dewatering (by an amount that is less than the existing seasonal groundwater level fluctuation) could cause some incremental, but difficult to quantify, additional settlement of the sewer line beyond the ongoing slow biodegradation and secondary compression settlement. The potential for settlement will be partially mitigated in the vicinity of the proposed bridge that will be implemented as part of the restoration plan, where the sewer pipe will be encased and suspended from the bridge.

Despite the very low potential for this project to cause any significant settlement of the existing sewer, CalPortland will develop and include provisions for monitoring the Robinson Trail sewer main in a project monitoring plan document. An initial baseline survey, including utility elevation surveying at selected monitoring points as well as television inspection of the relevant section of pipeline, should be performed prior to project implementation to identify existing sags or leakage. Additionally, Pierce County Public Works and Utilities should provide CalPortland with any existing information about the current sewer condition, any prior video inspections, and history of prior settlement-related maintenance issues, etc. If, during dewatering, new sags or leakage are detected in sewer lines (beyond the rate of anticipated change that would be expected to result from natural conditions alone, based on review/documentation of pre-project conditions), and such damage appears to correlate with measured dewatering-related groundwater drawdown in the vicinity, CalPortland will work with Pierce County to take corrective action to restore the affected areas. Due to a lack of settlement-prone soils in sewer locations outside of the Robinson Trail area, monitoring is not necessary elsewhere.

4.1.2 - Potential for Increased Erosion and/or Landslide Hazard

Slope stability of the current and proposed conditions is discussed in detail in Sections 2.2.2 and 2.2.6 of Appendix B to the DEIS. Geologic analyses for the project are based on investigations and observations performed over a period of more than 30 years, including over 109 borings completed in the late 1980s to facilitate planning of the initial Pioneer Aggregates mine.

Mapped landslide and steep slope hazards are not present within the project area, though they are present nearby in the Sequalitchew Creek ravine. The project includes a 100-foot buffer along the top of the Sequalitchew Creek ravine slope (see Figure 10 of Appendix B), which conservatively doubles the 50-foot buffer required by the DuPont Municipal Code between proposed development activity and hillslopes of 40 percent (22 degrees or approximately 2.5H:1V).

Proposed mine slopes were designed by a geotechnical engineer and slope stability analysis identified acceptable factor-of-safety values for each of the slope profiles evaluated. Furthermore, mine slopes are contoured to drain into the pit/away from the ravine (see Figure 10 of EIS Appendix B).

Due to their generally coarse-grained nature and good infiltration characteristics, the soils in the South Parcel Project area possess a low erosion risk and are generally not moisture sensitive. While vegetation removal and mine slope construction will increase the potential for erosion within the mine area, proper implementation of stormwater management best practices (as required by permit conditions) are expected to prevent significant erosion of coarse site soils. Furthermore, the South Parcel Project, together with the existing mine, will be excavated as a closed depression and all surface runoff will drain internally within the site; therefore, any erosion that were to occur would be contained within the mine site and would not impact Sequalitchew Creek or the trail area, as discussed further below.

While vegetation is generally beneficial to surficial slope stability (by providing root cohesion, soil cover, and evapotranspiration), dewatering is not anticipated to cause significant vegetation loss in the Sequalitchew Creek ravine and therefore, no increase in related slope stability hazards is anticipated. As discussed in Section 3.6 and Appendix H of the DEIS and further explained in the response to Key Topic Area Comment 4.6.3 (Plants & Animals), most vegetation in the affected area is primarily dependent on precipitation, not groundwater-fed seeps/springs, and is adapted to well-drained soils (as evidenced by the surrounding vegetation and existing slope conditions in nearby non-seep/spring portions of the hillside). Furthermore, dewatering will reduce soil pore pressures (pressures exerted by water trapped within voids in soil masses) at some spring and/or groundwater seepage locations, thereby reducing one of the risk factors known to contribute to slope instability. For these reasons, dewatering may reduce slope failure hazard in the ravine.

4.1.3 - Potential for Soil Compaction, Drying and/or Cracking

As discussed in Section 3.6 of the DEIS, the presence of the Vashon Aquifer is not responsible for soil moisture, nor does it regulate wildfire risk in most areas in and around the proposed project. Low humidity, high temperature, wind and fuel load are the main contributing factors to wildfire risk. The depth to groundwater beneath these forested areas is already more than 10 feet, which is too deep for capillary action to draw moisture into the soil. For these reasons, proposed dewatering is not anticipated to affect soil moisture conditions except in localized areas where groundwater is in contact with the ground surface such as seeps/spring locations. See also responses to Key Topic Area Comment 4.1.2, 4.6.3, and 4.6.4.

4.1.4 - Earthquake Related Hazards

Earthquake hazards related to the proposed project are discussed in the geologic hazard evaluation included in Appendix B to the DEIS. As discussed in Appendix B, the proposed mine does not contain seismic hazard areas because the soils present on slopes greater than 40 percent are not expected to be seasonally or perpetually saturated and do not pose a specific risk of settlement, movement, or liquefaction (in part due to the coarse/dense soils and other characteristics of the site geology). Mine slopes were designed by a geotechnical engineer and were found to be of acceptable slope stability hazard risk during earthquake conditions; furthermore, proposed mine slopes will be similar to existing mine slopes, which performed well in the 2001 Nisqually Earthquake. No reports of mine slope or natural ravine slope failures were noted in the area after that earthquake.

New permanent slopes around the periphery of the proposed mine area have been designed at a relatively low angle (3H:1V, or approximately 18.4 degrees), a much more conservative angle than observed natural slope angles (temporary mine cuts in undisturbed, native material are typically observed in stable configuration at 75 degrees to as steep as vertical, with loose sand and gravel standing at 35 degrees). Final slopes will be layered with topsoil and mulch and revegetated to support long-term erosion control. Along the eastern perimeter, long-term groundwater seepage is anticipated to occur due to the exposure of fine-grained Olympia Beds near the base of the excavation. To maintain a stable face in this area, CalPortland will implement aggregate surface treatment systems recommended by geotechnical engineers to allow the discharge of seepage while promoting confinement of the natural soils. In other locations, any minor erosion observed on permanent cut faces will be addressed by monitoring, maintenance, and localized revegetation as

required by the surface mine reclamation permit. As discussed in response to Key Topic Area 4.1.2, all cut slopes will be directed inward toward the mine site and therefore any temporary erosion that were to occur would be contained within the mine site.

4.1.5 - Potential for Soil Contamination Due to Mining

The project is not anticipated to contribute to new environmental contamination or mobilize/spread existing contamination from the surrounding areas.

As discussed in Section 3.2.2.2 of Appendix B to the DEIS, spills, leaks, and drips of chemical products are not typically a significant groundwater quality concern for mining sites or operations like the South Parcel Project because of the limited use of chemicals and small number of heavy equipment/vehicles operating in a large area. Petroleum products (diesel fuel, motor oil, and hydraulic fluid) used to operate the mining equipment are the only chemical constituents used within the mining area and mining companies are typically able to excavate and contain small spills because heavy equipment is always on site and available to quickly excavate contaminated soil and contain it in the bed of a dump truck. In accordance with the mine's Spill Response Plan, required under the Sand and Gravel General NPDES/SWD permit, any spills would be cleaned up immediately. For additional discussion of stormwater management and groundwater-related contamination concerns, see the response to Key Topic Areas 4.3 (Groundwater) and 4.4 (Surface Water).

With respect to the mobilization or release of existing contamination in the vicinity, the remediation and monitoring of nearby contaminated/remediated sites is regulated under the Washington Model Toxics Control Act (MTCA). As detailed in CalPortland's Cleanup Action Plan (CAP), topsoil in the proposed project area will be monitored for both lead and arsenic concentrations, and if either constituent is found to exceed its respective cleanup level, that batch of soil will be mixed with clean soil (and remixed if necessary) until acceptable cleanup levels are reached. The CAP and DOE's 2021 opinion of no further remedial action (based on the remedial action meeting the substantive requirements of MTCA) are available at: https://apps.ecology.wa.gov/cleanupsearch/site/15278. DEIS text will be revised accordingly to clarify this process.

As discussed in Appendix B of the DEIS, backfill used for the project will consist of select retained South Parcel material and/or imported clean fill only. Any material used for backfill must comply with the minimum standards for reclamation specified in Washington State Surface Mining revised code (RCW 78.44.141).

Discussion of contamination related to JBLM Landfill 5 is included in the Key Topic response 4.3.3.2.

Several other specific concerns were raised regarding potential sources of contamination that do not apply to this project either because the type of mining or the site-specific soil conditions are not relevant. Specific concerns include acid mine waste and tailings (which are not typically generated by aggregate mines) and concerns about nitrates. Blasting is not part of the proposed action and there are no other proposed activities that would be a source of nitrates.

Additional discussion of groundwater-related topics is included in response to Key Topic Area 4.3 (Groundwater). Concerns about dust/air quality are addressed in Key Topic Area 4.2 (Air Quality).

4.2 Key Topic: Air Quality – Air Quality Conditions with Mining

Comments on the Draft EIS were received that relate to providing discussion on the potential for proposed mining and dewatering at the site to impact air quality in the site vicinity and regionally related to GHG emissions and climate change. These comments relate to several topics of analysis conducted in support of Draft EIS Section 3.2 (Air Quality) as well as to some issues not previously analyzed in the Draft EIS. Key air quality topics of interest include:

- 4.2.1 – Potential for Air Quality Impacts associated with Mining Activities
- 4.2.2 – Compliance with Federal/State/Local Regulations and Enforcement
- 4.2.3 – Greenhouse Gas Emissions and Climate Change

4.2.1 - Potential for Air Quality Impacts associated with Mining Activities

As indicated in Section 3.2 (Air Quality) of the Draft EIS, fugitive dust and equipment emissions would be generated during both the construction (site clearing) and mining phases of the Proposed Action. Construction phase dust and equipment emissions would be generated from activities such as logging/clearing, top-soil removal, and construction of perimeter berms. These construction phase emissions would be temporary and localized in nature, and with proposed mitigation measures (described below) would not be anticipated to result in significant impacts.

During mining operations, fugitive dust emissions would continue to be emitted from the Remine Area and the Expansion Area (South Parcel) would be a new location of emissions (Draft EIS page 3.2-5). The potential for fugitive dust emissions would likely be greatest in the dry summer months. Emissions from equipment would be associated with equipment operations on the site as well as automobile and truck transport trips on area roadways; the number of auto and truck trips from the site with the Proposed Action would reflect a continuation of current conditions.

The annual amount of mining activity, and associated air quality conditions, with the Proposed Action in combination with mining at the Existing Mine was discussed in the Draft EIS (see page 3.2-7 of the Draft EIS) and indicates that combined emissions would not exceed current levels, and cumulative mining air quality impacts are not anticipated. In addition, air quality impacts associated with mining would be temporary in nature and would occur some distance from potential future development that could occur in the vicinity. No significant cumulative air quality impacts are anticipated.

Proposed measures identified in the Draft EIS to minimize the level of emissions under the Proposed Action include:

- The use of control equipment, enclosures, and wet (or chemical) suppression techniques, as practical, and curtailment during high winds.

- Surfacing roadways and parking areas with asphalt, concrete, or gravel.

- Treating temporary, low-traffic areas (e.g., construction sites) with water or chemical stabilizers, reducing vehicle speeds, constructing pavement or rip rap exit aprons, and use of

the existing wheel wash system or equivalent equipment by vehicles before they exit to prevent the track-out of mud or dirt onto paved public roadways.

Possible measures identified in the Draft EIS include:

- Converting incandescent lighting systems to LED and implementing motion-activated lighting.
- Regenerating electricity from the conveyor belt leading downhill to the barge load-out facility.
- Participating in PSE's Schedule 258 electricity energy efficiency program.

With the application of the proposed mitigation measures, no significant air quality impacts under the Proposed Action are anticipated.

4.2.2 – Compliance with Federal/State/Local Regulations and Enforcement

The comments requesting adherence to applicable federal, state, and local air quality standards is noted. Accordingly, this Final EIS includes additional air quality mitigation measures as provided below and in Section 3.2 (Air Quality).

Added Air Quality Mitigation Measures

- The Puget Sound Clean Air Agency Regulation I is intended to control the emission of air contaminants from all sources within the jurisdiction of the Agency, to provide for the uniform administration and enforcement of this Regulation, and to carry out the requirements and purposes of the Washington Clean Air Act and the Federal Clean Air Act. The Proposed Action would comply with all applicable provisions of Regulation I, including the below.
    - Operations would be subject to Puget Sound Clean Air Agency Regulation I, Section 9.15 (Fugitive Dust Control Measures), Section 9.18 (Crushing Operations), and Section 9.20 (Maintenance of Equipment).
    - The facility should be sure to comply with all applicable Agency regulations.
    - The City of DuPont should ensure compliance with RCW 46.61.655 relating to vehicles driven on public highways.
    - Stationary engines may be required to undergo air quality permitting through the Agency's Notice of Construction program (in Agency Regulation I, Section 6, and WAC 173-400), while non-road engines are subject to the Agency's notification requirements in Regulation I, Section 15.

4.2.3 – Greenhouse Gas Emissions and Climate Change

A Greenhouse Gas (GHG) emissions inventory was prepared for the Draft EIS to estimate the higher end of the range of emissions from the Proposed Action (see page 3.2-6 of the Draft EIS). Emissions results at the maximum extent of mining indicates an overall annual GHG emissions of 4,559 mtpy of CO_2e under the Proposed Action. There are no well-established nor well-recognized thresholds for determining whether GHG emission rates from an individual project would be considered significant, although there are reporting thresholds established by the USEPA and by Ecology for stationary sources. Furthermore, GHG emission rates are reported by Ecology for the State of Washington, by USEPA for the United States, and by the World Resources Institute (and others) for the entire globe. The large-scale (United States and global) emission inventories are relevant since the impacts due to GHG emissions are considered to be global in scale. Even these maximum potential worst-case GHG emissions from the proposed sources are less than half of the reporting thresholds identified by Washington State (10,000 mtpy CO_2e) and federal agencies (25,000 mtpy CO_2e). Therefore, the GHG emissions from the Proposed Action would represent a very small percentage of the total state-wide inventory.

4.3 Key Topic: Groundwater

Comments on the Draft EIS were received that relate to potential or proposed changes related to groundwater at the South Parcel site and in the site vicinity. These comments relate to several topics of analysis conducted in support of Draft EIS Section 3.3 (Water Resources - Groundwater) as well as to some issues not previously analyzed in the Draft EIS. Key groundwater topics of interest include:

- 4.3.1 – Groundwater modeling methodology
  - 4.3.1.1 – Technical questions/comments about model robustness/validity and modeler credentials
  - 4.3.1.2 – Questions/comments about whether/how climate change was incorporated
- 4.3.2 – Dewatering effects – general comments/concerns
- 4.3.3 – Groundwater quality
  - 4.3.3.1 – Potential impacts to groundwater quality or related impacts on the environment, Puget Sound, or nearby wells/water sources (general)
  - 4.3.3.2 – Potential mobilization of contaminants from JBLM Landfill 5 or the former DuPont Works site
- 4.3.4 – Drinking water supply – quality, quantity, and protection of the Vashon Aquifer as a drinking water supply
- 4.3.5 – Long-term viability and funding of the project and Restoration Plan
- 4.3.6 – Incorporation of previously approved Monitoring Plan (adaptive management) into EIS

4.3.1 Groundwater modeling methodology

4.3.1.1 Technical questions/comments about model robustness/validity and modeler credentials

Model Validity and Modeler Credentials

A numerical groundwater model and supporting site water balance analyses were developed to simulate the groundwater and surface water system in the DuPont area and analyze potential effects of the Proposed Action. The DuPont groundwater model has been calibrated, validated, and refined over a period of more than 20 years as summarized in Section 3.3.2 of the EIS and detailed in Appendix E. The site water balance is summarized in Section 3.3.2 of the EIS and detailed in Appendix B (Section 3.1.3.1, Section 4.2.1, and Appendix F). The model and analyses provide reasonable and conservative tools for evaluating and projecting patterns in groundwater and for addressing uncertainty. The technical team responsible for model development and analysis includes highly qualified Washington State-certified Professional Hydrogeologists (LHGs), Geologists (LGs), and Engineers (PEs) with advanced degrees and decades of applicable experience. Additional third-party review of technical elements of the project models, analyses, and predicted effects has been provided by:

- Derek Booth, PE, PG, a geology professor (UW and UC Santa Barbara) and researcher who has been involved with project review since 2009. Dr. Booth's DEIS comments regarding the Proposed Action are available for review as Org Letter 3.

- Mindy Roberts, PhD, environmental engineer (formerly with Washington Department of Ecology), former University of Tacoma lecturer, and current Puget Sound Program Director for Washington Conservation Action.
- Glenn Mutti-Driscoll, LHG, hydrogeologist.
- USGS hydrogeologists for the region.

DuPont & USGS Groundwater Models

Comments included questions about the groundwater model developed by consultants under contract to the applicant used for the technical studies and the EIS and the models developed by the US Geological Survey (USGS) in 2011 and 2024.

The DuPont model was developed to provide a local-scale model that simulates local groundwater flow and predicts the effects of the proposed project. The local model has several advantages over the 2011 regional USGS Chambers-Clover Creek regional groundwater model (which existed when the Dupont model was developed) and the USGS' subsequent Southeast Sound regional groundwater model (which was published in August 2024). Advantages the local Dupont model has over regional groundwater flow models includes a finer grid spacing (which allows more precise simulation of local features in the model), the local wetland complex is simulated, subsurface data from over 100 onsite boreholes and local testing data are incorporated into it, and more locally-observed groundwater and surface water data are incorporated into it,

The USGS models were designed and calibrated to address issues at a watershed scale; they are not appropriate standalone tools for simulating local-scale groundwater/surface water conditions near the project site or analyzing the potential effects of the project. As summarized in Section 3 (page 27) of Appendix B, and detailed throughout Appendix E, the DuPont (project) groundwater model has incorporated applicable elements of the USGS Chambers-Clover Creek watershed model. A summary of these elements has also been added to Section 3.3.2 of the EIS, complementing the summary already provided in Appendix B.

Model Calibration, Validation, and Conservative Assumptions

Throughout the process of developing, validating and applying the DuPont groundwater model, comprehensive data and conservative assumptions were used at each step to account for potential uncertainty. The major steps in the process are summarized below.

- Extended observations of watershed conditions within the project vicinity: CalPortland has collected data on groundwater levels, marsh water levels, stream flow rates, and precipitation, since 2000. Monthly groundwater and surface water monitoring is ongoing, as described in Section 3.1.1.2 of Appendix B.
- The DuPont model simulates a wide range of precipitation conditions over an 11-year period, from 2004 to 2015 a relatively long period of data collection which includes both relatively wet and relatively dry years (as shown in Figure 9 of Appendix E) and enhances the predictive reliability of the model results.
- Groundwater model calibration and validation: The background data set described above was used to *calibrate* the DuPont model to ensure that it reasonably replicates existing conditions. After calibration, the model was then *validated* to assess the model's ability to

reproduce historical conditions by comparing groundwater elevation predictions for a different set of years (which were not used for model calibration) without modifying the modeled aquifer parameters. Finally, both modeled and predicted water levels were further refined through additional corrections to increase the level of precision. This process (described in detail in Appendix E) meets and exceeds industry standards for model development, refinement, and reduction of uncertainty with respect to aquifer water level predictions. A separate wetland water balance model was provided to evaluate impacts on wetland water levels and surface water flows due to the proposed action. The inputs to this model were based on existing well water level information, surface water measurements at several weirs and water level measurements in wetlands. The water balance model was calibrated by comparing observed marsh water levels with the model predictions for historical conditions. Results of the calibration are shown on Figures 33 and 34 of Appendix B.

- A specific criticism of the water balance model was the presumption that the East and West Edmond Marsh system was treated in modeling as being primarily recharged by surface water rather than groundwater. There are limited wells monitored upgradient of the Edmond Marsh system. These wells have groundwater levels higher than Edmond Marsh water levels, particularly in wintertime. There is no definitive information on the groundwater levels between these upgradient wells and the Edmond Marsh system. Based on water level measurements from existing wells located on the periphery of Edmond Marsh, groundwater is closely connected to surface water in East Edmond Marsh (providing recharge to and receiving discharge from the marsh depending on time of year and location) and is seasonally connected in West Edmond Marsh. Some groundwater flow is presumed between the Bell, McKay and Hamer Marsh systems and the Edmond Marsh complex which lies at a lower elevation. There are also well-defined surface water connections between Hamer Marsh and East Edmond Marsh. The wetland water balance model approximates the volumes of water moving into and out of the marsh complexes. The projected amounts of water correlate well with observed marsh elevation levels. The modeled case for dewatering with and without restoration assume groundwater elevations underlying the marsh are significantly lower than current conditions ("worst-case" groundwater levels as discussed in the "Conservative Assumptions" bullet below) and potentially will underpredict groundwater inflow to the wetlands in dewatering scenarios. With the proposed replenishment of the Edmond Marsh wetland and Sequalitchew Creek with water from Sequalitchew Lake, together with lowering Edmond Marsh surface water levels to provide a gradient for flows, the magnitude of water from the lake would result in much higher Sequalitchew Creek flows on average.
- Conservative assumptions: The model incorporates conservative assumptions that are intended to limit uncertainty. Two key examples incorporated into the marsh water balance analysis are:
    - The lower 95th percentile drawdown predictions were used to calculate the worst-case groundwater levels used in the water balance for predicting impacts to Bell, Hamer, McKay, and East and West Edmond Marshes. This assumption is conservative in the portions of the marshes where groundwater and surface water are in hydraulic connection; where an unsaturated zone exists between groundwater and surface (such

as the west end of West Edmond in summer) the depth of groundwater does not affect surface water levels in the marshes.
    - The existing streamflow in Sequalitchew Creek is assumed to be 100 percent groundwater when estimating the impact of dewatering on streamflows (in actuality, a portion of the streamflow in wetter months derives from surface or shallow subsurface [interflow] flows that would not be impacted by dewatering).

- Monitoring & adaptive management: The proposed action incorporates a dewatering observation period to further verify the model, coupled with adaptive management practices to adjust the model as needed. Adjustments to the model and/or project can be made if actual observed conditions differ from predicted conditions. Adaptive management practices are key components of the Monitoring Plan (Appendix F to the EIS) and Restoration Plan, and provide a structure for ongoing data collection, evaluation, and adjustment as needed throughout the project.

4.3.1.2 Questions/comments about whether/how climate change was incorporated

Numerous comments and questions were received related to climate change. The majority of climate-change related comments expressed general concern that climate change/warming would exacerbate drought conditions in the future. Many comments expressed concerns about implementing the Proposed action in the face of climate change with respect to reduction of groundwater and/or surface water levels, water scarcity (in general), future availability of drinking water supply, and/or potential changes to plant/animal habitat conditions that may occur as a result of worsening future drought conditions.

The following response addresses questions and comments about how the model and analysis performed accounts for climate variability and future anticipated climate changes and considers whether the Proposed Action could potentially exacerbate projected impacts of climate change with respect to groundwater and/or surface water conditions. Additional supporting explanation is provided in a technical memorandum (Aspect and Herrera, 2025[6]). Several other related topics are also addressed in the following key topic responses: effects of project on drinking water supply – Section 4.3.4; general concerns about dewatering – Section 4.3.2 (also see additional specific dewatering related comment responses as referenced therein), project impact on Sequalitchew Creek – Section 4.4.1; and, impacts of dewatering on plant and animal habitat – Section 4.6.3. General discussion of greenhouse gases and overall effects of the Proposed Action on climate change (not related to groundwater or surface water conditions) is included in Section 4.2.3.

Climate models are global or regional in scope and provide a best available science-based perspective on changes in regional meteorological conditions that can be used to project changes in regional conditions. (Mauger 2015, Pitz, 2016; NOAA, 2025; UW CIG, 2010). In the Puget Sound trends are expected to include:

- "Year-to-year variability will continue to cause some periods that are abnormally wet, and others that are abnormally dry. For the foreseeable future, the region will continue to experience years and decades with conditions that temporarily mask or amplify the

[6] Aspect and Herrera. 2025. Climate Change Projections for DuPont and the South Parcel Project. February.

projected changes in water resources, even as long-term trends continue" (Mauger 2015). Extreme events (droughts, flooding, etc.) may occur with greater frequency, magnitude, and year-to-year persistence (Dalton 2013, Ramondi 2013, Hamlet 2007; Pagano 2005).

- Spring precipitation is projected to increase in the Puget Sound region, but no other trends are statistically significant (Mauger 2015). A two to seven percent rise in winter precipitation is projected for the State of Washington as a whole (Pitz 2016).
- Increases are projected in the frequency and intensity of heavy precipitation. (Mauger 2024) More frequent "atmospheric river" events are projected, which may exceed the soil ability to infiltrate runoff leading to less infiltration and aquifer recharge (Pitz 2016). However, the Steilacoom gravels in the immediate vicinity of the site are extremely permeable and likely could infiltrate such storms. The less permeable Vashon recessional outwash of the larger aquifer area extending to the east to around Tanwax Creek, which provides the majority of aquifer recharge, consists of stratified silt, sand, and gravel deposits which have a wider range of permeability and a wider range of responses to large storms which may result in more surface water runoff and less infiltration in some areas (Welch 2024).

The trends for the Puget Sound Region likely will apply to the DuPont area with similar annual rainfall, a slight increase in springtime rainfall and summer seasons that may become slightly drier. Because drier conditions are projected to occur largely during the summer months when aquifer recharge is already minimal (as reflected in monitoring data and incorporated into the DuPont model), average groundwater levels are not expected to be negatively impacted as a result of climate-related changes in precipitation; however yearly variation may differ more than currently and individual dry years and series of drier years may occur more often. On average, the impacts projected from the groundwater drawdown of the aggregate mine under the Proposed Action are likely to be similar to the modeled results.

Rather, anticipated increases in recharge rates during the wet season when evapotranspiration is low may increase annual recharge and groundwater storage that "would in turn increase baseflow to local streams" (Pitz 2016) such as Sequalitchew Creek.

The DuPont groundwater model quantitatively accounts for climate variability by simulating the range of historical precipitation conditions from 2004 to 2015, including both relatively wet and relatively dry months and years. The 2004 to 2015 data do not, however, include about the lower 25% of precipitation occurrence in the area, and therefore the range of variability in the future is likely to include lower rainfall years and somewhat lower groundwater levels with somewhat different effects on wetlands and surface water.

Impacts of the Proposed Action (without implementation of the Restoration Plan) on wetlands for wetter, average, and drier years are described in EIS Section 3.3 Groundwater, Section 3.4 Surface Water, and Section 3.3. Plants and Animals. Impacts include decreases in water levels in West Edmond Marsh in an average year by about two feet from November through March, from a total depth of around 4 feet, and would transition to lower decreases in the summer coincident with the lowest marsh levels occurring in May, several months before the naturally occurring low point typically occurs in September. In East Edmond Marsh and the Bell, McKay and Hamer Marshes, the decreases are less due to the fact that those marshes are farther from dewatering and primarily recharged by surface water. If the project and Restoration Plan are implemented, Edmond Marsh

wetland levels would be reduced from high winter elevations of about 212.4 to 210.5 feet to the east to about 207.9 to and 206.5 feet to the west near Center Drive to accommodate the gradient needed for flows from Sequalitchew Lake. The lake receives most of its water from groundwater discharging at Sequalitchew Springs. The aquifer feeding Sequalitchew Springs is likely to be relatively stable in the future and similar to existing conditions. Climate change is likely to have a minimal impact on streamflow in Sequalitchew Creek on average and may result in a slight increase, but greater variability in rainfall events may increase the frequency of when flows out of the lake are lower than under existing conditions, particularly in the summer. With climate change, summers with extended dry periods would likely continue to be the norm, and those summers may become more frequent or the dry period longer; however, slightly increased precipitation in the spring, coupled with the size of the aquifer dampening the effects of any single season, is expected to reduce negative effects from dry summers.

4.3.2 Dewatering effects – general comments/concerns

As described in Draft EIS sections 3.3 and 3.4, dewatering consisting of interception of groundwater to accommodate mining below the existing water table with the Proposed Action would lower upgradient groundwater levels in the mine vicinity. As discussed in EIS section 3.3.4, groundwater drawdown would reduce water levels in the Edmond Marsh complex. With implementation of proposed mitigation measures in the Restoration Plan (including increasing flows from Sequalitchew Lake, with a lowering of wetland elevations to accommodate the gradient needed for flow) would reduce or compensate for the interception of the groundwater that currently provides flow to Sequalitchew Creek, but with impacts to wetland water levels and to stream flows on years with low flows from the lake as further described in Section 4.4.3.

At present, the shallowest groundwater in DuPont is located near Bell Marsh, which is sufficient distance from the project that dewatering impacts are not anticipated. Closer to the mine, groundwater levels currently fluctuate between about 12 to 20 feet or more from ground surface; water at that depth has limited effect on soil moisture, and upland plant and animal habitat in the types of sandy gravel subsoils found in this area of DuPont.

Impacts of public water supplies have been studied in detail. As described in Section 3.3 of the EIS (and discussed in key topic response 4.3.4 below), the City of DuPont's water supply wells withdraw water from deeper aquifers below the Vashon Aquifer and will not be impacted by the proposed project.

For discussion on additional specific dewatering-related concerns, please see the following key topic responses: 4.1.1 (potential for settlement, sinkholes/subsidence, and associated property impacts), 4.1.2 (erosion and/or landslide hazard), 4.1.3 (soil compaction, drying, and/or cracking), 4.3.1 through 4.3.3 (groundwater quality), 4.3.4 (drinking water supply), 4.4.1 (Sequalitchew Creek impacts), 4.4.2 (wetland/marsh impacts), 4.4.1 (Old Fort Lake and Pond Lake impacts), 4.5.2 (Sequalitchew Creek fisheries), 4.6.3 (plant and animal habitat), and 4.6.4 (wildfire risk).

4.3.3 Groundwater quality

4.3.3.1 Potential impacts to groundwater quality or related impacts on the environment, Puget Sound, or nearby wells/water sources (general)

As discussed in the EIS (Section 3.2.2), dewatering of the aquifer within the boundaries of the aggregate mine and conducting the intercepted water via surface channels to the westerly margin of the pit will not introduce new potential sources of groundwater contamination upgradient of the mine. The implementation of best management practices (BMPs) throughout the Proposed Action is designed to address contaminants from the excavation which might enter the intercepted water which is proposed to be infiltrated in the vicinity of the existing "sea level aquifer" which discharges within the tidal zone of Puget Sound. Concern about sediment eroded from steep slopes carried by groundwater that flows down slopes and into surface water conveyance will be addressed by settlement and treatment in constructed wetland prior to infiltration. Concerns about combining runoff from future development after closure of the aggregate mine with intercepted groundwater and potential impacts of contamination from new development will be addressed at the time for future development. Some of the concerns raised by commenters relate to potential impacts that frequently occur at hard rock/metal mining sites but are not applicable to aggregate mining sites.

Mining would proceed in accordance with a Cleanup Action Plan approved by Ecology to address surface soils on the site which are contaminated with arsenic and other materials from the Tacoma Smelter Plume[7]. These soils are proposed to be stockpiled, mixed with silt mined at a deeper elevation which would dilute the levels of contaminants, tested to ensure they meet residential cleanup levels, then used in mine reclamation.

Many of the issues raised with respect to groundwater contamination were related to concerns about the quality or availability of drinking water supply. For *drinking water*-related concerns (included potential impacts to vicinity wells), see also key topic response 4.3.4. For additional discussion related to the potential for *contamination of soils* due to mining, see key topic response 4.1.5.

Specific groundwater quality concerns were raised regarding the DuPont Works site and JBLM Landfill #5. For discussion regarding the potential for proposed dewatering to affect existing contamination from either of these sites, see key topic response 4.3.3.2.

Several other specific concerns were raised regarding potential sources of contamination but do not apply to the Proposed Action either because the type of mining proposed or the site-specific soil conditions are not relevant. For instance, acid mine drainage and tailings are not typically generated by aggregate mines, and such waste products will not be produced by the Proposed Action, and have not occurred with the applicant's existing operations in DuPont. Concerns about nitrates were also raised; however, blasting or use of explosives is not part of the Proposed Action and there are no other proposed project activities that would serve as a potential source of nitrates.

[7] https://apps.ecology.wa.gov/cleanupsearch/site/15278

4.3.3.2 Potential mobilization of contaminants from JBLM Landfill 5 or the former DuPont Works site

As discussed in Section 3.2.2.1 of Appendix B, groundwater drawdown is not anticipated to significantly affect the fate and transport of groundwater contaminants from the JBLM Landfill #5. Additional explanatory text has been added to Section 3.2.2.1 of Appendix B and Section 3.3.1 of the EIS.

There are two potential sources of contamination from the landfill: leachate, which is water that carries contaminants from the waste material, and landfill gas, which is produced as waste decays. These potential sources and their fate/transport mechanisms are discussed in more detail below.

As documented by the Landfill 5 Remedial Investigation Report,[8] all landfill materials were placed above the groundwater table to avoid direct contact of waste materials with groundwater. Nevertheless, shallow (Vashon Aquifer) groundwater contaminated by infiltration of precipitation through landfill materials and water generated from decomposing waste material has historically flowed into the South Parcel property and toward the Olympia Beds Truncation (aka Kitsap cutoff). Natural attenuation and engineering controls, including a cover system designed to prevent precipitation from infiltrating the waste in the landfill, have reduced the mobilization of contaminants to groundwater and improved groundwater quality over time. The landfill was closed in accordance with applicable laws and regulations and removed from the Superfund Site listing in 1992, with a Record of Decision that indicated "no further remedial action required." Lowering groundwater levels in the landfill vicinity will not impact the effectiveness of the existing cover system and will not change or increase the interaction of groundwater with waste material. Thus, dewatering will not provide a mechanism to increase the rate of leachate production or mobilization. Similarly, groundwater drawdown is not anticipated to affect the rate of landfill gas generation, which is predominately controlled by the age of waste and is currently being mitigated by landfill gas collection engineering controls.

Because the proposed action will lower the elevation of groundwater in the vicinity of the landfill, some shallow groundwater monitoring wells may need to be modified or replaced to allow for continued monitoring of groundwater adjacent to the landfill. The initial dewatering testing period will assess this condition and address it if necessary. Because dewatering will lower aquifer water levels on the South Parcel property, the hydraulic gradient from the landfill to the South Parcel will be steeper, causing contaminants originating at the landfill to more quickly reach the South Parcel site. Under existing conditions this contaminated groundwater would flow beneath the South Parcel, encounter the Olympia Beds truncation, and ultimately enter the unconfined portion of the sea level aquifer to the west. The proposed dewatering action would capture potentially contaminated and uncontaminated groundwater that flows into the South Parcel site and convey it to infiltration basins situated above the unconfined sea level aquifer to the west. Because the comingled Vashon-Sea Level Aquifer will receive the same groundwater as under current conditions and landfill-related contaminants will be diluted via mixing with unimpacted groundwater, significant adverse impacts to groundwater quality from the proposed action are not expected.

[8] U.S. Army Corps of Engineers Seattle District, 1991. Remedial Investigation Report, Volume 1, Fort Lewis Landfill No. 5 Remedial Investigation/Feasibility Study. Draft Final. Prepared by Woodward-Clyde Consultants.

Similarly, dewatering is not anticipated to affect any potential residual contamination from the former DuPont Works site, a remediation site associated with historical explosives that operated from 1909 through 1976. Because groundwater levels will be lowered (not raised), the potential for groundwater interaction with any existing residual contamination in near-surface soils will be reduced or remain unchanged.

4.3.4 Drinking water supply – quality, quantity and protection of the Vashon Aquifer as a drinking water supply

Numerous comments expressed concern about impacts of the Proposed Action on the long-term quality or availability of drinking water supplies. General groundwater quality impacts are discussed in key topic response 4.3.3.

As described in the EIS (Section 3.3.1, Water Supply Wells and Springs section) and detailed in Appendix B (Section 3.23), all drinking water for the City of DuPont and its residents is currently sourced from deeper confined aquifers that are isolated from the Vashon Aquifer); JBLM's drinking water supply is Sequalitchew Springs, which is upgradient from proposed dewatering impacts. The proposed project would only dewater shallow groundwater of the Vashon aquifer and, therefore, no drinking water sources would be impacted by the proposed project. Aquifer units in the project and DuPont vicinity are discussed in detail in Section 3 of Appendix B to the EIS.

The Vashon Aquifer is not considered to be a viable supply source for the City of DuPont and therefore city regulations for critical aquifer recharge areas are not applicable as they apply only to "aquifer recharge areas used for potable water" DMC 25.105.030.015. The Vashon Aquifer which is affected by the proposed aggregate mine dewatering is shallow and unconfined: it lacks an overlying low-permeability layer to protect its water quality from infiltrating surface-derived contamination. For example, as a result of bacterial contamination from surface and/or shallow subsurface sources (unrelated to the mine), the City decommissioned their two historic village water supply wells which were completed in the shallow Vashon Aquifer and seeks to transfer related water rights to the more viable deeper aquifer system.

4.3.5 Funding of the project and Restoration Plan

Comments expressed concerns about funding of project mitigations.

Funding for Mitigation Wetlands

CalPortland will be required to fund construction of the wetlands to mitigate impacts to the Kettle wetland and seep wetlands in Sequalitchew Creek ravine, including a monitoring program to ensure successful establishment of the mitigation wetlands.

Funding of Groundwater and Stormwater Systems

CalPortland will be required to fund construction of the separate groundwater and stormwater systems. The groundwater system will consist of collection, conveyance and infiltration infrastructure. The stormwater system will consist of separate collection and conveyance system, stormwater treatment, and infiltration. These systems will remain through completion of mine reclamation and as required thereafter.

Funding of Restoration Plan

CalPortland has agreed to fund implementation of the Restoration Plan, which is undergoing a separate permitting and SEPA process.

4.3.6 Incorporation of Monitoring Plan (Adaptive Management) into EIS

Two commenters requested that additional detail on the substantive requirements of the Monitoring Plan be incorporated into the main text of the EIS. The Monitoring Plan is included as Appendix F of the EIS. This plan was negotiated between the applicant and non-governmental stakeholders and may be modified by the City of DuPont as the result of EIS and permit review.

The Monitoring Plan includes the following key elements:

- The Monitoring Plan (Appendix F) provides a detailed adaptive management process that includes an iterative five step process of assessment, design, implementation and monitoring, evaluation, and adjustment.
- The Monitoring Plan establishes groundwater levels at each monitoring well during each phase of dewatering as performance thresholds to be maintained. It also specifies the frequency of measurements and comparisons with those thresholds.
- The Monitoring Plan establishes limitations on the rate mining can progress during the active dewatering phase including a minimum time for mining each segment and a commitment that mining will not advance to the next segment or dewatering intensify (such as adding new dewatering wells or increasing pumping rates) if performance thresholds are not met.
- If groundwater levels are below the performance thresholds, the Monitoring Plan requires that CalPortland evaluate and implement potential adjustments to the dewatering system, including revising mine phasing, adjusting the dewatering plan (number of wells, spacing, alignment, pumping duration), changing the depth or extent of mining, and other actions including ceasing dewatering and mining.
- The Monitoring Plan also specifies a series of required notifications about dewatering progress, milestones, data collection and response actions, as well as identifying routine reporting requirements.

4.4. Key Topic: Surface Water

Comments on the Draft EIS were received that relate to potential or proposed changes related to surface water at the South Parcel site and in the site vicinity. These comments relate to several topics of analysis conducted in support of Draft EIS Section 3.4 (Water Resources – Surface Water) as well as to some issues not previously analyzed in the Draft EIS. Key surface water topics of interest include:

- 4.4.1 - Current conditions of Sequalitchew Creek
- 4.4.2 -Sequalitchew Creek and springs impacts from dewatering
- 4.4.3 - Wetlands/marshes impacts from dewatering
- 4.4.4 - Old Fort Lake and Pond Lake impacts from dewatering
- 4.4.5 - Surface water quality impacts
- 4.4.6 - General surface water impacts
- 4.4.7 - Sequalitchew Creek Restoration Plan
- 4.4.8 - Sequalitchew Creek restoration without dewatering

4.4.1 Current conditions of Sequalitchew Creek

Chapter 3.4.1 of the EIS describes the complex interaction between the marsh system and groundwater. The relationship between groundwater and surface water in the marshes varies seasonally and spatially. In certain times of year and certain locations in the marshes, groundwater discharges into the marshes. In other locations and at other times of year, surface water from the marshes recharges groundwater. As a result, both water levels in East Edmond Marsh and flows in the Sequalitchew Creek ravine are currently groundwater driven but were not historically.

The primary historical natural water source for Edmond Marsh and Sequalitchew Creek is surface water from Sequalitchew Lake, but in its current (altered) condition, groundwater plays a more important role. Historically, surface water flow from Sequalitchew Lake passed through Edmond Marsh and traveled into the Sequalitchew Creek ravine. However, development of Fort Lewis' water supply reduced the amount of surface water flowing out of Sequalitchew Lake, and construction of the Diversion Canal in 1950s provided an alternate pathway for surface waters from the lake and Bell, McKay, and Hamer marshes to flow to Puget Sound. Beaver activity in Edmond Marsh has resulted in the marsh water level being higher than Sequalitchew Lake, which prevents flow from the lake into Edmond Marsh. East Edmond Marsh does receive significant inflows from groundwater, as well as precipitation and surface water from nearby stormwater systems and a culvert from Hamer Marsh; however, this is not the natural condition.

In response to comments on the DEIS, Table 21 has been added to the Earth and Water Resources Report in Appendix B of the EIS to illustrate the role of groundwater inflows and outflows in the water balance of the marshes under existing and proposed conditions. Under current conditions groundwater inflows account for 26 percent of the water source to East Edmond Marsh, as shown in Table 21. Precipitation falling directly on the marsh is the primary water source. Groundwater inflows are less important in Bell, Hamer, McKay and West Edmond marshes. Bell, Hamer, and McKay marshes receive most of their water from stormwater inflows from JBLM and West Edmond Marsh is dominated by inflows from East Edmond Marsh and direct precipitation.

The EIS describes the current condition of the reach of Sequalitchew Creek between West Edmond Marsh as "grassy and without flow most of time". This description accurately reflects the current status of this reach and is consistent with observations of infrequent flow in the reach.

4.4.2 Sequalitchew Creek and springs impacts from dewatering

As described in Chapter 3.4.1, dewatering associated with the Proposed Action will decrease the number and flow rate of the springs and seeps that currently provide the primary water source to Sequalitchew Creek in the ravine. The reduction in spring flow at completion of the project when passive dewatering is proposed is projected to range from 73 percent in January to 86 percent in summer, resulting in a reduction in groundwater contributions to the flow in the Sequalitchew Creek ravine of 1.6 cfs in January to 0.34 cfs in summer.

Implementation of the Sequalitchew Restoration Plan would reconnect surface water flow from Sequalitchew Lake to Edmond Marsh and Sequalitchew Creek by lowering the water levels of the wetlands to provide a gradient for flows. This would result in substantially increased flows in Sequalitchew Creek most of the time. The average annual flow in Sequalitchew Creek is projected to be 12.9 cfs, compared with 1.6 cfs at the mid-ravine gage under current conditions. Winter average flows would be about 26.3 cfs with summer flows of 2.5 cfs in August.

The EIS identifies that there would be periods (approximately 10 percent of the time) when flows in Sequalitchew Creek ravine would be lower with the cumulative effects of mining and restoration than they are now. The frequency and duration of these periods is described in Section 4.5.3 of the Earth and Water Resources Report included as Appendix B of the EIS. The median duration of periods of lower flow is project to be 3 days; however, projections indicate that there would be longer periods of lower flows, with the longest up to 98 days in duration. These periods occur in dry years (particularly 2005) when outflow from Sequalitchew Lake is limited.

There would be an increase in the number of days when no flow is observed at the mid-ravine gage, from 0.13 percent of the time currently to 0.46 percent of the time with mining and restoration. Of the 19-year period studied, these results correspond with 7 days of no flow under existing conditions and 24 days of no flow with mining and restoration. Low flow periods occur in the summer; therefore, these low flows or no-flow conditions would occur in the hottest months with subsequent impacts on water temperature and adverse impacts on aquatic habitat. There is no evidence to suggest that the creek would be dry for the hottest 5 months of every year as asserted by several commenters.

Information about the impacts of dewatering on habitat in response to EIS comments is presented in key topic response 4.6.3 and in the Plants and Animals Technical Report in Appendix H of the EIS.

4.4.3 Wetlands/marshes impacts from dewatering

Dewatering associated with the Proposed Action will lower the groundwater table beneath Edmond Marsh as described in Chapter 3.3.2 of the EIS. The amount of drawdown at a given location depends primarily on the proximity to the mine and the dewatering step. Figures 3.3-6 through -9 provide predicted drawdown contours for each dewatering step. Drawdown beneath Edmond Marsh is greatest in Step 3 -Active Dewatering during Mining and ranges from about 9 feet at the northwest

end of West Edmond Marsh (the portion of Edmond Marsh closest to the proposed mine) to about 1 foot near the Robinson Trail and less than 0.25 feet at DuPont Steilacoom Road.

The effect of the change in groundwater levels beneath the marshes on the surface water levels in the marshes varies seasonally and is described in Chapter 3.4.2 and illustrated in Figure 3.4-4. Because of the peat deposits under the marshes and the seasonally varying differences in groundwater and surface water elevations, the change in groundwater level does not directly translate to an equivalent change in surface water levels. For example, in West Edmond Marsh, the predicted 9-foot decrease in groundwater level would result in an annual average decrease in water levels of 1.9 feet, ranging from 0.35 feet in late summer to 3 feet in spring. In East Edmond Marsh, the decrease in groundwater of about 1 foot would result in an average lowering of surface water levels of about 0.1 feet.

The majority of the marsh complex experiences surface water and groundwater levels that are similar and hydraulically connected to one another, and therefore aquifer drawdown generally will cause surface water elevations to decrease. The western two-thirds of West Edmond Marsh typically have "perched" conditions between May and October, meaning the water table is below the marsh bottom elevation. Decreases in winter groundwater elevations are predicted to decrease marsh water elevations from about November through April, however in the drier period of average years (when surface water and groundwater are seasonally disconnected in this area), lower aquifer water levels would cause less decrease in West Edmond Marsh surface water levels.

Implementation of the Restoration Plan would require managing beaver activity and creating a gradient through Edmond Marsh so that water could flow from Sequalitchew Lake to the Sequalitchew Creek ravine. Surface water levels in Edmond Marsh would have to be maintained at levels lower than under existing conditions in order for flow to be restored. As described in Section 3.4.2 and 3.4.3, the water levels in East and West Edmond Marshes would be lowered by about 3 feet compared to existing conditions. However, there would generally be flow through Edmond Marsh throughout the year, resulting in more stable water levels, particularly in West Edmond Marsh. Impacts to wetland function and habitat from dewatering and implementation of the Restoration Plan are discussed in Section 3.6.

4.4.4 Old Fort Lake and Pond Lake impacts from dewatering

Water levels in Old Fort Lake, Pond Lake, Grant Lake, Strickland Lake and other isolated wetlands, including Wetlands 1-D #8, #9, #10 and #11, are primarily dependent on the groundwater levels in the Vashon aquifer. As described in Section 3.4.2 of the EIS, the water levels in these water bodies would be lowered as an impact of dewatering. The magnitude of the change in water levels varies based on proximity to the South parcel. Projected decreases in water level range from approximately 3 feet in Wetland 1-D to 0.5 feet in Old Fort Lake.

Section 3.6.2 provides details of the impacts of water level changes on plants and habitat in Pond Lake and other isolated wetlands. Additional detail on predicted impacts to Old Fort Lake and Pond Lake is presented in the Plants and Animals Technical Report in Appendix H of the EIS.

As noted by several commenters, the Sequalitchew Creek Restoration Plan would not directly mitigate wetland impacts.

4.4.5 Surface water quality impacts

The Proposed Action does not include discharges of stormwater or groundwater from within the mine to Sequalitchew Creek, Edmond Marsh, or other surface water bodies. All stormwater and groundwater collected within the mine will be infiltrated and flow to the sea level aquifer, which then flows to Puget Sound.

As described in the Marsh and Sequalitchew Creek Water Quality sections of Section 3.4.2 of the EIS, the cumulative effect of mining and restoration will likely result in improved water quality within Edmond Marsh resulting from consistent surface water flow from Sequalitchew Lake, but also higher temperatures in Sequalitchew Creek as the current cool groundwater source is 1) reduced due to impacts from mine dewatering and 2) overcome by naturally warmer surface water flows from Sequalitchew Lake coming through Edmond Marsh. The anticipated warmer temperatures are analogous to historical conditions, before construction of the Diversion Canal, when Sequalitchew Lake was the primary source of water to Sequalitchew Creek.

Several commenters expressed concern about acid mine drainage. Acid mine drainage occurs in coal and mineral ore mining when naturally occurring sulfidic mineralization in the mined rock is exposed to oxygen resulting in the formation of sulfuric acid. Acid mine drainage does not result from mining glacially derived sand and gravel deposits in western Washington.

4.4.6 General surface water impacts

Many commenters expressed general concerns about the impacts to surface waters in DuPont, particularly Sequalitchew Creek and Edmond Marsh, as well as opposition to the project because of the perceived impacts to surface water resources. These comments have been noted.

Several commenters expressed concern that the excavation of the mine pit would interrupt the natural flow of water leading to reductions in water quantity and impacting drinking water supplies. As described in Chapter 4.3.1 of the EIS, the City of DuPont's drinking water is supplied from wells completed in a lower aquifer beneath the Vashon Aquifer. In addition, the wells are located far from the proposed mine. Dewatering would not impact the City's drinking water supply.

Expansion of the existing mine would result in changes to the site's hydrology. Clearing for mining would reduce evapotranspiration, resulting in more stormwater generated within the mine. The Proposed Action includes the infiltration of all stormwater generated within the mine, resulting in an increase in recharge of the sea level aquifer, which flows to Puget Sound.

Dewatering associated with the excavation of the aggregate mine will decrease the number and flow rate of the springs and seeps that currently provide the primary water source to Sequalitchew Creek in the ravine, as described in Chapter 3.4.1. The reduction in spring flow at completion of the project when passive dewatering is proposed is projected to range from 73 percent in January to 86 percent in summer, resulting in a reduction in groundwater contributions to the flow in the Sequalitchew Creek ravine.

Dewatering will not result in surface water flooding as the soils in the DuPont area are generally sands and gravels which will not compact as a result of a change in groundwater level – see Chapter 4.1.3 for additional information on soil compaction.

4.4.7 Sequalitchew Creek Restoration Plan

Several commenters asked questions about the relationship between the Proposed Action and the Sequalitchew Creek Restoration Plan, noting that the Restoration Plan is described as a separate action but is mentioned many times within the EIS. As described in Chapter 2 of the EIS, and pursuant to the 2011 Settlement Agreement, mining of the South Parcel and the Restoration Plan for Sequalitchew Creek are separate, but related projects with varying provisions. The Settlement Agreement expresses agreement of non-governmental entities that the Restoration is deemed adequate mitigation of the "direct and indirect impacts of mining on Sequalitchew Creek." It also provides that additional mitigation may be implemented during the permit process and that impacts on wetlands will be addressed during the regulatory permit process. IThe EIS also evaluates the Restoration Plan in the context of cumulative impacts.

As described in Section 3.4.2 of the EIS (under Cumulative Impacts with Proposed Action and Sequalitchew Creek Restoration Plan heading), the Sequalitchew Creek Restoration Plan seeks to restore and enhance streamflow from Sequalitchew Lake through Edmond Marsh into Sequalitchew Creek by sequentially restoring flows currently diverted by the Joint Base Lewis McCord (JBLM) diversion structure back to the creek, lowering the water elevation of the Edmond Marsh complex to provide a gradient for flows through the wetland complex to the creek, and facilitating flows through existing "losing reaches". This would benefit stream aquatic habitat, particularly for anadromous fish. It would decrease water levels in the Edmond Marsh complex and reduce the area of wetlands.

The City of DuPont is the SEPA Lead Agency and is currently reviewing permit applications to implement the Sequalitchew Creek Restoration Plan. Additional information about the Sequalitchew Creek Restoration project is available on the City of DuPont's website at: https://wa-dupont.civicplus.com/705/Sequalitchew-Creek-Restoration.

4.4.8 Sequalitchew Creek restoration without dewatering

Many commenters noted that the Restoration Plan could be implemented without being linked to the Proposed Action and its impacts from dewatering. The potential for implementing the Sequalitchew Creek Restoration Plan without funding from CalPortland is included in both scenarios A and B of Alternative 2 - No Action.

4.5 Key Topic: Fisheries

Comments received on the Draft EIS relate to the potential for proposed dewatering to impact fisheries resources in the site vicinity. These comments relate to several topics of analysis conducted in support of Draft EIS Section 3.5 (Fisheries) as well as some issues not previously analyzed in the Draft EIS. Key fisheries topics of interest include:

- 4.5.1– Dewatering Fisheries Conditions Relationship to City Values
- 4.5.2 – Potential for Dewatering to Impact Sequalitchew Creek Fisheries Resources

4.5.1 – Dewatering Fisheries Conditions Relationship to City Values

Values of citizens of the City of DuPont vary and there is no single set of values that reflect the values of every citizen. However, through shared interests, the City and community developed a Comprehensive Plan to guide DuPont into the future. The overall vision identified in the 2015 DuPont Comprehensive Plan is "*the City of DuPont is a model small city known for its planned setting and hometown sense of community; a place that blends its natural beauty, Northwest history, and vibrant economy with a proactive approach to its future*". The Comprehensive Plan provides a Mineral Resource Overlay intended to conserve resource lands of long-term commercial significance. The South Parcel site is underlain by commercially significant mineral resources and is designated as a Mineral Resources Overlay area. The Comprehensive Plan acknowledges that phased mining and reclamation may occur in the Overlay area subject to City review.

Additionally, the Proposed Action is intended to be consistent with the 2011 Settlement agreement that is described in Section 2.3 of the DEIS. The agreement, which was approved by the City council, stipulates that mining would not be allowed without funding of the Restoration Plan.

The overall character of the Sequalitchew Creek ravine, the flora and fauna in the ravine, and the Sequalitchew Creek Trail is not anticipated to change significantly, preserving the character of this valuable city resource (see Key Topic 4.5.2 below for discussion on fisheries conditions and Key Topic 4.12 for discussion on the character of Sequalitchew Creek ravine under the Proposed Action).

4.5.2 – Potential for Dewatering to Impact Sequalitchew Creek Fisheries Resources

Fish habitat under existing flows in Sequalitchew Creek is described in Section 3.5 (Fisheries) page 3.5-4. Current conditions do not support most of the species and life stages that were present in the creek prior to the 1990's, when water flowed freely from Sequalitchew Lake to the ravine and flows were perennially higher. "The cumulative impacts of the Proposed Action and Sequalitchew Creek Restoration Plan (the cumulative condition) would generally improve all aspects of the freshwater fish habitat in the Sequalitchew Creek watershed compared to current conditions. (see DEIS page 3.5-17). The cumulative effects of the Proposed Action on stream habitat in Sequalitchew Creek would include a reestablishment of flow from Sequalitchew Lake through the marshes and into Sequalitchew Creek ravine. The proposal would also result in reestablishing the ecosystem process, specifically, the movement of water, sediment, nutrients, biota, and dissolved gasses through the watershed from the headwater springs on Sequalitchew Lake to Puget Sound. (see DEIS page 3.5-10)

This would allow greater ecosystem productivity to take hold in the creek as the stream energy necessary to create and maintain habitat is restored.

Reestablishment of peak flows and the associated sediment movement is key to restarting the arrested habitat-forming processes in Sequalitchew Creek downstream of Edmond Marsh. Currently, even where flows persist perennially, they are inadequate to move sediment effectively, to create pools, or to scour finer grained materials from the substrate to create conditions suitable for spawning. The input of sediment and organic matter would stimulate biological productivity and develop greater resources at the lower trophic (food chain) levels. Restoration would also result in pool and riffle habitat formation over time. This habitat and development of lower trophic productivity are key to developing conditions sufficient to restore target species such as Chum and cutthroat trout in the system. Chum would also benefit from the restoration of a more varied hydrograph. Puget Sound stocks typically spawn in freshwater systems in November and December as flows rise in response to winter rains. This effect has been limited in the system due to the current lack of surface water connectivity (see DEIS page 3.5-12).

Cumulatively, the increase in hydrology and stream energy are anticipated to increase aquatic ecosystem productivity and create and maintain habitat diversity, particularly for target species such as chum salmon and cutthroat trout in the system. The two graphs on page 3.5-13 of the DEIS compare existing flow conditions in the creek to predicted flow conditions under the proposed action (mining) only, and predicted flow conditions with mining and restoration. During the period when chum salmon would use the creek, between mid-October and mid-February flows would be substantially higher as a result of the Proposed Action with restoration, compared to existing conditions.

4.6 Key Topic: Plants & Animals

Comments on the Draft EIS were received that relate to the potential for proposed mining at the site and proposed dewatering to impact plants and animals resources in the site vicinity. These comments relate to several topics of analysis conducted in support of Draft EIS Section 3.6 (Plants & Animals) as well as some issues not previously analyzed in the Draft EIS. Key plants and animals topics of interest include:

- 4.6.1 – Site Clearing Impact to Plants & Animals Habitat.
- 4.6.2 – Potential for Mining Noise to Impact Animals.
- 4.6.3 – Potential for Dewatering to Impact Plants & Animal Habitat
- 4.6.4 – Potential for Dewatering to Increase Wildlife Risk.
- 4.6.5 – Potential to Impact Gray Squirrel
- 4.6.6 – Potential to Impact Oregon White Oak & Oak Prairie Habitat

4.6.1 – Site Clearing Impact to Plant and Animal Habitat

Pursuant to the Growth Management Act, the DuPont Comprehensive Plan designates the South Parcel site as "mineral lands of long-term commercial significance" on which mining is appropriate. The DEIS identifies impacts (direct, indirect and cumulative) to fish, plants and animals and mitigation measures that will avoid avoidable impacts and reduce and/or compensate for unavoidable impacts.

The proposed site reclamation plan and wetland mitigation plan would mitigate loss of onsite resources. Identified impacts would be unavoidable but with implementation of mitigation described in DEIS Section 3.6 (Plants & Animals), are not considered to be significant.

These mitigation measures include revegetation of cleared and mined areas as part of a segmental reclamation plan reviewed and approved by the Washington Department of Natural Resources. After mining forested slopes would surround the developable areas on the mine floor.

Forests

The proposal includes a plan to offset the loss of harvested trees with the planting of 177 acres of forested slopes, and creation of an 8.3-acre wetland and buffer. Both actions would be monitored to confirm success. A 100-foot setback would remain forested from the top of slopes greater than 40% within the Sequalitchew Creek ravine. If the site were developed without mining the required setback would be reduced to 50 feet from the top of the ravine slopes.

The Proposed Action would result in the loss of existing conifer forest and Landmark trees on the South Parcel. As indicated on page 3.6-13 of the DEIS:" Reclamation would include the establishment of mixed species, including Oregon white oak, and conifer-dominant forests along the slopes of the mine. Additionally, "replacement of landmark trees would be provided, consistent with City of DuPont replacement ratio guidance."

The proposed site reclamation plan and wetland mitigation plan would mitigate loss of onsite tree cover and habitat resources. These impacts would be unavoidable but not considered significant with mitigation described in DEIS Sub-section 3.6.3.

Shrublands and Grasslands

The proposal also includes the disturbance of 102 acres of shrublands and grassland. The re-mine area is dominated by grasses planted by CalPortland consistent with the current surface mine reclamation permit requirements, and unforested portion of the expansion area is currently dominated by Scott's broom. During clearing all topsoil would be stockpiled and used in the reclamation process as required by the surface mine reclamation act (RCW 78.44). The process of handling the topsoil and mixing it with clean material and placing it on the mine slopes in accordance with the reclamation plan and cleanup action plan will reduce the concentrations of any deleterious substances levels that protect human health and the environment.

Animals

Both the Proposed Action and future development under the No Action Alternative would result in the dispersal of animals into adjoining habitat including along the biodiversity corridor mapped by WDFW that extends from the Nisqually delta to the south, and north to a forested area northwest of JBLM that covers over 2,000 acres. This is anticipated to provide a migratory corridor to allow dispersal of terrestrial species as discussed on Page 3.6-17 of the DEIS.

4.6.2 – Potential for Mining Noise to Impact Animals

Noise conditions under the Proposed Action would generally be consistent with the existing condition – including mining on adjacent mineral resource lands, and JBLM activities -- to which local wildlife is habituated. Noise from the mine will also remain the same relative to ambient noise from JBLM, which includes loud booms from heavy weapons and the surrounding urban community. As discussed in Section 3.7 (Noise) of the DEIS, the noise levels associated with the Proposed Action in combination with mining at the Existing Mine would not exceed current levels and would comply with adopted noise standards. Although short-term unavoidable noise impacts may be expected, any such impacts would not be considered significant

4.6.3 – Potential for Dewatering to Impact to Plant and Animal Habitat

Groundwater does not contribute to soil moisture under existing conditions with the exception of areas near wetlands that have a water table near the ground surface. The soils in the area are very well drained, and the underlying Vashon Recessional Outwash does not have the physical properties to wick moisture upward by capillary action more than about 3-feet. Oregon White Oak have the deepest roots of species native to DuPont. The roots of Oregon White Oak grow to 5-feet in depth. This means that the water table in the area must be at least 8 to 10 feet from the ground surface to have any effect on soil moisture available to plants.

The only areas experiencing drawdown where the water table is within 10 feet of the ground surface are within and immediately adjacent to wetlands. The effects of drawdown on wetlands from mining

and cumulatively with mining and restoration are discussed in detail in Section 3.6 (Plants & Animals) of the DEIS.

Another perspective indicating that forest health in the City is not related to shallow groundwater can be observed along the Puget Sound side of the mine, the Home Course and lower Sequalitchew Creek. These forested slopes rise over 200 feet above the ground water table and the forest is healthy. Upstream near the middle of the ravine the trail passes the Olympia bed formation. This is marked by the seep wetland complex. Immediately above the Olympia beds the water table is much closer to the surface. The forests above and below the rapid change in depth of the water table are nearly identical in composition and health.

Listed Species/Habitat

The proposed site reclamation plan and wetland mitigation plan are intended to mitigate loss of onsite resources. These impacts would be unavoidable but not considered significant with mitigation (described in DEIS section 3.6.3). Both of these actions would be monitored to ensure success. Specific goals and objectives must be met over a period of at least 10 years. Failure to meet these criteria could result in fines or forfeiture of bonds by CalPortland.

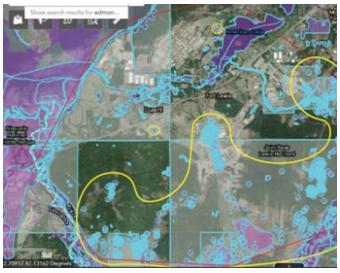
The Proposed Action would indirectly impact the off-site Seep Wetlands associated with the Sequalitchew Creek Ravine (as described in the DEIS on pages 3.6-22). The 0.13-acre seep area would transition from wetland to upland resembling other areas along the Sequalitchew Ravine. These indirect impacts are described on page 3.6-26 of the Draft EIS and the associated mitigation for those impacts is described in the DEIS on pages 3.6-25. The mitigation would result in the creation of a larger seep wetland complex than currently exists.

Cumulatively, implementation of the Sequalitchew Creek Restoration Plan would further mitigate for the loss of wetland acreage associated with the proposal. The Sequalitchew Creek Restoration Plan, described in section 3.6 (Plants & Animals), would reduce these unavoidable adverse impacts to a non-significant status

4.6.4 – Potential for Dewatering to Increase Wildfire Risk

The presence of the Vashon Aquifer is not responsible for soil moisture or the overall forest health in and around the site. Low humidity, high temperature, wind and fuel load are the main contributing factors to wildfire risk. Humidity, temperature, and wind are meteorological conditions resulting from regional weather patterns and are unaffected by groundwater elevation. Similarly, fuel load is not affected by groundwater elevation but is the result of vegetation type; plant moisture stress; plant density, and forest structure.

4.6.5 – Potential to Impact Gray Squirrel



The Washington Department of Fish and Wildlife (WDFW) keeps records of verified sightings of Western Gray squirrel individuals, and the presence of suitable habitat. This data is available on their online Priority Habitat & Species (PHS) map. A review of the data shows that all documented individuals and suitable habitat are found east of DuPont – Steilacoom Road and south of interstate 5. WDFW PHS maps show only one location North of I-5 where an observation of Western Gray Squirrel has been observed. Examination of the record reveals that that observation near American Lake occurred on December 31, 1977. WDFW has not reported any other verified observations of Western Gray Squirrels North of I-5 near DuPont in the past 47 years.

In terms of limiting factors on the Puget Trough Western Gray Squirrel population habitat fragmentation and alteration from activities like development, road building, logging, wildfire, and fire suppression are likely to have had the greatest adverse effects on squirrels. Existing development including Interstate 5, Dupont Steilacoom Road, Center Drive, residential neighborhoods of DuPont, warehouses and light industrial areas of DuPont and JBLM Landfill 5 have already isolated the site from existing Western Gray Squirrel population.

The Puget Trough Western Gray Squirrel is not considered to be a genetically distinct population by the US Fish and Wildlife Service. This Final EIS is updated to reflect that *Sciurus griseus* has recently been reclassified by the state of Washington from threatened to endangered but remains unprotected by the Federal Endangered Species Act (last reviewed 2004) due to the health of the population outside of the Puget Trough (see Section 3.6 of this Final EIS).

4.6.6 – Potential to Impact Oregon White Oak & Oak Prairie Habitat

The soils in nearly all areas of DuPont cannot receive moisture from groundwater because the underlying geologic formations are very gravelly and have little capillary action to pull water up to the roots of trees. Oregon white oaks are also drought tolerant, and their range extends south into relatively arid areas of southern California.

The Applicant (CalPortland) has successfully grown replacement trees, including Oregon white oak, as part of the segmental reclamation process in adjacent mining areas. These trees can be seen on recent aerial images of the site and are on the west side of the mine, where the ground water table is more than 100 feet below the upper slope.

There are several Garry Oak specimens within the clearing limits of the Proposed Action including 15 Oregon White Oak specimens with landmark status (DMC 25.10.120). Five specimens qualifying as landmark trees would be retained in the buffer of the Proposed Action. The Landmark Tree Inventory Report (DEIS Appendix I) includes a Landmark Tree Replacement Plan.

The Proposed Action would not impact any existing oak woodlands as discussed on page 3.6-9 of the DEIS. The Proposed Action would not impact any Westside Prairie habitat which is described by WDFW as, “open native grasslands with little or no tree cover. Prairies have flat, rolling, or gentle

slopes and are adapted to moist winters and dry summers." (Westside prairie | Washington Department of Fish & Wildlife) This is an anthropogenic (human influenced) ecosystem that, "historically was maintained by indigenous peoples who intentionally burned prairie to prevent invading trees and shrubs, increase the growth of food plants such as camas, and improve habitat for game species. Without fire, woody plants often invade and crowd out the native grasses and flowering plants that make up this ecosystem." (Ibid). The open areas on the site are currently dominated by non-native species and woody shrubs.

4.7 Key Topic: Noise

Comments received on the Draft EIS relate to the potential for proposed mining to impact noise conditions in the site vicinity. These comments relate to several topics of analysis conducted in support of Draft EIS Section 3.7 (Noise) as well as some issues not previously analyzed in the Draft EIS. Key noise topics of interest include:

- 4.7.1– Noise Analysis Methodology, Findings and Mitigation.
- 4.7.2– Adequacy of City of DuPont Noise Regulations.
- 4.7.3 – Noise Impacts from Mining Activities.
- 4.7.4 – Cumulative Noise Conditions

4.7.1– Noise Analysis Methodology, Findings and Mitigation.

Measurement of existing noise and the use of a model to estimate noise from a proposed action is a generally accepted approach to evaluating noise in SEPA documents. This approach is founded on science and provides objective and quantitative results. The specific model used for the Pioneer Aggregates South Parcel Draft EIS is used extensively for public and private projects of all types. Some statements that expressed a preference for using a subjective approach to identifying noise (i.e., surveying residents about their perceptions) rather than modeling are noted. Similarly, statements generally expressing dissatisfaction with the noise analysis methodology used on the Draft EIS without providing information or reasons, are noted.

The Draft EIS methodology and conclusions about noise are summarized below.

The analysis measured existing noise levels at selected locations, shown on Draft EIS Figure 3.7-1 and in Table 3.7-3, to establish a baseline. Measurement locations included sites near Creekside Village/Center Drive -- close to the trailhead of the Sequalitchew Creek trail -- Edmonds Village, and the Home Course. The most prominent noise sources identified were those from JBLM and military (helicopters) and commercial aircraft. Existing mine operations were not audible

The noise model (CadnaA noise model) adds noise generated by proposed project operations to existing noise levels and these totals are then compared to regulatory noise limits. The City's noise regulations (DMC 9.09.040d), which are based on state regulations (WAC 173-060), establish maximum noise limits for different categories of land use.

Table 3.7-4 of the Draft EIS shows the results of the modeling relative to noise limits established by city and state regulations. All modeled locations would be within the City's established noise limits during daytime operating hours (7AM-10PM). Projected increases in noise relative to existing levels would not be considered to be perceptible to most people. One location – the upper floor of the Creekside apartments – would exceed the noise limits during one phase of mining (2C) during early morning hours (5-7 AM).

Noise levels at the location closest to the trail would be within applicable limits. The proposal would retain an undisturbed vegetated buffer between South Parcel mining and the trail. Section 3.9/Aesthetics of the Draft EIS provides photos indicating how vegetation and topography would

prevent views of mining from the trail; existing topography and vegetation would similarly buffer the trail from noise impacts.

Proposed mitigation to address the noise level exceedance at the Creekside apartments includes limiting operating hours and restricting use of bulldozers to daytime hours. A 20-foot high noise berm is also proposed to mitigate noise impacts to these residents. Several comments generally stated their disagreement with the sufficiency of proposed mitigation but did not provide factual information to support the opinions; these comments are noted.

4.7.2– Adequacy of City of DuPont Noise Regulations.

Some comments expressed concerns about the city's noise regulations, generally stating that they were too weak, did not include some noise types, and should be updated. As noted previously, the City's existing noise standards are based on state regulations which are followed by many cities across the state. It is noted that the noise standards are not based on specific types of noise; rather they consider the noise generated and received by broad categories of land use. Noise limits for each category are based on the intensity of the noise source and the sensitivity of the receivers (e.g., residential or industrial), not on the type of noise per se. These comments are not related to the proposal, are beyond the scope of the Draft EIS, and are noted.

4.7.3 – Noise Impacts from Mining Activities.

As indicated in Section 3.7 (Noise) of the Draft EIS, noise associated with proposed mining was modeled (CadnaA noise model), and modeled noise levels generally complied with applicable noise limits. Some exceedance at the upper floors of the Creekside Apartment units facing the site may exceed applicable noise limits if Phase 2C mining occurred during early morning hours (between 5 and 7 AM); limiting bulldozer use during these morning hours results in modeled noise levels below the noise limits.

Section 3.7.4 of the Draft EIS indicates, "although short-term unavoidable noise impacts may be expected. Due to the short-term nature of the…impacts would not be considered significant." Ambient noise levels from civilian and military aircraft, truck traffic, firing ranges, and common urban sources (e.g. leaf blowers) in DuPont are already quite high. Regarding potential impacts to wildlife, Inside the mine and immediately adjacent to the processing plant, where noise related to the project is highest, there is very little habitat and by extension few if any receptor species. Mining would not take place in the South Parcel Expansion area at night when they would be most likely to impact wildlife behavior.

Please also see Key Topic discussion 4.7.1 for additional detail on the Noise analysis methodology and analysis results.

4.7.4 – Cumulative Noise Conditions

The measurements of existing noise levels used in the Draft EIS noise analysis includes the presence of existing mining activity and off-site noise, such as JBLM activities, I-5, local truck traffic and other land uses in DuPont (e.g., warehouse uses). Table 3.7-5 of the Draft EIS identifies cumulative noise levels (i.e., existing noise levels plus project-generated noise) and concludes that cumulative noise

would be within applicable noise limits. As noted previously, noise levels would not increase perceptibly on the creek trail. Comments that express concerns about various sources of existing noise unrelated to the proposal are noted.

4.8 Key Topic: Land & Shoreline Use

Comments received on the Draft EIS address the potential for proposed mining use and activities to impact existing land uses in the site vicinity. These comments primarily relate to incompatibility of proposed mining with surrounding residential, community garden, and recreational (Sequalitchew Creek Trail) uses. These comments relate to topics of analysis conducted in support of Draft EIS Section 3.8 (Land & Shoreline Use) as discussed below:

- 4.8.1 – Proposed Action's Incompatibility with Surrounding Uses

4.8.1 – Proposed Action's Incompatibility with Surrounding Uses

As indicated on page 3.8-6 of the Draft EIS, the proposal would occur on a site that is designated as appropriate for mining in the DuPont Comprehensive Plan and the applicable zoning classification. The Draft EIS does not identify significant land use impacts or inconsistencies with planned or permitted land uses. Section 3.8 (Land & Shoreline Use) of the Draft EIS identifies the environmental impacts of the proposal to surrounding uses. Changes to the site and views of the mining operation would not be visible from surrounding land uses. The meaning of the term "damage" in this context is interpreted to refer to potential off-site impacts from mining operations, such as dust, noise and views; please refer to the discussion in the Draft EIS and Key Topic Areas 4.2, 4.7 and 4.9, respectively. Mitigation measures for identified impacts – including vegetated buffers and a noise berm -- are identified in Section 3.8 of the Draft EIS. As noted in the Draft EIS Aesthetics discussion Proposed plantings along Powerline Road would limit views into the site from the Community Garden. Note that comments and responses related to impacts to the Creek trail are contained in Key Topic 4.12 discussion relating to impacts to the character of the Sequalitchew Creek ravine associated with mining activities under the Proposed Action.

4.9 Key Topic: Aesthetics

Comments regarding the aesthetics analysis generally stated the importance and beauty of the Sequalitchew Creek trail as an aesthetic and recreational amenity and indicated that Proposed Action would destroy its appearance and serenity, as well as views along the creek trail. A number of comments also asserted that proposed dewatering of the aquifer will in turn cause vegetation in the creek ravine to dry up and die, ultimately resulting in deterioration of views and enjoyment. The key aesthetic topic of interest is:

- 4.9.1 Potential for Changes to the Aesthetics Character of Sequalitchew Creek Ravine, including loss of Vegetation.

4.9.1 - Potential for Changes to the Aesthetics Character of Sequalitchew Creek Ravine, including loss of Vegetation

As identified in the view simulations included in Section 3.9 (Aesthetics) of the Draft EIS, visual changes to the South Parcel site and of the mining operation itself, would not be visible from key view locations in the site vicinity and would not itself change or provide views of the mine. In particular, as shown in Figure 3.9-7, vegetation in the ravine and the difference in topography between the ravine trail and the South Parcel mining site would not permit views of the mining site. No change in access to the trail would occur.

As indicated in the discussion for Key Topic 4.6 (Plants & Animals) groundwater does not contribute to soil moisture under existing conditions with the exception of areas near seeps and wetlands that have a water table near the ground surface. The comments asserting that dewatering would result in vegetation on the ravine slopes drying up and dying, changing the environment of the creek trail, expresses an opinion that is not consistent with the geology of the site, the depth of the aquifer and the movement of groundwater; dewatering under the Proposed Action is not anticipated to significantly affect vegetation along the ravine of Sequalitchew Creek.

4.10 Key Topic: Cultural Resources

Comments on the Draft EIS were received that relate to identification of and impacts to cultural resources. These comments relate to several topics of analysis conducted in support of Draft EIS Section 3.10 (Cultural Resources) as well as to some issues not previously analyzed in the Draft EIS. Key cultural resources topics of interest include:

- 4.10.1 – Tribal Sovereignty and Consultation
- 4.10.2 – Methodology and Scope of Analysis
- 4.10.3 – Sequalitchew Ancestral Village Landscape
- 4.10.4 – Cumulative Impacts of Mining and Restoration
- 4.10.5 – General Impacts to Tribes

4.10.1 – Tribal Sovereignty and Consultation

The City, applicant and property owner acknowledge and respect tribal sovereignty and have consulted and worked cooperatively with the Nisqually Tribe for decades. The City and applicant have made repeated efforts to consult with the tribe in regard to the South Parcel proposal; those efforts continue. The City and applicant express their commitment to honor existing and on-going commitments and continuing consultation and collaboration with the Nisqually Tribe.

4.10.2 – Methodology and Scope of Analysis

Geographic Scope of Analysis

A desktop analysis was considered an appropriate step in the analysis of data in view of the extensive cultural resource studies and ground surveys that have been conducted on and around the South Parcel site over the course of several decades. This approach was seen as reasonable and could serve as a basis for identifying any subsequent actions needed based on the accumulated data. It is acknowledged that these studies have been focused on historic and archaeological resources, and not on the ethnographic elements now commented on by the Tribe. It is also recognized that the Tribe possesses unique information about Tribal customs, beliefs and practices that is not available elsewhere, including state and federal databases.

Consistent with the Tribe's suggestion, the geographic scope of the study area has been expanded to 1 mile; all previously identified resources within this expanded study area, identified in the WISSARD database and existing reports, are included in a revised Cultural Resources report. The updated report (HRA 2025) has been submitted to DAHP, entered into WISSARD and is considered confidential.

The term "affected area" suggested in the comment is more commonly used in NEPA documents, while "area of direct impact" is more common in SEPA-related documents. SEPA analysis is focused on impacts to the physical environment (WAC 197-11- 444 and 448(1), and WAC 197-11-740); given that focus, it is reasonable for analyses to emphasize direct physical impacts and to use the "area of direct impact" to identify environmental consequences. The section of the SEPA rules cited in the

comment (WAC 197-11-430(3)) does not reference or require use of the "affected area" to define a study area. The comment's opinion is acknowledged.

As required by SEPA (WAC 197-11-060 (4)(d)-(e)), the EIS does address direct, indirect and cumulative impacts, although the different types of impacts are discussed in different subsections of the Cultural Resources chapter of the document. This categorization and organization of the analysis is standard in SEPA documents and is consistent with the flexibility provided by the SEPA rules to organize documents and present information in whatever way is considered useful.

Cited DC Circuit Court Decision

The court case cited in the comment (*National Parks Conservation Association v. Semonite,* D.C. Circuit Court, 2019) was interpreting the requirements of the National Historic Preservation Act, which is not applicable to the South Parcel proposal because it does not involve a federal action. It is agreed, however, that categorization of impacts as direct or indirect relates to causality and the presence/proximity of any intervening actors or actions that may contribute to the impact. But that semantic distinction does not change the EIS's appropriate focus on direct impacts pursuant to SEPA's requirements.

DEIS Analysis is Limited and Lacks Ethnographic Inquiry

The essence of the comment is interpreted to be that equating "direct impacts" with ground disturbing activities and physical impacts limits the analysis to archaeological /physical resources and artifacts, and excludes consideration of direct or indirect impacts that are not manifest physically and/or that result in impacts to spiritual and non-physical aspects of the cultural environment. That comment is acknowledged as a statement of opinion. Nevertheless, impacts to the physical environment are the focus of a SEPA EIS and are directly related to a project's ground disturbance, construction and operation. More indirect and abstract impacts, which are the primary concern expressed in the comment, may be beyond the capability of an EIS to identify and/or to evaluate. The SEPA Rules recognize the following: "For some proposals, it may be impossible to forecast the environmental impacts with precision, often because some variable cannot be predicted or values cannot be quantified" (WAC 197-11-330(3)(d)). The extent and significance of impacts to spiritual aspects or associations of the physical environment are not deducible. While the existence and validity of the Nisqually Tribe's beliefs and values are not questioned, it is not possible for a non-tribal third-party observer or analyst to accurately identify and objectively evaluate and quantify impacts to these values. Within the context of SEPA, spiritual values, beliefs and practices are not "elements of the environment" for discussion in an EIS (WAC 197-11-444, WAC 197-11-448, WAC 197-11-740).

4.10.3 – Sequalitchew Ancestral Village Landscape

Ancestral Village Contains Spiritual Resources and Should be Analyzed

The boundaries of what is stated to be the Sequalitchew Ancestral Village landscape are unknown and cannot be determined based on the comment or available information. It is not likely to be a single property in terms of ownership, however, and is not likely limited to the South Parcel. Some

specific resources identified in the comment have been identified previously and are included in WISSARD and prior reports. For example, the ancestral village site located along the shoreline south of Sequalitchew Creek has previously been identified and evaluated. The nature, presence and significance of other resources mentioned in the comment, including resource gathering locations, have not been disclosed by the Tribe and are unknown. It is noted that WISSARD does not identify the presence of any designated TCPs within the expanded 1-mile study area. A recent cultural resource report prepared for the Restoration Plan application (Aqua Terre, 2022), also did not identify any designated TCP within that project's study area.

The Nisqually Tribe has expressed concern about the potential for burial sites in the area and the Tribe's concern is acknowledged. However, no known burial locations or cemeteries have been identified on the South Parcel site, although several sites have been identified in the surrounding area. The comment that the Ancestral Village Landscape and most of the individual resources within it are TCPs and are themselves eligible for listing in the NRHP is acknowledged. Insufficient information is available to evaluate and determine the eligibility of the resources mentioned in the comments. The traditional gathering locations of culturally significant plants are not known to the professional consultants involved with the project. It is also not known if blue camas currently exists on the site; historical presence of the plant is not an indication of current existence or of a probable impact. The comment regarding the potential for restoration of prairie habitat on the site is acknowledged as the personal opinion of the commenter.

Salmon are Cultural Resource

The comment regarding the Tribe's treaty rights is acknowledged. In regard to salmon, it is noted that Sequalitchew Creek does not currently support use by salmon, and any perceived diminution of the Tribe's rights are unrelated to the South Parcel proposal itself or to actions of the applicant. A major objective of the Restoration Plan, as described in the EIS and Restoration Plan documents, is to enhance water flows in the creek on balance so it is sufficient to support salmon, which would mitigate the effects of drawdown of the aquifer. The proposal would enable this positive environmental benefit to occur and would seem to support, rather than to denigrate, the Tribe's interests and treaty rights in salmon.

As noted in 4.10.2, above, SEPA is focused on impacts to the physical environment and an EIS is unable and not required to evaluate non-physical impacts to spiritual values or non-human beings. The EIS can and does evaluate impacts to the physical resources within the South Parcel site, including wetlands, Sequalitchew Creek and salmon. Impacts to the creek from dewatering of the aquifer, for example, are addressed in Section 3.4 of the EIS and in responses to comment in the FEIS; impacts to fish are addressed in Section 3.5 of the EIS. On balance, cumulative impacts of the South Parcel and Restoration Plan are anticipated to be beneficial to salmon. No significant impact to kettle lakes has been identified. The Draft EIS, Section 3.6, discloses impacts to the on-site kettle wetland and proposes mitigation. However, any impacts to cultural values, practices or non-human beings associated with these resources area are unknown, cannot be quantified or assessed in an EIS, and are beyond the scope of SEPA.

4.10.4 – Cumulative Impacts of Mining and Restoration

The Restoration Plan is a separate project that is undergoing its own review under SEPA. A cultural resource report (Aqua Terra, 2022), was submitted with the Restoration Plan JARPA application. It did not identify any designated TCPs within its defined study area, but it did identify a burial site and graves adjacent to its study area; the specific location was redacted. It is possible that the statement in the Restoration Plan checklist may be incomplete. The South Parcel Draft EIS Cultural Resource discussion, Section 3.10-6, does not identify significant cumulative impacts to cultural resources.

4.10.5 – General Impacts to Tribes

The impacts asserted in the comment are not clearly defined or specifically related to the South Parcel proposal, and are not within elements of the environment that SEPA requires to be evaluated within an EIS (see WAC 197-11-444, WAC 197-11-448, and WAC 197-11-740). Environmental justice, for example, is not an element of the environment, and "spiritual harms" are ineffable and beyond the scope of an EIS. It is not clear if the term "land based traumas" is used globally and historically, or if it refers specifically to the South Parcel proposal. It is noted that mining of the site is a transitional use and is a permitted activity pursuant to the Washington State Growth Management Act, the DuPont Comprehensive Plan and applicable zoning regulations

4.11 Key Topic: Transportation

Comments received on the Draft EIS relate to the potential for proposed mining at the South Parcel site to impact transportation and roadway conditions in the site vicinity. These comments are related to several topics of analysis conducted in support of Draft EIS Section 3.11 (Transportation). Key transportation topics of interest include:

- 4.11.1 – Concerns about Increased Truck Traffic under the Proposed Action
- 4.11.2 – Potential for Increased Truck Traffic to Increase Road Maintenance Costs

4.11.1 – Concerns about Increased Truck Traffic under the Proposed Action

As indicated in Section 3.11 (Transportation) of the Draft EIS, the proposed Pioneer Aggregates South Parcel Project would allow for continued mine operations that are similar to those already permitted, including export of the majority of material from the site via barge transport. The processing plant would remain in the same location, and the market area for product and travel patterns for transport vehicles are expected to remain the same. Trip generation is expected to continue at current levels and would remain below the peak day estimates that had been evaluated in the 2013 North Parcel FEIS., which considered cumulative impacts with the South Parcel project. Expansion to the South Parcel would have a short period when logging trips are added to the traffic stream. The 2013 FEIS had estimated up to 24 logging truck trips per day (12 loads). This is likely to be conservatively high since the timber to be logged on the South Parcel is of poorer quality than for the previously logged North Parcel.

The 2013 North Parcel FEIS evaluated traffic operations at area intersections for the future horizon year of 2035. The year 2035 conditions accounted for substantial growth in traffic due to a dozen major development projects and background growth, and the analysis was consistent with assumptions in the I-5 Joint Base Lewis-McChord (JBLM) Transportation Analysis.[9] Impacts of the project were evaluated for the peak day condition, which as shown above, reflect a higher trip condition than occurred during the peak day in 2020. The North Parcel FEIS traffic operations analysis found that, "*…project-generated trips are expected to constitute 3% or less of total trips through the LOS E and F intersections in the AM peak hour, and less than 1% in the PM peak hour. This reflects projected conditions on a day of peak mining operations; on days of more typical mining operations, these proportions would be even lower.*" It goes on to conclude, "*Because the project-generated trips would represent a small proportion of traffic volumes at the study area intersections and would have negligible effect on the levels of service at the I-5 ramps and city intersections, no adverse level of service impacts are projected to result from the South Parcel proposal*." The conclusion is still reasonable given that the trips are expected to remain similar to or less than those evaluated in the 2013 FEIS, and that the horizon year evaluated (2035) is reasonable to capture the extended life of the mine with expansion to the South Parcel.

The proposed Pioneer Aggregates South Parcel Project is not expected to exacerbate transportation conditions in the study area. Trip generation is expected to continue at current levels and would remain below the peak day estimates that had been evaluated in the 2013 FEIS. Traffic operations were evaluated in the 2013 North Parcel FEIS for the anticipated South Parcel traffic and extended

[9] *Washington State Department of Transportation (WSDOT) and the Tranpso Group, I-5 Transportation Alternatives Analysis & Traffic Operational Model, from Mounts Road to SR 512. Prepared for the City of Lakewood, September 2010.*

mine life and concluded that the South Parcel would not adversely affect traffic operations in the site vicinity. This conclusion is still reasonable and significant transportation impacts are not anticipated.

Vehicular, bicycle and pedestrian safety conditions under the Proposed Action are not anticipated to change under the Proposed Action compared to current conditions.

4.11.2 – Potential for Increased Truck Traffic to Increase Road Maintenance Costs to the City of DuPont

As indicated in Section 4.12 (Fiscal) of the Draft EIS, the cost/revenue balance to the City of DuPont associated with the Proposed Action, including costs associated with road maintenance costs associated with heavy truck traffic under the Proposed Action, is analyzed under two approaches (cost allocation approach and average value approach). The fiscal analysis indicates a surplus to the City of DuPont under either approach, ranging from an estimated annual surplus of $18,400 under the cost allocation approach to an estimated annual surplus of $125,700 under the average value approach. Thus, costs to the City of DuPont for road repairs associated with trucks associated with the Proposed Action is not anticipated to exceed tax revenues associated with the Proposed Action.

4.12 Key Topic: Sequalitchew Creek Character Conditions

Comments on the Draft EIS stated the importance and beauty of the Sequalitchew Creek trail, and the potential for proposed dewatering at the South Parcel site to impact conditions along the Sequalitchew Creek ravine that would diminish the existing character of ravine. These comments include the potential for dewatering to result in geotechnical impacts such as increased erosion and landslides at the creek ravine. Many comments stated that Proposed Action would destroy the appearance, serenity and views along the creek trail, and that proposed dewatering of the aquifer will in turn cause vegetation in the creek ravine to dry up and die, ultimately resulting in deterioration of views and enjoyment. Lastly, comments stated that noise associated with mining activities would be audible from the trail and would diminish the trail experience. These comments relate to several elements of the environment analyzed in the Draft EIS, including:

- 4.12.1 - Geotechnical impacts along the ravine, including soil erosion/landslide.
- 4.12.2 - Changes to the visual character of the ravine, including loss of vegetation.
- 4.12.3 - Mining noise audible within the ravine, including along the Trail.

4.12.1 - Potential for Geotechnical impacts along Sequalitchew Creek Ravine

As indicated in Section 3.1 (Earth) of the Draft EIS (page 3.1-11), "based on the slope steepness, the presence of the seeps, and the contact between permeable and impermeable soils, the north slope of the Sequalitchew Creek ravine qualifies as a landslide hazard area, steep slope, and seismic hazard under DMC GHA criteria. The slope is identified by the DNR as susceptible to shallow landslides. DMC 25.105.050 (3) defines erosion hazards as including channel migration zones (areas along a river or stream where the channel can be reasonably predicted to migrate over time). The Sequalitchew Creek migration zone is considered an erosion hazard." However, as noted in Key Topic response 4.1.1.2, the project area is set back at least 100 feet from the top of the Sequalitchew Creek ravine slope (see Figure 10 of Appendix B), which conservatively doubles the 50-foot buffer required by the DuPont Municipal Code between proposed development activity and steep slopes. Therefore, the Proposed Action would not directly impact existing potential slope hazards along the Sequalitchew Creek ravine.

Regarding indirect geotechnical impacts to the Sequalitchew Creek ravine, Section 3.1 of the Draft EIS (page 3.1-14) indicates that "the dewatering and grading associated with the Proposed Action would reduce groundwater flow toward the steep slopes of Sequalitchew Creek ravine along the east portion of the Expansion Area onsite. The Proposed Action would also route groundwater that would potentially flow toward the creek instead toward the mined areas. Ultimately, this is anticipated to reduce the potential for landslides and slope failures within the Sequalitchew Creek ravine. The seeps and springs identified on **Figure 3.1-3** of the Draft EIS are expected to be reduced or dewatered in their entirety, which may reduce the level of landslide hazard susceptibility within the ravine", as further discussed in Key Topic response 4.1.1.2 (see Key Topic responses 4.4.1, 4.4.2, 4.4.7, and 4.4.8 for additional discussion of groundwater-surface water interaction in Sequalitchew Creek and potential impacts of the proposed project). As discussed in Key Topic responses 4.1.3 and 4.6.3, groundwater does not currently play a role in soil moisture conditions except in localized areas where groundwater is in contact with the ground surface such as seeps/spring locations and

therefore proposed dewatering is not expected to significantly change soil conditions or cause cracking, drying, or compaction. Thus, the potential for geotechnical impacts to the north side of the Sequalitchew Creek ravine under the Proposed Action (including potential for increases in soil erosion, landslides and cracking/compaction) is not anticipated.

See Key Topic 4.1 (Earth) for additional discussion on geotechnical conditions with the Proposal.

4.12.2– Potential for Changes to the Aesthetic Character of Sequalitchew Creek Ravine, including loss of vegetation.

As identified in the view simulations included in Section 3.9 (Aesthetics) of the Draft EIS, visual changes to the South Parcel site and of the mining operation itself, would not be visible from key view locations in the site vicinity and would not itself change or provide views of the mine. In particular, as shown in Figure 3.9-7, vegetation in the ravine and the difference in topography between the ravine trail and the South Parcel mining site would not permit views of the mining site. No change in access to the trail would occur.

As indicated in the discussion for Key Topic 4.6 (Plants & Animals) groundwater does not contribute to soil moisture under existing conditions with the exception of areas near seeps and wetlands that have a water table near the ground surface. The comments asserting that dewatering would result in vegetation on the ravine slopes drying up and dying, changing the environment of the creek trail, expresses an opinion that is not consistent with the geology of the site, the depth of the aquifer and the movement of groundwater; dewatering under the Proposed Action is not anticipated to significantly affect vegetation along the ravine of Sequalitchew Creek.

4.12.3 – Potential for Mining Noise to be audible within the Sequalitchew Creek Ravine, including along the Trail.

As indicated in Section 3.7 (Noise) of the Draft EIS (page 3.7-8), “Receptor location R1 (located at the ground floor of the Creekside Apartments near the upper portion of the Sequalitchew Creek Trail) provides modeled sound levels at the location closest to the Sequalitchew Creek trail. Sound levels during mining phase 2C, which is closest to the trail and to recreational users, is modeled to be within applicable noise limits and is not anticipated to result in a significant adverse impact to trail users.” In addition, the trail is lower topographically than the mining site, is not within line-of-sight of mining operations, and is separated by a dense vegetated buffer. Thus, the potential for noise associated with mining activities under the Proposed Action to affect the experience of users of the Sequalitchew Creek Trail is considered low.

4.13.1 Key Topic: Other Topics

The topic of regarding evaluation and discussion of potential alternatives not included in the EIS for the proposed action was raised in the comments. Some commenters requested additional evaluation or expressed a desire for other alternatives with less perceived impacts to be considered, or to be analyzed in more detail. Other commenters expressed opinions that potential alternatives that have previously been studied and deemed infeasible, that are inconsistent with the 2011 Settlement Agreement, and/or that would not augment streamflow between Sequalitchew Lake and the ravine, should be removed from the EIS discussion altogether.

Other topics raised in the comments include consideration of Sequalitchew Creek restoration without the Proposed Action, and need for other contingency measures.

- 4.13.1 - Alternatives Considered but Not Carried Forward
  - 4.13.1.1 – Limit effects to mine area or above water table only
  - 4.13.1.2 – Previously proposed/evaluated interception channel(s) alternatives
  - 4.13.1.3 – Environmental Coalition of Pierce County Suggested Alternative
- 4.13.2 - Sequalitchew Creek Restoration without Proposed Action

4.13.1 Alternatives Considered but Not Carried Forward

Section 2.5 of the EIS describes a wide range of alternatives that have been identified and evaluated in studies, environmental documents, feasibility analyses and the provisions of settlement agreements. These have included options for mining, locating mining facilities, and mitigating for environmental Impacts. Additional alternatives considered in the Draft EIS included reduced mining, no mining of the kettle wetland and construction of an interceptor channel in lieu of dewatering wells. The EIS discusses each of these options and concludes that they are not consistent with the objectives of the pr ponent, are not considered feasible, and are not reasonable alternatives for purposes of SEPA analysis.

4.13.1.1 Limit effects to mine area or above water table only

Section 2.5 of the EIS describes a range of mining alternatives that have been considered for the South Parcel and previous mining proposals in DuPont. A “reduced mining” alternative that mined above the aquifer was considered; however, it was not considered reasonable pursuant to SEPA criteria and was not carried forward for detailed discussion in the EIS (see Draft EIS, page 2-30). Similarly, reduced mining in the form of either a smaller mining area or reduced depth of mining was considered but eliminated from detailed analysis.

Mining above the aquifer was also studied as a potential alternative in the 2010 Final Feasibility Study. That analysis concluded that the site’s high seasonal groundwater level would result in effectively prohibiting commercially viable mining under this scenario. Prior and recent analyses of this alternative, therefore, have concluded that this alternative does not meet the criteria for a “reasonable alternative” because it could not feasibly attain or approximate the proposal's objectives and does not appear to reduce environmental impacts.

4.13.1.2 Previously proposed/evaluated interception channel(s) alternatives

An interception channel alternative was previously suggested during the EIS scoping process and was deemed to be infeasible, as discussed in the "Additional Alternatives Considered" section on EIS p. 2-31 (#3). The original proposed concept involved construction of an interceptor channel (or open ditch) along the western edge of Edmond Marsh. A shallow ditch would not capture sufficient groundwater to allow for mining of the South Parcel. To be effective, such a ditch/trench would need to extend vertically to the depth of the Olympia Beds and horizontally along the full length of the east side of the South Parcel. To meet these requirements, the channel would need to be excavated to an unrealistic depth (80 to 100 feet) and width (500 to 600 feet), resulting in dramatic land use and surface water impacts on the marshes and surrounding areas. In practice, such a channel is infeasible given current land uses and restrictions.

Commenters also suggested a revision of the interceptor trench concept but as a restoration element aimed at collecting groundwater in Edmond Marsh. This concept does not involve dewatering for mining, and, while the interceptor swale could theoretically be shallower than the required dewatering depth, several factors nevertheless drive the need for a certain minimum required depth. For an interceptor swale within Edmond Marsh to effectively intercept groundwater, the swale would need to be deeper than the peat layer present at the bottom of the marsh and along its southern boundary. Borings and hand excavations in the marsh indicate that the peat layer is approximately 3 to 5 feet thick. Thus, the interceptor swale would need to extend at least 5 feet below the bottom of the marsh to collect groundwater efficiently, resulting in a much lower groundwater discharge elevation than the surface water outflow from Sequalitchew Lake. The swale would need to have a minimum bottom slope of about 0.5 to 1 percent to convey the collected groundwater to Sequalitchew Creek. This would result in needing to excavate a channel extending approximately 1,000 feet beyond the outlet of Edmond Marsh with Sequalitchew Creek, to near the approximate location of the culvert on Sequalitchew Creek near City Hall. Once the channel reaches the coarser Steilacoom gravels to the west of Edmond Marsh, it would need to be lined to prevent re-infiltration of the collected groundwater.

Construction of such a channel would cause significant impact to Edmond Marsh by draining surface water from any portions of the marsh it passes through. Edmond Marsh would be smaller, with significant impacts to aquatic habitat, plants, and animals. The interceptor swale would also affect the upgradient marshes by lowering the groundwater table beneath them. This swale was evaluated, and discarded, as a potential component of the Southern Alignment element in the stakeholder process leading to development of the Sequalitchew Creek Restoration Plan.

4.13.1.3 Environmental Coalition of Pierce County Suggested Alternative

The Environmental Coalition of Pierce County (O4-11&12) suggest an alternative to the proposed restoration of flows from Sequalitchew Lake to Sequalitchew Creek which envisions intercepting Vashon Aquifer ground water flow along the eastern boundary of Edmond Marsh and discharging into Sequalitchew Creek near Center Drive. It is presumed that this would not be designed to dewater the proposed mine but would be an additional measure to mitigate loss of flows to Sequalitchew Creek, with or without the proposed restoration of surface water flows from

Sequalitchew Lake. As such, it would have the potential to mitigate periods of low or no-flow from the lake and high stream temperature impacts.

This alternative differs from Alternative 3, above in that it is upgradient of the Edmond Marsh complex.

Uncertainty exists as to the elevation of groundwater east of and upgradient of the marshes. There are limited wells monitored upgradient of the Edmond Marsh System. The wells that have been monitored have groundwater levels higher than Edmond Marsh water levels, particularly in wintertime. There is no definitive information on the groundwater levels between these upgradient wells and the Edmond Marsh System. Based on water level measurements from existing wells located on the periphery of Edmond Marsh, groundwater is closely connected to surface water in East Edmond Marsh (providing recharge to and receiving discharge from the marsh depending on time of year and location) and is seasonally connected in West Edmond Marsh. Some groundwater flow is presumed between the Bell, McKay and Hamer marsh systems upgradient of the Edmond Marsh complex which lies at a lower elevation. Even if the groundwater level is below the marsh level during the drier seasons, some interception of groundwater from a relatively shallow interceptor trench or a drain placed in a trench and backfilled is possible.

The volume of water that could be intercepted is unknown, but an order of magnitude can be derived by the model of the aquifer as a whole. The Vashon Aquifer in the vicinity is projected to produce a flow rate of groundwater discharging into the proposed aggregate mine of 6.9 cfs, on average, and up to 13.7 cfs during the wet season drawing from a mine face 200 feet deep and 6,000 feet wide with a face area of about 1.2 million square feet. This would result in a groundwater flow per square foot of about 575×10^{-6}. If the aquifer level is presumed to be at or near the marsh level in winter and just below the bottom level of the marsh in the summer, to produce 0.5 to 2.5 cfs discharge from an interceptor upgradient of Edmond Marsh along the entire 6,000 feet from Center Drive to Steilacoom – DuPont Road would require an interceptor about 15 to 30 feet deep. Most of this interception would be below the level of the Edmond Marsh complex, however it would intercept most or all groundwater that currently flows into the wetland, or about 25% of the total inflow. This would have a greater impact on diverting water from the wetland than the aquifer drawdown that results from dewatering the proposed aggregate mine. It would have a greater adverse impact on wetland water levels than the mine drawdown, without the mitigation of flows from Sequalitchew Lake.

As compared to the proposed Restoration Plan to provide a gradient for flows from Sequalitchew Lake, the latter would likely reduce wetland water levels by a greater amount than this alternative/mitigation option. The Restoration Plan would reduce wetland elevations in Edmond Marsh from high winter elevations of about 212.4 to the east and 210.5 to the west to about 210.5 and 206.5feet, respectively. The Restoration Plan would, however, provide average monthly flows in the ravine section of the creek between 26.3 cfs in March and 2.5 cfs in August, compared to the current flows ranging from 0.5 cfs in the summer to 2.5 cfs in winter. However, flows from the proposed Restoration Plan in periods where there is no projected outlet flows from Sequalitchew Lake are projected to be lower than under existing conditions approximately 10% of the time with a number of no flow periods.

This alternative may be considered marginally practical from an engineering and construction point-of-view, although a 35-foot-deep interceptor 6,000 feet long has construction and cost limitations. The flows provided would be much less than either the proposed Restoration Plan or the mitigation measures discussed below of diverting water intercepted to allow mining back to Sequalitchew Creek. It would produce lower temperature water in Sequalitchew Creek compared to the Restoration Plan but would be comparable in temperature to diverting water intercepted at the mine face back to the stream. This lack of clear advantage over other alternatives and issues of construction feasibility and cost justifies not carrying this alternative forward for detailed analysis.

4.13.2 Sequalitchew Creek Restoration without Proposed Action

Many commenters noted that the Restoration Plan could be implemented without being linked to the Proposed Action and its impacts from dewatering. The potential for implementing the Sequalitchew Creek Restoration Plan without funding from CalPortland is included in both scenarios A and B of Alternative 2 - No Action. As described in Section 2.5 of the EIS, while funding for implementation of the Restoration Plan on JBLM is programmed by JBLM) alternate funding sources, such as grants, would be required to implement the components of the Restoration Plan within the City of DuPont. The Washington Department of Ecology's Streamflow Restoration competitive grant program (authorized by Chapter 90.94 RCW) is one such example of grant funding sources. These funding sources are competitive and there is no guarantee that the same level of funding could be obtained or obtained on the same timeline.

Matrix Responses Section

This **Matrix Comment Responses Section** provides tables of all the indexed comments received on the Draft EIS, a summary of the comment, and a response that either cross-references to applicable key topic areas or provides a response to the individual comment.

STATE AGENCIES COMMENT MATRIX

Pioneer Aggregates DEIS Comment Response Matrix _**State Agency Letters**

LETTER	TOPIC	COMMENT RESPONSE
SA 1 - DNR	Figure corrections on DEIS pg. 3.1-5 and 3.3-4 (Figures 3.1.2 and 3.3-2)	**1**. The noted discrepancies in symbology between the cross section and the legend were the result of an apparent color change that resulted during copying/pasting of the original figure (Figure 8 in Appendix B of the Draft EIS) into the Draft EIS. This issue has been corrected to the extent possible and the full-resolution original figure (Figure 8 in Appendix B) has been referenced in the text.
	DEIS pg. 3.1-14 correction	**2**. Comment noted, the cited correction has been made to Section 3.2 (Earth) of this Final EIS. The sentence now reads "A geotechnical analysis (Aspect 2024) evaluated the stability of the proposed cut slopes of the South Parcel during mining operations is included as Appendix B of this Final EIS.
	Lead sampling and possible topsoil lead concentrations exceeding Ecology cleanup levels	**3**. Please refer to Key Topic response 4.1.5 (Earth).
	Lead sampling and possible topsoil lead concentrations exceeding Ecology cleanup levels	**4**. Please refer to Key Topic response 4.1.5 (Earth)
	Correction of DNR Surface Mine Reclamation Permit terminology	**5**. Comment noted. The cited reference to "Department on Natural Resources – Surface Mine Permit" has been made for this Final EIS (see Chapter 2 – Description of the Proposed Action and Alternatives)
SA 2 – DNR	Correction of DNR Surface Mine Reclamation Permit terminology	**1.** Comment noted. See Response to Letter SA-1, comment 5.
	Correction of DNR Surface Mine Reclamation Permit terminology	**2**. Comment noted. See Response to Letter SA-1, comment 5.
	Figure 3.1-2 correction	**3.** Please refer to response to SA-1, comment 1.
	DEIS page 3.1-14 correction	**4.** Comment noted. See Response to Letter SA-1, comment 2.
	Lead sampling and possible topsoil lead concentrations exceeding Ecology cleanup levels	**5**. Please refer to Key Topic response 4.1.5 (Earth).
	Lead sampling and possible topsoil lead concentrations exceeding Ecology cleanup levels	**6.** Please refer to Key Topic response 4.1.5 (Earth).
	Figure 3.3-1 correction	**7**. Please refer to response to SA-1, comment 1.

LETTER	TOPIC	COMMENT RESPONSE
	Lead sampling and possible topsoil lead concentrations exceeding Ecology cleanup levels	**8**. Please refer to Key Topic response 4.1.5 (Earth).
	Lead sampling and possible topsoil lead concentrations exceeding Ecology cleanup levels	**9**. Please refer to Key Topic response 4.1.5 (Earth).
SA 3 - Department of Ecology	Drawdown around JBLM landfill #5	**1**. Based on post-mining simulation, the projected groundwater drawdown in the vicinity of JBLM Landfill #5 will range up to approximately 9 feet with the greatest anticipated drawdown at the southwestern corner of the landfill area. The description of JBLM Landfill #5 and the related effects of the Proposed Action have been updated accordingly in Section 3 of the EIS and Appendix B, Earth and Water Resources Report. Drawdown near JBLM Landfill #5 will not result in any significant adverse impacts. Please refer to Key Topic response 4.3 (Groundwater).
	Figure 3.3-6, 3.3-7, 3.3-8, 3.3-9 corrections	**2**. Due to the small scale of these figures and high level of features currently included, it is impractical to include the location of JBLM Landfill #5 on these figures. However, for reference, the location of the former Fort Lewis Military Reservation (that includes Landfill #5) is indicated on Figure 3.3-2 and the location of Landfill #5 (approximately 0.5 miles east of the South Parcel) is shown on Figure 12 of Appendix B, Earth and Water Resources Report. EIS Figures 3.3-6 through 3.3.9 are also available at a slightly larger scale as Figures 22 through 25 in Appendix B. See also response to comment SA3-1 regarding maximum drawdown in the JBLM Landfill #5 vicinity.
	Description of groundwater quality on page 3.3-12 needs more recent data	**3**. Thank you for providing updated documentation of groundwater conditions observed at JBLM Landfill #5 including the 2022 Annual Groundwater Monitoring Report (INNOVEX-ERRG Joint Venture, 2023). We have reviewed 2022 annual reporting and 2023 semi-annual reporting and updated the descriptions of the JBLM Landfill #5 and the effects of the proposed action in Section 3 of the EIS and Appendix B, Earth and Water Resources Report. In general, our review of this report reinforces our understanding of the site conceptual model and does not result in any changes to the previous impacts analysis.
	Two 2023 semi-annual groundwater reports are available	**4**. Please refer to response to SA-3, comment 4.
	All grading and filling of land must utilize only clean fill	**5**. Please refer to Key Topic response 4.1.5 (Earth).
	Heavy metals contamination in project site area and Glacier Northwest Cleanup Action Plan	**6**. Please refer to Key Topic response 4.1.5 (Earth)

LETTER	TOPIC	COMMENT RESPONSE
	Dewatering impacts on JBLM landfill 5	**7**. Proposed dewatering and associated groundwater level drawdown are not anticipated to significantly affect the fate and transport of groundwater contaminants, leachate, or gas from JBLM Landfill 5. These concerns are addressed in the response to Key Topic response 4.13 (Other Topics). Dewatering is similarly not anticipated to affect the rate of differential settlement at the landfill, create ponding, or otherwise cause damage to foundations, landfill liners, or cover systems, as discussed below. Landfill settlement, dominated by the process of waste decomposition (transformation of material states from solid to liquid to vapor), has historically occurred at JBLM Landfill 5, as visually observed and documented by Tacoma-Pierce County Health Department annual reporting. However, due to the age of waste, burned condition of older waste in the landfill, and stabilization of microbiological activity from the recent transition from active to passive landfill gas collection, JBLM Landfill 5 materials are likely nearing functional stability, as demonstrated by little to no settlement, little to no landfill gas generation, and little to no leachate generation. Because of the age and condition of waste materials and relatively minor extent of dewatering (a maximum of approximately 9 feet at the southeast corner of the landfill area), the proposed dewatering is anticipated to have little to no effect on the rate of approach of JBLM Landfill 5 toward functional stability. Other potential settlement mechanisms for landfill materials are also unlikely. Structural settlement (collapse of void space) is unlikely due to a general lack of remaining void space/structure in the materials due to the length of load time since placement and the burned state of the oldest material. The potential for settlement of underlying native gravels is also not anticipated as this type of soil is not prone to settlement (see response to Key Topic response 4.3 [Groundwater]).
	Model Toxics Control Act and known/suspected contaminated sites in the near vicinity of the project site	**8**. Comment noted.
	Dam safety construction permit	**9**. A Dam Safety construction permit is not required for the proposed stormwater ponds or mitigation wetland. The stormwater ponds are constructed below surrounding grade and each have a volume less than 10 acre-feet, even when considering the total volume of both cells of the two-

LETTER	TOPIC	COMMENT RESPONSE
		celled wetponds as a single pond. The mitigation wetland will have a total volume of approximately 3 to 4 acre-feet and is constructed below surrounding grade. As the proposed ponds and wetland do not meet or exceed the criteria for a Dam Safety construction permit, submittal of construction plans is not required.
	Sand and Gravel General Permit Notice of Intent submission	**10**. Comment noted.
	Notification of permit coverage for Mine Dewater Water	**11**. Comment noted.
	Site management plan, site map, and monitoring plan must be updated as necessary	**12**. Comment noted.
	Satisfying public notice requirements for the Ecology permit action	**13**. Comment noted.

OTHER AGENCIES COMMENT MATRIX

Pioneer Aggregates DEIS Comment Response Matrix _**Other Agency Letters**

LETTER	TOPIC	COMMENT RESPONSE
OA 1 - Nisqually Tribe	Nisqually tribe consultation	**1.** The comment is noted. Please see the response to Key Topic 4.10.1, which acknowledges tribal sovereignty and identifies ongoing consultation efforts.
	Adequacy of DEIS cultural resources analysis geographic scope, methodologies, identification and analysis	**2.** The comment regarding the significance of the site vicinity to the Nisqually people is noted.
	Adequacy of DEIS cultural resources analysis geographic scope, methodologies, identification and analysis	**3.** Comment noted. Please refer to Key Topic 4.10 (Cultural Resources) for a discussion on Cultural Resources analysis & methodology.
	Adequacy of DEIS cultural resources analysis geographic scope, methodologies, identification and analysis	**4.** Comment noted. Please refer to Key Topic 4.10 (Cultural Resources) for a discussion on Cultural Resources analysis & methodology.
	Adequacy of DEIS cultural resources analysis geographic scope, methodologies, identification and analysis	**5**. Comment noted. Please refer to Key Topic 4.10 (Cultural Resources) for a discussion on Cultural Resources analysis & methodology.
	Adequacy of DEIS cultural resources analysis geographic scope, methodologies, identification and analysis	**6**. Comment noted. Please refer to Key Topic 4.10 (Cultural Resources) for a discussion on Cultural Resources analysis & methodology.
	Adequacy of DEIS cultural resources analysis geographic scope, methodologies, identification and analysis	**7**. Comment noted. Please refer to Key Topic 4.10 (Cultural Resources) for a discussion on Cultural Resources analysis & methodology.
	Adequacy of DEIS cultural resources analysis geographic scope, methodologies, identification and analysis	**8**. Comment noted. Please refer to Key Topic 4.10 (Cultural Resources) for a discussion on Cultural Resources analysis & methodology.
	Adequacy of DEIS cultural resources analysis geographic scope, methodologies, identification and analysis	**9**. Comment noted. Please refer to Key Topic 4.10 (Cultural Resources) for a discussion on Cultural Resources analysis & methodology.
	Adequacy of DEIS cultural resources analysis geographic scope, methodologies, identification and analysis	**10**. Comment noted. Please refer to Key Topic 4.10 (Cultural Resources) for a discussion on Cultural Resources analysis & methodology.
	Adequacy of DEIS cultural resources analysis geographic scope, methodologies, identification and analysis	**11**. Comment noted. Please refer to Key Topic 4.10 (Cultural Resources) for a discussion on Cultural Resources analysis & methodology.
	Adequacy of DEIS cultural resources analysis geographic scope, methodologies, identification and analysis	**12**. Comment noted. Please refer to Key Topic 4.10 (Cultural Resources) for a discussion on Cultural Resources analysis & methodology.
	Adequacy of DEIS cultural resources analysis geographic scope, methodologies, identification and analysis	**13**. Comment noted. Please refer to Key Topic 4.10 (Cultural Resources) for a discussion on Cultural Resources analysis & methodology.
	Adequacy of DEIS cultural resources analysis geographic scope, methodologies, identification and analysis	**14**. Comment noted. Please refer to Key Topic 4.10 (Cultural Resources) for a discussion on Cultural Resources analysis & methodology.
	Adequacy of DEIS cultural resources analysis geographic scope, methodologies, identification and analysis	**15**. Comment noted. Please refer to Key Topic 4.10 (Cultural Resources) for a discussion on Cultural Resources analysis & methodology.

LETTER	TOPIC	COMMENT RESPONSE
	Adequacy of DEIS cultural resources analysis geographic scope, methodologies, identification and analysis	**16**. Comment noted. Please refer to Key Topic 4.10 (Cultural Resources) for a discussion on Cultural Resources analysis & methodology.
	Adequacy of DEIS cultural resources analysis geographic scope, methodologies, identification and analysis	**17.** Comment noted. Please refer to Key Topic 4.10 (Cultural Resources) for a discussion on Cultural Resources analysis & methodology.
	Adequacy of DEIS cultural resources analysis geographic scope, methodologies, identification and analysis	**18**. Comment noted. Please refer to Key Topic 4.10 (Cultural Resources) for a discussion on Cultural Resources analysis & methodology
	Adequacy of DEIS cultural resources analysis geographic scope, methodologies, identification and analysis	**19**. Comment noted. Please refer to Key Topic 4.10 (Cultural Resources) for a discussion on Cultural Resources analysis & methodology.
	Adequacy of DEIS cultural resources analysis geographic scope, methodologies, identification and analysis	**20**. Comment noted. Please refer to Key Topic 4.10 (Cultural Resources) for a discussion on Cultural Resources analysis & methodology.
	Adequacy of DEIS cultural resources analysis geographic scope, methodologies, identification and analysis	**21**. Comment noted. Please refer to Key Topic 4.10 (Cultural Resources) for a discussion on Cultural Resources analysis & methodology.
	Adequacy of DEIS cultural resources analysis geographic scope, methodologies, identification and analysis	**22**. Comment noted. Please refer to Key Topic 4.10 (Cultural Resources) for a discussion on Cultural Resources analysis & methodology.
OA 2 - Pierce Co. Planning & PW		N/A
OA 3 - Pierce Co. Planning & PW	Proximity of the proposed Noise/Visual Berm to existing sewers and potential setback requirements to avoid overloading the existing infrastructure.	**1**. The Noise/Visual Berm is located entirely outside of the sewer easement and would not impact access to the existing sewer. Based on review of as-builts[1] and existing/proposed mine grading plans, the 36-inch-diameter high-density polyethylene Spirolite® sewer pipeline (Class 100) is located approximately 18 feet away from the berm toe (which is sloped at a grade of 2 Horizontal to 1 Vertical; 2H:1V) and is 16 feet deep at that location. Product specifications[2] indicate the allowable crush load of this grade of pipe is of 2,692 pounds/square foot (psf). Earth pressure analysis estimates the existing load of overlying soil on the pipe, under current conditions, at approximately 2,080 psf. Load attenuation analysis performed in Rocscience Settle3D indicates that the proposed berm would impose an additional stress of approximately 25 psf at the pipe location/depth, for a total combined earth pressure (including the weight of existing overburden material) of approximately 2,105 psf. The additional load imposed by the proposed berm is negligible with respect to existing earth pressures and the allowable

LETTER	TOPIC	COMMENT RESPONSE
		crush load rating for the pipe. Based on this analysis, no special measures are required to protect the sewer line. Proposed regrading along the east side of the South Parcel is limited in extent and occurs above the sewer line with sufficient vertical separation to avoid impacting the sewer pipe or access to it. The Powerline Road sewer is roughly 15 to 20 feet below existing grade. As proposed, grading along the sewer alignment lowers the existing grade by about 4.5 feet, and more typically 2 to 3 feet, leaving a minimum cover thickness of at least 10 feet. Mining would remove more material above the four stubouts that extend farther into the South Parcel, but in all cases at least 4 feet of cover would remain above the crown of the pipe at the westernmost location. Therefore, sufficient cover depth would be retained at all locations, in accordance with DOE's Criteria for Sewage Works Design (2008) manual (which specifies a minimum cover of 3 feet). [1] ESM, 2003. As-built construction plans for Powerline and Wharf Road Public Sanitary Sewer, prepared for Weyerheuser Real Estate Company Land Management Division. As-built certification 11-24-03. [2] https://isco-pipe.com/wp-content/uploads/2019/02/spirolite_isco.pdf
	Requested monitoring and preventive action if the proposed dewatering leads to settlement that creates sags in the sewer system.	**2**. Please refer to Key Topic 4.1.1 (Earth) for a general discussion on the potential for soil settlement associated with proposed dewatering. Key Topic 4.1.1.2 (Earth) specifically addresses the potential for settlement of the Robinson Trail sewer line and associated proposed monitoring.
	Monitoring of Bell Marsh Wetland to ensure that water levels stay below the proposed sewer line at Robinson Trail	**3.** Monitoring of Edmond Marsh water levels, where the Robinson Trail bridge and sewer line are located, has been ongoing for years and will be a necessary component of the Sequalitchew Creek Restoration Plan. Based on comparison of sewer as-built elevations and measured groundwater/surface water level conditions from 2004 to 2020, it is likely that groundwater levels already rise above portions of the sewer main seasonally under existing conditions. However, as discussed in Appendix B to the EIS and shown on Figure 35 of that document, maximum marsh surface water levels are not expected to increase as a result of the proposed project and/or Restoration Plan.
	Monitoring and corrective action to ensure that water levels stay below the sewer main at Robinson Trail Bridge	**4.** Please see the previous comment response.

LETTER	TOPIC	COMMENT RESPONSE
OA 4 - PSCAA	Federal, state and local agencies' control of air quality impacts; air quality mitigation enforcement	**1.** Comment noted.

ORGANIZATIONS COMMENT MATRIX

Pioneer Aggregates DEIS Comment Response Matrix _**Organizations Letters**

LETTER	TOPIC	COMMENT RESPONSE
Org 1 - Chambers-Clover Creek	Groundwater impacts from dewatering on public lands	**1.** The comments are noted. Please refer to Key Topic discussions in Key Topics Section 4.4. (Surface Water).
	Sequalitchew Creek as a groundwater discharge driven system, Sequalitchew "dry reach" should be called "losing reach"; this reach should not be "sealed to establish surface flows	**2.** Please refer to Key Topic response 4.4.1 (Surface Water).
	Dry reach should not be "sealed" to establish surface flows	**3.** Please see Key Topic response 4.4.1 (Surface Water - Current conditions of Sequalitchew Creek)
	Surface and groundwater inputs to East Edmond Marsh are not properly accounted for	**4.** Please refer to Key Topic response 4.4.8 (Surface Water)
	Anticipated alteration of flows from JBLM Diversion Structure Repair Project, potential for alternative funding source for Sequalitchew Creek restoration	**5.** Please refer to Key Topic responses 4.4.8 and 4.4.9 (Surface Water).
	For No Action Alternative; suggest development of a restoration plan committee based on factual assessment of hydrology and opportunities for restoration of ecological function	**6.** The comment is noted. The Restoration Plan is a separate project that is undergoing separate environmental review and permitting.
Org 2 - Env. Caucus		N/A (see attached individual response)
Org 3 - Env. Caucus	DEIS should more explicitly detail agreed-to actions under the South Parcel Monitoring Plan	**1.** Thank you for your comment. Please refer to Key Topic 4.13 (Other Topics).
	Non-credible and infeasible mitigation measures should be removed from the EIS and replaced with agreed-upon monitoring thresholds	**2.** Comment noted. Please refer to Key Topic 4.13 (Other Topics).
Org 4 - Env. Coalition Of Pierce Co.	Sequalitchew Lake as a suitable water source for Edmond Marsh and Sequalitchew Creek; intercept groundwater to flow down Sequalitchew Creek	**1.** Thank you for your comment. Please refer to Key Topic 4.13 (Other Topics).
	Restoration Plan basis	**2.** Please refer to Chapter 2 of the EIS, which summarizes the Settlement Agreement and the process leading to development of the proposed

LETTER	TOPIC	COMMENT RESPONSE
		Restoration Plan. Also refer to Key Topics 4.3.5 (Groundwater), 4.4.7 (Surface Water), and 4.5.2 (Fisheries).
	Impacts on water resources when the pumps are turned off in 2038/need to continue pumping	**3.** Please refer to Key Topics 4.3.5 (Groundwater), 4.4.7 (Surface Water), and 4.5.2 (Fisheries).
	Uses of site following reclamation, including city park with trees, recreation area with lake, skate park	**4.** Please refer to the Land Use discussion in section 3-8 of the South Parcel EIS. Uses of the South Parcel site following mining will be determined by the City of DuPont Comprehensive Plan land use and zoning designations, which are Manufacturing and Research for most of the site and some Residential Reserve. The comment's expressed preference for alternative uses is acknowledged.
	Status of Restoration Plan; adequacy of Plan to mitigate impacts of mining on Sequalitchew Creek and other impacts to watershed; potential for another restoration scenario, project consistency with 1994 agreement between WRECO and Lone Star, consistency with plans, policies and regulations related to the natural environment	**5**. Please refer to Key Topic responses 4.4.2 (Surface Water) and 4.4.8. Also please note that the Restoration Plan is a separate proposal that is undergoing separate permitting and environmental review.
	Impacts on water resources when the pumps are turned off in 2038/need to continue pumping	**6.** Please refer to Key Topic 4.3.5.
	Loss of wetland and stream function with respect to DuPont Critical Area Ordinances	**7.** Detailed information on critical areas is contained in EIS Section 3.6 and Appendix H, and in the *Critical Areas Report and Habitat Management Plan* (2021) submitted as part of the South Parcel application. The City will evaluate the consistency of the project with applicable provisions of the Critical Areas Ordinance in its Staff Report to the Hearing Examiner.
	Consistency with plans, policies and regulations related to the natural environment (Natural Environment Goals)	**8.** The City will evaluate the consistency of the South Parcel proposal with applicable goals and policies in its Staff Report to the Hearing Examiner.
	Alternative 1 watershed impacts with respect to previous agreements	**9.** The opinion expressed in the comment is noted.
	Necessity of Supplemental Impact Analysis for long-term dewatering mitigation; dewatering impacts of creek ravine/seeps on vegetation/tree canopy, soil erosion, wildlife habitat/biodiversity, and creek temperature.	**10.** Comment noted. Please refer to Key Topics 4.1.2, 4.3.2, 4.4.5, 4.4.7, 4.6.3, 4.12.1, and 4.12.2.
	Proposed initial activities for alternative Sequalitchew Creek watershed restoration plan proposal	**11.** The comment is noted. The Restoration Plan is a separate proposal and consideration of Restoration Plan alternatives is not within the scope of analysis of the South Parcel EIS. This EIS analyzed mining conditions with the Restoration Plan.

LETTER	TOPIC	COMMENT RESPONSE
	Proposed groundwater interception channel and additional beaver dam and culvert removal activities	**12.**Please refer to Key Topic 4.13.1.3 for additional information.
	Request for Supplemental Impact Analysis of alternative restoration plan proposal	**13.** The Restoration Plan is a separate project that is undergoing separate environmental review and permitting. The Restoration Plan was developed by a consortium of public agencies and environmental organizations through a multi-year process that evaluated numerous alternatives. The South Parcel proposal addresses mining and is distinct from the Restoration Plan. Restoration Plan alternatives are beyond the scope of the South Parcel EIS. This EIS does evaluate conditions with proposed mining with the Restoration Plan. Additional information about the Restoration Plan is included in Chapter 2 of the EIS. In addition, please refer to Key Topic 4.13.1, which addresses mining alternatives that were considered in the EIS but not carried forward for detailed analysis based on criteria in SEPA.
	General comments on historical and future use; anticipated loss of trees and wetland habitat; need for viable long-term restoration plan; need for mining recovery plan with forests and wetlands	**14.** Comments noted. Please refer to Key Topic 4.3.5 (Groundwater), 4.6.1 (Plants & Animals).
Org 5 - Garry Oak	Groundwater level impacts from dewatering, including on public lands, Sequalitchew Creek restoration without dewatering, against project	**1.** Comment noted. For general dewatering related concerns, please see Key Topic response 4.3.2 (Groundwater)
	Sole source aquifer protection	**2.** Please see Key Topic 4.3.4 (Groundwater).
	General dewatering concerns including sole source aquifer protection	**3.** Please see Key Topic 4.3 (Groundwater) sections 4.3.2 and 4.3.4.
	Sequalitchew Creek restoration as a salmon habitat	**4.** The comment regarding the importance of restoring Sequalitchew Creek is noted. Refer to Key Topics 4.4 (Surface Water), 4.5 (Fisheries), 4.6 (Plants & Animals) and 4.12 (Sequalitchew Creek Character) for discussion on Sequalitchew Creek conditions.
	Protection of biodiversity in Sequalitchew Creek ecosystem, including human interconnection with the environment	**5.** Comment noted. See Key Topics 4.1 (Earth), 4.6 (Plants & Animals), and 4.12 (Sequalitchew Creek Character) for discussion on the potential to impact the biodiversity of the Sequalitchew Creek ravine.
Org 6 - Washington Conservation Action	Background on South Parcel Restoration and Monitoring Plans	**1.** Comment noted.

LETTER	TOPIC	COMMENT RESPONSE
	Insufficient incorporation of South Parcel Monitoring Plan into EIS	**2.** Comment noted. Please refer to Key Topics 4.3.6.

INDIVIDUALS COMMENT MATRIX

Pioneer Aggregates DEIS Comment Response Matrix _**Individuals Letters**

LETTER	TOPIC	COMMENT RESPONSE
Letter 1 - Abbott	Air quality/climate change impacts	**1**. Comment noted. Refer to Key Topic 4.2 (Air Quality) and 4.6 (Plants & Animals for discussion of air quality and tree conditions.
	General groundwater quality impacts	**2**. Comment noted. Please refer to Key Topics in Section 4.3 (Groundwater).
	Questions about changes to Sequalitchew Creek and related impacts to animals	**3**. Please refer to Key Topic response 4.4.2 (Surface Water)
	Impacts on animals/squirrels and water contamination	**4.** Comment noted. Refer to Key Topic 4.6 (Plants & Animals) for discussion on the Gray Squirrel and Key Topic 4.3.3 (Groundwater) and 4.4.6 (Surface Water) for discussion on potential water quality impacts
	Safety impacts	**5.** As indicated in DEIS Section 3.11 (Transportation) and Key Topic 4.11 (Transportation), the Proposed Action would not result in traffic volumes beyond current conditions, and the potential for safety impacts would not increase over current conditions.
Letter 2 - Albone	Potential for impacts to wildlife and increased fire risk due to drying of vegetation along Sequalitchew Creek	**1.** Comments noted. Refer to Key Topics 4.6 (Plants & Animals) for discussion on the potential for dewatering to impact plants and increase the risk of wildfires.
	Air quality/GHG emissions impacts	**2.** Comment noted. Refer to Key Topic 4.2 (Air Quality) for discussion on air quality conditions.
	Potential drought and wildfire impacts	3. Comment noted. Please refer to Key Topics 4.1.3 (Earth), 4.3.2 (Groundwater), and 4.6.4 (Plants & Animals).
	Against project	**4.** Comments noted. Refer to Key Topics 4.6 (Plants & Animals) for discussion on dewatering impacts to plants and potential to increase the risk of wildfires.
	Noise impacts	**5.** Comment noted.
Letter 3 - Alexander	Water resources	**1.** Comments noted. Refer to Key Topics 4.3 (Groundwater) and 4.4 (Surface Water).
	Air quality impacts	**2.** Comments noted.
	General groundwater impacts	**3.** Comments noted. Refer to Key Topics 4.3 (Groundwater) and 4.4 (Surface Water).

LETTER	TOPIC	COMMENT RESPONSE
	Surface water quality impacts	**4.** Comments noted. Refer to Key Topics 4.3 (Groundwater) and 4.4 (Surface Water).
	Plants and animals impacts	**5.** Comments noted. Refer to Key Topics 4.5 (Fisheries) and 4.6 (Plants & Animals) for discussion on habitat conditions.
	General noise impacts	**6.** Comment noted.
	Wetlands/marshes impact from dewatering	**7.** Comment noted. Please refer to Key Topics 4.4.3 (Surface Water) and 4.6 (Plants and Animals) for discussion of wetland impacts.
Letter 4 - Alvardo	General earth impacts	**1.** Comment noted. Please refer to Key Topic 4.1 (Earth).
	General groundwater impacts including permanent reduction of water levels	**2.** Comment noted. Please refer to Key Topic 4.3.2 (Groundwater).
	General surface water impacts including habitat reduction	**3.** Comment noted. Please refer to Key Topic response 4.4.6 (Plants & Animals).
	General plant and animal impacts including habitat reduction.	**4.** Comments noted. For discussion of impacts to plants & animals and Sequalitchew Creek, refer to Key Topics 4.6 (Plants & Animals) and 4.12 (Sequalitchew Creek Ravine Character), respectively.
	General land use/transportation impacts	**5.** Comments noted. Refer to Key Topic 4.11 (Transportation) for traffic conditions with the Proposed Action.
	General cultural resources impacts	**6.** Comment noted.
Letter 5 - Amadee	General groundwater impacts including adverse impacts to vegetation and wildfire risk	**1.** Comment noted. Refer to Key Topic 4.3 (Groundwater).
	Flow of fresh water into marshlands will impact the salt/freshwater balance resulting in food chain impacts	**2.** The proposed Restoration Plan would increase the freshwater flow to the brackish marsh as occurred historically before construction of the Diversion Canal.
	Contamination of soils from mining impacts, increased erosion and landslide risk	**3.** Comment noted. Refer to Key Topics 4.1.2 for discussion of erosion and landslide risks and 4.1.5 (Earth) for discussion on soil contamination.
Letter 6 - Amadee	General environmental impacts including adverse impacts to Sequalitchew Creek Trail slopes and vegetation	**1.** Comment noted. Please refer to Key Topics 4.3.2 (Groundwater), 4.6.3 (Plants & Animals), and 4.12 (Sequalitchew Creek Ravine Character).
	Potable water impacts	**2.** Comment noted. Please refer to Key Topic responses 4.3.4 (Groundwater).
	Wetlands/marshes impacts from dewatering	**3.** Please refer to Key Topic response 4.4.3 (Surface Water).

LETTER	TOPIC	COMMENT RESPONSE
	Dewatering impacts on plants and animals	**4.** Comment noted. Refer to Key Topic 4.6 (Plants & Animals) for discussion on plants conditions with dewatering.
	Sequalitchew Creek Trail impacts	**5.** Comment noted. Refer to Key Topic 4.12 (Sequalitchew Creek Character) for discussion on the Trail.
	Against project	**6.** Comment noted.
Letter 7 - Ambrose	Reduction of potable water; effects of dewatering on vegetation/wetlands, fire risk, Old Fort Lake water levels, and Sequalitchew Creek.	**1.** Comment noted. Please refer to Key Topic responses 4.3.2 and 4 (Groundwater), 4.4.4, 4.6.3 and 4 (Plants & Animals).
	General surface water impacts	**2.** Comment noted. Please refer to Key Topic response 4.4.6 (Surface Water) for general surface water impact discussion.
	Dewatering impacts on plants and animals	**3.** Comment noted. Please refer to Key Topic response 4.6.3 (Plants & Animals).
	Sequalitchew Creek Trail impacts	**4.** Comment noted. Refer to Key Topics 4.1 (Earth), 4.6 (Plants & Animals) and 4.12 (Sequalitchew Creek Character) for discussion on Sequalitchew Creek ravine conditions.
	Against project	**5.** Comment noted.
Letter 8 - Andersin	Lost enjoyment of Sequalitchew Creek and increased potential for fire due to drying of vegetation along Sequalitchew Creek	**1.** Comment noted. Refer to Key Topic responses 4.3.2 (Groundwater), 4.6.3 and 4 (Plants & Animals), and 4.12 (Sequalitchew Creek Character).
	Adequacy of mitigation and substantial nature of unavoidable impacts	**2.** Comment noted. Refer to Key Topics 4.3 (Groundwater) and 4.4 (Surface Water) for discussion of groundwater and surface water.
	Potential for fire due to drying of vegetation along Sequalitchew Creek	**3.** Comment noted. Refer to Key Topics 4.3 (Groundwater) for discussion of groundwater impacts including climate change, 4.4 for surface water, and 4.6.4 (Plants & Animals) for wildfire risk.
	Sequalitchew Creek restoration without dewatering	**4.**Please refer to Key Topic 4.13.2 (Alternatives Considered).
Letter 9 - Anderson	Dewatering impacts on plants	**1.** Please refer to Key Topic response 4.6.3 (Plants & Animals) for discussion on habitat.
	Wetlands and bodies of water impacts from dewatering	**2.** Please refer to Key Topics 4.4.2,3 and 4 (Groundwater), and 4.6.3 (Plants & Animals).

LETTER	TOPIC	COMMENT RESPONSE
	Sequalitchew Creek restoration without dewatering	**3.** Comment noted. Refer to Key Topics 4.1 (Earth), 4.3 (Groundwater), 4.6 (Plants & Animals) and 4.12 (Sequalitchew Creek Character) for discussions on Sequalitchew Creek conditions.
Letter 10 - Anderson	Air quality impacts from mining	**1.** Comment noted. Refer to Key Topic 4.2 (Air Quality) for discussion on air quality conditions.
	Groundwater impacts (dewatering, potential for contamination)	**2.** Comment Noted. Please refer to Key Topics 4.3.2 and 3 (Groundwater).
	General plants and animals impacts	**3.** Comment noted. Refer to Key Topics 4.5 (Fisheries) and 4.6 (Plants & Animals) for discussion on the potential for dewatering to impact habitat.
	Quality of life impacts	**4.** Comment noted.
Letter 11 - Anderson	Impacts to Sequalitchew Creek Trail	**1.** Comment noted. Refer to Key Topics 4.1 (Earth), 4.6 (Plants & Animals) and 4.12 (Sequalitchew Creek Character) for discussion on Sequalitchew Creek conditions.
	Impacts to Sequalitchew Creek Trail	**2.** Please refer to Key Topic responses 4.6.3 (Plants & Animals) and 4.12.2 (Sequalitchew Creek Character).
	Impacts to Sequalitchew Creek Trail	**3.** Please refer to Key Topic responses 4.4.6 (Surface Water), and 4.12.2 (Sequalitchew Creek Character).
Letter 12 - Arent	Sequalitchew Creek impacts from dewatering	**1.** Please refer to Key Topic responses 4.4.2 (Surface Water) and 4.4.5.
	Dewatering impacts on animals	**2.** Comment noted. Refer to Key Topic s 4.5 (Fisheries) and 4.6 (Plants & Animals) for discussion on habitat impacts associated with dewatering.
Letter 13 - Ariosa	General groundwater impacts	**1.** Comment noted. See Key Topic 4.3 (Groundwater) for discussion on groundwater conditions under the Proposed Action.
	Groundwater impacts (dewatering)	**2.** Comment noted. Please refer to Key Topic 4.3.2 (Groundwater).
	Wetlands and bodies of water impacts from dewatering	**3.** Comment noted. Refer to Key Topics 4.3 (Groundwater), 4.4 (Surface Water), and 4.6 (Plants & Animals) for discussion on groundwater and wetlands conditions.
Letter 14 - Ambruster	General environmental impacts, habitat	**1.** Comment noted. Refer to Key Topic 4.6.1 (Plants & Animals) for discussion of habitat.
	Air quality impacts from mining	**2.** Comment noted. See Key Topic 4.2 (Air Quality) for discussion on air quality conditions.

LETTER	TOPIC	COMMENT RESPONSE
	Water quality impacts	**3**. Comment noted. Refer to Key Topic 4.3 (Groundwater) for discussion of groundwater.
	Potable water impacts	**4.** Comment noted. Refer to Key Topics 4.3.3 (Groundwater) for discussion of groundwater quality, 4.3.4 for drinking water supply, and 4.4 (Surface Water) for surface water.
	General plants and animals impacts	**5**. Comment noted. Refer to Key Topic 4.5 (Plants & Animals) for discussion on plants and animals conditions.
	Noise impacts on sensitive populations	**6**. Comment noted. Refer to Key Topic 4.7 (Noise) for discussion on noise condition.
	General environmental impacts (use of area by people to connection with nature)	**7.** Comment noted. Refer to Key Topic for 4.12.2 (Sequalitchew Creek Character) for discussion of Sequalitchew Creek Ravine.
	Property value impacts	**8**. Comment noted. Property values is not an environmental element analyzed under the Washington State Environmental Policy Act (SEPA). The Draft EIS includes a detailed evaluation of the potential for impacts to land uses in the vicinity of the Proposed Action. See Section 3.8 (Land Use) of the Draft EIS and key Topic 4.8 (Land & Shoreline Use) of this Chapter.
Letter 15 - Baglio	Environmental impacts	**1.** Comment noted. See the Key Topics portion of this chapter for discussion on environmental conditions.
	Psychological, sociological, human rights impacts/other possible uses of the site	**2.** Comments noted.
Letter 16 - Baird	General groundwater impacts	**1.** Comment noted. Refer to Key Topics 4.3 (Groundwater) and 4.4 (Surface Water) for discussion on water resources.
Letter 17 - Bakke	Quality of habitat after reclamation	Comment noted. Refer to Key Topic 4.6 (Plants and Animals) for further discussion on habitat impacts.
	Dewatering impacts on animals and habitats	**2**. Please refer to Key Topic response 4.6.3 (Plants & Animals).
	Dewatering impacts on animals and habitats	**3**. Please refer to Key Topic responses 4.4.2 (Surface Water) and 4.4.3.
	Dewatering impacts on plants and animals	**4.** Comments noted. See Key Topics 4.1 (Earth), 4.3 (Groundwater), 4.4 (Surface Water), 4.5 (Fisheries), 4.6 (Plants & Animals), and 4.12 (Sequalitchew Creek Character) for discussion on habitat conditions with proposed dewatering.

LETTER	TOPIC	COMMENT RESPONSE
	Sequalitchew Creek Trail impacts	**5.** Comment noted. Refer to Key Topics 4.6 (Plants & Animals) and 4.12 Sequalitchew Creek Character) for discussion on Sequalitchew Creek conditions.
Letter 18 - Bakke		NA
Letter 19 - Barbera	General environmental impacts	**1.** Comment noted.
	General groundwater impacts (drought, potential for contamination)	**2.** Please refer to Key Topics 4.3.1.2 (Earth), 4.3.2 (Groundwater), 4.3.3, and 4.3.4.
	Impacts on Gary oaks and oak prairie habitat	**3.** Comments noted. Refer to Key Topics 4.6 (Plants & Animals) for discussion on trees and habitat.
	General land use impacts	**4.** Comments noted.
Letter 20 - Barr	Sequalitchew Creek Trail impacts	**1.** Comment noted. Refer to Key Topic 4.12 (Sequalitchew Creek Character) for discussion on the potential to impact Sequalitchew Creek character.
Letter 21- Barrientos	Sequalitchew Creek Trail impacts	**1**. Comment noted. Refer to Key Topic 4.3 (Groundwater)for discussion of groundwater.
	Against project; impacts to creek area and general environment	**2.** Comment noted. Refer to Key Topics 4.6.3 (Plants & Animals) and 4.12 (Sequalitchew Creek Character).
	Potential for fire due to drying of vegetation along Sequalitchew Creek	**3**. Please refer to Key Topic responses 4.4.2 (Surface Water), 4.4.3, 4.4.4, 4.6.3 (Plants & Animals) and 4.6.4.
	Sequalitchew Creek restoration without dewatering	**4**. Please see Key Topic 4.13.1 (Alternatives Considered).
Letter 22 – Barrow	Forest stewardship and recreational opportunities	**1.** Comments regarding Weyerhaeuser as landowner are noted. See Key Topics 4.4.7 (Surface Water) and 4.6.1 (Plants & Animals) regarding CalPortland's restoration and reclamation planning.
	GMA justification of the project; general understanding of dewatering	**2.** As described in Chapter 2 of the EIS, dewatering is proposed as a means to access the sand and gravel resource, not as a means to wash the rock. Refer to Key Topic 4.3.2 (Groundwater) for additional discussion of dewatering concerns.
	Drought, climate change, and setbacks around water sources	**3**. Please see Key Topic 4.3.4.(Groundwater) and 4.3.1.2.
	Consistency with plans, policies, and regulations related to the natural environment	**4**. The comments regarding the changing nature of environmental regulations and municipal planning are noted.

LETTER	TOPIC	COMMENT RESPONSE
	Replaced landmark trees survival with dewatering	**5.** Comments noted. Refer to Key Topic 4.6 (Plants & Animals) for discussion on the potential for plant habitat to be impacted by dewatering.
	Dewatering impacts on animals	**6.** Comments noted. See Key Topics 4.1 (Surface Water) and 4.6 (Plants & Animals) for discussion on potential for dewatering to impact vegetation and wetlands.
	Impacts on squirrels and Gary oak/oak prairie habitat	**7.** Refer to Key Topic 4.6.5 (Plants & Animals) regarding potential to impact Gray Squirrel and Key Topic 4.6.6 regarding Potential to Impact Oregon White Oak & Oak Prairie Habitat.
	Dewatering impacts on animals	**8.** Comment noted. Refer to Key Topic 4.6 (Plants & Animals) for discussion on the animal habit, including Gray Squirrel.
	Adequacy of mitigation and substantial nature of unavoidable impacts	**9.** Before mining can proceed in the South Parcel, the Washington Department of Natural Resources will need to issue a surface mine reclamation permit using their authority provided by the Washington State Surface Mining Act (78.44 RCW). The permit will include an approved Surface Mine Reclamation Plan for the whole mine site, and conditions intended to ensure the property is reclaimed to a condition suitable for its ultimate use. The surface mining act directs the DNR to ensure that a sufficient performance security (bond) is available to reclaim each permitted mine (RCW 78.44.087).
	Sequalitchew Creek restoration without dewatering	**10.** Comment noted. Please refer to Key Topic response 4.13.1 (Alternatives Considered)– Sequalitchew Creek Restoration without Dewatering.
Letter 23 – Barrow	Impacts on squirrels and Gary oak/oak prairie habitat	**1.** Comment noted. Refer to Key Topic 4.6 (Plants & Animals) for discussion on habit, including oak habitat and squirrel habitat.
Letter 24 – Bishop	General environmental impacts	**1.** Comment noted. Refer to Key Topic 4.12 (Sequalitchew Creek Character) for discussion on Sequalitchew Creek conditions.
Letter 25 – Bivens	General groundwater impacts	**1.** Comment noted.
	Air quality impacts from mining	**2.** Comment noted. Refer to Key Topic 4.2 (Air Quality) for discussion on air quality conditions.

LETTER	TOPIC	COMMENT RESPONSE
	General groundwater impacts (future drought, general lack of water)	**3.** Please refer to Key Topics 4.3.1.2 (Groundwater) and 4.3.4.
	General plants and animals impacts	**4.** As indicated in Section 3.6 (Plants & Animals) of the DEIS, the majority of the trees on the South Parcel would be removed under the Proposed Action. See Key Topic 4.6 (Plants & Animals) for additional discussion on habit conditions under the Proposed Action.
	General noise impacts	**5.** Comment noted. Refer to Key Topic 4.7 (Noise) for discussion on noise conditions.
	Against project	**6.** Comment noted.
	General aesthetic impacts	**7.** As indicated in Section 3.9 (Aesthetics) of the DEIS, changes to the visual character of the South Parcel would change under the Proposed Action. See Key Topic 4.9 (Aesthetics) for additional discussion on visual character.
	Impacts to experience of using Sequalitchew Creek Trail	**8.** Comment noted. Refer to Key Topic 4.12 (Sequalitchew Creek Character) for discussion on Sequalitchew Creek ravine conditions.
Letter 26 – Bjork	Existing air quality/climate change conditions and exacerbation with dewatering	**1.** Please refer to Key Topic responses 4.3.1.2 (Groundwater) and 4.4.3 (Surface Water).
	Sequalitchew Creek impacts from dewatering	**2.** Please refer to Key Topic response 4.12.2 (Sequalitchew Creek Character) - Changes to the visual character of the ravine, including loss of vegetation.
	Dewatering impacts on plants	**3.** Please refer to Key Topic response 4.6.3 (Plants & Animals) – Potential for Dewatering to Impact Plants & Animal Habitat.
	General land use impacts	**4.** Comment noted.
	Against project	**5.** Comment noted.
Letter 27 – Black	Dewatering impacts on plants	**1.** Please refer to Key Topic response 4.6.3 (Plants & Animals) – Potential for Dewatering to Impact Plants & Animal Habitat.
	General surface water impacts	**2.** Please refer to Key Topic response 4.4.6 (Surface Water) – General Surface Water Impacts.
	General plants and animals impacts	**3.** Comment noted. Refer to Key Topic 4.6 (Plants & Animals) for discussion on potential for habitat impacts.
	Noise impacts from truck traffic	**4.** Comment noted. Refer to Key Topic 4.7 (Noise) for discussion noise conditions.

LETTER	TOPIC	COMMENT RESPONSE
	General aesthetic impacts	**5**. Comments noted. Refer to Key Topics 4.6 (Plants & Animals) and 4.9 (Aesthetics) for discussion on plant habitat and view conditions.
Letter 28 – Borne	Impacts to experience of using Sequalitchew Creek Trail	**1**. Please refer to Key Topic response 4.12.2 (Sequalitchew Creek Character) - Changes to the visual character of the ravine, including loss of vegetation.
	Impacts to experience of using Sequalitchew Creek Trail	**2.** Please refer to Key Topic response 4.12.2 (Sequalitchew Creek Character) - Changes to the visual character of the ravine, including loss of vegetation.
	Noise impacts from mining	**3.** Comment noted. Refer to Key Topic 4.7 (Noise) for discussion on noise conditions.
Letter 29 – Bradley	Dewatering impacts on plants and animals	**1.** Comments noted. Refer to Key Topic 4.6 (Plants & Animals) for discussion on habitat conditions with the Proposed Action.
Letter 30 – Bradt	Foreign company's impacts on DuPont's water and biological resources	**1.** Comments noted. Refer to Key Topics 4.3 (Groundwater) and 4.4 (Surface Water) for discussion on water resources.
	Quality of life impacts	**2**. Comment noted.
Letter 31 – Brandon	Groundwater level impacts from dewatering including on public lands	**1.** Comments noted. Refer to Key Topics 4.1 (Earth), 4.3 (Groundwater), 4.4 (Surface Water), and 4.12 (Sequalitchew Creek Character) for discussion on conditions with proposed dewatering.
	Air quality impacts from truck traffic	**2.** Comment noted. Refer to DEIS Section 3.2 (Air Quality) and Key Topic 4.2 (Air Quality) for discussion on air quality conditions under the Proposed Action.
	Wetlands and bodies of water impacts from dewatering	**3**. Please refer to Key Topic responses 4.4.2 (Surface Water), 4.4.3, 4.4.4, and 4.6.3 (Plants & Animals).
	Potential for fire due to drying of vegetation along Sequalitchew Creek	**4**. Comments noted. Refer to Key Topics 4.3.2 (Groundwater), 4.3.1.2, and 4.6.4.
	Sequalitchew Creek restoration without dewatering	**5.** Please refer to Key Topic response 4.13.1 (Alternatives Considered) – Sequalitchew Creek Restoration without Dewatering.
	Wetlands and bodies of water impacts from dewatering	**6.** Comments noted. Refer to Key Topics 4.1 (Earth), 4.4 (Surface Water), and 4.6 (Plants & Animals) for discussion on habitat conditions with the Proposed Action.
	Wetlands and bodies of water impacts from dewatering	**7**. Comments noted. Refer to Key Topics 4.1 (Earth), 4.4 (Surface Water), and 4.6 (Plants & Animals) for discussion on habitat conditions with the Proposed Action

LETTER	TOPIC	COMMENT RESPONSE
	General noise impacts	**8.** Comment noted. Refer to Key Topic 4.7 (Noise) conditions with the Proposed Action.
	Impacts to experience of using Sequalitchew Creek Trail	**9.** Comment noted. Refer to Key Topic 4.12 (Sequalitchew Creek Character) for discussion on Sequalitchew Creek Trail conditions.
	Impacts to experience of using Sequalitchew Creek Trail	**10.** Comment noted. Refer to Key Topic 4.12 (Sequalitchew Creek Character) for discussion on Sequalitchew Creek Trail conditions.
	General Nisqually Tribe cultural resource impacts	**11**. Comments noted. Refer to Key Topics 4.10 (Cultural Resources) for discussion on cultural resource conditions.
	Truck traffic impacts	**12.** Comments noted. Refer to Key Topic 4.11 (Transportation) for discussion on truck traffic conditions.
	Impacts to experience of using Sequalitchew Creek Trail/against project	**13.** Comment noted. Refer to Key Topic 4.12 (Sequalitchew Creek Character) for discussion on Sequalitchew Creek Trail conditions.
Letter 32 – Brewer	Blank	**1**. N/A
Letter 33 – Brewer	Impacts to Sequalitchew Creek and other water systems from dewatering	**1**. Please refer to Key Topics 4.3.2 (Groundwater), 4.4.2 (Surface Water), and 4.12.2 (Sequalitchew Creek Character).
	Groundwater quality impacts	**2.** Comments referencing impacts identified in the DEIS noted.
	Aesthetic impacts of mining expansion	**3.** Comments noted. Refer to 3.9 (Aesthetics) and Key Topics 4.9 (Aesthetics) for discussion on view conditions with the Proposed Action.
Letter 34 – Brinkhaus	Against project	**1.** Comment noted.
Letter 35 – Bristol	Against project	**1.** Comment noted. Refer to Key Topic 4.12 (Sequalitchew Creek Character) for discussion on Sequalitchew Creek ravine conditions with the Proposed Action.
Letter 36 – Buckner	Potential for fire due to drying of vegetation along Sequalitchew Creek	**1.** The cited statement from the DEIS regarding groundwater dewatering is noted. Refer to Key Topic 4.6 (Plants & Animals) for discussion on the potential for proposed dewatering to increase the potential for wildfires.
	Air quality impacts from mining	**2.** Comment noted. Refer to Key Topic 4.2 (Air Quality) for discussion on air quality conditions.
	Dewatering concerns; consistency with plans, policies, and regulations related to the environment	**3.** Comment noted. Groundwater mitigations are discussed in Section 3.3.3 (Groundwater) of the EIS. Please see Key Topic 4.3.3 (Groundwater) for general concerns regarding dewatering.

LETTER	TOPIC	COMMENT RESPONSE
	Adequacy of mitigation and substantial nature of unavoidable impacts	**4.** The comment regarding the functions of wetlands is noted.
	Impacts to Sequalitchew Creek flow, vegetation, habitat, and water quality.	**5.** Please refer to Key Topic responses 4.4.2, (Surface Water) 4.4.5, and 4.6.3 (Plants & Animals).
	Noise impacts on community garden	**6.** Comment noted. Refer to Key Topic 4.7 (Noise)
	Land use impacts on surrounding areas	**7.** Comment noted. Refer to Key Topic 4.8 (Land & Shoreline Use) for discussion on land use impacts and Key Topic 4.2 (Air Quality) for discussion on pollution and associated mitigation measures.
	Impacts on DuPont master planned community	**8.** Comment noted. Refer to DEIS Section 3.9 (Aesthetics) and Key Topic 4.9 (Aesthetics) for discussion regarding aesthetic conditions with the Proposed Action.
	Lot Y office/warehouse elimination of access to historic and prehistoric sites	**9.** Comment noted. The proposed Action does not entail relocation of the Sequalitchew Creek Trail. Refer to Key Topic 4.12 (Sequalitchew Creek Character) for discussion on Sequalitchew Creek ravine conditions and Key Topic 4.11 (Transportation) for discussion on truck traffic.
	Increased traffic of Powerline Road and Center Drive	**10.** Comment noted. Refer to Key Topic 4.11 (Transportation) for discussion on impacts of increased traffic.
	Wetlands and bodies of water impacts from dewatering	**11.** Please refer to Key Topic responses 4.4.2 (Surface Water), 4.4.3, 4.4.4, and 4.6.3 (Plants & Animals).
Letter 37 – Bundt	Dewatering impacts on plants	**1.** Comments noted. See Key Topics 4.1 (Earth), 4.6 (Plants & Animals), and 4.12 (Sequalitchew Creek Character) for discussion on vegetation conditions with proposed dewatering.
	Potential for fire due to drying of vegetation along Sequalitchew Creek with dewatering	**2.** Comment noted. Refer to Key Topic 4.1 (Earth) for discussion on drying of vegetation and wildfire potential.
	Against project	**3.** Comment noted.
	Impacts to experience of using Sequalitchew Creek Trail	**4.** Comment noted. Refer to Key Topic 4.12 (Sequalitchew Creek Character) for discussion on Sequalitchew Creek ravine conditions.
	Noise impacts from mining	**5.** Comment noted. Refer to Key Topic 4.7 (Noise).
Letter 38 – Bundt	Wetlands/marshes impacts from dewatering	**1.** Comments noted. See Key Topics 4.1 (Earth), 4.4 (Surface Water), 4.5 (Fisheries), 4.6 (Plants & Animals), and 4.12 (Sequalitchew Creek Character) for discussion on impacts of proposed dewatering.
Letter 39 – Burch	Groundwater impacts	**1.** Comment noted. See Key Topic 4.3 (Groundwater) for discussion on groundwater conditions under the Proposed Action.

LETTER	TOPIC	COMMENT RESPONSE
	Potable water impacts from dewatering and contamination	**2.** The comments related to the importance of surface and groundwater resources are noted. Refer to Key Topics 4.3.2 (Groundwater) and 4.4 (Surface Water) of this Chapter for discussion on the potential for impacts to water resources under the Proposed Action.
	Against project	**3.** Comment noted.
Letter 40 – Cady	Potable water impacts from dewatering and contamination	**1.** Comment noted, See Key Topic 4.3.2 (Groundwater)
Letter 41 – Calahan	General environmental impacts	**1.** Refer to Key Topics 4.3 (Groundwater), 4.4 (Surface Water), 4.6 (Plants and Animals), and 4.12 (Sequalitchew Creek).
	General air quality/GHG emissions impacts	**2.** Comment noted. Refer to Key Topics 4.2 (Air Quality) and 4.7 (Noise) for discussion on air/noise pollution and associated mitigation measures.
	Groundwater recharge impacts	**3.** Please refer to Key Topic 4.3 (Groundwater).
	Impacts to experience of using Sequalitchew Creek Trail	**4.** Comment noted. Refer to Key Topic 4.12 (Sequalitchew Creek Character) for discussion on Sequalitchew Creek ravine conditions.
	General plants and animals impacts	**5.** Comment noted. Refer to Key Topic 4.5 (Plants & Animals) for discussion on plants and animals impacts as well as habitat conditions.
	Potential for DuPont to shift away from warehouse and industrial uses	**6.** Comment noted. Refer to Key Topic 4.8 (Land & Shoreline Use) for discussion on land use impacts.
	Potential for DuPont to shift away from warehouse and industrial uses	**7.** Comment noted. Refer to Key Topic 4.8 (Land & Shoreline Use) for discussion on land use impacts.
	Impacts to experience of using Sequalitchew Creek Trail	**8.** Comment noted. Refer to Key Topic 4.12 (Sequalitchew Creek Character) for discussion on aesthetic impacts as well as Sequalitchew Creek ravine conditions.
	Need for a cultural resources study	**9.** Comment noted. Refer to Key Topic 4.10 (Cultural Resources)
	Truck traffic impacts	**10.** Comment noted. Refer to Key Topic 4.11 (Transportation) for discussion on impacts of increased traffic.
Letter 42 – Campbell	Against project	**1.** Comment noted.
Letter 43 – Canonica	Against project	**1.** Comment noted.
	Wetlands and bodies of water impacts from dewatering	**2.** Please refer to Key Topic responses 4.4.2 (Surface Water), 4.4.3, 4.4.4, and 4.6.3 (Plants & Animals).

LETTER	TOPIC	COMMENT RESPONSE
	Against project	**3.** Comment noted.
	Wetlands and bodies of water impacts from dewatering	4. Please refer to Key Topic responses 4.4.2 (Surface Water), 4.4.3, 4.4.4, and 4.6.3 (Plants & Animals).
	Groundwater impacts, potential for fire due to dewatering, climate change, dewatering impacts on plants and animals	**5**. Refer to Key Topics 4.3.1.2 (Groundwater), 4.6.3 (Plants & Animals), and 4.6.4.
	Sequalitchew Creek restoration	**6**. Please refer to Key Topic response 4.13.1 (Alternatives Considered) – Sequalitchew Creek Restoration without Dewatering.
Letter 44 – Carels	Pollution in water	**1.** Comment noted. Refer to Key Topic 4.4 (Surface Water).
	Noise pollution	**2.** Comment noted. Refer to Key Topic 4.7 (Noise).
	General aesthetic impacts	**3.** Comment noted. Refer to Key Topic 4.12 (Sequalitchew Creek Character Conditions).
	Transportation impacts	**4**. Comment noted. Refer to Key Topic 4.11 (Transportation).
Letter 45 – Carter	Other possible uses of the site	**1.** Comments noted. Refer to Key Topic 4.8 (Land and Shoreline Use).
	Air quality impacts from truck traffic and mining	**2.** Comment noted. Refer to Key Topics 4.2 (Air Quality) and 4.11 (Transportation).
	General environmental impacts	**3.** Comment noted.
	General environmental impacts	**4.** Comment noted.
Letter 46 – Case	General environmental impacts	**1.** Comment noted. Refer to Key Topic 4.6 (Plants & Animals).
	General air quality/GHG emissions impacts	**2.** Comment noted. Refer to Key Topic 4.2 (Air Quality).
Letter 47 – Chandler	N/A	**1.** N/A
Letter 48 – Chandler	Potential for mushrooms in the project area, impacts on mushrooms	**1.** Comments related to fungal species are noted. Refer to Key Topic 4.6 (Plants & Animals) for discussion on fungal species condition and potential for impact at the South Parcel portion of the site.
	Potential for mushrooms in the project area, impacts on mushrooms	**2.** See response to comment 1 of this letter.
	Potential for mushrooms in the project area, impacts on mushrooms	**3.** See response to comment 1 of this letter.
	Potential for mushrooms in the project area, impacts on mushrooms	**4.** See response to comment 1 of this letter.

LETTER	TOPIC	COMMENT RESPONSE
	Potential for mushrooms in the project area, impacts on mushrooms	**5**.Habitat to support common mushroom species in Western Washington will be replaced by site reclamation
	Potential for mushrooms in the project area, impacts on mushrooms	**6.** See response to comment 1 of this letter.
	Against project	**7.** Comment noted.
Letter 49 – Childers	General earth impacts	**1.** Comment noted. Refer to Key Topic 4.1 (Earth).
	Air quality impacts from mining	**2.** Comment noted. Refer to Key Topic 4.2 (Air Quality).
	Potable water/groundwater impacts	**3**. Refer to Key Topics 4.3.2 (Groundwater), 4.3.3, and 4.3.4.
	General surface water impacts	4. Please refer to Key Topic response 4.4.6 (Surface Water) – General Surface Water Impacts.
	General plants and animals impacts	**5.** Comment noted. Refer to Key Topic 4.6 (Plants & Animals).
	General noise impacts	**6.** Comment noted. Refer to Key Topic 4.7 (Noise).
	Against project	**7.** Comment noted.
	General aesthetic impacts	**8.** Comment noted. Refer to Key Topic 4.12 (Sequalitchew Creek Character Conditions).
	General plants and animals impacts	**9.** Comment noted. Refer to Key Topic 4.6 (Plants & Animals).
Letter 50 – Childers	Blank	Blank Comment Form
Letter 51 – Choo	General environmental impacts	**1.** Comment noted. Refer to Key Topic 4.1 (Earth).
	Federal, state, and local agencies' control of air quality impacts/air quality mitigation	**2.** Comment noted. Refer to Key Topic 4.2 (Air Quality).
	General environmental impacts	**3.** Comment noted. Refer to Key Topic 4.1 (Earth).
	Cumulative noise impacts	**4.** Comment noted. Refer to Key Topic 4.7 (Noise).
	General plants and animals impacts	**5.** Comment noted. Refer to Key Topic 4.6 (Plants & Animals).
Letter 52 – Chown	Against project	**1.** Comment noted.
	General air quality/GHG emissions impacts	**2.** Comment noted. Refer to Key Topic 4.2 (Air Quality).
Letter 53 – Claassen	Potable water impacts from dewatering and contamination	**1.** The comments related to the importance of surface and groundwater resources is noted. Refer to Key Topics 4.3 (Groundwater) and 4.4 (Surface Water) of this Chapter for discussion on the potential for impacts to water resources under the Proposed Action.

LETTER	TOPIC	COMMENT RESPONSE
	Sequalitchew Creek impacts from dewatering	**2.** Comment noted. Refer to Key Topics 4.1 (Earth), 4.3 (Groundwater), 4.6 (Plants & Animals) and 4.12 (Sequalitchew Creek Character) for discussions on Sequalitchew Creek conditions.
Letter 54 – Clonch	Impacts to experience of using Sequalitchew Creek Trail	**1.** Comment noted. Refer to Key Topic 4.12 (Sequalitchew Creek Character) for discussion on Sequalitchew Creek ravine conditions.
Letter 55 – Coffey	Mineral resources in area are of high quality and needed to build infrastructure	**1**. The comment regarding the need for aggregate mineral resources on the site is noted.
	Federal, state, and local agencies' control of air quality impacts	**2.** Comment noted.
	No concerns (Vashon Aquifer is not a suitable source of drinking water)	**3**. Thank you for your comment regarding the Vashon Aquifer not being a suitable source of drinking water. This topic is further discussed in Key Topic 4.3.4 (Groundwater).
	Positive aspects of restoration plan	**4.** Comment noted.
	Positive aspects of restoration plan	**5.** Comment noted.
	Positive aspects of retaining bluff and shoreline along Puget Sound	**6.** Comment noted.
	Mitigation for possible cultural resources impacts	**7.** Comment noted.
	Use of barges and truck routes to mitigate transportation impacts	**8.** Comment noted.
Letter 56 – Colbert	Dewatering impacts on plants	**1.** Comment noted. Refer to Key Topic 4.6 (Plants & Animals).
Letter 57 – Cooper	Groundwater quality impacts	**1.** See Key Topic response 4.1.5 (Earth) – Potential for Soil Contamination Due to Mining.
	Air quality impacts from mining	**2.** Comment noted. Refer to Key Topic 4.2 (Air Quality).
	Groundwater quality impacts	**3**. See Key Topics 4.3.2 (Surface Water) and 4.3.3.
	Sequalitchew Creek impacts from dewatering	**4**. Please refer to Key Topic response 4.4.2 (Surface Water) – Sequalitchew Creek and Springs Impacts from Dewatering.
	Dewatering impacts on animals	**5**. Please refer to Key Topic response 4.6.3 (Plants & Animals) – Potential for Dewatering to Impact Plants and Animal Habitat
	General noise impacts	**6.** Comment noted. Refer to Key Topic 4.7 (Noise).
	Impacts to experience of using Sequalitchew Creek Trail	**7.** Comment noted. Refer to Key Topic 4.12 (Sequalitchew Creek Character) for discussion on Sequalitchew Creek ravine conditions.

LETTER	TOPIC	COMMENT RESPONSE
Letter 58 – Correll	Impacts on squirrels/against project	**1.** Comments noted. Refer to Key Topic 4.6 (Plants & Animals).
	General air quality/GHG emissions impacts	**2.** Comment noted. Refer to Key Topic 4.2 (Air Quality).
	Groundwater quality impacts	**3.** See Key Topic 4.3.3 (Groundwater).
	Surface water quality impacts	**4.** Please refer to Key Topic response 4.4.5 (Surface Water) – Surface Water Quality Impacts.
	Impacts on squirrels	**5.** Comments noted. Refer to Key Topic 4.6 (Plants & Animals).
	General noise impacts	**6.** Comment noted. Refer to Key Topic 4.7 (Noise).
	General land use impacts	**7.** Comment noted. Refer to Key Topic 4.8 (Land & Shoreline Use).
	General aesthetic impacts	**8.** Comment noted. Refer to Key Topic 4.12 (Sequalitchew Creek Character Conditions).
	General cultural resources impacts	**9.** Comment noted. Refer to Key Topic 4.10 (Cultural Resources).
	Truck traffic impacts	**10.** Comment noted. Refer to Key Topic 4.11 (Transportation).
Letter 59 – Credo	General environmental impacts	**1.** Comment noted. Refer to Key Topic 4.1 (Earth).
	General air quality/GHG emissions impacts	**2.** Comment noted. Refer to Key Topic 4.2 (Air Quality).
	Potable water impacts from dewatering and contamination	**3.** Comments noted. Refer to Key Topic 4.3.2 (Groundwater), 4.3.4, 4.4.2 (Surface Water), 4.4.3, and 4.6.3 (Plants & Animals).
Letter 60 – Crewdson	General environmental impacts	**1.** Comment noted.
	Air quality/climate change impacts due to tree/vegetation removal	**2.** Comment noted. Refer to Key Topic 4.2 (Air Quality).
	General groundwater impacts	**3.** Comment noted. See Key Topic 4.3 (Groundwater).
	Wetlands/marshes impacts from dewatering	**4.** Comments noted. See Key Topics 4.1 (Earth), 4.4 (Surface Water), 4.5 (Fisheries), 4.6 (Plants & Animals), and 4.12 (Sequalitchew Creek Character) for discussion on impacts of proposed dewatering.
	General plants and animals impacts	**5.** Comment noted. Refer to Key Topic 4.6 (Plants & Animals).
	General noise impacts	**6.** Comment noted. Refer to Key Topic 4.7 (Noise).
	Impacts on DuPont master planned community	**7.** The comment regarding the planned nature of Northwest Landing is noted. As indicated in Section 3.8 (Land Use) of the Draft EIS, the site is located within the DuPont Comprehensive Plan's designated Mineral Resource Overlay which identifies mineral resources of long-term significance. Mining is permitted use within this overlay and is consistent with overall planning concept for the City of DuPont.

LETTER	TOPIC	COMMENT RESPONSE
	Impacts to experience of using Sequalitchew Creek Trail	**8.** Comment noted. Refer to Key Topic 4.12 (Sequalitchew Creek Character) for discussion on Sequalitchew Creek ravine conditions.
Letter 61 – Cruz	Concerns about squirrel habitats	**1.** Comment noted. Refer to Key Topic 4.6 (Plants & Animals) for discussion regarding habitat conditions.
	General noise impacts	**2.** Comment noted. Refer to Key Topic 4.7 (Noise).
	General groundwater impacts	**3.** Comment noted. Refer to Key Topic 4.3 (Groundwater).
	General surface water impacts	**4.** Comment noted. Refer to Key Topic 4.4 (Surface Water).
Letter 62 – Cupper	Dewatering impacts on animals	**1**. See Key Topics 4.1.3 (Earth), 4.3.2 (Groundwater), 4.3.3, and 4.6.3 (Plants & Animals).
	Dewatering impacts on animals	**2.** Comment noted. Refer to Key Topic 4.6 (Plants & Animals).
	Cumulative noise impacts	**3.** Comment noted. Refer to Key Topic 4.7 (Noise).
Letter 63 – Davis	Impacts to wildlife	**1.** Comment noted. Refer to Key Topic 4.6 (Plants & Animals).
	Cumulative noise impacts/noise impacts from vegetation removal	**2.** Comment noted. Refer to Key Topic 4.7 (Noise).
	Safety impacts	**3.** Comment noted. Refer to Key Topic 4.11 (Transportation) for discussion of impacts from increased traffic.
Letter 64 – Dome	Impacts to experience of using Sequalitchew Creek Trail	**1.** Comment noted. Refer to Key Topic 4.12 (Sequalitchew Creek Character) for discussion on Sequalitchew Creek ravine conditions.
	General plants and animals impacts	**2.** Comment noted. Refer to Key Topic 4.6 (Plants & Animals).
Letter 65 – Donahue	General environmental impacts	**1.** Comments noted.
	Adequacy of mitigation and substantial nature of unavoidable impacts	**2**. The comments regarding the importance of detailed evaluation and identification of mitigation for water resources is noted. Refer to key Topics 4.3 (Groundwater) and 4.4 (Surface Water for detail on the methodology utilized to analyze water resource impacts and identify mitigation.
Letter 66 – Donahue	Same as Letter 65	**1**. See response to Letter 65.
	Same as Letter 65	**2.** See response to letter 65.
Letter 67 – Eckstein	Erosion/landslides impacts from vegetation and topsoil removal	**1.** Comment noted. Refer to Key Topic 4.1 (Earth)
	Air quality contamination	**2.** Comment noted. Refer to Key Topic 4.2 (Air Quality)
	General groundwater impacts/saltwater intrusion with dewatering	**3**. Refer to Key Topics 4.3.1.2 (Groundwater), 4.3.2, 4.3.3, and 4.3.4.

LETTER	TOPIC	COMMENT RESPONSE
	Wetlands/bodies of water impacts from dewatering, surface water quality impacts	**4.** Comment noted. Please refer to Key Topic responses 4.4.2 (Surface Water) and 4.4.3.
	Dewatering impacts on animals	**5.** Comment noted. Refer to Key Topic 4.6 (Plants & Animals).
	General noise impacts	**6.** Comment noted. Refer to Key Topic 4.7 (Noise).
	Impacts to experience of using Sequalitchew Creek Trail	**7.** Comment noted. Refer to Key Topic 4.12 (Sequalitchew Creek Character) for discussion on Sequalitchew Creek ravine conditions.
	Methodist Mission historical marker	**8.** As indicated in Section 3.10 (Cultural Resources) of the Draft EIS the Methodist Episcopal Mission site (45PI66) is located south of the site. As indicated in Section 3.10, the 2011 Settlement Agreement stipulates that no mining would be conducted within 189 feet of the Mission marker. With adherence with this stipulation, significant impacts to the Mission Marker under the Proposed Action are not anticipated.
	Truck traffic	**9.** Comment noted. Refer to Key Topic 4.11 (Transportation).
Letter 68 – Eft	General environmental impacts	**1.** Comment noted.
	General noise impacts	**2.** Comment noted.
	General environmental impacts	**3.** Comment noted. Refer to Key Topics 4.1 (Earth), 4.10 (Cultural Resources), and 4.12 (Sequalitchew Creek Character Conditions).
Letter 69 – Einck	Potable water impacts from dewatering and contamination	**1.** The comments related to the importance of surface and groundwater resources is noted. Refer to Key Topics 4.3 (Groundwater) and 4.4 (Surface Water) of this Chapter for discussion on the potential for impacts to water resources under the Proposed Action
	Potable water impacts from dewatering and contamination	**2.** Refer to Key Topic 4.3.4 (Groundwater).
Letter 70 – Einck	General noise impacts	**1.** Comment noted. Refer to Key Topic 4.7 (Noise).
Letter 71 – Elliott	Consistency with purposes of the City's critical area regulations	**1.** Thank you for the comment which is acknowledged. The cited statements are the general purposes of DuPont's critical area regulations (DMC 25.105). These purpose statements are effectuated by the regulations in the chapter and are not independent criteria used to measure the performance of site-specific proposals. The staff report that will accompany the EIS and application to the Hearing Examiner will include an independent analysis of the consistency of the proposal with the code's requirements and will recommend appropriate conditions.

LETTER	TOPIC	COMMENT RESPONSE
	Consistency with comprehensive plans policies related to the natural environment	**2.** The comprehensive plan's goals are general statements of objectives that the City will pursue, primarily through its planning and regulatory programs. As noted in the previous response, City staff will independently evaluate the consistency of the proposal with applicable goals, policies and regulations related to the natural environment and will identify appropriate mitigation measures and conditions in the staff report for the proposal. The Hearing Examiner will similarly evaluate consistency with applicable policies and regulations.
	Adequacy of mitigation and substantial nature of unavoidable impacts (Sequalitchew Creek, seeps, and biodiversity)	**3**. Please refer to Key Topic responses 4.4.5 (Surface Water),4.6.3 (Plants & Animals), and 4.12.2 (Sequalitchew Creek Character).
	Sequalitchew Creek restoration without dewatering	**4**. The opinion expressed in the comment is acknowledged. Refer to Key Topic 4.13.1 (Alternatives Considered).
	Geotech dewatering impacts	**5.** Comment noted. Refer to Key Topics 4.1 (Earth), especially 4.1.2, and 4.12 (Sequalitchew Creek Character) for discussion on Sequalitchew Creek ravine conditions with proposed dewatering.
	Geotech dewatering impacts	**6.** Comments noted. Refer to Key Topics 4.1 (Earth), especially 4.1.2, 4.6 (Plants & Animals), and 4.12 (Sequalitchew Creek Character) for discussion on dewatering conditions in the vicinity of the site, including Sequalitchew Creek ravine.
	Wetlands/marshes impacts from dewatering	**7.** The comments regarding wetlands are noted. Refer to DEIS Section 3.4 (Surface Water) and Key Topic 4.4 (Surface Water) for discussion on wetland conditions with the Proposed Action.
	Dewatering impacts to wetlands and Sequalitchew Creek, wetland mitigation plan	**8**. Please refer to Key Topic responses 4.42 (Surface Water), 4.4.3, 4.4.5, and 4.6.3 (Plants & Animals).
	Existing air quality/climate change conditions and exacerbation from dewatering	**9.** Comments regarding climate change are noted. See Key Topic 4.2 (Air Quality) for discussion on greenhouse gas emissions associated with the Proposed Action.
	Potential for fire due to drying of vegetation along Sequalitchew Creek with dewatering	**10.** Comments noted. Refer to Key Topic 4.6 (Plants & Animals) for discussion on the potential for dewatering to impact plants and increase the risk of wildfires.
	Dewatering impacts on plants and animals	**11.** Comments noted. Refer to Key Topic 4.6 (Plants & Animals).

LETTER	TOPIC	COMMENT RESPONSE
	Wetlands/bodies of water impacts from dewatering	**12.** Comments regarding potential for impacts to wetlands noted. Reter to DEIS sections 3.4 (Surface Water) and 3.6 (Plants and Animals), and Key Topic 4.4 (Surface Water) for discussion on wetland conditions with proposed dewatering.
	General plants and animals impacts, oak prairie habitat impacts	**13.** Comments noted. Refer to Key Topic 4.6 (Plants & Animals).
	Adequacy of mitigation and substantial nature of unavoidable impacts	**14**. Comments noted.
	Contradictory assertions regarding dewatering impacts	**15**. Comments noted. Refer to Key Topics 4.1 (Earth), 4.6 (Plants & Animals), and 4.12 (Sequalitchew Creek Character) for discussion on dewatering conditions in the vicinity of the site, including Sequalitchew Creek ravine.
	Consistency with plans, policies, and regulations related to the natural environment	**16**. The comments regarding the importance minimizing the potential for impact to the natural environment is noted. Sections 3.3 (Groundwater), 3.4 (Surface Water), 3.5 (Fisheries), and 3.6 (Plants & Animals) provides analysis of the potential for the Proposed Action to impact natural resources and identifies mitigation measures. Also see Key Topics 4.3 (Groundwater), 4.4 (Surface Water), 4.5 (Fisheries) and 4.6 (Plants & Animals).
Letter 72 – Estep	Sequalitchew Creek current vs. previous condition	**1.** Comment noted. Refer to Key Topic 4.12 (Sequalitchew Creek Character Conditions).
	Sequalitchew Creek current vs. previous condition	**2.** Comment noted. Refer to Key Topic 4.12 (Sequalitchew Creek Character Conditions).
	Mining above groundwater to avoid impacts	**3.** Comment noted. Figure 39 in Appendix B of the EIS shows predicted streamflow after mining and restoration as planned under the proposed action. Refer to Key Topic 4.13.1.2 (Alternatives Considered) for discussion of limiting the project effects to the mine area only.
	Status of restoration plan, adequacy of Plan to mitigate impacts of mining on Sequalitchew Creek and other impacts to watershed	**4**. Comment Noted. Please refer to Key Topic 4.4 (Surface Water) regarding surface water and 4.5 (Fisheries).
	Status of restoration plan, adequacy of Plan to mitigate impacts of mining on Sequalitchew Creek and other impacts to watershed	**5**. Comment noted.
	Dewatering impacts on plants	**6.** Comment noted. Refer to Key Topic 4.6 (Plants & Animals)
	Sharing experience in the area	**7.** Comments noted.

LETTER	TOPIC	COMMENT RESPONSE
	Adequacy of mitigation and substantial nature of unavoidable impacts	**8**. Comment Noted. Refer to Key Topic 4.13.1.2 (Alternatives Considered).
Letter 73 – Etzkorn	Removal of vegetation, forest habitat, and landmark trees for mining	**1.** Comments noted. Refer to Key Topic 4.6 (Plants & Animals) for discussion of vegetation and habitat conditions.
	Status of restoration plan, adequacy of Plan to mitigate impacts of mining on Sequalitchew Creek and other impacts to watershed	**2.** Comments regarding the Sequalitchew Creek Restoration Plan noted. As indicated in Chapter 2 (Description of Proposed Action and Alternatives) a condition of approval for mining on the South Parcel, CalPortland is required to participate in the Sequalitchew Creek Restoration Plan. The analysis presented in this EIS includes consideration of mining conditions with implementation of the Sequalitchew Creek Restoration Plan.
	Against project	**3.** Comment noted.
Letter 74 – Farrell	Groundwater level impacts from dewatering	**1**. See Key Topic 4.3 (Groundwater), especially 4.3.2. No aquifer "piercing" is proposed.
Letter 75 – Fester	Potential for fire due to drying of vegetation along Sequalitchew Creek with dewatering	**1.** Comments noted. Refer to Key Topics 4.6 (Plants & Animals) for discussion on the potential for dewatering to impact plants and increase the risk of wildfires.
	Air quality/climate change impacts due to tree/vegetation removal	**2.** Comments noted. Refer to Key Topic 4.2 (Air Quality).
	Consistency with critical area regulations for aquifer	**3.** DMC 25.105.050 contains regulations for critical areas, including aquifers. The statement regarding the importance of aquifers is acknowledged.
	Dewatering impacts on animals, impacts on squirrels, Gary oaks/oak prairie habitat	**4.** Comments noted. Refer to Key Topic 4.6 (Plants & Animals) for discussion regarding habitat conditions.
	Impacts to aquifer	**5**. The comment is acknowledged.
Letter 76 – Fischer	General environmental impacts, against project	**1.** Comments noted.
Letter 77 – Fischer	Existing air quality/climate change conditions and exacerbation with dewatering	**1.** Comment noted. Refer to Key Topic 4.2 (Air Quality).
	General groundwater impacts	**2**. Refer to Key Topic 4.3.4 (Groundwater).
	Potential for fire due to drying of vegetation along Sequalitchew Creek with dewatering	**3**. Refer to Key Topic 4.6.4 (Plants & Animals).
	General plants and animals impacts	**4.** Comments noted. Refer to Key Topic 4.6 (Plants & Animals).
	Need for a cultural resources study	**5.** Comment noted. Refer to Key Topic 4.10 (Cultural Resources).
	Against project	**6.** Comment noted.

LETTER	TOPIC	COMMENT RESPONSE
Letter 78 – Fletcher	General earth impacts	**1.** Comment noted. Refer to Key Topic 4.1 (Earth).
	General air quality/GHG emissions impacts	**2.** Comments noted. Refer to Key Topic 4.2 (Air Quality).
	General groundwater impacts	**3.** Refer to Key Topics 4.3.2 (Groundwater), 4.4.2 (Surface Water), and 4.6.3 (Plants & Animals).
	Potable water impacts from dewatering and contamination	**4.** The comments related to the importance of surface and groundwater resources is noted. Refer to Key Topics 4.3 (Groundwater) and 4.4 (Surface Water) of this Chapter for discussion on the potential for impacts to water resources under the Proposed Action.
	General plants and animals impacts, dewatering impacts on animals	**5.** Comments noted. Refer to Key Topic 4.6 (Plants & Animals).
	General noise impacts	**6.** Comment noted. Refer to Key Topic 4.7 (Noise).
	Other possible uses of the site	**7.** Comments noted. Refer to Key Topic 4.8 (Land & Shoreline Use).
	General aesthetic impacts	**8.** Comment noted. Refer to Key Topic 4.9 (Aesthetics).
	General cultural resources impacts, limit use of metal detectors to reduce impacts on cultural resources	**9.** Comments noted. Refer to Key Topic 4.10 (Cultural Resources).
	Need for more buses, trains, and trails in DuPont	**10**. The comment requesting additional bus and train service is noted.
	Against project	**11.** Comment noted.
Letter 79 – Foe	Quality of life impacts	**1.** Comments noted.
	Potable water impacts from dewatering and contamination	**2.** Comments noted. Refer to Key Topics 4.3 (Groundwater), 4.6 (Plants & Animals), 4.7 (Noise), and 4.8 (Land & Shoreline Use).
	Potable water impacts from dewatering and contamination	**3.** Refer to Key Topics 4.3.2 (Groundwater) and 4.3.4.
	General plants and animals impacts	**4.** Comments noted. Refer to Key Topic 4.6 (Plants & Animals).
	General plants and animals impacts	**5.** Comments noted. Refer to Key Topic 4.6 (Plants & Animals).
	General plants and animals impacts	**6.** Comments noted. Refer to Key Topic 4.6 (Plants & Animals).
	General plants and animals impacts	**7.** Comments noted. Refer to Key Topic 4.6 (Plants & Animals).
Letter 80 – Foe	General air quality/GHG emissions impacts	**1.** Comments noted. Refer to Key Topics 4.1 (Earth) and 4.6 (Plants & Animals).
	Air quality/climate change impacts due to tree/vegetation removal	**2.** Comments noted. Refer to Key Topic 4.2 (Air Quality).
	Potable water impacts from dewatering and contamination	**3.** Refer to Key Topics 4.3.1.2 (Groundwater), 4.3.2 and 4.3.4.
	Quality of life impacts	**4.** The comment about changes to quality of life is acknowledged.

LETTER	TOPIC	COMMENT RESPONSE
	General plants and animals impacts	**5.** Comments noted. Refer to Key Topic 4.6 (Plants & Animals).
	Noise and vibration impacts on wildlife, general noise impacts	**6.** Comments noted. Refer to Key Topics 4.6 (Plants & Animals) and 4.7 (Noise).
	General environmental impacts	**7.** Comments noted.
	Potential for fire due to drying of vegetation along Sequalitchew Creek with dewatering	**8.** Comments noted. Refer to Key Topics 4.6 (Plants & Animals) for discussion on the potential for dewatering to impact plants and increase the risk of wildfires.
	General environmental impacts	**9.** Comments noted.
Letter 81 – Fot	Impacts on industrial park and JBLM landfill #5	**1**. Refer to Key Topic 4.1.1 (Earth) – Potential for Settlement, Sinkholes/Subsidence, and Associated Property Impacts.
	Impacts on industrial park and JBLM landfill #5	**2**. Refer to Key Topic 4.3.3.2 (Groundwater).
Letter 82 – Francis	Wetlands/marshes impacts from dewatering, Sequalitchew Creek impacts from dewatering	**1**. Refer to Key Topics 4.4.2 (Surface Water), 4.4.3, 4.6.3 (Plants & Animals), 4.6.4, and 4.12.2 (Sequalitchew Creek Character).
	General aesthetic impacts	**2.** Comment noted. Refer to Key Topic 4.9 (Aesthetics).
Letter 83 – Gesacion	Impacts to experience of using Sequalitchew Creek Trail	**1.** Comment noted. Refer to Key Topic 4.12 (Sequalitchew Creek Character) for discussion on Sequalitchew Creek ravine conditions.
	Noise impacts from mining	**2.** Comment noted. Refer to Key Topic 4.7 (Noise).
Letter 84 – Goering	Groundwater quality impacts	**1.** Comment noted. Refer to Key Topic 4.3 (Groundwater).
	Potential for fire due to drying of vegetation along Sequalitchew Creek Trail	**2.** Comments noted. Refer to Key Topics 4.6 (Plants & Animals) for discussion on the potential for dewatering to impact plants and increase the risk of wildfires.
	Potable water impacts, groundwater analysis methodology and modeling, potential for USGS and UW professors to help research outcome of mining	**3**. Refer to Key Topics in Section 4.3 (Groundwater).
	Potable water impacts from dewatering and contamination	**4**. Refer to Key Topics 4.3 (Groundwater), 4.4 (Surface Water), and 4.12 (Sequalitchew Creek Character).
	Nisqually tribe consultation	**5.** Comment noted. Refer to Key Topic 4.10 (Cultural Resources).
	Saltwater intrusion with dewatering	**6**. Refer to Key Topic 4.3.3 (Groundwater).
	Property value impacts	**7.** Comment noted.
	Sequalitchew Creek/Trail a cultural resource	**8**. Comment noted. See Key Topic 4.12 (Sequalitchew Creek Character) of this Chapter for a discussion on the potential for mining under the Proposed Action to impact the character of the Sequalitchew Creek ravine.

LETTER	TOPIC	COMMENT RESPONSE
Letter 85 – Goosetree	Potable water impacts from dewatering and contamination	**1**. The comments related to the importance of surface and groundwater resources is noted. Refer to Key Topics 4.3 (Groundwater) and 4.4 (Surface Water) of this Chapter for discussion on the potential for impacts to water resources under the Proposed Action.
	Existing air quality/climate change conditions, dewatering impacts on wetlands, Sequalitchew Creek, plants and animals	**2**. Refer to Key Topics 4.3.2 (Groundwater), 4.4,5 (Surface Water), and 4.12 (Sequalitchew Creek Character).
Letter 86 – Gowenlock	Groundwater level impacts from dewatering	**1.** Comment noted. Refer to Key Topics 4.3 (Groundwater) and 4.6.3 (Plants & Animals).
Letter 87 – Gowenlock	Groundwater level impacts from dewatering	**1.** Comment noted. Refer to Key Topic 4.3 (Groundwater)
Letter 88 – Gowenlock	Groundwater level impacts from dewatering	**1.** Comment noted. Refer to Key Topic 4.3 (Groundwater)
Letter 89 – Granum	General earth impacts	**1.** Comment noted.
	Air quality/climate change impacts due to tree/vegetation removal	**2.** Refer to Key Topics 4.3.2 (Groundwater), 4.6.3 (Plants & Animals), and 4.6.4.
	Potable water impacts from dewatering and contamination	**3**. Refer to Key Topic 4.3.4 (Groundwater).
	Wetlands/bodies of water impacts from dewatering	**4**. The comment regarding the importance of water resources and habitat is noted. See key Topics 4.3 (Groundwater), 4.4 (Surface Water), 4.5 (Fisheries), and 4.6 (Plants & Animals) for discussion on the potential the mining under the Proposed Action to impact water and habitat resources.
	Dewatering impacts on animals	**5.** Comment noted. Refer to Key Topic 4.6 (Plants & Animals).
	Noise impacts from mining	**6.** Comment noted. Refer to Key Topic 4.7 (Noise).
	Temporary vs. permanent land use impacts	**7.** Comment noted. Refer to Key Topic 4.8 (Land & Shoreline Use).
	Cumulative transportation impacts	**8.** Comment noted. Refer to Key Topic 4.11 (Transportation).
Letter 90 – Graves	Air quality/climate change impacts due to tree/vegetation removal	**1.** Comments noted. Refer to Key Topic 4.6 (Plants & Animals) for discussion regarding impacts on habitat conditions.
	Air quality/climate change impacts due to tree/vegetation removal	**2.** Comments noted. Refer to Key Topic 4.6 (Plants & Animals).
Letter 91 – Greenlaw	General plants and animals impacts	**1.** Comments noted. Refer to Key Topic 4.6 (Plants & Animals).

LETTER	TOPIC	COMMENT RESPONSE
Letter 92 – Greenlaw	Impacts to experience of using Sequalitchew Creek Trail	**1.** Comment noted. Refer to Key Topic 4.12 (Sequalitchew Creek Character) for discussion on Sequalitchew Creek ravine conditions.
Letter 93 – Guise	Impacts to experience of using Sequalitchew Creek Trail	**1.** Comment noted. Refer to Key Topic 4.12 (Sequalitchew Creek Character) for discussion on Sequalitchew Creek ravine conditions.
	Dewatering impacts on plants and animals	**2.** Refer to Key Topics 4.4.2 (Surface Water) and 4.12 (Sequalitchew Creek Character).
Letter 94 – Gustafson	Against project	**1.** Comment noted.
	Evacuation routes	**2.** The comment regarding the lack of evacuation routes in the City of DuPont is noted.
Letter 95 – Habte	Air quality/climate change impacts due to tree/vegetation removal, general groundwater impacts	**1.** The comment regarding mining under the Proposed Action resulting in removal of trees on the South Parcel is noted. Refer to Draft EIS Section 3.6 (Plants & Animals) and Key Topic 4.6 (Plants & Animals) of this Chapter.
	Air quality/climate change impacts due to tree/vegetation removal	**2.** Comment noted. Refer to Key Topic 4.2 (Air Quality).
	General groundwater impacts	**3.** Comment noted. Refer to Key Topic 4.3 (Groundwater).
	General surface water impacts	**4.** Comment noted. Refer to Key Topic 4.4 (Surface Water).
	Dewatering impacts on animals, displacement of animals with mining, associated impacts	**5.** Comment noted. Refer to Key Topic 4.6 (Plants & Animals).
	General noise impacts	**6.** Comment noted. Refer to Key Topic 4.7 (Noise).
	Against warehouse and industrial uses	**7.** Comment noted. Refer to Key Topic 4.12 (Sequalitchew Creek Character Conditions).
	Cleanliness and maintenance of neighborhood	**8.** Comment noted.
	Against project	**9.** Comment noted.
Letter 96 – Hall	Against project, adequacy of mitigation. and substantial nature of unavoidable impacts	**1.** Refer to Key Topic 4.3.2 (Groundwater), 4.4.2 (Surface Water), and 4.12 (Sequalitchew Creek Character).
	Wetlands/bodies of water impacts from dewatering	**2.** Refer to Key Topic 4.3.2 (Groundwater), 4.4.3 (Surface Water), and 4.6.3 (Plants & Animals).
	Potential for fire due to drying of vegetation along Sequalitchew Creek Trail	**3.** Refer to Key Topic 4.6.4 (Plants & Animals).
	Sequalitchew restoration without dewatering	**4.** Refer to Key Topic 4.13.1.2 (Alternatives Considered).
Letter 97 - Hall	General plants and animals impacts	**1.** Comment noted. Refer to Key Topic 4.6 (Plants & Animals).
	Against project	**2.** Comment noted.

LETTER	TOPIC	COMMENT RESPONSE
	Dewatering impacts on plants	**3.** Comment noted. Refer to Key Topic 4.6 (Plants & Animals).
Letter 98 – Hampton	Groundwater, plants and animals impacts	**1**. Refer to Key Topic 4.3.2 (Groundwater) and 4.6.3 (Plants & Animals).
	Impacts on animals habitats, aquifer	**2.** Comments noted. Refer to Key Topic 4.6 (Plants & Animals).
Letter 99 – Hannon-Papier	General earth impacts	**1.** Comment noted. Refer to Key Topic 4.1 (Earth).
	General air quality/GHG emissions impacts	**2.** Comment noted. Refer to Key Topic 4.2 (Air Quality).
	General groundwater impacts	**3.** Comment noted. Refer to Key Topic 4.3 (Groundwater).
	General surface water impacts	**4.** Comment noted. Refer to Key Topic 4.4 (Surface Water).
	General plants and animals impacts	**5.** Comment noted. Refer to Key Topic 4.6 (Plants & Animals).
	Noise impacts from truck traffic	**6.** Comment noted. Refer to Key Topic 4.7 (Noise).
	Against project	**7.** Comment noted.
	General aesthetic impacts	**8.** Comment noted. Refer to Key Topic 4.9 (Aesthetics).
	General cultural resources impacts	**9.** Comment noted. Refer to Key Topic 4.10 (Cultural Resources).
	General transportation impacts	**10.** Comment noted. Refer to Key Topic 4.11 (Transportation).
	Against warehouse and industrial uses	**11.** Comment noted.
Letter 100 – Harlow	General earth impacts	**1.** Comment noted. Refer to Key Topic 4.1 (Earth).
	Groundwater level impacts from dewatering	**2.** Refer to Key Topics 4.3.2 (Groundwater) and 4.3.4.
	Sequalitchew Creek impacts from dewatering	**3.** Comment noted. Refer to Key Topic 4.12 (Sequalitchew Creek Character)
Letter 101 – Harrington	Surface water quality impacts, Geotech dewatering impacts, dewatering impacts on animals	**1**. Refer to Key Topics 4.1.2 (Earth), 4.1.3, 4.3.2 (Groundwater), 4.4.5 (Surface Water), 4.6.3 (Plants & Animals), and 4.6.4.
	Wetland/marshes impacts from dewatering	**2**. The comment regarding potential for wetland impacts is noted. Refer to Draft EIS Sections 3.4 (Surface Water) and Section 3.6 (Plants & Animals), as well as Key Topics 4.4 (Surface Water) 4.6 (Plants & Animals) for discussion on the potential for wetland impacts under the Proposed Action.
	General plants and animals impacts	**3.** Comment noted. Refer to Key Topic 4.6 (Plants & Animals).
	Impacts to experience of using Sequalitchew Creek Trail	**4.** Comment noted. Refer to Key Topic 4.12 (Sequalitchew Creek Character) for discussion on Sequalitchew Creek ravine conditions.
	General cultural resources impacts	**5.** Comment noted. Refer to Key Topic 4.10 (Cultural Resources).
	Impacts to experience of using Sequalitchew Creek Trail	**6.** Comment noted. Refer to Key Topic 4.12 (Sequalitchew Creek Character) for discussion on Sequalitchew Creek ravine conditions.

LETTER	TOPIC	COMMENT RESPONSE
Letter 102 – Hart	Against project	**1.** Comment noted.
	Potential for fire due to drying of vegetation along Sequalitchew Creek with dewatering	**2.** Comment noted. Refer to Key Topic 4.6 (Plants & Animals).
	Potable water impacts from dewatering and contamination	**3.** The comments related to the importance of surface and groundwater resources is noted. Refer to Key Topics 4.3 (Groundwater) and 4.4 (Surface Water) of this Chapter for discussion on the potential for impacts to water resources under the Proposed Action.
	Sequalitchew Creek impacts from dewatering, wetlands/marshes impacts from dewatering	**4.** The comment indicating that potential for environmental impacts outweighs project benefits is noted. Refer to Key Topics 4.3 (Groundwater), 4.4 (Surface Water), 4.6 (Plants & Animals), and 4.2 (Sequalitchew Creek Character).
	Noise impacts from mining	**5.** Comment noted. Refer to Key Topic 4.7 (Noise).
	Safety impacts, truck traffic impacts	**6.** Comments noted. Refer to Key Topic 4.11 (Transportation).
	General environmental impacts	**7.** Comments noted.
Letter 103 – Harter	For project/no concerns	**1.** Comment noted.
Letter 104 – Harvey	Against project	**1.** Comment noted.
	General air quality/GHG emissions impacts	**2.** Comment noted. Refer to Key Topic 4.2 (Air Quality).
	Noise impacts from mining	**3.** Comment noted. Refer to Key Topic 4.7 (Noise).
Letter 105 – Hascall	Impacts to experience of using Sequalitchew Creek Trail, positive aspects of retaining bluff and shoreline along Puget Sound, dewatering impacts on plants and animals	**1.** Comments noted. Refer to Key Topic 4.12 (Sequalitchew Creek Character) for discussion on Sequalitchew Creek ravine conditions and 4.6 (Plants & Animals) for discussion on impacts to plants and animals.
Letter 106 – Heck	Impacts to experience of using Sequalitchew Creek Trail	**1.** Comment noted. Refer to Key Topic 4.12 (Sequalitchew Creek Character) for discussion on Sequalitchew Creek ravine conditions.
	Impacts to experience of using Sequalitchew Creek Trail	**2.** Comment noted. Refer to Key Topics 4.3.2 (General Dewatering Effects), 4.3.6 (Potential for Dewatering to Impact Plants & Animal Habitat), and 4.12 (Sequalitchew Creek Character) for discussion on Sequalitchew Creek ravine conditions.
	Impacts to experience of using Sequalitchew Creek Trail	**3.** Comment noted. Refer to Key Topic 4.12 (Sequalitchew Creek Character) for discussion on Sequalitchew Creek ravine conditions.
	Impacts to experience of using Sequalitchew Creek Trail	**4.** Comment noted. Refer to Key Topic 4.12 (Sequalitchew Creek Character) for discussion on Sequalitchew Creek ravine conditions.

LETTER	TOPIC	COMMENT RESPONSE
	Impacts to experience of using Sequalitchew Creek Trail	**5.** Comment noted. Refer to Key Topic 4.12 (Sequalitchew Creek Character) for discussion on Sequalitchew Creek ravine conditions.
Letter 107 – Hill	General environmental impacts	**1.** Comment noted.
	Air quality impacts from mining, truck traffic	**2.** Comments noted. Refer to Key Topics 4.2 (Air Quality) and 4.11 (Transportation).
	Dewatering impacts on plants and animals, against project	**3.** Refer to Key Topics 4.3.2 (Groundwater) and 4.6.3 (Plants & Animals).
	General surface water impacts	**4.** Comment noted. Refer to Key Topic 4.4 (Surface Water).
	General plants and animals impacts	**5.** Comment noted. Refer to Key Topic 4.6 (Plants & Animals).
	Noise impacts from mining	**6.** Comment noted. Refer to Key Topic 4.7 (Noise).
	Other possible uses of the site	**7.** Comment noted. Refer to Key Topic 4.8 (Land & Shoreline Use).
	Additional homes increasing traffic	**8.** Comment noted.
Letter 108 – Hongo	Potential for fire due to drying of vegetation along Sequalitchew Creek with dewatering	**1.** Comment noted. Refer to Key Topic 4.6 (Plants & Animals)
	Geotech dewatering impacts, dewatering impacts on plants, animals, wetlands	**2.** Refer to Key Topics 4.3.2 (Groundwater), 4.4.2 (Surface Water), 4.4.3, 4.4.4, and 4.12.2 (Sequalitchew Creek Character).
	Dewatering impacts on animals	**3.** Comment noted. Refer to Key Topic 4.6 (Plants & Animals).
	Noise impacts from mining	**4.** Comment noted. Refer to Key Topic 4.7 (Noise).
	Impacts to experience of using Sequalitchew Creek Trail	**5.** Comment noted. Refer to Key Topic 4.12 (Sequalitchew Creek Character) for discussion on Sequalitchew Creek ravine conditions.
	Against project	**6.** Comment noted.
Letter 109 – Horspool	Potable water impacts/general environmental impacts	**1.** The comments related to the importance of surface and groundwater resources is noted. Refer to Key Topics 4.3 (Groundwater), 4.4 (Surface Water), and 4.12 (Sequalitchew Creek Ravine) of this Chapter for discussion on the potential for impacts to water resources under the Proposed Action.
	Dewatering impacts on plants and animals	**2.** Comment noted. Refer to Key Topic 4.6 (Plants & Animals).
	Noise impacts from mining	**3.** Comment noted. Refer to Key Topic 4.7 (Noise).
Letter 110 – Hurst	Against project	**1.** Comment noted.
	Potential for fire due to drying of vegetation along Sequalitchew Creek with dewatering	**2.** Comment noted. Refer to Key Topic 4.6 (Plants & Animals).
	General groundwater impacts	**3.** Refer to Key Topic 4.3.2 (Groundwater), 4.6.3 (Plants & Animals), and 4.6.4.

LETTER	TOPIC	COMMENT RESPONSE
	General surface water impacts	**4**. Please refer to Key Topic response 4.4.6 – General Surface Water Impacts.
	General plants and animals impacts	**5.** Comment noted. Refer to Key Topic 4.6 (Plants & Animals).
	General noise impacts	**6.** Comment noted. Refer to Key Topic 4.7 (Noise).
	General land use impacts	**7.** Comment noted. Refer to Key Topic 4.8 (Land & Shoreline Use).
	General aesthetic impacts	**8.** Comment noted. Refer to Key Topic 4.9 (Aesthetics).
	General cultural resources impacts	**9.** Comment noted. Refer to Key Topic 4.10 (Cultural Resources).
	Cumulative transportation impacts	**10.** Comment noted. Refer to Key Topic 4.11 (Transportation).
	Against project	**11.** Comment noted.
Letter 111 – Hurst	General plants and animals impacts	**1.** Comment noted. Refer to Key Topic 4.6 (Plants & Animals).
	General air quality/GHG emissions impacts	**2.** Comment noted. Refer to Key Topic 4.2 (Air Quality).
	General environmental impacts	**3.** Comment noted.
	General surface water impacts	**4.** Comment noted. Refer to Key Topic 4.4 (Surface Water).
	General environmental impacts	**5.** Comment noted.
	Cumulative noise impacts	**6.** Comment noted. Refer to Key Topic 4.7 (Noise).
	General plants and animals impacts	**7.** Comment noted. Refer to Key Topic 4.6 (Plants & Animals)
Letter 112 – Jellison	Blank	**1.**
Letter 113 – Jellison	General environmental impacts	**1.** Comment noted.
	Potable water, surface water, and groundwater impacts	**2**. Refer to Key Topic 4.3.4 (Groundwater Quality), 4.5.2 (Impacts to Fisheries Resources) and 4.6 (Plants & Animals).
	Removal of vegetation, forest habitat, and landmark trees for mining	**3.** Comments noted. Refer to Key Topic 4.6 (Plants & Animals).
	Property values impacts, psychological, sociological, and human rights impacts	**4**. The comments regarding the range of potential impacts are noted. See Key Topics 4.3 (Groundwater), 4.4 (Surface Water), 4.6 (Plants & Animals), 4.8 (Land Use), and 4.12 (Sequalitchew Creek Character).
	General environmental impacts	**5.** Comment noted.
Letter 114 – Johnson	Existing air quality/climate change conditions and exacerbation with dewatering, general groundwater impacts	**1.** Comments noted. Refer to Key Topics 4.2 (Air Quality) and 4.3 (Groundwater).
	General groundwater impacts	**2.** Comment noted. Refer to Key Topic 4.3 (Groundwater).

LETTER	TOPIC	COMMENT RESPONSE
	Existing air quality/climate change conditions and exacerbation with dewatering	**3.** Comments noted. Refer to Key Topic 4.2 (Air Quality).
	Impacts to experience of using Sequalitchew Creek Trail	**4.** Please refer to Key Topic responses 4.4.2 (Surface Water) and 4.12.2 (Sequalitchew Creek Character).
	Existing air quality/climate change conditions and exacerbation with dewatering	**5.** Comments noted. Refer to Key Topic 4.2 (Air Quality).
	Against project	**6.** Comment noted.
	General groundwater impacts	**7.** Comments noted. Refer to Key Topic 4.3 (Groundwater).
Letter 115 – Johnston	Sequalitchew Creek impacts from dewatering	**1.** Please refer to Key Topic response 4.4.2 (Surface Water)– Sequalitchew Creek and Springs Impacts from Dewatering.
	General environmental impacts	**2.** Comments noted. Refer to Key Topics 4.3 (Groundwater) and 4.4 (Surface Water).
	Aesthetic impacts from killing vegetation	**3.** Comment noted. Refer to Key Topic 4.9 (Aesthetics).
	General environmental impacts	**4.** Comment noted.
Letter 116 – Kalicj	General environmental impacts	**1.** Comment noted.
	Air quality/climate change impacts due to tree/vegetation removal, air quality impacts from mining	**2.** Comments noted. Refer to Key Topic 4.2 (Air Quality).
	General groundwater impacts	**3.** Please refer to Chapter 3.3 (Groundwater) of the EIS and Key Topic responses in 4.3 (Groundwater) for additional information on impacts to groundwater.
	General aesthetic impacts	**4.** Comments noted. Refer to Key Topic 4.9 (Aesthetics).
	General plants and animals impacts	**5.** Comments noted. Refer to Key Topic 4.6 (Plants & Animals).
	Noise and vibration impacts on wildlife, noise impacts from mining	**6.** Comments noted. Refer to Key Topics 4.6 (Plants & Animals) and 4.7 (Noise).
	Impacts to experience of using Sequalitchew Creek Trail	**7.** Comment noted. Refer to Key Topic 4.12 (Sequalitchew Creek Character) for discussion on Sequalitchew Creek ravine conditions.
Letter 117 – Kennedy	Adequacy of range of EIS alternatives	**1.** Comment noted. As indicated in WAC 197-11-440, when a proposal is for a private project on a specific site, the lead agency shall be required to evaluate only the no-action plus other reasonable alternatives for achieving the proposal's objectives. The term reasonable is intended to limit the number and range of alternatives. The project's objectives include mining the resources on the site and other alternatives would not meet these objectives.

LETTER	TOPIC	COMMENT RESPONSE
Letter 118 – King	Concerns about SEPA alternatives	**1.** Comment noted. As indicated in WAC 197-11-440, when a proposal is for a private project on a specific site, the lead agency shall be required to evaluate only the no-action plus other reasonable alternatives for achieving the proposal's objectives. The term reasonable is intended to limit the number and range of alternatives. The project's objectives include mining the resources on the site and other alternatives would not meet these objectives.
	Impacts beyond project site	**2**. Comments regarding potential impacts to water resources off the site are noted. Refer to Key Topics 4.3 (Groundwater) and 4.4 (Surface Water) for detail.
	Potable water impacts, groundwater analysis methodology and modeling	**3.** Please see Key Topic response 4.3.1.2 (Groundwater).
	Sequalitchew Creek restoration without dewatering	**4.** Comment noted. Please refer to Key Topic response 4.13.1 (Alternatives Considered) – Sequalitchew Creek Restoration without Dewatering.
	Dewatering impacts on animals	**5**. Please refer to Key Topic response 4.6.3 (Plants & Animals) – Potential for Dewatering to Impact Plants & Animal Habitat.
	Adequacy of restoration plan commitments	**6**. The comments regarding the importance of restoration plan are noted. See Key Topic 4.4.7 (Surface Water) for additional discussion.
	Fiscal impacts on City	**7**. Draft EIS Section 3.12 (Fiscal Conditions) provides an analysis of fiscal conditions. As indicated, revenues to the City under the Proposed Action would exceed anticipated costs. The potential for tourism loss due to the Proposed Action is speculative. See Key Topic 4.12 (Sequalitchew Creek Character) for discussion on Sequalitchew Creek conditions under the Proposed Action.
	Fiscal impacts on City; long-term maintenance of restoration system	**8**. Please see Key Topic response 4.3.5 (Groundwater).
	Long-term groundwater effects	**9.** Please see Key Topic response 4.3.1.2 (Groundwater) (questions/comments about whether/how climate change was incorporated) and 4.3.4 (drinking water supply).
	Fiscal impacts on City due to loss of Sequalitchew Creek hikers	**10**. See Key Topic responses 4.6.3 (Plants & Animals) and 4.12 (Sequalitchew Creek Character). See also response to comment 7 of this letter.

LETTER	TOPIC	COMMENT RESPONSE
	Long-term funding for restoration plan	**11**. See Key Topic response 4.3.5 (Groundwater).
	Noise analysis methodology	**12.** Refer to Key Topic 4.7 (Noise).
	Truck traffic impacts	**13.** Comments noted. Refer to Key Topic 4.11 (Transportation).
	Adequacy of noise mitigation for surrounding residents	**14**.Refer to Key Topic 4.7.1 (Noise) Analysis Methodology, Findings and Mitigation.
	City and other noise regulations	**15.** The comment's opinion that the city's noise regulations are generally too weak is noted.
	Noise and vibration impacts on wildlife	**16.**Refer to Key Topic 4.6.2 (Plants & Animals)– Potential for Mining Noise to Impact Animals, and Key Topic 4.7 (Noise).
	Removal of vegetation, forest habitat, and landmark trees for mining	**17.** Comments noted. Refer to Key Topic 4.6 (Plants & Animals)
	Add recreation and scenic resources element to DEIS	**18**. Refer to Key Topic 4.12 (Sequalitchew Creek Character Conditions).
	Impacts on squirrels	**19**. Refer to Key Topic 4.6.5 (Plants & Animals) Potential to Impact Gray Squirrel.
	Amphibian impacts from drops in wetland water levels, impacts on insects	**20**. The cumulative effects of the Proposal would help to stabilize water levels in Edmond Marsh which would benefit reproductive success of amphibians. (See Azous, Amanda, and Richard Horner. 2001. Wetlands and Urbanization – Implications for the future. Chapter 5.)
	DuPont Historical Society/Museum consultation	**21**. The DuPont Historical Society did not comment during the SEPA process for the proposal.
	Noise and vibration impacts on wildlife	**22.** Refer to Key Topic 4.6.2 (Plants & Animals) Potential for Mining Noise to Impact Animals, and Key Topic 4.7 (Noise).
	Tree planting mitigation goal	**23.**Before mining can proceed in the South Parcel, the Washington Department of Natural Resources will need to issue a surface mine reclamation permit using their authority provided by the Washington State Surface Mining Act (78.44 RCW). The permit will include an approved Surface Mine Reclamation Plan for the whole mine site, and conditions intended to ensure the property is reclaimed to a condition suitable for its ultimate use. The surface mining act directs the DNR to ensure that a sufficient performance security (bond) is available to reclaim each permitted mine (RCW 78.44.087). DNR Surface mine inspectors periodically inspect the mine to ensure that reclamation is being implemented properly including the planting and maintenance of vegetation including trees, and that the performance security is

LETTER	TOPIC	COMMENT RESPONSE
		adjusted to ensure it is sufficient to guarantee reclamation of any un-reclaimed areas.
	Reclamation Plan goals, process, and outcome	**24**. The Washington Department of Natural Resource cannot release the performance security (bond) until the mine is fully reclaimed and vegetation including trees are well established.
Letter 119 – Kirstien	Against project, general plants and animals impacts	**1.** Comments noted. Refer to Key Topic 3.6 (Plants & Animals).
	General plants and animals impacts, impacts to experience of using Sequalitchew Creek Trail	**2.** Comment noted. Refer to Key Topics 4.6 (Plants & Animals) and 4.12 (Sequalitchew Creek Character) for discussion on Sequalitchew Creek ravine conditions.
Letter 120 – Klein	Against project, groundwater level impacts from dewatering	**1.** Comment noted. Refer to Key Topic 4.3 (Groundwater).
	Against project, groundwater level impacts from dewatering	**2.** Comment noted. Refer to Key Topic 4.3 (Groundwater).
	Against project, groundwater level impacts from dewatering	**3**. Comment noted. Refer to Key Topic 4.3 (Groundwater).
Letter 121 – Koenig	Potable water impacts from dewatering and contamination	**1**. Please refer to Key Topic response 4.4.2 (Surface Water) – Sequalitchew Creek and Springs Impacts from Dewatering.
Letter 122 – Koivisto	Land use impacts on surrounding areas, against project	**1.** Comments noted. Refer to Key Topic 4.8 (Land & Shoreline Use).
Letter 123 – Koivisto	Air quality/climate change impacts due to tree/vegetation removal	**1.** Comment noted. Refer to Key Topic 4.2 (Air Quality).
	Impacts to experience of using Sequalitchew Creek Trail	**2.** Comment noted. Refer to Key Topic 4.12 (Sequalitchew Creek Character) for discussion on Sequalitchew Creek ravine conditions.
Letter 124 – Konrad	Groundwater level impacts from dewatering	**1**. Please refer to Key Topic responses 4.3.3 (Groundwater), 4.4.2 (Surface Water), and 4.6.4 (Plants & Animals).
	Sequalitchew Creek impacts from dewatering, wetlands/marshes impacts from dewatering	**2**. Please refer to Key Topic response 4.4.2 (Surface Water) – Sequalitchew Creek and Springs Impacts from Dewatering.
	Wetlands/bodies of water impacts from dewatering, adequacy of wetland mitigation plan	**3**. Please refer to Key Topic responses 4.4.3 (Surface Water), 4.4.4, and 4.6.3 (Plants & Animals).
	Potential for fire due to drying of vegetation along Sequalitchew Creek Trail	**4**. Please refer to Key Topic response 4.6.4 (Plants & Animals) – Potential for Dewatering to Increase Wildlife Risk

LETTER	TOPIC	COMMENT RESPONSE
	Sequalitchew Creek restoration without dewatering	**5**. Comment noted. Please refer to Key Topic response 4.13.1 (Alternatives Considered) – Sequalitchew Creek Restoration without Dewatering.
	Property value impacts, economic contribution of mine to regional economy and businesses	**6.** Comments noted.
Letter 125 – Korkodilos	Sequalitchew Creek impacts from dewatering, against project	**1.** Comment noted. Refer to Key Topic 4.12 (Sequalitchew Creek Character).
	Impacts to Sequalitchew Creek Trail	**2.** Comment noted. Refer to Key Topic 4.12 (Sequalitchew Creek Character).
	Against project	**3.** Comment noted.
Letter 126 – Kotsakova	General groundwater impacts, dewatering impacts, general environmental impacts, quality of life impacts	**1**. Refer to Key Topics 4.6.3 (Plants & Animals) and 4.12 (Sequalitchew Creek Character).
	General surface water impacts, dewatering impacts on plants	**2.** Comments noted. Refer to Key Topics 4.4 (Surface Water), 4.5 (Fisheries), and 4.6 (Plants & Animals)
Letter 127 – Latch	Potable water impacts from dewatering and contamination	**1.** The comments related to the importance of surface and groundwater resources is noted. Refer to Key Topics 4.3 (Groundwater) and 4.4 (Surface Water) of this Chapter for discussion on the potential for impacts to water resources under the Proposed Action.
	Dewatering impacts on plants and animals	**2.** Comment noted. Refer to Key Topic 4.6 (Plants & Animals).
Letter 128 – Lee	Attached letter is Letter 129	See below responses to Letter 129
Letter 129 – Lee	Economic contribution of mine to regional economy and businesses	**1**. The comments regarding the importance of mining the site resources is noted.
	Positive impacts of locally sourcing sand and gravel	**2.** Comments noted.
	For project/no concerns	**3.** Comment noted.
Letter 130 – Lewsi	General earth impacts	**1.** Comment noted. Refer to Key Topic 4.1 (Earth).
	General air quality/GHG emissions impacts	**2**. Comment noted. Refer to Key Topic 4.2 (Air Quality).
	For project/no concerns	**3.** Comment noted.
	General environmental impacts	**4.** Comment noted.
	General environmental impacts	**5.** Comment noted.
	For project/no concerns	**6.** Comment noted.
Letter 131 – Lillegard	Geotech dewatering impacts	**1.** Comment noted. Refer to Key Topic 4.1 (Earth) and 4.4.2 (Surface Water) Sequalitchew Creek and Springs Impacts from Dewatering.

LETTER	TOPIC	COMMENT RESPONSE
	Against project	**2.** Comment noted.
	Impacts to watershed as cultural resources	**3.** Comment noted. Refer to Key Topic 4.10 (Cultural Resources).
Letter 132 – Limata	Water quantity and quality impacts from mining, general groundwater impacts, potable water impacts, general surface water impacts	**1.** Please refer to Key Topic responses 4.3.3 (Groundwater) and 4.4.6 (Surface Water).
	Impacts to air quality	**2.** Comment noted. Refer to Key Topic 4.2 (Air Quality).
	Wetlands/marshes impacts from dewatering	**3**. Please refer to Key Topic response 4.4.3 (Groundwater) – Wetlands/marshes Impacts from Dewatering.
	Geotech dewatering impacts	4. Please refer to Key Topic response 4.1.1 (Earth) – Potential for Settlement, Sinkholes/Subsidence, and Associated Property Impacts
	Dewatering impacts and loss of vegetation/trees and habitat in Puget Sounds	**5.** Comments noted. Refer to Key Topic 4.6 (Plants & Animals).
Letter 133 – Lincoln	Groundwater level impacts from dewatering, dewatering impacts and loss of vegetation/trees and habitat in Puget Sound	**1.** Comments noted. Refer to Key Topics 4.3 (Groundwater) and 4.6 (Plants & Animals).
	Groundwater level impacts from dewatering; fish restoration	**2.** Comment noted. Refer to Key Topics 4.3 (Groundwater) and 4.5 (Fisheries).
	General plants and animals impacts	**3**. Please refer to Key Topic responses and 4.5 (Fisheries) and 4.6.3 (Plants & Animals) – Potential for Dewatering to Impact Plants & Animal Habitat.
	General plants and animals impacts	**4.** Comment noted. Refer to Key Topic 4.6 (Plants & Animals).
	General cultural resources impacts	**5.** Comment noted. Refer to Key Topic 4.10 (Cultural Resources).
	Access to and preservation and maintenance of Methodist Mission marker	**6**. As indicated in Section 3.10 (Cultural Resources) of the Draft EIS the Methodist Episcopal Mission site (45PI66) is located south of the site. As indicated in Section 3.10, the 2011 Settlement Agreement stipulates that no mining would be conducted within 189 feet of the Mission marker. With adherence with this stipulation, significant impacts to the Mission Marker under the Proposed Action are not anticipated.
	General cultural resources impacts	**7.** Comment noted. Refer to Key Topic 4.10 (Cultural Resources).
	Impacts on insects	**8.** Comment noted. Refer to Key Topic 4.6 (Plants & Animals).
Letter 134 – Lopez	Geotech dewatering impacts, impacts to experience of using Sequalitchew Creek Trail	**1.** Comments noted. Refer to Key Topics 4.1 (Earth) and 4.12 (Sequalitchew Creek Character Condition).
	General aesthetic impacts	**2.** Comment noted. Refer to Key Topic 4.9 (Aesthetics).

LETTER	TOPIC	COMMENT RESPONSE
	Other possible uses of the site	**3.** The comment regarding other uses on the site, including grocery store, are noted.
Letter 135 – Luna	General environmental impacts	**1.** Comment noted.
	General plants and animals impacts	**2.** Comments noted. Refer to Key Topic 4.6 (Plants & Animals).
	Noise and vibration impacts on wildlife, general noise impacts	**3.** Comments noted. Refer to Key Topic 4.7 (Noise).
	Impacts to experience of using Sequalitchew Creek Trail	**4.** Comment noted. Refer to Key Topic 4.12 (Sequalitchew Creek Character) for discussion on Sequalitchew Creek ravine conditions.
Letter 136 – Lyday	General environmental impacts	**1.** Comment noted.
	General surface water impacts	**2.** Comment noted. Refer to Key Topic 4.4 (Surface Water).
	General plants and animals impacts	**3.** Comment noted. Refer to Key Topic 4.6 (Plants & Animals).
	General cultural resources impacts	**4.** Comment noted. Refer to Key Topic 4.10 (Cultural Resources).
	Against project	**5.** Comment noted.
Letter 137 – Lyday	Impacts on squirrels, displacement of animals with mining, associated impacts	**1.** Comments noted. Refer to Key Topic 4.6 (Plants & Animals).
	Aesthetic impacts of mining expansion, view impacts from Center Drive	**2.** Comments noted. Refer to Key Topic 4.9 (Aesthetics).
	General cultural resources impacts	**3.** Comment noted. Refer to Key Topic 4.10 (Cultural Resources).
	Impacts to experience of using Sequalitchew Creek Trail	**4.** Comment noted. Refer to Key Topic 4.12 (Sequalitchew Creek Character) for discussion on Sequalitchew Creek ravine conditions.
Letter 138 – Mazzuca	Known/suspected contaminated sites within ¼ mile of the mining site	**1**. Comment noted. See Key Topics 4.1 (Earth) and 4.3 (Groundwater) for discussion on soil contamination conditions.
	Potential for fire due to drying of vegetation along Sequalitchew Creek Trail	**2.** Comment noted. Refer to Key Topics 4.6.4 (Potential for Dewatering to Increase Wildfire Risk) and 4.12 (Sequalitchew Creek Character) for discussion on Sequalitchew Creek ravine conditions.
	Potential for fire due to drying of vegetation along Sequalitchew Creek Trail	**3.** Comment noted. Refer to Key Topics 4.6.4 (Potential for Dewatering to Increase Wildfire Risk) and 4.12 (Sequalitchew Creek Character) for discussion on Sequalitchew Creek ravine conditions.
	General plants and animals impacts	**4.** Comments noted. Refer to Key Topic 4.6 (Plants & Animals)
	Cumulative noise impacts	**5.** Comment noted. Refer to Key Topic 4.7 (Noise)
Letter 139 – McDonald	Sequalitchew Creek, wetlands/marshes impacts from dewatering	**1**. Please refer to Key Topic response 4.4.2 (Surface Water) – Sequalitchew Creek and Springs Impacts from Dewatering.

LETTER	TOPIC	COMMENT RESPONSE
Letter 140 – McDonald	Mineral resources in area are of high quality and needed to build infrastructure, uses of site following reclamation	**1**.The comment regarding the quality of the site resource is noted.
	Federal, state, and local agencies' control of air quality impacts, air quality mitigation enforcement	**2.** Comments noted. Refer to Key Topic 4.2 (Air Quality).
	Potable water impacts from dewatering and contamination	**3**. Comment noted.
	Positive aspects of restoration plan	**4.** Comment noted.
	City and other noise regulations	**5.** Comments noted. Refer to Key Topic 4.7 (Noise).
	Land use regulations to control impacts	**6.** Comment noted. Refer to Key Topic 4.8 (Land & Shoreline Use).
	Effectiveness of buffer areas and visual barriers	**7.** Comments noted. Refer to Key Topic 4.9 (Aesthetics).
	Continued investment in community	**8.** Comments noted.
	Barging of resource and improvements to vehicular transportation facilities positive impacts	**9**. Comment noted. As indicated in Draft EIS Section 3.12 (Transportation) the proposed continued use of barges to transport the majority of mined material would continue to minimize the number of truck trips.
Letter 141 – McEvoy	Removal of vegetation, forest habitat, and landmark trees for mining	**1.** Comments noted. Refer to Key Topics 4.6 (Plants & Animals) and 4.9 (Aesthetics).
	General air quality/GHG emissions impacts	**2.** Comment noted. Refer to Key Topic 4.2 (Air Quality).
	General groundwater impacts	**3.** Comment noted. Refer to Key Topic 4.3 (Groundwater).
	Impacts to Western Gray Squirrel habitat	**4.** Comment noted. Refer to Key Topic response 4.6.5 (Plants & Animals) Potential to Impact Gray Squirrels.
	General noise impacts	**5.** Comment noted. Refer to Key Topic 4.7 (Noise).
Letter 142 – McNeil	Air quality impacts from mining	**1.** Comment noted. Refer to Key Topic 4.2 (Air Quality).
	Sequalitchew Creek restoration without dewatering, impacts to experience of using Sequalitchew Creek Trail, potential for hillslope instability	**2.** Comments noted. Refer to Key Topics 4.13 (Other Topics), 4.12 (Sequalitchew Creek Character) for discussion on Sequalitchew Creek ravine conditions, 4.6.3 (Plants & Animals) Potential for Dewatering to Impact Plant and Animal Habitat, and 4.1.2 (Earth) Potential for Increased Erosion and/or Landslide Hazard.
	Noise impacts from mining	**3.** Comment noted. Refer to Key Topic 4.7 (Noise).
	Uses of site following reclamation	**4**. The comment regarding post reclamation use of the site is noted. As indicated in Chapter 2 of the Draft EIS, it is assumed the site would be developed consistent with site zoning.

LETTER	TOPIC	COMMENT RESPONSE
Letter 143 – Mitcham	Impacts to experience of using Sequalitchew Creek Trail	**1.** Comment noted. Refer to Key Topic 4.12 (Sequalitchew Creek Character) for discussion on Sequalitchew Creek ravine conditions.
	Air quality/climate change impacts due to tree/vegetation removal	**2.** Comments noted. Refer to Key Topic 4.2 (Air Quality).
	Impacts to Sequalitchew Creek	**3.** Comment noted. Refer to Key Topic 4.12 (Sequalitchew Creek Character) for discussion on Sequalitchew Creek ravine conditions.
	Dewatering impacts on animals	**4.** Comment noted. Refer to Key Topic 4.6 (Plants & Animals).
	Impacts to experience of using Sequalitchew Creek Trail	**5.** Comment noted. Refer to Key Topic 4.12 (Sequalitchew Creek Character) for discussion on Sequalitchew Creek ravine conditions.
	Noise impacts from mining	**6.** Comment noted. Refer to Key Topic 4.7 (Noise).
	Against project	**7.** Comment noted.
	Impacts to experience of using Sequalitchew Creek Trail	**8.** Comment noted. Refer to Key Topic 4.12 (Sequalitchew Creek Character) for discussion on Sequalitchew Creek ravine conditions.
	Noise impacts from truck traffic	**9.** Comment noted. Refer to Key Topic 4.7 (Noise).
	Impacts to experience of using Sequalitchew Creek Trail	**10.** Comment noted. Refer to Key Topic 4.12 (Sequalitchew Creek Character) for discussion on Sequalitchew Creek ravine conditions.
Letter 144 – Mitchell	Potable water impacts from dewatering and contamination, dewatering impacts on plants and animals, property value impacts	**1**. The comments related to the importance of surface and groundwater resources is noted. Refer to Key Topics 4.3 (Groundwater) and 4.4 (Surface Water) for discussion on the potential for impacts to water resources under the Proposed Action. Refer to Key Topic 4.6 (Plants & Animals) for discussion on potential impacts to wildlife and habitat.
	General air quality/GHG emissions impacts	**2.** Comment noted. Refer to Key Topic 4.2 (Air Quality).
	Potable water impacts from dewatering and contamination, groundwater quality impacts	**3**. Refer to Key Topics 4.3.3 (groundwater quality) and 4.3.4 (drinking water supply).
	Sequalitchew Creek impacts from dewatering	**4**. Please refer to Key Topic responses 4.3.3 (Groundwater), 4.4.2 (Surface Water), and 4.6.3 (Plants & Animals).
	Geotech dewatering impacts	**5**. Please refer to Key Topics 4.1.1 (Earth), 4.2 (Air Quality), 4.3 (Groundwater), and 4.6.4 (Plants & Animals).
	Impacts on Sequalitchew Creek and Edmond Marsh, inadequacy of mitigation and substantial nature of unavoidable impacts	**6.** Please refer to Key Topic responses 4.4.2 (Surface Water), 4.4.3, and 4.4.4.
	Restoration Plan should be implemented without the aggregate mine.	**7**. Please refer to Key Topic responses 4.13 (Other Topics), 4.3.5 (Groundwater), 4.6.3 (Plants & Animals), 4.12.2 (Sequalitchew Creek Character).

LETTER	TOPIC	COMMENT RESPONSE
	Provisions of DMC Open Space District and relationship to Restoration Plan	**8**. Comment noted. Please refer to Key Topics 4.1 (Earth), 4.12 (Sequalitchew Creek Character), and 4.13 (Other Topics).
	Provisions of DMC Open Space District and relationship to Restoration Plan	**9**. Comment noted. Please refer to Key Topics 4.1 (Earth), 4.12 (Sequalitchew Creek Character), and 4.13 (Other Topics).
	Impacts on water resources when the pumps are turned off in 2038/need to continue pumping	**10**. The Proposed Action does not include collecting and conveying groundwater from within the mine to Sequalitchew Creek or West Edmond Marsh. Groundwater emanating from the toe of the mined slope would be collected and conveyed to infiltration ponds on the floor of the mine. A portion of the collected groundwater would provide the water source for a mitigation wetland to be constructed within the mine. Please refer to Key Topic responses 4.3.5 (Groundwater), 4.4.2 (Surface Water) and 4.4.3.
	Categories of off-site wetlands	**11**.Wetland ratings for the off-site wetlands according to the DuPont Municipal Code DMC 25.105.050) and the Ecology rating system (Hruby 2014) are in Chapter 2 of the Plants and Animals Report. West Edmond Marsh is classified as a Category II wetland East Edmond Marsh is classified as a Category II wetland The Sequalitchew Creek riparian forest wetlands are considered Category II wetlands The Sequalitchew Creek brackish marsh is classified as a Category II wetland The forested Seep Wetlands are classified as Category IV wetlands Wetland 1D is considered a Category II wetland Pond Lake is considered a Category III wetland
	General plants and animals impacts	**12.** Comment noted. Refer to Key Topic 4.6 (Plants & Animals).
	Noise impacts from mining, noise impacts from vegetation removal	**13.** Comments noted. Refer to Key Topic 4.7 (Noise).
	Provisions of DMC Open Space District and relationship to Restoration Plan	**14**. Comment noted. Please refer to Key Topics 4.1 (Earth), 4.12 (Sequalitchew Creek Character), and 4.13 (Other Topics).
	Impacts due to loss of trees and vegetation	**15.** Comment noted. Refer to Key Topic 4.6 (Plants & Animals).
	Historical monuments in mine area	**16**. As indicated in Section 3.10 (Cultural Resources) of the Draft EIS the Methodist Episcopal Mission site (45PI66) is located south of the site. As indicated in Section 3.10, the 2011 Settlement Agreement stipulates that no mining would be conducted within 189 feet of the Mission marker. With adherence with this stipulation, significant

LETTER	TOPIC	COMMENT RESPONSE
		impacts to the Mission Marker under the Proposed Action are not anticipated.
	Impacts on I-5/involvement of WSDOT in review	**17.** Comment noted. Refer to Key Topic 4.11 (Transportation).
	Adequacy of mitigation and substantial nature of unavoidable impacts; general dewatering impacts; cost for long-term water conveyance	**18**. Please refer to Key Topic response 4.1.1 (Earth), 4.3.2 (Groundwater), 4.3.5, and 4.4.7 (Surface Water).
Letter 145 – Mitchell	Adequacy of mitigation and substantial nature of unavoidable impacts	**1**. Please refer to Key Topic responses 4.3.1.2 (Groundwater) and 4.4.6 (Surface Water).
	Impacts on water resources when the pumps are turned off in 2038/need to continue pumping	**2**. The Proposed Action does not include collecting and conveying groundwater from within the mine to Sequalitchew Creek or West Edmond Marsh. This is a potential mitigation measure. Please refer to Key Topic responses 4.13 (Other Topics) and 4.4.7 (Surface Water) Sequalitchew Creek Restoration Plan.
	General groundwater impacts, groundwater level impacts from dewatering	**3.** Comments noted. Refer to Key Topic 4.3 (Groundwater).
	Contingency mitigation lack of effectiveness. Impacts on water resources when the pumps are turned off in 2038/need to continue pumping	**4**. The comments regarding the perceived inadequacy of water resources mitigation is noted. Refer to Key Topics 4.13 (Other Topics), 4.3 (Groundwater) and 4.4 (Surface Water) of this Chapter for detail on water resources.
Letter 146 – Mitchell	General earth impacts	**1.** Comment noted.
	General air quality/GHG emissions impacts	**2.** Comment noted. Refer to Key Topic 4.2 (Air Quality)
	Impacts to water quality	**3**. Comment noted. Refer to Key Topics 4.3 (Groundwater) and 4.4 (Surface Water) for details on water resources.
	General plants and animals impacts	**4.** Comment noted. Refer to Key Topic 4.6 (Plants & Animals).
	General plants and animals impacts	**5.** Comment noted. Refer to Key Topic 4.6 (Plants & Animals).
	General noise impacts	**6.** Comment noted. Refer to Key Topic 4.7 (Noise).
	General environmental impacts	**7.** Comment noted.
Letter 147 – Mueller	General environmental impacts	**1.** Comment noted.
	General air quality/GHG emissions impacts	**2.** Comment noted. Refer to Key Topic 4.2 (Air Quality).
	Impacts to experience of using Sequalitchew Creek Trail	**3.** Comment noted. Refer to Key Topic 4.12 (Sequalitchew Creek Character) for discussion on Sequalitchew Creek ravine conditions.
	General surface water impacts	**4.** Comment noted. Refer to Key Topic 4.4 (Surface Water).

LETTER	TOPIC	COMMENT RESPONSE
	General plants and animals impacts	**5.** Comment noted. Refer to Key Topic 4.6 (Plants & Animals).
	General noise impacts	**6.** Comment noted. Refer to Key Topic 4.7 (Noise).
	General land use impacts	**7.** Comment noted. Refer to Key Topic 4.8 (Land & Shoreline Use).
	General aesthetic impacts	**8.** Comment noted. Refer to Key Topic 4.9 (Aesthetics).
	General cultural resources impacts	**9.** Comment noted. Refer to Key Topic 4.10 (Cultural Resources).
	Need for more buses, trains, and trails in DuPont	**10**. The comment regarding the desire for additional bus and train service, and additional trails is noted.
	Adequacy of mitigation and substantial nature of unavoidable impacts	**11**. Comment noted.
Letter 148 – Mueller	General environmental impacts	**1.** Comment noted.
	General air quality/GHG emissions impacts	**2.** Comment noted. Refer to Key Topic 4.2 (Air Quality)
	General groundwater impacts	**3.** Comment noted. Refer to Key Topic 4.3 (Groundwater).
	General surface water impacts	**4.** Comment noted. Refer to Key Topic 4.4 (Surface Water).
	Mineral resources in area are of high quality and needed to build infrastructure, general plants and animals impacts	**5**. The comment regarding the need for the site aggregate resource is noted.
	General noise impacts	**6.** Comment noted. Refer to Key Topic 4.7 (Noise)
	Impacts on DuPont master planned community	7. The comment regarding community planning is noted.
	General aesthetics impacts, impacts to experience of using Sequalitchew Creek Trail	**8.** Comments noted. Refer to Key Topics 4.9 (Aesthetics) and 4.12 (Sequalitchew Creek Character Conditions).
	General cultural resources impacts	**9.** Comment noted. Refer to Key Topic 4.10 (Cultural Resources).
	Need for more buses, trains, and trails in DuPont	**10**. The comment regarding the desire for more bus and train service, and trails is noted.
	Adequacy of mitigation measures and substantial nature of unavoidable impacts	**11**. The comments regarding the complexity of impacts and mitigation is noted.
Letter 149 – Muir	Earthquake hazards	**1**. The comments regarding area seismic activity and evacuation routes are noted. Refer to Draft EIS Section 3.1 (Earth) and Key Topic 4.1 (Earth) of this Chapter for discussion on geotechnical conditions.
	General air quality/GHG emissions impacts, air quality impacts from mining	**2.** Comment noted. Refer to Key Topic 4.2 (Air Quality).
	Groundwater level impacts from dewatering	**3.** Please refer to Key Topic response 4.3.3 (Groundwater) and 4.6.3 (Plants & Animals).

LETTER	TOPIC	COMMENT RESPONSE
	Wetlands/marshes impacts from dewatering, wetland mitigation plan	**4.** Please refer to Key Topic response 4.6.3 (Plants & Animals) - Potential for Dewatering to Impact Plants & Animal Habitat.
	General impacts on plants and animals, dewatering impacts on plants, against project	**5.** Comments noted. Refer to Key Topic 4.6 (Plants & Animals) for discussion on impacts to wildlife and habitat conditions.
	Noise impacts from mining, cumulative noise impacts	**6.** Comments noted. Refer to Key Topic 4.7 (Noise).
	General cultural resources impacts	**7.** Comment noted. Refer to Key Topic 4.10 (Cultural Resources).
	Truck traffic impacts	**8.** Comment noted. Refer to Key Topic 4.11 (Transportation).
	Against project	**9.** Comment noted. Refer to Key Topic 4.6.5 (Plants & Animals) - Potential for Dewatering to Increase Wildlife Risk
Letter 150 – Nauth	General groundwater impacts, groundwater analysis methodology and modeling results	**1**. Comment noted. Refer to Key Topic 4.3 (Groundwater).
	General plants and animals impacts	**2.** Comment noted. Refer to Key Topic 4.6 (Plants & Animals).
	General plants and animals impacts	**3.** Comment noted. Refer to Key Topic 4.6 (Plants & Animals).
	Impacts to experience of using Sequalitchew Creek Trail	**4.** Comment noted. Refer to Key Topic 4.12 (Sequalitchew Creek Character) for discussion on Sequalitchew Creek ravine conditions.
Letter 151 – Nolan	General environmental impacts	**1.** Comment noted.
	General air quality/GHG emissions impacts	**2.** Comment noted. Refer to Key Topic 4.2 (Air Quality).
	Groundwater/surface water quality impacts	**3.** Comments noted. Refer to Key Topics 4.3 (Groundwater) and 4.4 (Surface Water).
	General surface water impacts	4. Comment noted. Refer to Key Topic 4.4 (Surface Water).
	General plants and animals impacts	**5**. Comment noted. Refer to Key Topic 4.6 (Plants & Animals).
	Noise impacts from mining, noise and vibration impacts on wildlife	**6**. Comments noted. Refer to Key Topic 4.7 (Noise).
	General surface water impacts	**7**. Comment noted. Refer to Key Topic 4.4 (Surface Water).
	General aesthetic impacts	**8.** Comment noted. Refer to Key Topic 4.9 (Aesthetics).
	Sequalitchew Creek/Trail a cultural resource, historic markers/sites along trail	**9**. As indicated in Section 3.10 (Cultural Resources) of the Draft EIS the Methodist Episcopal Mission site (45PI66) is located south of the site. As indicated in Section 3.10, the 2011 Settlement Agreement stipulates that no mining would be conducted within 189 feet of the Mission marker. With adherence with this stipulation, significant impacts to the Mission Marker under the Proposed Action are not anticipated.

LETTER	TOPIC	COMMENT RESPONSE
	Safety impacts	**10**. The comment regarding traffic safety is noted. Refer to Draft EIS Section 3.11 (Transportation) for discussion on traffic conditions.
	Against project	**11**. Comment noted.
Letter 152 – Noland	Earthquake hazards	**1**. Refer to Key Topic 4.1.2 (Earth) Potential for Increased Erosion and/or Landslide Hazard, and Key Topic 4.1.4 Earthquake Related Hazards.
	Removal of vegetation, forest habitat, and landmark trees for mining	**2.** Comments noted. Refer to Key Topic 4.6 (Plants & Animals)
	Adequacy of noise mitigation for surrounding residents and trail users	**3.** Comment noted. Refer to Key Topic 4.7 (Noise)
	Adequacy of noise mitigation for surrounding residents and trail users, land use impacts on surrounding areas, quality of life impacts	**4**. Comments noted. Refer to Key Topic 4.7 (Noise), Key Topic 4.8 (Land & Shoreline Use), and Key Topic 4.12 (Sequalitchew Creek Character Conditions).
	General aesthetic impacts	**5.** Comment noted. Refer to Key Topic 4.9 (Aesthetics).
	Potential for DuPont to shift away from warehouse and industrial uses	**6**. The comment regarding the industrial nature of portions of DuPont are noted.
	Maintenance of current truck patterns	**7**. The comment regarding truck traffic remaining at current patterns is noted.
	Follow up on comments	**8**. Comment noted.
Letter 153 – Nordbye	Groundwater level impacts from dewatering	**1.** Comment noted. Refer to Key Topic 4.3 (Groundwater).
	Groundwater level impacts from dewatering	
Letter 154 – Norris	Supports No Action alternative	**1.** The opinion expressed in the comment is acknowledged.
	Consistency with plans, policies, and regulations related to the natural environment	**2.** The comment is acknowledged.
	Consistency with the general purposes of the city's critical area regulations	**3.** Thank you for the comment, which is acknowledged. The cited statements are the general purposes of the City's critical area regulations (DMC 25.105). These purpose statements are effectuated by the regulations contained in this chapter of the code and are not independent criteria used to measure the performance of site-specific proposals. The staff report that will accompany the EIS and the application to the Hearing Examiner will include an independent analysis of the consistency of the proposal with the

LETTER	TOPIC	COMMENT RESPONSE
		code's requirements and will recommend any appropriate conditions.
	Consistency with comprehensive plan goals related to the natural environment	**4.** The comprehensive plan's goals cited in the comment are general statements of objectives that the city will pursue, primarily through its planning and regulatory programs. City staff will independently evaluate the consistency of the proposal with applicable plan goals and policies and regulations related to the natural environment in the staff report to the Hearing Examiner. The Hearing Examiner will similarly evaluate consistency of the proposal with applicable policies.
	Geotech dewatering impacts	**5.** Comment noted. Refer to Key Topic 4.1.2 (Earth) Potential for Increased Erosion and/or Landslide Hazard and 4.12.1 Geotechnical impacts along the ravine.
	Geotech dewatering impacts	**6.** Refer to Key Topics 4.1 (Earth), 4.3.6 (Groundwater), and 4.12 (Sequalitchew Creek Character).
	Geotech dewatering impacts	**7.** Comment noted. Refer to Key Topics 4.1 (Earth) and 4.3 (Groundwater).
	Adequacy of mitigation and substantial nature of unavoidable impacts	**8**. The comment regarding lack of water resources mitigation is noted. Refer to Draft EIS sections 3.3 (Groundwater) and 3.4 (Surface Water), as well as Key Topics 4.3 (Groundwater) and 4.4 (Surface Water) of this Chapter.
	Impacts to experience of using Sequalitchew Creek Trail	**9.** Comment noted. Refer to Key Topic 4.12 (Sequalitchew Creek Character) for discussion on Sequalitchew Creek ravine conditions.
	Potential for fire due to frying of vegetation along Sequalitchew Creek with dewatering	**10.** Comment noted. Refer to Key Topic 4.6.4 (Potential for Dewatering to Increase Wildfire Risk) and 4.12 (Sequalitchew Creek Character) for discussion on Sequalitchew Creek ravine conditions.
	Not consistent with DuPont Municipal Code 25.105.050 Critical areas	**11.** Detailed information on critical areas is contained in EIS Section 3.6 (Plants & Animals) and Appendix H. The City will evaluate the consistency of the project with applicable provisions of the Critical Areas Ordinance in its decision.
	Potable water impacts from dewatering and contamination	**12.** The comments related to the importance of surface and groundwater resources is noted. Refer to Key Topics 4.3 (Groundwater) and 4.4 (Surface Water) of this Chapter for discussion on the potential for impacts to water resources under the Proposed Action.
	Dewatering impacts on plants and animals	**13.** Comment noted. Refer to Key Topic 4.6 (Plants & Animals).

LETTER	TOPIC	COMMENT RESPONSE
	Adequacy of mitigation and substantial nature of unavoidable impacts	**14**. Comments noted. Refer to Key Topics 4.3 (Groundwater), 4.4 (Surface Water), 4.6 (Plants & Animals), and 4.12 (Sequalitchew Creek Character).
	Against project, adequacy of mitigation monitoring	**15**. The comments regarding adherence to the 2011 Settlement Agreement and adequacy of mitigations are noted. Refer to Key Topic 4.3 (Groundwater) and specifically to 4.3.6 Incorporation of Monitoring Plan.
Letter 155 – Novak	Dewatering impacts on plants and animals	**1.** Comment noted. Refer to Key Topic 4.1 (Earth) and 4.6 (Plants & Animals).
	General air quality/GHG emissions impacts	**2.** Comment noted. Refer to Key Topic 4.2 (Air Quality).
	Dewatering impacts on plants and animals, geotech dewatering impacts	**3**. Refer to Key Topics 4.1.2 (Earth), 4.4.2 (Surface Water), 4.6.3 (Plants & Animals), and 4.12.1 (Sequalitchew Creek Character).
	Dewatering impacts on plants, adequacy of mitigation	**4**. Refer to Key Topics 4.6.1 (Plants & Animals) and 4.6.3.
	Noise impacts from mining, noise impacts from vegetation removal	**5.** Comments noted. Refer to Key Topic 4.7 (Noise).
	Adequacy of mitigation and substantial nature of unavoidable impacts	**6**. Please refer to Key Topic response 4.4.7 (Surface Water).
	General environmental impacts, against project	**7.** Comments noted.
Letter 156 – Novak	Impacts on squirrels	**1.** Comment noted. Refer to Key Topic 4.6 (Plants & Animals).
Letter 157 – Novak	Impacts to experience of using Sequalitchew Creek Trail, dewatering impacts on plants	**1**. Comments noted. Refer to Key Topics 4.6 (Plants & Animals) and 4.12 (Sequalitchew Creek Character) for discussion on Sequalitchew Creek ravine conditions.
	Noise impacts from mining, noise impacts from truck traffic	**2.** Comments noted. Refer to Key Topic 4.7 (Noise).
	Against project, potential for fire due to drying of vegetation along Sequalitchew Creek with dewatering; potable water concerns	**3.** Comments noted. Refer to Key Topic responses 4.3.4 (Drinking Water Supply) and 4.6.4 (Potential for Dewatering to Increase Wildlife Risk).
	Dewatering impacts on plants and animals	**4**. Comments noted. Refer to Key Topic responses 4.4.3 (Surface Water) and 4.6.3 (Plants & Animals).
	Dewatering impacts on plants and animals, adequacy of mitigation	**5**. The comment that plant and animal habitat is correlated with water resources is noted. Refer to Key Topics 4.3 (Groundwater), 4.4 (Surface Water), and 4.6.3 (Potential for Dewatering to Impact Plants & Animal Habitat).

LETTER	TOPIC	COMMENT RESPONSE
	Air quality impacts from mining, air quality impacts from truck traffic, noise impacts from mining and truck traffic	**6.** Comments noted. Refer to Key Topic 4.2 (Air Quality) and 4.7 (Noise).
	Land use impacts on surrounding areas	**7.** Comment noted. Refer to Key Topic 4.8 (Land & Shoreline Use)
	Impacts to experience of using Sequalitchew Creek Trail	**8.** Please refer to Key Topic response 4.12.2 (Sequalitchew Creek Character).
	Impacts on natural environment on Tribes	**9.** Comments noted. Refer to Key Topic 4.10 (Cultural Resources)
	Truck traffic impacts, impacts on I-5/involvement of WSDOT in review	**10.** Comments noted. Refer to Key Topic 4.11 (Transportation)
	Status of Restoration Plan, dewatering impacts on plants and animals	**11.** The comment regarding lack of water resources mitigation is noted. Refer to EIS Sections 3.3 (Groundwater) and 3.4 (Surface Water), as well as Key Topics 4.3 (Groundwater) and 4.4 (Surface Water).
	Adequacy of range of EIS alternatives	**12.** Comment noted. As indicated in WAC 197-11-440, when a proposal is for a private project on a specific site, the lead agency shall be required to evaluate only the no-action plus other reasonable alternatives for achieving the proposal's objectives. The term reasonable is intended to limit the number and range of alternatives. The project's objectives include mining the resources on the site and other alternatives would not meet these objectives.
	Adequacy of Restoration Plan and monitoring obligations	**13.** Refer to Key Topic 4.3.6 (Groundwater) Incorporation of Monitoring Plan.
Letter 158 – Ockerman	Wetlands/bodies of water impacts from dewatering	**1.** Comments regarding water and habitat concerns noted. Refer to Key Topics 4.3 (Groundwater), 4.4 (Surface Water), 4.5 (Fisheries) and 4.6 (Plants and Animals).
Letter 159 – Ogata	Surface water quality impacts, general earth impacts, contamination of soils due to mining, displacement of communities and indigenous people	**1.** Comments regarding water and habitat concerns noted. Refer to Key Topics 4.1 (Earth), 4.3 (Groundwater), 4.4 (Surface Water), 4.5 (Fisheries) and 4.6 (Plants and Animals).
	General air quality/GHG emissions impacts, air quality impacts from mining, cumulative air quality impacts	**2.** Comments noted. Refer to Key Topic 4.2 (Air Quality).
	General groundwater impacts	**3.** Comments noted. Refer to Key Topic 4.3 (Groundwater).
	Wetlands/bodies of water impacts from dewatering, cumulative surface water impacts, disruption of natural flow patterns due to mining	**4.** Evaluation of the cumulative impacts of multiple mining operations would be speculative as there are no other proposals for aggregate mining within the City of DuPont and the existing Pioneer Aggregates mine and Proposed Action occupy all lands identified as Mineral Resources within the City. It is unlikely that another aggregate mine

LETTER	TOPIC	COMMENT RESPONSE
		would occur within the Sequalitchew Creek watershed since the entire watershed is within the City of DuPont and JBLM.
	General plants and animals impacts, impacts on animals from contaminated water	**5.** Comments noted. Refer to Key Topic 4.6 (Plants & Animals).
	Noise impacts from mining, noise and vibration impacts on wildlife, cumulative noise impacts	**6.** Comments noted. Refer to Key Topic 4.7 (Noise).
Letter 160 – Okita	General aesthetics impacts, impacts to experience of using Sequalitchew Creek Trail	**1**. Please refer to Key Topic responses 4.4.2 (Surface Water), 4.4.3, 4.4.4, 4.6.3 (Plants & Animals), and 4.12 (Sequalitchew Creek Character).
Letter 161 – Oliver	Enjoyment of area and history of soil contamination; concerns for citizens	**1**. Comments noted.
	Dewatering impacts on humans and animals	**2.** Comment noted. Refer to Key Topics 4.3 (Groundwater) and 4.6 (Plants & Animals).
	General surface water impacts	**3.** Comment noted. Refer to Key Topic 4.4 (Surface Water).
	General plants and animals impacts	**4.** Comment noted. Refer to Key Topic 4.6 (Plants & Animals).
	Noise impacts from mining	**5.** Comment noted. Refer to Key Topic 4.7 (Noise).
	Land use impacts on surrounding areas	**6.** Comment noted. Refer to Key Topic 4.8 (Land & Shoreline Use).
	General aesthetics impacts	**7.** Comment noted. Refer to Key Topic 4.9 (Aesthetics).
	Impacts to environment as a cultural resource	**8**. Comment noted. Refer to Key Topic 4.10 (Cultural Resources) for discussion on historic and cultural resources.
Letter 162 – Oliver	Potable water impacts from dewatering and contamination	**1**. Refer to Key Topics 4.3.4 (Groundwater) and 4.3.1.2.
Letter 163 – Orozco	General plants and animals impacts	**1.** Comment noted. Refer to Key Topic 4.6 (Plants & Animals).
Letter 164 – Page	Potable water impacts from dewatering and contamination	**1.** The comments related to the importance of surface and groundwater resources is noted. Refer to Key Topics 4.3 (Groundwater) and 4.4 (Surface Water) of this Chapter for discussion on the potential for impacts to water resources under the Proposed Action
	Sequalitchew Creek impacts from dewatering, wetlands/marshes impacts from dewatering	**2**. Please refer to Key Topic responses 4.4.2 (Surface Water) and 4.4.3.
	Dewatering impacts on plants	**3**. Please refer to Key Topic response 4.6.3 (Plants & Animals) for discussion of potential for dewatering to impact plants & animal habitats.
	Impacts to experience of using Sequalitchew Creek Trail	**4.** Please refer to Key Topic response 4.12.2 (Sequalitchew Creek aesthetic condition).

LETTER	TOPIC	COMMENT RESPONSE
Letter 165 – Parks	General environmental impacts	**1.** Comments noted.
	General surface water impacts	**2.** Comment noted. Refer to Key Topic 4.4 (Surface Water).
	Displacement of animals with mining and associated impacts	**3.** Comments noted. Refer to Key Topic 4.6 (Plants & Animals).
	General noise impacts	**4.** Comment noted. Refer to Key Topic 4.7 (Noise).
	General environmental impacts	**5.** Comments noted.
Letter 166 – Payton	Against project	**1.** Comment noted.
Letter 167 – Pennock	For project/no concerns	**1.** Comment noted.
Letter 168 – Peppers	Groundwater level impacts	**1**. Please refer to Key Topic responses 4.4.2 (Surface Water), 4.4.3, and 4.12.2 (Sequalitchew Creek Character).
Letter 169 – Perfue	Potential for fire due to drying of vegetation along Sequalitchew Creek with dewatering	**1**.The comment regarding fire risk is noted. Refer to Key Topic 4.6.3 (Plants & Animals).
	Potable water impacts from dewatering and contamination	**2**. Refer to Key Topics 4.3.4 (Groundwater) and 4.6 (Plants & Animals).
Letter 170 – Perkins	Dewatering impacts of the springs	**1**. Comment noted. Please refer to Key Topic response 4.4.2 (Surface Water) for discussion of Sequalitchew Creek and Springs Impacts from Dewatering.
	General plants and animals impacts	**2.** Comment noted. Refer to Key Topic 4.6 (Plants & Animals).
	General aesthetic impacts	**3.** Comment noted. Refer to Key Topic 4.9 (Aesthetics).
Letter 171 – Pettibon	General environmental impacts, against project	**1.** Comments noted.
	Impacts on aquatic wildlife	**2.** Comment noted. Refer to Key Topic 4.6 (Plants & Animals).
Letter 172 – Pettibon	General environmental impacts	**1.** Comment noted.
	General air quality/GHG emissions impacts	**2.** Comment noted. Refer to Key Topic 4.2 (Air Quality).
	General groundwater impacts	**3.** Comment noted. Refer to Key Topics 4.3 (Groundwater) and 4.6 (Plants & Animals).
	Wetlands/marshes impacts from dewatering	4. Comment noted. Refer to Key Topics 4.3 (Groundwater) and 4.4 (Surface Water).
	Dewatering impacts on animals	**5.** Comment noted. Refer to Key Topic 4.6 (Plants & Animals).
	Aesthetic buffers around mine	**6.** Comment noted. Refer to Key Topic 4.9 (Aesthetics).

LETTER	TOPIC	COMMENT RESPONSE
Letter 173 – Power	Geotech dewatering impacts, impacts to experience of using Sequalitchew Creek Trail	**1**.Refer to Key Topics 4.1.1 (Earth) for discussion of Potential for Settlement, Sinkholes/Subsidence, and Associated Property Impacts, and 4.12 (Sequalitchew Creek Character conditions).
	Air quality impacts from mining	**2.** Comment noted. Refer to Key Topic 4.2 (Air Quality).
	Potable water impacts from dewatering and contamination	**3**. Please refer to Key Topic response 4.3.4 (Groundwater) Drinking water supply – quality, quantity, and protection of the Vashon Aquifer as a drinking water supply
	Sequalitchew Creek impacts from dewatering, dewatering impacts on animals	**4**. Please refer to Key Topic responses 4.6.3 (Plants & Animals) and 4.12.2 (Sequalitchew Creek Character).
	Dewatering impacts on animals, impacts on animals from contaminated water	**5**. Please refer to Key Topic responses 4.6.3 (Plants & Animals).
	Other uses for site	**6.** The comment regarding use of the site as a park is noted.
	Aesthetic concerns	**7.** Comment noted. Refer to Key Topic 4.9 (Aesthetics).
	Impacts from truck traffic	**8.** Comment noted. Refer to Key Topic 4.11 (Transportation).
	Compliance of existing CalPortland mine with regulations	**9.** The comment regarding need for the Applicant to meet required regulations is noted.
Letter 174 – Power	General environmental impacts	**1.** Comment noted.
Letter 175 – Preston	Geotech dewatering impacts, bodies of water impacts from dewatering, dewatering impacts on plants and animals	**1**. The comment regarding the relationship between groundwater and Sequalitchew Creek is noted. See Key Topics 4.1 (Earth), 4.3 (Groundwater), 4.4 (Surface Water), and 4.12 (Character of Sequalitchew Creek Ravine) of this Chapter.
	Impacts to potable water supply	**2**. The comment related to the importance of drinking water access and availability is noted. Refer to Key Topics 4.3 (Groundwater) and 4.4 (Surface Water) of this Chapter for discussion on the potential for impacts to water resources under the Proposed Action.
Letter 176 – Rakes	Air quality impacts from mining	**1.** Comment noted. Refer to Key Topic 4.2 (Air Quality).
	Existing air quality/climate change conditions and exacerbation with dewatering, groundwater level impacts from dewatering	**2**. Please refer to Key Topic responses 4.3.2 (Groundwater), 4.3.3, and 4.4.3 (Surface Water).
	Sequalitchew Creek impacts from dewatering	**3**. Please refer to Key Topic response 4.4.2 (Surface Water) for discussion on Sequalitchew Creek and springs impacts from dewatering.

LETTER	TOPIC	COMMENT RESPONSE
	Dewatering impacts on plants and animals	**4.** Comment noted. Refer to Key Topic 4.6 (Plants & Animals) and 4.12 (Sequalitchew Creek Character Conditions).
	Noise impacts from mining	**5.** Comment noted. Refer to Key Topic 4.7 (Noise)
	Potential for mine to expand away from Sequalitchew Creek	**6.** Comment noted. Refer to Key Topic 4.12 (Sequalitchew Creek Character Conditions).
	Impacts to experience of using Sequalitchew Creek Trail	**7.** Comment noted. Refer to Key Topic 4.12 (Sequalitchew Creek Character) for discussion on Sequalitchew Creek ravine conditions.
	Sequalitchew Creek/Trail a cultural resource	**8**.Comment noted. Refer to Section 3.10 (Cultural Resources) and Key Topic 4.10 (Cultural Resources) for discussion on cultural resources.
Letter 177 – Rambeau	Impacts to experience of using Sequalitchew Creek Trail, Creek/Trail a cultural resource, against project	**1**. The comment regarding the importance of the Sequalitchew Creek Trail is noted. Refer to Key Topic 4.12 (Sequalitchew Creek Ravine Character) of this Chapter.
Letter 178 – Reeves	Potable water impacts from dewatering and contamination, wetlands/bodies of water impacts from dewatering	**1**. Please refer to Key Topic responses 4.3.4 (Groundwater), 4.4.3 (Surface Water), and 4.4.4.
	Potential for fire due to drying of vegetation along Sequalitchew Creek with dewatering	**2.** Please refer to Key Topic response 4.6.4 (Plants & Animals).
	Dewatering impacts on animals	**3.** Comment noted. Refer to Key Topic 4.6 (Plants & Animals).
	Consistency with plans, policies, and regulations related to the natural environment	**4**.Comment noted.
Letter 179 – Reidinger	Letter attached is Letter 180	**1**. N/A (see comment letter #180)
Letter 180 – Reidinger	Include Sequalitchew Creek Restoration Plan as an appendix to EIS	**1**. Comment noted.
	Groundwater level impacts from dewatering	**2.** The comments regarding potential impacts to springs and the creek are noted. See Key Topic response 4.4 (Surface Water) for additional discussion.
	Status of Restoration Plan, adequacy of Plan to mitigate impacts of mining on Sequalitchew Creek and other impacts to watershed	**3**. Please refer to Key Topic responses 4.4.2 (Surface Water) and 4.4.7.
	Groundwater analysis methodology and modeling results, dewatering impacts on springs and creek flow	**4.** Predicted impacts to springs and seeps have been studied in detail as reported in Section 3.4 (Surface Water), Appendix B, and Appendix E of the EIS. Refer to Key Topic discussion in 4.3.1 (Groundwater) for additional information.
	Dewatering impacts on plants	**5**.Refer to key Topic 4.6 (Plants & Animals).

LETTER	TOPIC	COMMENT RESPONSE
	Dewatering impacts on plants	**6**. Please refer to Key Topic response 4.6.3 (Plants & Animals).
	Jurisdictional discontinuities between the Restoration Plan and JBLM's use of water	**7.** Please refer to Key Topic response 4.4.7 (Surface Water) for discussion of the Sequalitchew Creek Restoration Plan.
	Elimination of Kettle wetland and adequacy of Wetland Mitigation Plan	**8**.The comments regarding the impacts to the Kettle Wetland are noted. Refer to Section 3.6 (Plants and Animals) and Key Topics 4.4 (Surface Water) and 4.6 (Plants and Animals).
	Existing air quality/climate change conditions and exacerbation with dewatering, wetlands/bodies of water impacts from dewatering	**9.** Please refer to Key Topic responses 4.3.1.2 (Groundwater), 4.4.3 (Surface Water), and 4.4.4.
	Elimination of Kettle wetland and adequacy of Wetland Mitigation Plan	**10.** The Kettle has been delineated and assessed using state approved rating systems several times. The most recent Wetland Delineation Report (2021) is included in the Critical Areas Report for the project. Section 3.1.1 describes the vegetation in and around the wetland.
	Elimination of Kettle wetland and adequacy of Wetland Mitigation Plan	**11**. Salvage operations in the Kettle Wetland will focus on excavating, transporting and placing the wetland soils from the Kettle into the new Mitigation wetland. Additionally, specimens of plants in and around the wetland that are suitable for transplantation or propagation will be salvaged for use at the mitigation site.
	Elimination of Kettle wetland and adequacy of Wetland Mitigation Plan	**12**. The exact timing of the wetland mitigation is subject to multiple variables. Rough grading for wetland construction will begin as pumping progresses toward the Kettle. As soon as the soils in the Kettle are dry enough to be handled, they will be moved to the mitigation site. Initially wetland hydrology in the mitigation site will be maintained with pumped groundwater, but as pumping ends water from springs forming on the mine face will be conveyed to the wetland in a vegetated, open channel. **12b**. The wetland mitigation site and buffer will be maintained for 10 years or more to ensure that a closed canopy of native trees is established, and the site is fully vegetated with native species. This will provide long-term natural resistance to invasive vegetation.
	Elimination of Kettle wetland and adequacy of Wetland Mitigation Plan	**13**. After mining and reclamation is complete, the mitigation wetland will be protected by the City's Critical Areas Ordinance (CAO). Future development will be subject to environmental review and permitting consistent with the DuPont Municipal Code, and other state and federal rules in place at the time the development is proposed. The

LETTER	TOPIC	COMMENT RESPONSE
		mitigation wetland will have the same regulatory protections as other wetlands in the area at that time.
	Existing air quality/climate change conditions and exacerbation with dewatering	**14**. Please refer to Key Topic response 4.3.1.2 (Groundwater) which discusses whether/how climate change was incorporated
Letter 181 – Rizzo	Against project	**1.** Comment noted.
	Against project	**2.** Comment noted.
	Shooting of guns and bombs at night	**3.** Comment noted.
	Against project	**4.** Comment noted.
	Need for more buses, trains, and trails in DuPont	**5**. The comment regarding need for a train station in DuPont is noted.
	Against project	**6.** Comment noted.
Letter 182 – Rodger	Groundwater impacts from dewatering, wetlands/bodies of water impacts from dewatering, potential to cause drought	**1**. Please refer to Key Topic responses 4.4.2 (Surface Water), 4.4.3, 4.4.4, 4.4.5, and 4.6.3 (Plants & Animals).
	General aesthetic impacts, impacts to experience of using Sequalitchew Creek Trail	**2.** Comments noted. Refer to Key Topics 4.9 (Aesthetics) and 4.12 (Sequalitchew Creek Character Conditions).
	General environmental, quality of life impacts	**3.** Comments noted.
Letter 183 – Rodger	General environmental impacts, against project	**1.** Comments noted.
	General environmental impacts, against project, impacts to experience of using Sequalitchew Creek Trail	**2.** Comment noted. Refer to Key Topic 4.12 (Sequalitchew Creek Character) for discussion on Sequalitchew Creek ravine conditions.
Letter 184 – Roelofsen	General environmental impacts, against project	**1.** Comments noted.
	General environmental impacts, against project	**2.** Comments noted.
Letter 185 – Rose	Dewatering impacts, general noise impacts, general land use impacts, general transportation impacts	**1**. Comments noted. The potential for impacts to the natural environment and transportation is discussion in Chapter 3.11 of this EIS.
Letter 186 – Rouse	Geotech dewatering impacts	**1.** Comment noted. Refer to Key Topic 4.1 (Earth).
	Dewatering impacts on plants and animals	**2.** Comment noted. Refer to Key Topic 4.6 (Plants & Animals).
	Dewatering impacts on plants and animals, impacts to experience of using Sequalitchew Creek Trail	**3.** Comments noted. Refer to Key Topics 4.6 (Plants & Animals) and 4.12 (Sequalitchew Creek Character) for discussion on Sequalitchew Creek ravine conditions.
	Dewatering impacts on plants and animals	**4.** Comment noted. Refer to Key Topic 4.6 (Plants & Animals).

LETTER	TOPIC	COMMENT RESPONSE
	Other possible uses of the site	**5**. Comment noted.
	Impacts to experience of using Sequalitchew Creek Trail	**6.** Comment noted. Refer to Key Topic 4.12 (Sequalitchew Creek Character) for discussion on Sequalitchew Creek ravine conditions.
	Impacts to experience of using Sequalitchew Creek Trail	**7.** Comment noted. Refer to Key Topic 4.12 (Sequalitchew Creek Character) for discussion on Sequalitchew Creek ravine conditions.
Letter 187 – Russell	Status of Restoration Plan, adequacy of Plan to mitigate impacts of mining on Sequalitchew Creek and other impacts to watershed	**1**. Please refer to Key Topic response 4.4.7 (Surface Water) for discussion on the Sequalitchew Creek Restoration Plan.
	Status of Restoration Plan, adequacy of Plan to mitigate impacts of mining on Sequalitchew Creek and other impacts to watershed	**2**. Please refer to Key Topic response 4.13 (Other Topics) for Sequalitchew Creek restoration without dewatering.
	Sharing experience in the area	**3.** Comment noted.
	General environmental impacts	**4.** Comment noted.
	General impacts from dewatering	**5**. Please refer to Key Topic responses 4.3.2 (Groundwater) and 4.4.3 (Surface Water).
	Groundwater impacts from dewatering	**6**. The proposed action does not include pumping dewatering water to West Edmond Marsh or Sequalitchew Creek, however, this is a potential mitigation measure. Please refer to Key Topic response 4.13 (Other Topics) Possible Contingency Mitigation Measures - Routing of intercepted groundwater back to Sequalitchew Creek and 4.4.2 (Surface Water) for discussion of Sequalitchew Creek and Springs Impacts from Dewatering.
	Dewatering impacts on animals	**7**. Please refer to Key Topic responses 4.6.2 (Plants & Animals) and 4.6.3.
	Adequacy of Sequalitchew Creek Restoration Plan	**8**. Please refer to Key Topic responses 4.4.1 (Surface Water) and 4.4.7.
	Current conditions of Sequalitchew Creek and Edmond Marsh	**9**. Please refer to Key Topic response 4.4.1 (Surface Water) for discussion of current conditions of Sequalitchew Creek.
	Adequacy of Sequalitchew Creek Restoration Plan	**10**. Please refer to Key Topic responses 4.4.1 (Surface Water) and 4.4.7.
	Mineral Resource Land Overlay	**11.** The City of DuPont followed the requirements and criteria of the Growth Management Act regarding designating mineral lands of long-term significance and when it applied the Mineral Resource Lands Overlay in the Comprehensive Plan. The comment's opinion is noted.
	Adequacy of mitigation measures	**12**. Please refer to Key Topic response 4.4.7 (Surface Water) for discussion around Sequalitchew Creek Restoration Plan.

LETTER	TOPIC	COMMENT RESPONSE
	Adequacy of Sequalitchew Creek Restoration Plan	**13**. Please refer to Key Topic response 4.4.7 (Surface Water) for discussion of the Sequalitchew Creek Restoration Plan.
	Adequacy of Sequalitchew Creek Restoration Plan	**14**. Please refer to Key Topic response 4.4.7 (Surface Water) for discussion of the Sequalitchew Creek Restoration Plan.
	Beaver dams and dam removal	**15**. Please refer to Key Topic response 4.4.7 (Surface Water) for discussion of the Sequalitchew Creek Restoration Plan.
	General surface water impacts	**16**. Please refer to Key Topic responses 4.4.1 (Surface Water) and 4.13.(Other Topics).
	Other materials submitted to the City/CalPortland	**17.** Please refer to Key Topic response 4.13.1 (Alternatives Considered).
	General groundwater impacts	**18**. Comment noted. Please refer to Key Topic 4.13.1(Other Topics).
Letter 188 – Schenk	Existing air quality/climate change conditions and exacerbation from dewatering, groundwater level impacts from dewatering	**1.** Comment noted. Refer to Key Topic 4.3 (Groundwater) for additional information about groundwater and climate change.
	General noise impacts, updating of City noise ordinance	**2**. The comment reflecting noise impact conditions provided in Section 3.7 (Noise) of this EIS.
	Reclamation Plan goals, process, and outcome	**3**. Mining began at the site in Steilacoom in the 1890s, approximately 80 years before the Washington State Surface Mining Act (78.44 RCW) was established. Mining in the South Parcel will not proceed until the Washington Department of Natural Resources issues a surface mine reclamation permit using their authority provided by the Surface Mining Act (78.44 RCW). The permit will include an approved Surface Mine Reclamation Plan for the whole mine site, and conditions intended to ensure the property is reclaimed to a condition suitable for its ultimate use. The surface mining act directs the DNR to ensure that a sufficient performance security (bond) is available to reclaim each permitted mine (RCW 78.44.087). DNR Surface mine inspectors periodically inspect the mine to ensure that reclamation is being implemented properly including the planting and maintenance of vegetation including trees, and that the performance security is adjusted to ensure it is sufficient to guarantee reclamation of any un-reclaimed areas. The Washington Department of Natural Resource cannot release the performance security (bond) until the mine is fully reclaimed and vegetation including trees are well established.
	Groundwater level impacts from dewatering	**4.** Comment noted. Refer to Key Topic 4.3 (Groundwater)

LETTER	TOPIC	COMMENT RESPONSE
Letter 189 – Schmidt and Smith	Sequalitchew Creek restoration without dewatering	**1.** Please refer to Key Topic responses 4.4.2 (Surface Water) and 4.6.4 (Plants & Animals).
	Wetlands/marshes impacts from dewatering, potential for fire due to drying of vegetation along Sequalitchew Creek with dewatering	**2.** Please refer to Key Topic response 4.4.3 (Surface Water) for discussion of wetlands/marshes Impacts from dewatering.
	Existing air quality/climate change conditions and exacerbation with dewatering	**3.** Please refer to Key Topic response 4.3 (Groundwater) for discussion on whether/how climate change was incorporated.
	Sequalitchew Creek restoration without dewatering	**4.** The comment regarding CalPortland Sequalitchew Creek Restoration funding is noted. Please refer to Key Topic response 4.13.1 – Sequalitchew Creek Restoration without Dewatering.
Letter 190 – Schneider	General plants and animals impacts, impacts to experience of using Sequalitchew Creek Trail	**1.** Comments noted. Refer to Key Topics 4.6 (Plants & Animals) and 4.12 (Sequalitchew Creek Character) for discussion on Sequalitchew Creek ravine conditions.
	General groundwater and surface water impacts	**2.** Comments noted. Refer to Key Topics 4.3 (Groundwater) and 4.4 (Surface Water).
	Groundwater level impacts from dewatering, potential to cause drought, quality of life impacts	**3.** Comment noted. Refer to Key Topics 4.3 (Groundwater).
	Repeat of comments 1,2, and 3	**4.** Refer to responses to comments 1,2, and 3.
	Repeat of comments 1,2, and 3	**5.** Refer to responses to comments 1,2, and 3.
	Repeat of comments 1,2, and 3	**6.** Refer to responses to comments 1,2, and 3.
	Against dewatering of the aquifer	**7.** The comment regarding opposition to proposed dewatering is noted.
Letter 191 – Schnell	Sequalitchew Creek impacts from dewatering, plants and animals impacts from dewatering	**1.** Please refer to Key Topic response 4.6.3 (Plants & Animals).
	Wetlands/marshes impacts from dewatering, Sequalitchew Creek/Trail a cultural resource	**2.** The comment regarding opposition to proposed dewatering is noted.
	General environmental impacts	**3.** Comment noted.
Letter 192 – Senftleben	Impacts to experience of using Sequalitchew Creek Trail, against project	**1.** Comment noted. Refer to Key Topic 4.12 (Sequalitchew Creek Character) for discussion on Sequalitchew Creek ravine conditions.
Letter 193 – Shaver	General transportation impacts, general environmental impacts	**1.** Comments noted. Refer to Key Topic 4.11 (Transportation).
	Existing air quality/climate change conditions and exacerbation with dewatering	**2.** Comments noted. Refer to Key Topic 4.2 (Air Quality).
	Groundwater level impacts from dewatering, potable water impacts from dewatering and contamination	**3.** Please refer to Key Topic response 4.3.4 (Groundwater.

LETTER	TOPIC	COMMENT RESPONSE
	General surface water impacts	**4.** Please refer to Key Topic response 4.4.6 (Surface Water).
	General plants and animals impacts	**5.** Comment noted. Refer to Key Topic 4.6 (Plants & Animals).
	General noise impacts	**6.** Comment noted. Refer to Key Topic 4.7 (Noise).
	General land use impacts	**7.** Comment noted. Refer to Key Topic 4.8 (Land & Shoreline Use).
	General transportation impacts	**8.** Comment noted. Refer to Key Topic 4.11 (Transportation).
Letter 194 – Shaw	Groundwater levels impacts from dewatering, dewatering impacts on plants and animals, against project	**1**. Please refer to Key Topic response 4.6 (Plants & Animals).
Letter 195 – Shenkel	General environmental impacts	**1.** Comment noted.
	Air quality impacts from mining, general noise impacts	**2.** Comments noted. Refer to Key Topics 4.2 (Air Quality) and 4.7 (Noise)
	Displacement of animals with mining and associated impacts	**3.** Comment noted. Refer to Key Topic 4.6 (Plants & Animals).
	Against project	**4.** Comment noted.
Letter 196 – Shoup	Reclamation Plan goals, process, and outcome	**1.**The comment regarding post-mining use of the mined site is noted. Refer to Chapter 2 of this Final EIS for discussion on post-mining use.
	Potable water impacts from dewatering and contamination, saltwater intrusion with dewatering	**2**. Please refer to Key Topic response 4.3 (Groundwater).
	Status of Restoration Plan, adequacy of Plan to mitigate impacts of mining on Sequalitchew Creek	**3**. Please refer to Key Topic response 4.4 (Surface Water) for discussion on the Sequalitchew Creek Restoration Plan.
	General plants and animals impacts	**4.** Comment noted. Refer to Key Topic 4.6 (Plants & Animals).
	General noise impacts	**5.** Comment noted. Refer to Key Topic 4.7 (Noise).
	General land use impacts	**6.** Comment noted. Refer to Key Topic 4.8 (Land & Shoreline Use).
	General aesthetic impacts	**7.** Comment noted. Refer to Key Topic 4.9 (Aesthetics).
	Nisqually tribe consultation	**8.** Comment noted. Refer to Key Topic 4.10 (Cultural Resources).
	Safety impacts	**9**.Comment noted. As indicated in Section 3.11 (Transportation), the Proposed Action would continue existing truck traffic levels, with no increase in truck traffic anticipated.
	Against project	**10.** Comment noted.
Letter 197 – Shupe	Dewatering impacts of plants, general aesthetic impacts	**1.** Comments noted. Refer to Key Topics 4.6 (Plants & Animals) and 4.9 (Aesthetics).
	Air quality/climate change impacts due to tree/vegetation removal	**2.** Comment noted. Refer to Key Topic 4.2 (Air Quality).

LETTER	TOPIC	COMMENT RESPONSE
	Wetlands/bodies of water impacts from dewatering	**3**.The comment regarding the potential for wetland impact is noted. See Key Topics 4.3 (Groundwater), 4.4 (Surface Water), and 4.6 (Plants and Animals) of this Chapter.
Letter 198 – Slattery	General environmental impacts, against project	**1.** Comments noted.
	Air quality impacts from mining	**2.** Comment noted. Refer to Key Topic 4.2 (Air Quality).
	General groundwater impacts	**3**. Refer to Key Topic 4.3 (Groundwater).
	Sequalitchew creek impacts from dewatering	**4.** Please refer to Key Topic response 4.4 (Surface Water).
	Displacement of animals with mining and associated impacts	**5.** Comment noted. Refer to Key Topic 4.6 (Plants & Animals).
	General noise impacts	**6.** Comment noted. Refer to Key Topic 4.7 (Noise).
	General land use impacts	**7.** Comment noted. Refer to Key Topic 4.8 (Land & Shoreline Use).
	Aesthetic impacts of mining expansion	**8.** Comment noted. Refer to Key Topic 4.9 (Aesthetics).
	General transportation impacts	**9.** Comment noted. Refer to Key Topic 4.11 (Transportation).
	Against project	**10.** Comment noted.
Letter 199 – Slattery	General earth impacts	**1.** Comment noted.
	Air quality impacts from truck traffic	**2**. Comment noted. As indicated in Section 3.11 (Transportation), the Proposed Action would continue existing truck traffic levels, with no increase in truck traffic anticipated.
	General groundwater impacts	**3.** Comment noted. Refer to Key Topic 4.3 (Groundwater).
	General surface water impacts	**4.** Comment noted. Refer to Key Topic 4.4 (Surface Water).
	General plants and animals impacts	**5.** Comment noted. Refer to Key Topic 4.6 (Plants & Animals).
	Noise impacts from truck traffic	**6**. Comment noted. As indicated in Section 3.11 (Transportation), the Proposed Action would continue existing truck traffic levels, with no increase in truck traffic anticipated.
	General aesthetic impacts	**7.** Comment noted. Refer to Key Topic 4.9 (Aesthetics).
	General aesthetic impacts	**8.** Comment noted. Refer to Key Topic 4.9 (Aesthetics).
	General cultural resources	**9.** Comment noted. Refer to Key Topic 4.10 (Cultural Resources).
	General transportation impacts	**10.** Comment noted. Refer to Key Topic 4.11 (Transportation).
	Against project	**11.** Comment noted.

LETTER	TOPIC	COMMENT RESPONSE
Letter 200 – Snyder	Geotech dewatering impacts, air quality impacts from mining, air quality impacts from traffic, air quality impacts on sensitive populations	**1**. The comments regarding potential for air quality impacts is noted. See Section 3.2 (Air Quality) and Key Topic 4.12 (Sequalitchew Creek Ravine Character).
	Groundwater level impacts from dewatering, potable water impacts from dewatering	**2**. Please refer to Key Topic responses 4.1.1 (Earth) and 4.3.4 (Groundwater).
	General environmental impacts	**3.** Comment noted.
	Noise impacts from mining	**4.** Comment noted. Refer to Key Topic 4.7 (Noise).
	Increased traffic on Powerline Road and Center Drive	**5**. Comment noted. As indicated in Section 3.11 (Transportation), the Proposed Action would continue existing truck traffic levels, with no increase in truck traffic anticipated.
Letter 201 – Sortais	General groundwater impacts, wetlands/bodies of water impacts from dewatering, potential for fire due to drying of vegetation along Sequalitchew Creek with dewatering	**1**. Please refer to Key Topic responses 4.4 (Surface Water).
Letter 202 – Sprague	Impacts to experience of using Sequalitchew Creek Trail	**1**. Please refer to Key Topic response 4.12.2 (Sequalitchew Creek aesthetic conditions).
Letter 203 – Steinhart	Dewatering impacts on plants and animals	**1.** Comment noted. Refer to Key Topic 4.6 (Plants & Animals).
	Noise impacts from mining	**2.** Comment noted. Refer to Key Topic 4.7 (Noise).
	Impacts to experience of using Sequalitchew Creek Trail	**3.** Comment noted. Refer to Key Topic 4.12 (Sequalitchew Creek Character) for discussion on Sequalitchew Creek ravine conditions.
	Impacts to experience of using Sequalitchew Creek Trail	**4**. Please refer to Key Topic response 4.12.2 (Sequalitchew Creek aesthetic conditions).
Letter 204 – Stephenson	Potable water impacts from dewatering and contamination, wetlands/bodies of water impacts from dewatering, against project	**1**. Please refer to Key Topic responses 4.4 (Surface Water).
	Impacts to experience of using Sequalitchew Creek Trail	**2.** Comment noted. Refer to Key Topic 4.12 (Sequalitchew Creek Character) for discussion on Sequalitchew Creek ravine conditions.
	Against project	**3.** Comment noted.
Letter 205 – Stephenson	Dewatering impacts on everything, against project, general environmental impacts, adequacy of mitigation and substantial nature of unavoidable impacts	**1.** Please refer to Key Topic responses 4.4 (Surface Water).
Letter 206 – Switzer	Need for thorough EIS review and third-party reviewer, general environmental impacts	**1**. Comment noted. The City of DuPont, as SEPA lead agency, is charged with conducting objective environmental review. Where Applicant prepared technical reports are utilized, third-party review is conducted.

LETTER	TOPIC	COMMENT RESPONSE
	Surface water quality impacts, impacts on animals from contaminated water	**2.** Please refer to Key Topic response 4.4 (Surface Water).
	General land use impacts	**3.** Comment noted. Refer to Key Topic 4.8 (Land & Shoreline Use).
Letter 207 – Taylor	Impacts to experience of using Sequalitchew Creek Trail	**1.** Comment noted. Refer to Key Topic 4.12 (Sequalitchew Creek Character) for discussion on Sequalitchew Creek ravine conditions.
	Air quality/climate change impacts due to tree/vegetation removal	**2.** Comment noted. Refer to Key Topic 4.2 (Air Quality).
	Dewatering impacts on plants and animals	**3.** Comment noted. Refer to Key Topic 4.6 (Plants & Animals).
	General plants and animals impacts	**4.** Comment noted. Refer to Key Topic 4.6 (Plants & Animals).
	General plants and animals impacts	**5.** Comment noted. Refer to Key Topic 4.6 (Plants & Animals).
	General noise impacts	**6.** Comment noted. Refer to Key Topic 4.7 (Noise).
	Against project, need for thorough EIS review and a third-party reviewer	**7.** Comment noted. The City of DuPont, as SEPA lead agency, is charged with conducting objective environmental review. Where Applicant prepared technical reports are utilized, third-party review is conducted. Comment noted. The City of DuPont , as SEPA lead agency, is charged with conducting objective environmental review. Where Applicant prepared technical reports are utilized, third-party review is conducted.
Letter 208 – Teague	Removal of vegetation, forest habitat, and landmark trees for mining, general environmental impacts	**1.** Comments noted. Refer to Key Topic 4.6 (Plants & Animals).
	Air quality impacts from mining	**2.** Comment noted. Refer to Key Topic 4.2 (Air Quality).
	Dewatering impacts on plants and animals	**3.** Please refer to Key Topic response 4.6 (Plants & Animals).
	General surface water impacts	**4.** Comment noted. Refer to Key Topic 4.4 (Surface Water).
	Dewatering impacts on plants and animals	**5.** Comment noted. Refer to Key Topic 4.6 (Plants & Animals).
	Impacts to experience of using Sequalitchew Creek Trail	**6.** Comment noted. Refer to Key Topic 4.12 (Sequalitchew Creek Character) for discussion on Sequalitchew Creek ravine conditions.
	General cultural resources impacts, DuPont Historical Society/Museum consultation	**7.** Comments noted. Please refer to Key Topic 4.10 (Cultural Resources).
Letter 209 – Tennille	Potential for mushrooms in project area, and for impacts on mushrooms with proposed mining	**1.** Comment noted. See Key Topic 4.6 (Plants & Animals) and Section 3.6 (Plants & Animals) for discussion on mushrooms on the site.
	General air quality/GHG emissions impacts, general groundwater impacts	**2.** Comments noted. Refer to Key Topics 4.2 (Air Quality) and 4.3 (Groundwater).
	General surface water impacts, general environmental impacts	**3.** Comments noted. Refer to Key Topic 4.4 (Surface Water).

LETTER	TOPIC	COMMENT RESPONSE
	Other possible uses of the site	**4.** Comment noted.
	Against project	**5.** Comment noted.
Letter 210 – Thayer	Against project	**1.** Comment noted.
	General groundwater impacts	**2.** Refer to Key Topic 4.3 (Groundwater).
	Displacement of animals with mining and associated impacts	**3.** Comment noted. Refer to Key Topic 4.6 (Plants & Animals).
Letter 211 – Thayer	General environmental impacts, against project	**1.** Comments noted.
Letter 212 – Thayer	General earth impacts	**1.** Comment noted.
	General groundwater impacts	**2.** Comment noted.
	Displacement of animals with mining and associated impacts	**3.** Comment noted. Refer to Key Topic 4.6 (Plants & Animals).
	General environmental impacts	**4.** Comment noted.
	General aesthetic impacts	**5.** Comment noted. Refer to Key Topic 4.9 (Aesthetics).
Letter 213 – Thayer	For project/no concerns	**1.** Comment noted.
Letter 214 – Thomas	Noise impacts from mining, quality of life impacts	**1.** Comment noted. Refer to Key Topic 4.7 (Noise).
Letter 215 – Thornton	General groundwater impacts	**1.** Comment noted. Refer to Key Topic 4.3 (Groundwater).
	General surface water impacts	**2.** Comment noted. Refer to Key Topic 4.4 (Surface Water).
	General plants and animals impacts	**3.** Comment noted. Refer to Key Topic 4.6 (Plants & Animals).
	General noise impacts	**4.** Comment noted. Refer to Key Topic 4.7 (Noise).
	Sequalitchew Creek/trail a cultural resource	**5.** Comments noted. See Key Topic 4.10 (Cultural Resources) and Section 3.10 (Cultural Resources) for discussion on cultural resources, and Key Topic 4.12 (Sequalitchew Creek Ravine Character) for discussion on the potential to impact the character of the Sequalitchew Creek ravine.
	Impacts to experience of using Sequalitchew Creek Trail, against project	**6.** Comment noted. Refer to Key Topic 4.12 (Sequalitchew Creek Character) for discussion on Sequalitchew Creek ravine conditions.
Letter 216 – Toppenberg	Geotech dewatering impacts, dewatering impacts on plants, animals, and bodies of water	**1**.Comments noted. See Key Topics 4.1 (Earth) and 4.12 (Sequalitchew Creek Ravine Character).

LETTER	TOPIC	COMMENT RESPONSE
	Potable water impacts from dewatering and contamination, groundwater quality impacts	**2**. Refer to Key Topics 4.3 (Groundwater).
	Existing air quality/climate change conditions and exacerbation with dewatering	**3.** Comment noted. Refer to Key Topic 4.2 (Air Quality).
	Groundwater quality impacts	**4**. Refer to Key Topic 4.3 (Groundwater).
	Geotech dewatering impacts, dewatering impacts on plants, animals, and bodies of water	**5.** Refer to Key Topics 4.1.1 (Earth), 4.3.2 (Groundwater), and 4.6.3 (Plants & Animals).
	Flooding due to aquifer compaction/depletion	**6**. Refer to Key Topics 4.1(Earth) and 4.3 (Groundwater).
	Displacement of animals due to mining, potential for fire due to drying of vegetation along Sequalitchew Creek with dewatering	**7**.Comments regarding potential for habitat impacts noted. Refer to Key Topics 4.6 (Plants & Animals) and 4.12 (Sequalitchew Creek Ravine Character).
	General noise impacts	**8.** Comment noted. Refer to Key Topic 4.7 (Noise).
	Other possible uses of the site	**9**.Comments noted. Refer to Key Topic 4.12 (Sequalitchew Creek Ravine Character).
	Geotech dewatering impacts, other possible uses for the site	**10**. Comments noted. See Key Topics 4.1 (Earth) and 4.12 (Sequalitchew Creek Ravine Character).
	Potable water impacts from dewatering and contamination	**11.** The comments related to the importance of surface and groundwater resources is noted. Refer to Key Topics 4.3 (Groundwater) and 4.4 (Surface Water) of this Chapter for discussion on the potential for impacts to water resources under the Proposed Action.
Letter 217 – Torres	General environmental impacts	**1.** Comments noted.
	Air quality impacts from mining	**2.** Comment noted. Refer to Key Topic 4.2 (Air Quality).
	Groundwater quality impacts	**3**. Refer to Key Topic 4.3 (Groundwater).
	Potable water impacts from dewatering and contamination, general surface water impacts	4. Refer to Key Topics 4.3 (Groundwater).
	General plants and animals impacts	**5.** Comment noted. Refer to Key Topic 4.6 (Plants & Animals).
	Noise impacts from mining	**6.** Comment noted. Refer to Key Topic 4.7 (Noise).
	General environmental impacts	**7.** Comments noted. Refer to Key Topics 4.2 (Air Quality) and 4.6 (Plants & Animals).
	General surface water impacts	**8.** Comment noted. Refer to Key Topic 4.4 (Surface Water).
	General transportation impacts	**9.** Comment noted. Refer to Key Topic 4.11 (Transportation).
	Erosion/landslides impact from vegetation and topsoil removal, and mining, air quality impacts from mining	**10**. Comments noted. Refer to Key Topics 4.1 (Earth), 4.2 (Air Quality), 4.4 (Surface Water), and 4.7 (Noise).

LETTER	TOPIC	COMMENT RESPONSE
Letter 218 – Torres-Figueroa	Groundwater level impacts from dewatering	**1**. Refer to Key Topics 4.3 (Groundwater).
	Sequalitchew Creek impacts from dewatering, wetlands/marshes impacts from dewatering	**2**. Please refer to Key Topic responses 4.4 (Surface Water).
	Dewatering impacts on plants and animals	**3**. Please refer to Key Topic response 4.6 (Plants & Animals).
	Impacts to experience of using Sequalitchew Creek Trail	**4**. Please refer to Key Topic response 4.12 (Sequalitchew Creek aesthetic conditions).
Letter 219 – Trauba	General earth impacts, impacts to experience of using Sequalitchew Creek Trail	**1.** Comment noted. Refer to Key Topic 4.12 (Sequalitchew Creek Character) for discussion on Sequalitchew Creek ravine conditions.
	General air quality/GHG emissions impacts	**2.** Comment noted. Refer to Key Topic 4.2 (Air Quality).
	General groundwater impacts, potable water impacts from dewatering and contamination	**3.** The comments regarding water flows currently affecting the Sequalitchew Creek noted. Refer to Key Topic 4.12 (Sequalitchew Creek Ravine Character).
	General surface water impacts	**4.** Comment noted. Refer to Key Topic 4.4 (Surface Water).
	General plants and animals impacts	**5.** Comment noted. Refer to Key Topic 4.6 (Plants & Animals).
	General noise impacts	**6.** Comment noted. Refer to Key Topic 4.7 (Noise).
	Against project	**7.** Comment noted.
	General aesthetic impacts	**8.** Comment noted. Refer to Key Topic 4.9 (Aesthetics).
	Surface water quality impacts	**9.** Comment noted. Refer to Key Topic 4.4 (Surface Water).
	General transportation impacts	**10.** Comment noted. Refer to Key Topic 4.11 (Transportation).
	Against project	**11.** Comment noted.
Letter 220 – Tucci	For project/no concerns	**1.** Comment noted.
Letter 221 – Tucci	For project/no concerns, economic contribution of mine to regional economy and businesses	**1.** Comments noted.
Letter 222 – Underwood	Attached letter is Letter 223	See response to Letter 223
Letter 223 - Underwood	General groundwater impacts	**1**. The comments regarding the importance of the Vashon Aquifer are noted. Refer to Key Topic 4.3 (Groundwater).
	Groundwater level impacts from dewatering, wetlands/bodies of water impacts from dewatering	**2**. Refer to Key Topics 3.3 (Groundwater) and 3.4 (Surface Water).
	Geotech dewatering impacts	**3.** Comment noted. Refer to Key Topic 4.1 (Earth).
	Saltwater intrusion with dewatering	**4.** Refer to Key Topic 4.3 (Groundwater).

LETTER	TOPIC	COMMENT RESPONSE
	Air quality impacts from mining, noise impacts from mining	**5.** Comments noted. Refer to Key Topic 4.2 (Air Quality) and 4.7 (Noise)
	Groundwater quality impacts	**6.** Refer to Key Topic 4.3 (Groundwater).
	Dewatering impacts on plants and animals	**7.** Comment noted. Refer to Key Topic 4.6 (Plants & Animals).
	Mining above groundwater to avoid impacts, implement comprehensive groundwater management plan, against project	**8.** For discussion of potential alternatives that do not involve dewatering, see Key Topic 4.13 (Alternatives Considered).
Letter 224 – Uneikis	Toxic cleanup/Tacoma smelter plume	**1.** Comment noted. Refer to Key Topic 4.1 (Earth) for discussion on the potential for mining activity to mobilize existing contaminated soils.
	Toxic cleanup/Tacoma smelter plume	**2.** Comment noted. Refer to Key Topic 4.1 (Earth) for discussion on the potential for mining activity to mobilize existing contaminated soils.
	Groundwater level impacts from dewatering, plants and animals impacts from dewatering	**3.** Refer to Key Topics 4.6 (Plants & Animals) and 4.12 (Sequalitchew Creek Character Conditions).
	Aesthetic impacts of mining expansion	**4.** Comment noted. Refer to Key Topic 4.9 (Aesthetics).
	General plants and animals impacts, replace landmark trees survival with dewatering	**5.** Comment noted. Refer to Key Topic (Plants & Animals).
	General noise impacts	**6.** Comment noted. Refer to Key Topic 4.7 (Noise).
	Impacts to experience of using Sequalitchew Creek Trail	**7.** Comment noted. Refer to Key Topic 4.12 (Sequalitchew Creek Character) for discussion on Sequalitchew Creek ravine conditions.
	General environmental impacts	**8.** Comment noted.
	Against project	**9.** Comment noted.
Letter 225 – VanBeurden	Against project	**1.** Comment noted.
Letter 226 – Velazquez	General environmental impacts, potential for fire due to drying of vegetation along Sequalitchew Creek with dewatering	**1.** The comment regarding risk of increased fire hazard is noted. Refer to Key Topics 4.3 (Groundwater), 4.4 (Surface Water), and 4.6 (Plants & Animals).
	Existing air quality/climate change conditions and exacerbation with dewatering	**2.** Comments noted. Refer to Key Topic 4.2 (Air Quality).
	General surface water impacts	**3.** Comment noted. Refer to Key Topic 4.4 (Surface Water).
	Displacement of animals with mining and associated impacts	**4.** Comment noted. Refer to Key Topic 4.6 (Plants & Animals).
	Air quality/climate change impacts due to tree/vegetation removal	**5.** Comment noted. Refer to Key Topic 4.2 (Air Quality).

LETTER	TOPIC	COMMENT RESPONSE
Letter 227 – Wagner	Flooding due to aquifer compaction/depletion, dewatering impacts on animals	**1**. Comments noted. Refer to Key Topics 4.3 (Groundwater), and 4.4 (Surface Water) for discussion on water resources conditions.
	Noise impacts from mining, cumulative noise impacts	**2.** Comments noted. Refer to Key Topic 4.7 (Noise).
Letter 228 – Walrath	Mineral resources in area are of high quality and needed to build infrastructure	**1.** The comment regarding the need for aggregate resources is noted.
Letter 229 – Walrath	Economic contribution of mine to regional economy and businesses	**1**. The comment regarding the need for aggregate resources is noted.
Letter 230 – Walsh	Geotech dewatering impacts, wetlands/bodies of water impacts from dewatering, general environmental impacts	**1**. The comments regarding the potential for dewatering to impact water resources and habitat are noted. Refer to Key Topics 4.3 (Groundwater), 4.4 (Surface Water), 4.5 (Fisheries), and 4.6 (Plants & Animals).
	Against project, adequacy of mitigation and substantial nature of unavoidable impacts	**2**. Comments noted. Refer to Key Topics 4.3 (Groundwater), 4.4 (Surface Water), 4.6 (Plants & Animals) and 4.12 (Sequalitchew Creek Ravine Character).
	Potential for fire due to drying of vegetation along Sequalitchew Creek Trail	**3.** Please refer to Key Topic responses 4.3 (Groundwater) and 4.6 (Plants & Animals).
	Sequalitchew Creek impacts from dewatering, against project	4. Please refer to Key Topic responses 4.4 (Groundwater).
	Against project	**5.** Comment noted.
Letter 231 – Walsh	Property value impacts	**1.** Property values is not an environmental element analyzed under the Washington State Environmental Policy Act (SEPA). The Draft EIS includes a detailed evaluation of the potential for impacts to land uses in the vicinity of the Proposed Action. See Section 3.8 (Land Use) of the Draft EIS and key Topic 4.8 of this Chapter.
	Against project	**2.** Comment noted.
Letter 232 – White	Air quality impacts from mining	**1.** Comment noted. Refer to Key Topic 4.2 (Air Quality).
	Potable water impacts from dewatering and contamination	**2**. Please refer to Key Topic response 4.3 (Groundwater).
	Displacement of animals with mining and associated impacts	**3.** Comment noted. Refer to Key Topic 4.6 (Plants & Animals).
	Noise impacts from mining	**4.** Comment noted. Refer to Key Topic 4.7 (Noise).
	General aesthetic impacts, impacts to experience of using Sequalitchew Creek Trail	**5.** Comments noted. Refer to Key Topics 4.9 (Aesthetics) and 4.12 (Sequalitchew Creek Character Condition).
	Cumulative transportation impacts	**6.** Comment noted. Refer to Key Topic 4.11 (Transportation).

LETTER	TOPIC	COMMENT RESPONSE
	Potential for fire due to drying of vegetation along Sequalitchew Creek with dewatering	**7**. Comments noted. Refer to Key Topics 4.3 (Groundwater), 4.4 (Surface Water), and 4.6 (Plants & Animals) for discussion on water resources and habitat conditions.
Letter 233 – Whitted	Dewatering impacts on plants and animals, against project	**1.** Comments noted. Refer to Key Topic 4.6 (Plants & Animals).
Letter 234 – Wilkinson	General environmental impacts	**1.** Comments noted.
Letter 235 – Williams	General groundwater impacts	**1.** Comment noted.
	Air quality/climate change impacts due to tree/vegetation removal	**2.** Comment noted. Refer to Key Topic 4.2 (Air Quality).
	Mining above groundwater to avoid impacts	**3.** Please refer to Key Topic response 4.13.1 (Alternatives Considered) regarding EIS alternatives.
	General surface water impacts	**4**. Please refer to Key Topic response 4.4.6 (General Surface Water Impacts).
	Dewatering impacts on animals	**5.** Comment noted. Refer to Key Topic 4.6 (Plants & Animals).
	Noise impacts from mining, quality of life impacts	**6.** Comment noted. Refer to Key Topic 4.7 (Noise).
	Impacts to experience of using Sequalitchew Creek Trail	**7.** Comment noted. Refer to Key Topic 4.12 (Sequalitchew Creek Character) for discussion on Sequalitchew Creek ravine conditions.
	Truck traffic impacts	**8.** Comment noted. Refer to Key Topic 4.11 (Transportation).
	Community need for medical and emergency services, need for education about aquifer	**9**. The comments regarding community services are noted. For discussion of groundwater aquifer studies performed to date, see Sections 3.3 (Groundwater), 3.4 (Surface Water), Appendix B, and Appendix E to the EIS, as well as Key Topic 4.3 (Groundwater).
Letter 236 – Winkler	Mining above groundwater to avoid impacts	**1**. Comments noted. Refer to Key Topics 4.3 (Groundwater), 4.4 (Surface Water), and 4.6 (Plants & Animals) for discussion on water resources and habitat conditions.
	Wetlands/bodies of water impacts from dewatering, dewatering impacts on plants	**2**. Please refer to Key Topic responses 4.4 (Surface Water) and 4.6 (Plants & Animals).
	Potential for fire due to drying of vegetation along Sequalitchew Creek	**3**. Please refer to Key Topic responses 4.3 (Groundwater) and 4.6 (Plants & Animals).
	Mining above groundwater to avoid impacts	**4**. Comments noted. Refer to Key Topics 4.3 (Groundwater), 4.4 (Surface Water), and 4.6 (Plants & Animals) for discussion on water resources and habitat conditions.

LETTER	TOPIC	COMMENT RESPONSE
Letter 237 – Winkler	Mining above groundwater to avoid impacts, potential for fire due to drying of vegetation along Sequalitchew Creek	**1.** Please refer to Key Topic responses 4.1 (Earth), 4.6 (Plants & Animals), and 4.13.1 (Alternatives Considered).
	Potential for fire due to drying of vegetation along Sequalitchew Creek	**2.** Please refer to Key Topic responses 4.3 (Groundwater) and 4.6 (Plants & Animals).
	Potential for fire due to drying of vegetation along Sequalitchew Creek	**3.** Please refer to Key Topic responses 4.3 (Groundwater) and 4.6 (Plants & Animals).
Letter 238 – Zwerling	Against project	**1.** Comment noted.
	General air quality/GHG emissions impacts	**2.** Comment noted. Refer to Key Topic 4.2 (Air Quality).
	Groundwater quality impacts	**3.** Comment noted. Refer to Key Topic 4.3 (Groundwater).
	General surface water impacts	**4.** Comment noted. Refer to Key Topic 4.4 (Surface Water).
	General plants and animals impacts	**5.** Comment noted. Refer to Key Topic 4.6 (Plants & Animals).
	General noise impacts	**6.** Comment noted. Refer to Key Topic 4.7 (Noise).
	Against project	**7.** Comment noted.
	Impacts to experience of using Sequalitchew Creek Trail	**8.** Comment noted. Refer to Key Topic 4.12 (Sequalitchew Creek Character) for discussion on Sequalitchew Creek ravine conditions.
	Truck traffic impacts	**9.** Comment noted. Refer to Key Topic 4.11 (Transportation).
	General environmental impacts	**10.** Comment noted.

Chapter 5

ACRONYMS & ABBREVIATIONS

CHAPTER 5
ACRONYMS

ADI	Area of Direct Impacts
ASTM	American Society of Testing Materials
AV	Assessed Value
B&O	Business and Occupation Taxes
BMPs	Best Management Practices
CAP	Cleanup Action Plan
CFS	Cubic Feet Per Seconds
CMTs	Culturally modified trees
CO	Carbon monoxide
CP	Community Park
DAHP	Washington Department of Archaeology and Historic Preservation
DEIS	Draft Environmental Impact Statement
DMC	DuPont Municipal Code
DNR	Department of Natural Resources
DS	Determination of Significance
EDNA	Environmental Designation for Noise Abatement
EIS	Environmental Impact Statement
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
FEIS	Final Environmental Impact Statement
GHAs	Geologically Hazardous Areas
GMA	Growth Management Act
HBC	Hudson's Bay Company
I-5	Interstate-5
JBLM	Joint Base Lewis McChord
KVPs	Key Viewpoints
MOA	Memorandum of Agreement
MOU	Memorandum of Understanding
MRP	Manufacturing and Research Park
NAAQS	National Ambient Air Quality Standards
NDA	Nisqually Delta Association
NGVD	National Geodetic Vertical Datum
NRHP	National Register of Historic Places
NTU	Nephelometric Turbidity Units
O&M	Operations and Maintenance
PSAC	Puget Sound Agricultural Company
PSCAA	Puget Sound Clean Air Agency
Qgog	Vashon-Age Recessional Sand and Gravel

Qob	Olympia Beds
Qpog	Pre-Olympia Glacial Deposits
Qvr	Vashon Recessional Outwash
Qvs	Steilacoom Gravel
R-4	Residential
RCW	Revised Code of Washington
REET	Real Estate Excise Tax
RFEGs	Regional Enhancement Groups
RR	Residential Reserve
SEPA	State Environmental Policy Act
SEIS	Supplemental Environmental Impact Statement
SHPO	State Historic Preservation Office
SPSSEG	South Puget Sound Salmon Enhancement Group
SWPPP	Stormwater Pollution Prevention Plan
TCPs	Traditional Cultural Places
THPO	Nisqually Tribal Historic Preservation Officer
TRS	Taxable Retail Sales
TSP	Tacoma Smelter Plume
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
VCP	Voluntary Cleanup Program
WAC	Washington Administrative Code
WDFW	Washington Department of Fish and Wildlife
WEC	Washington Environmental Council
WHR	Washington Heritage Register
WISAARD	Washington Information System of Archaeological & Architectural Records Data
WSDOT	Washington State Department of Transportation

Chapter 6
REFERENCES

CHAPTER 6
REFERENCES

Anchor QEA. Fisheries Technical Report, June 2023.

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Aspect Consulting. South Parcel Monitoring Plan, November 22, 2017.

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City of DuPont Comprehensive Plan (2015 Periodic Update).

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Appendix B

Earth and Water Resources Report

EARTH AND WATER RESOURCES REPORT

Pioneer Aggregates South Parcel Project

Prepared for: CalPortland

Project No. 040001-018 ○ February 13, 2025 FINAL REV. 2

Aspect
A Geosyntec Company

earth + water

EARTH AND WATER RESOURCES REPORT

Pioneer Aggregates South Parcel Project

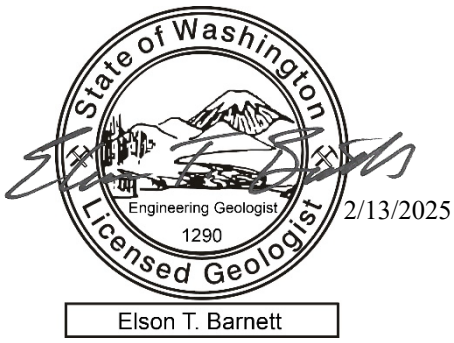
Prepared For: CalPortland

Project No. 040001-018 ○ February 13, 2025 FINAL REV. 2

Aspect Consulting



2/13/2025



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Contents

1 Introduction 1
1.1 Description of the Proposed Action 1
1.1.1 Existing Mine 2
1.1.2 South Parcel Project 3
1.2 Description of No Action Alternative 7

2 Geology and Slope Stability 9
2.1 Affected Environment 9
2.1.1 Topography and Landform Geography 9
2.1.2 Regional Tectonic Setting 10
2.1.3 Regional Geology and Geologic History 10
2.1.4 Site Geology 11
2.1.5 Hydrogeology 14
2.1.6 Geologically Hazardous Areas 14
2.2 Effects of the Proposed Action 17
2.2.1 Changes in Topography 17
2.2.2 Slope Stability 18
2.2.3 Erosion Potential 20
2.2.4 Steep Slope Buffer 20
2.2.5 Soil Settlement Potential 21
2.2.6 Topsoil Removal and Replacement 22
2.2.7 Effects on Geologically Hazardous Areas 23
2.3 Effects of the No Action Alternative 25
2.4 Mitigation Measures 25
2.5 Cumulative Impacts of Proposed Action and Restoration Plan 27
2.6 Significant Unavoidable Adverse Impacts 27

3 Groundwater 28
3.1 Affected Environment 29
3.1.1 Primary Data Sources 29
3.1.2 Primary Hydrogeologic Units 30
3.1.3 Groundwater Elevations and Flow Patterns 32
3.1.4 Groundwater Quality 34
3.1.5 Drinking Water Supplies 34
3.1.6 Springs 35
3.2 Effects of the Proposed Action 37
3.2.1 Groundwater Elevations and Flow Patterns 37
3.2.2 Groundwater Quality 41
3.2.3 Drinking Water Supplies 43
3.2.4 Springs 43
3.3 Effects of the No Action Alternative 44

3.4 Mitigation Measures 44
3.5 Significant Unavoidable Adverse Impacts 45
3.5.1 Groundwater Elevations and Flow Patterns 45
3.5.2 Groundwater Quality 45
3.5.3 Drinking Water Supplies 45
3.5.4 Springs 45

4 Surface Water and Stormwater 46
4.1 Affected Environment 46
4.1.1 Climate 46
4.1.2 Surface Water Features 47
4.1.3 Surface Water Quality 55
4.2 Effects of the Proposed Action 57
4.2.1 Site Water Balance 58
4.2.2 Mine Stormwater Management 60
4.2.3 Sequalitchew Creek Watershed 64
4.3 Effects of the No Action Alternative 71
4.4 Mitigation Measures 71
4.4.1 Mine Best Management Practices 72
4.4.2 Monitoring Plan 72
4.4.3 Sequalitchew Creek Watershed Restoration Plan 74
4.5 Cumulative Effects of Proposed Action and Restoration Plan 76
4.5.1 Marsh Water Levels 76
4.5.2 Edmond Marsh Water Quality 78
4.5.3 Sequalitchew Creek Streamflow 79
4.5.4 Sequalitchew Creek Water Quality 82
4.6 Significant Unavoidable Adverse Impacts 83

5 References 85

6 Limitations 91

List of Tables

1 Summary of Existing and Post-Reclamation Land Uses for Proposed Action

2 Estimated Annual Quantities and Timing of Aggregate Mining *(in text)* 7

3 Parcels, Zoning, and Potential Development for No Action Alternative *(in text)* 8

4 Summary of Factor of Safety Values for Slope Stability Analysis Results *(in text)* 19

5 Well Data Inventory

List of Tables (continued)

6 Summary of Hydrostratigraphic Units and Calibrated Parameter Values

7 Predicted Groundwater Dewatering Rates by Step

8 Well-Specific Maximum Water Level Changes

9 Sources of Water to the Intertidal Springs *(in text)* 36

10 Minimum Predicted Groundwater Levels for Each Dewatering Step

11 Surface Water Monitoring Station Inventory

12 Surface Water Elevations in Sequalitchew Creek Watershed

13 Summary of Surface Water Flows in Sequalitchew Creek

14 State Water Quality Standards Applicable to Sequalitchew Creek and Sequalitchew Lake *(in text)* 56

15 Summary of Surface Water Quality in Sequalitchew Creek Watershed

16 Land Use Scenarios Used in Mine Area Water Balance

17 Annual Average Mine Area Water Balance

18 Peak Surface Runoff Flows

19 Summary of Proposed Stormwater Quality Ponds *(in text)* 61

20 Summary of Proposed Infiltration Ponds *(in text)* 62

21 Percent Contribution of Subsurface Inflows/Outflows to the Total Inflows/Outflows for Marshes *(in text)* 69

22 Restoration Plan Elements in City of DuPont

23 Restoration Plan Elements on JBLM

24 Average Gains/Losses in Wetlands with Proposed Action and Restoration Plan *(in text)* 78

25 Predicted Flows in Sequalitchew Creek with Mining and Restoration *(in text)* 81

List of Figures

1 Vicinity Map

2 Project Site Plan

3 No Action Site Plan

4 Existing Topography

5 Site Explorations Map

6 Regional Geologic Map

7 Geologic Map

8 Generalized Geologic Cross Section – X-X’

9 Geologic Hazard Maps – Existing Conditions

10 Geologic Hazard Maps – Proposed Conditions

11 Slope Stability Sections – Proposed Conditions

12 Groundwater and Surface Water Monitoring Locations

13 Observed Groundwater Levels

14 Map of Water Table Conditions – May 2010

15 Map of Model-Calculated Water Table Range – Baseline

16 Hydrogeologic Cross Section – A-A’

17 Hydrogeologic Cross Section – B-B’

18 Groundwater Model Layout

19 Comparison of Observed and Calculated Groundwater Levels

20 Predicted Changes and Ranges in Groundwater Levels

21 Dewatering Plan

22 Map of Maximum Calculated Groundwater Level Changes: Step 1

23 Map of Maximum Calculated Groundwater Level Changes: Step 2

24 Map of Maximum Calculated Groundwater Level Changes: Step 3

25 Map of Maximum Calculated Groundwater Level Changes: Post Mining

26 Average Precipitation and Temperature by Month

27 Surface Water System

28 Edmond Marsh Cross Sections – C-C’

List of Figures (continued)

29 Bell, McKay, and Hamer Marsh Cross Sections – D-D' and E-E'

30 Streamflow Hydrograph for Diversion Weir and Sequalitchew Creek

31 Proposed Drainage Basins and Stormwater Management Facilities

32 Water Balance Marsh Segments and Flows

33 Water Balance Calibration for Hamer and East Edmond Marshes

34 Water Balance Calibration for West Edmond Marsh

35 Predicted Marsh Hydrographs with Mining and Restoration

36 Predicted Streamflow Hydrograph for Sequalitchew Creek with Mining Only

37 Predicted Hydrographs for Pond and Old Fort Lakes

38 Restoration Plan Elements

39 Predicted Average Monthly Streamflow Hydrographs for Sequalitchew Creek

40 Predicted Streamflow Hydrograph for Sequalitchew Creek with Mining and Restoration

41 Predicted Effects on Stream Temperature in Sequalitchew Creek

List of Appendices

A Select Boring Logs

B Hydrographs of Groundwater and Surface Water Monitoring Data

C Groundwater Elevation Contour Maps

D Intertidal Springs Evaluation

E Site Water Balance Results

F Wetland Water Balance Calculations

1 Introduction

Glacier Northwest, Inc. dba CalPortland is seeking regulatory approvals for the Pioneer Aggregates South Parcel Project ("South Parcel Project"), which proposes to extend sand and gravel mine operations to the southeast of existing activities at the Pioneer Aggregates Mine in DuPont, Washington. Figure 1 provides an overview map of the South Parcel Project.

This document evaluates the environmental conditions and potential impacts of the South Parcel Project, and potential alternative actions, on earth and water resources. These analyses are being conducted as a component of the State Environmental Policy Act (SEPA) evaluation for the South Parcel Project.

The report is divided into three main sections: Geology, Groundwater, and Surface Water. The Geology section summarizes the geologic conditions and geologic hazards, and analyzes the stability of the existing and proposed slopes. The Groundwater and Surface Water sections describe the existing systems, identify the effects of mining on water resources, and provide preliminary design concepts for stormwater and erosion controls.

1.1 Description of the Proposed Action

Consistent with the 2012 Settlement Agreement (discussed further below), the South Parcel Project (Proposed Action) includes horizontal expansion of mining into approximately 188 acres previously undisturbed by mining, and vertical expansion of approximately 125 acres where re-mining would deepen a portion of the existing mine. The South Parcel Project would extend mining at the current rate for approximately 14 additional years.

The proposed South Parcel Project activities would be focused southeast of the existing Pioneer Aggregates Mine in the City of DuPont (City), southwestern Pierce County, sections 22, 23, and 26, Township 19 North, Range 1 East of the Willamette Meridian. The South Parcel Project is bordered to the north and west by the existing Pioneer Aggregates mine; to the east by industrial/distribution facilities including Amazon, Dania, Pier 1 Imports, and FedEx; and to the south by Sequalitchew Creek and the Creekside Village residential development. The South Parcel Project would occur on lands owned by Weyerhaeuser Company and leased to CalPortland.

The South Parcel Project includes mining within areas previously undisturbed by mining (termed the "Expansion Area") and mining deeper within a portion of existing mine, referred to as the "Re-Mine Area." The Expansion Area is approximately 188 acres and is comprised of three subareas, shown on Figure 2. The Kettle Area is a 10.8-acre previously undisturbed area that includes the Kettle Wetland. The 9.2-acre Buffer Strip is a strip of vegetation that was retained along the inside of the originally permitted mine bordering the South Parcel. The South Parcel is 167.5 acres located southeast of the

original mine and inside the Mineral Resource Overlay in the City's adopted Comprehensive Plan.

The Re-Mine Area consists of 125 acres in the southeastern portion of the existing mine where groundwater limits the depth of current mining activities.

The South Parcel Project was developed consistent with a 2012 Settlement Agreement between CalPortland, the City of DuPont, the Washington State Department of Ecology (Ecology), and a coalition of environmental groups collectively referred to as the Environmental Caucus. The Settlement Agreement describes a process for a Restoration Plan for the Sequalitchew Creek watershed to be permitted and implemented contemporaneously with mining of the South Parcel. The Restoration Plan is designed "to help restore and enhance the Sequalitchew Creek watershed, including flows along the entire length of the Creek." The Restoration Plan is not intended solely as mitigation for the South Parcel Project, and the benefits of implementing would more than mitigate for the impacts of the mine. The Restoration Plan is described in Section 4.4.3.

1.1.1 Existing Mine

CalPortland's original sand and gravel mine was permitted in 1996 (355 acres). As provided under the Settlement Agreement, CalPortland applied for permits in 2013 for the North Parcel Mine Expansion to allow mining of approximately 142 acres within the North Parcel. Following the publication of a Final EIS in June 2013, the North Parcel mining expansion was permitted in 2014.

Activities at the existing site include mining and reclamation, processing, transport of sand and gravel, and manufacturing of concrete. The processing area is located adjacent to the mine site on a 52-acre parcel owned by Glacier Northwest (Glacier). Sand and gravel is removed from the mine by bulldozers and wheel loaders and transferred to the processing area by conveyor belts. At the processing facility, the material from the mine is crushed, washed, and separated into different size gradations. Aggregate products are stored in stockpiles in the processing area for distribution.

After completion of the production process, the majority (approximately 80 percent) of the finished aggregate products are transported from the plant area by conveyors and placed onto barges at Glacier's dock and barge-loading facility at Tatsolo Point. The remainder (approximately 20 percent) is sold as aggregate or used to make concrete on-site; in both cases it is transported by truck.

Water used to wash gravel during processing is recycled through a clarifying process to remove silt and clay. This fine material is run through a belt press to remove excess water, transported by truck, and then placed in holding cells in the mine, where it is allowed to dry for up to 3 years.

After drying, fines may be used to raise the floor of the mine by placing the material in cells separated by rock curtains to facilitate drainage. The material is placed in approximately 6-inch lifts and compacted to a material dry density of 90 percent (ASTM D1557) or greater. Once filled to the desired height with fines from the belt press in this manner, a gravel cap of not less than 10 feet is placed over the compacted fines to mitigate potential for settlement and facilitate drainage.

1.1.2 South Parcel Project

The proposed South Parcel Project includes expansion of the mine footprint by approximately 188 acres and extension of the existing rate of mining for an additional approximate 14-year period (depending on market conditions), increasing the available sand and gravel resources by 30 to 40 million tons. The Expansion Area is located within a Mineral Resource Overlay applied by the City's Comprehensive Plan. The purpose of the overlay is to conserve mineral resources of long-term commercial significance, as required by the Growth Management Act.

The South Parcel Project would involve six primary activities: logging, clearing and topsoil removal, groundwater management, mining, processing and transport, and reclamation. These activities would overlap, with multiple actions occurring in different portions of the mine at any one time. For example, while active mining is occurring in one portion of the mine, earlier-mined areas may be reclaimed, and other areas to be mined next could be cleared and having topsoil stockpiled.

The following sections provide descriptions of each of the primary activities involved in mining sand and gravel.

1.1.2.1 Logging

Timber was last logged from the South Parcel several decades ago, but tree cutting would still be needed prior to clearing and mining in the Expansion Area. A substantial portion of the proposed mining would occur within previously reclaimed areas of the existing mine (i.e., the Re-Mine Area) or in previously unmined areas where Scot’s broom shrub dominates the landscape. The Expansion Area would be logged at a single time prior to initiating mining.

1.1.2.2 Clearing and Topsoil Removal

Prior to mining, excavators would remove stumps and vegetation. This material would then be processed through a portable tub grinder and used to amend topsoil for use in reclamation. Clearing and topsoil removal would occur in the mine area, in segments as mining advances into the Expansion Area, over the life of the project.

The Expansion Area is located downwind of the former Asarco copper smelter and refinery in Ruston, Washington. Airborne pollution emitted from the former smelter has resulted in a 1,000-square-mile, area-wide plume of arsenic- and lead-contaminated soil known as the Tacoma Smelter Plume. Surficial soils in the Expansion Area that have been undisturbed since the mid-1980s may contain arsenic and lead at concentrations above cleanup levels. These soils would be cleaned up under an approved plan developed in consultation with Ecology through the Voluntary Cleanup Program (VCP). The plan incorporates the same process that is being successfully implemented on the North Parcel.

1.1.2.3 Groundwater Management

An existing aquifer is present in the sands and gravels to be mined under the South Parcel Project. Wells would be installed and pumped in advance of mining to intercept groundwater and dry out the gravels for mining. The mining plan is designed to minimize the amount of time that active dewatering by pumping wells is required.

Mining under the South Parcel Project would proceed slowly from the north to the south over a period of 5 to 8 years, extracting gravel to create a broad trough along the eastern property boundary. Once mining of each section of trough is completed, the adjacent wells can be turned off, allowing groundwater to passively seep from the stable mine slope and flow by gravity to an infiltration facility on the floor of the existing mine. After mining the trough along the perimeter, gravel would be extracted from the interior area over an approximately 6- to 9-year period.

A dewatering plan has been developed and is described in detail in the Monitoring Plan (Aspect, 2017a). The dewatering plan involves four steps, occurring over very different time scales. The four steps are:

The initial step is a 60-day pumping test that is completely reversible (i.e., no gravel would be extracted during the test). The results of that test would be analyzed to confirm predictions from the groundwater drawdown model and used to adjust the dewatering plan (well spacing, well screening, etc.) as necessary prior to commencing the next phase. Depending on seasonal timing, the Kettle Wetland (described in Section 4.1.2.1) may be dewatered during the pumping test, but the water level would return after completion of the test. Total duration that Kettle Wetland levels may be dewatered is less than 120 days.

The second step involves installing and pumping additional dewatering wells to lower water levels in the first mine segment in preparation for mining. This step would last about 6 months and functions as a greatly expanded pumping test. As with the initial step, it is also completely reversible. Groundwater observations during pumping would be compared to model predictions to confirm that actual changes in groundwater are within the range predicted during project planning, when potential impacts from the project are evaluated. This step would confirm model predictions before any gravel is removed from the Expansion Area. The Kettle Wetland would be dewatered shortly after commencing this dewatering step and would remain dewatered through the duration of this step, estimated at 180 days.

The third step – active dewatering during mining – involves mining the trough described above. Additional dewatering wells would be installed and pumped as mining progresses. Mining would begin at the location farthest from the Edmond Marsh and Sequalitchew Creek and proceed slowly south. Completing the trough would require 5 to 8 years depending on market conditions and the success in meeting predicted groundwater levels. The potential impact on groundwater levels builds slowly over time as wells are added and mining progresses to the south. This allows ample opportunity to monitor, confirm model predictions, and adapt to the conditions observed before mining proceeds into each dewatered segment.

The Kettle Wetland would be removed in the early mining of this dewatering step. The wetland soils and seed bank would be used in construction of the mitigation wetland, as described in the Wetland Mitigation Plan (Anchor QEA, 2021).

The final step – passive dewatering – begins when mining of the trough described above is complete and the last dewatering well is turned off. Passive dewatering represents the groundwater condition that would continue in perpetuity. Groundwater, no longer intercepted by wells, would form seeps at the toe of the eastern mine slope. It would flow by gravity through a conveyance ditch to newly created wetlands on the bottom of the

existing mine and eventually to an infiltration pond. Once this step has begun, further mining activities in the interior of the South Parcel would not affect groundwater outside the footprint of the mine.

In each of the four steps, water generated from dewatering would be conveyed to the floor of the existing mine and infiltrated. Water from the northern portion of the dewatering system would be routed directly to an infiltration pond located in the northern portion of the original mine parcel. Water from the southern portion of the dewatering system would be routed to a constructed mitigation wetland in the southwest corner of the existing mine, then flow north to the same infiltration pond.

1.1.2.4 Mining

The method of mining for the South Parcel Project would be identical to that currently used in the permitted mine area. A bulldozer would push excavated material from the top of the mine face to two front-end loaders working on the mine floor. The front-end loaders would scoop up the sand and gravel and dump it into portable hoppers that feed conveyors leading to the processing area.

The mine face of each sequence area would be a maximum of 80 feet high and would decrease as mine activities progress. During reclamation, the graded side slopes and mine areas would be revegetated and stabilized in accordance with the mine reclamation plan.

A conveyor would start at the north end of the Expansion Area and would be extended south as mining progresses. The conveyor is comprised of a 48-inch-wide rubberized belt supported by a series of rollers, called idlers, mounted on steel-framed segments that support the conveyor about 5 feet off the ground.

As mentioned above, clearing of the Expansion Area would occur in sequences lasting approximately 1 year, in coordination with mining and construction activities. Mass clearing of the site would not occur.

A 20-foot-high noise berm would be constructed along the southern boundary of the South Parcel behind retained vegetation to reduce potential noise associated with mining for adjacent land uses. The berm would be constructed prior to clearing in the adjacent portion of the South Parcel.

The project would directly impact an approximately 1.78-acre Kettle Wetland located within the existing mine just west of the South Parcel. The Kettle Wetland would be impacted by dewatering in preparation for mining, then removed during the initial phases of mining of the South Parcel Project. Impacts to the Kettle Wetland would be mitigated by creation of a larger wetland, referred to in this report as the constructed mitigation wetland, within the existing mine. Detailed analysis of the wetland impacts and mitigation are described in the Wetland Mitigation Plan (Anchor QEA, 2021).

1.1.2.5 Processing and Transport

Material mined under the South Parcel Project would be conveyed from the mine to the existing processing facility and processed in the same general manner as at present. The material extracted under the South Parcel Project is anticipated to have a higher moisture content and fines content than the aggregate currently being extracted. As a result, there

may be minor adjustments to some of the equipment used in the processing area, but the overall process and most of the equipment would remain unchanged.

Water is used to wash the raw material conveyed from the mine to remove silt and clay. Sand and gravel smaller than 1.5 inches pass through a screening and classifying process that separates and conveys the material to a series of stockpiles sorted by size and stacked on the south side of the processing plant. Stones larger than 1.5 inches are crushed, sorted by size, and conveyed to a series of crushed-rock stockpiles sorted by size north of the processing plant. Screening equipment, rock crushers, and other processing equipment are located between the stockpiles of sorted rock products. Custom blended rock products are also made to customer specifications.

More than 95 percent of water used to process the mined material is recycled through a treatment system where silt and clay is removed so the water can be reused to process more raw material from the mine.

The mode and extent of transporting aggregate products from the site would not change relative to existing operations. Approximately 80 percent of the product would be loaded onto barges at the existing dock at Tatsolo Point and transported to the Puget Sound regional market by barges. Approximately 20 percent of the product would be transported to the local market by truck. Some material would continue to be incorporated into concrete at the existing on-site concrete batch plant serving the local market.

1.1.2.6 Reclamation

As mining progresses, completed mine segments would be reclaimed. The reclamation plan would be reviewed by the Washington State Department of Natural Resources (DNR) for consistency with the Surface Mining Act (RCW 78.44). In general, reclamation would consist of regrading, replacement of topsoil, and revegetation. Glacier is in the process of preparing an application to revise the existing reclamation plan incorporated into the surface mining permit. DNR cannot approve the revised reclamation plan until after the City's permits are issued. The proposed reclamation plan would be similar to the plan approved by DNR for the existing mine.

A summary of the change in land uses that would occur as a result of the South Parcel Project mine reclamation is presented in Table 1. As shown in Table 1, the primary change occurring as a result of the South Parcel Project is the conversion of existing wooded areas into areas reclaimed as forest and as grass. Generally, the steeper slope areas would be reclaimed as forest and flat and gently sloping areas would be reclaimed as grass lands to support future redevelopment. This is true for areas within the South Parcel as well as the Kettle Area, Buffer Area, and the Re-Mine Area.

1.1.2.7 Estimated Volume and Extraction Rates

Estimated mining quantities are shown in Table 2. Based on past market demand, material would be extracted at an average rate of approximately 2.8 million cubic yards per year. An estimated 30 to 40 million cubic yards of material would be extracted as part of the South Parcel Project, which would extend the life of the current operation by about 14 years. The actual extraction rate and life of the mine would depend on the market demand for materials.

Table 2. Estimated Annual Quantities and Timing of Aggregate Mining

Timing	Existing Mine[1]	South Parcel Project
Years 1 through 14	1.4 million cy	1.4 million cy
Years 15 through 19	0	2.8 million cy

Notes: cy = cubic yards. [1] Existing mine includes North Parcel.

1.2 Description of No Action Alternative

This document also evaluates the No Action alternative, which is required by SEPA. No Action can be interpreted in two ways. It could mean that nothing happens on the site, which would essentially continue existing conditions. "No action" is also commonly interpreted to mean that the City would take no action on the mining proposal, but that does not necessarily mean that nothing would happen on the subject site. Although the South Parcel property would not be mined, it could be developed consistent with existing land use and zoning designations. Development potential under applicable zoning is described below.

Portions of the South Parcel are zoned for Manufacturing and Research Park (MRP; 136.2 acres), Residential-4 (R-4; 16.1 acres), Residential Reserve (RR; 22.3 acres), and Open Space (3.8 acres) uses. The MRP zoned areas are currently subject to restrictive covenants related to the Former DuPont Works Cleanup Site, which restrict use of the property to industrial uses. Remediation and rezoning are considered speculative, however, and would not be consistent with a "No Action" scenario.

The extent of development could vary considerably depending on zoning/density, site planning, economic considerations, and numerous site-specific, project-specific, and regulatory requirements including setbacks, open space, and the presence of critical areas. The following is intended to be a general estimate of the possible intensity of development for purposes of analysis only and is based primarily on zoned density and permitted site coverage. The development scenario for the South Parcel is reflected in Table 1. Development estimates are based on assumptions of building and parking areas as a percentage of developable area and do not represent a specific, or detailed, development proposal.

Areas zoned MRP would be available for development of up to 112 acres of light manufacturing and research park. Buildings may be up to 65 to 70 feet tall, and there are no maximum lot coverage requirements other than necessary to meet required setback (25 feet on the front property line, 15 feet on the sides and rear) and landscaping (20 percent of lot area) requirements. This zoned area could yield approximately 109 acres of impervious area at up to 80 percent lot coverage. The areas of the South Parcel zoned R-4 could be developed at a density of up to 4.5 single-family residences per gross acre[1], resulting in a total of approximately 76 residences and 69 percent impervious coverage[2].

[1] "Gross acre" means land designated for residential purposes in the comprehensive plan, inclusive of related streets and neighborhood parks. DMC 25.10.040.
[2] Impervious area estimates for residential development are based on the density based impervious surface coefficient (ISCs) published by California's Environmental Protection Agency (2010).

An additional four single-family residences could be developed in the smaller portion zoned for Residential Reserve density (one dwelling unit per 5 gross acres) and 34 percent impervious coverage.

There would be no changes in the use of the areas of the South Parcel zoned for Open Space; these areas are currently the naturally vegetated slope of the Sequalitchew Creek ravine and the Sequalitchew Creek pedestrian trail.

A summary of the parcels, zoning, and development potential of the South Parcel is presented in Table 3 and illustrated on Figure 3.

Table 3. Parcels, Zoning, and Potential Development for No Action Alternative

Parcel No.	Zoning	Parcel Area (in acres)	Potential Development
0119262015	MRP	21.0	16.8 acres MRP
	OS	3.7	None
	Total	24.7	16.8 acres MRP
0119262016	MRP	34.0	27.3 acres MRP
0119233016	MRP	19.9	16.0 acres MRP
0119233017	MRP	20.1	16.3 acres MRP
0119233014	MRP	20.3	16.3 acres MRP
0119233015	MRP	20.3	16.4 acres MRP
0119233011	R-4	16.0	72 residences
	R-R	21.9	4 residences
	Total	38.0	76 residences

There would be no change in use of the areas within the existing mine under the No Action alternative scenario; however, once the existing mine is reclaimed it would likely be redeveloped according to its underlying zoning, similar to the South Parcel.

The Kettle Wetland within the existing mine would remain intact, the buffers would remain vegetated, and mining operations would continue in other portions of the existing mine.

2 Geology and Slope Stability

Geologic and geotechnical analyses were performed to determine geologic conditions beneath the existing ground surface of the Proposed Action. These analyses were completed to evaluate the stability of proposed cut slopes and identify areas prone to geologic hazards, such as slope failure or seismically induced soil liquefaction. The analyses rely on geologic investigations conducted over a period of more than 30 years, notably including over 109 borings completed in the late 1980s to facilitate planning of the initial Pioneer Aggregates mine.

Mining of the South Parcel Project would extract sand and gravel from a thick deposit Vashon Recessional Outwash (Qgog) deposit, including the Steilacoom Gravel (Qvs) subunit. These deposits are consistent with the existing mine to the west and north. The planned mining proposed for the South Parcel Project would result in a reduction in groundwater seepage and springs that are observed within the north Sequalitchew Creek ravine slope that will result in making the slopes more stable. Slope stability analyses results indicate proposed mining cut slopes would be relatively stable for static and seismic conditions.

The following Sections 2.1 through 2.6 have been developed using key references that include the Geotechnical Engineering Report (Aspect, 2021a), Critical Areas Report (Anchor and Aspect, 2021), and Groundwater Model Update Report (Aspect, 2017b). A summary of the key data and our analyses are presented below.

2.1 Affected Environment

2.1.1 Topography and Landform Geography

The South Parcel Project includes the Expansion Area, which is previously undisturbed by mining, and the Re-Mine Area, which is a portion of the existing mine that would be mined deeper. Existing topography of both areas is shown on Figure 4. The Expansion Area is generally flat at an elevation of approximately 200 feet.[3] The Re-Mine Area has a rolling slope toward the west down to the floor of the existing mine (western boundary of the expansion). The slopes to the west within the Re-Mine Area vary between a grade of 10 percent to 70 percent locally.

The Sequalitchew Creek ravine is located south and southwest of the South Parcel Project; this ravine forms most of the southern boundary of the existing mine. The ravine deepens as it approaches Puget Sound to a maximum depth of 175 feet below the plateau elevation. Slopes along the northern side of the Sequalitchew Creek Ravine range from approximately 30 percent to 75 percent. A narrow-gauge railroad associated with the former E.I. DuPont de Nemours Company munitions facility was constructed on a bench cut in the northern slope of the ravine; it has since been converted to a public trail.

[3] Elevation relative to the National Geodetic Datum of 1929 (NGVD 29). Unless otherwise noted, all elevations in this report are relative to NGVD 29.

2.1.2 Regional Tectonic Setting

The South Parcel Project lies within the Puget Sound Lowland, between the Cascade and Olympic Mountain ranges. The Cascade and Olympic Mountains and the Puget Sound Lowland result from tectonic forces acting on the oceanic plates and continental plates that constitute the landmass of western North America. Higher-density offshore oceanic plates are being subducted (pulled under) beneath the lower density and more buoyant North American continental plate. The interaction of the oceanic and continental plates puts generally compressive stress on the margins of the plates.

Over the past tens of millions of years, these east-to-west oriented compressive stresses have resulted in uplift of the Olympic and Cascade Mountains, along with volcanism that has further increased the height of the Cascades. The tectonic forces that resulted in uplift of the Cascades and Olympics have also resulted in creation of a basin that lies below the Puget Lowland. Subsidence of the Puget Lowland allowed thick sedimentary sequences to collect in the basin for the last 35 million years. More recently, the sediments in the Puget Lowland have been subjected to north-to-south compressive stresses that have folded and faulted them and created a series of basins and uplifts within the Puget Lowland. These basins extend from the Chehalis area to the Fraser lowland which extends north of the Canadian border.

Tectonic forces that created these lowlands, mountain ranges, and basins remain active today and result in the moderate-size earthquakes that are frequently felt throughout the region as well as infrequent large earthquakes.

2.1.3 Regional Geology and Geologic History

Geologic nomenclature in this report is primarily based on Borden and Troost (2001) and Walsh et al. (2003a and 2003b), which provide the most recent comprehensive regional understanding of Pleistocene stratigraphy in the south-central Puget Lowland. We also reference other nomenclature where previous studies use a different name for the same or similar geologic units.

The most recent ice-sheet glaciation of the Puget Lowland is termed the Vashon Stade of the Fraser Glaciation. Global and regional scientific observations indicate that there were many cooler climatic periods prior to the Vashon glaciation that produced ice-sheet glaciations, and geologists have identified deposits from a number of these pre-Vashon glacial and nonglacial periods in the Puget Lowland (Borden and Troost, 2001).

During the southward advance of the Vashon ice sheet, ice blocked the normal northward drainage of water from the Puget Sound Lowland, creating a pro-glacial lake into which silt, clay, and fine sand were deposited. As the Vashon ice sheet advanced farther southward, meltwater streams and rivers filled the remaining low areas with a blanket of sand and gravel that extended throughout the lowland. These subglacial troughs are visible today as the major waterways of Puget Sound, Hood Canal, Lake Washington, and Lake Sammamish, and many of the broad river valley bottoms in the Puget Lowland. A discontinuous layer of basal till (commonly described as lodgment till in older studies) was deposited where the glacial ice sheet contacted previously deposited sediment.

The Vashon ice sheet was short-lived in the lowland and the glacial ice appears to have stagnated abruptly. Sediment that was entrained on or within the ice was deposited on the

landscape when the ice melted. These deposits are called ablation till and are found largely intact where they were deposited on the uplands. Ablation till deposited in low areas was reworked by meltwater streams that flowed from the melting glaciers to form recessional outwash. In places, the deposits were influenced by shifting ice margins creating highly variable ice contact deposits, which contain both water-worked sands and gravels, and interbeds and lenses of silt and clay and till-like deposits.

These recessional sand and gravel deposits and interbedded ice contact deposits are collectively identified as Vashon Recessional Outwash (Qvr) on the geologic map and profiles. The recessional outwash generally consists of clean (containing very little silt and clay) sand and gravel, or sand and gravel with variable amounts of silt and interbeds and lenses of silty sands and gravels.

As the glaciers melted and receded, a lobe of ice blocked the northward drainage of the Puyallup valley, creating Glacial Lake Puyallup. A prominent late recessional gravelly outwash member called the Steilacoom Gravel is interpreted to have formed when a series of ice dam bursts (jokulhlaups) released the glacially impounded water in Glacial Lake Puyallup (Troost, 2007; and Troost and Sofield, 2011). Floodwaters spilled and transported coarse-grained sediments into a broad outwash plain in the Sequalitchew Creek area. These coarse-grained deposits created thick deltas where the outburst channels flowed into a lower elevation lake (Glacial Lake Russell) that had formed behind the remaining Vashon glacial ice.

Glacial Lake Russell (which is now partially occupied by modern Puget Sound) was deep and had steep sided walls in the area of the South Parcel, similar to those of the modern coastal bluffs. The contact between the sediments exposed in the former walls of Glacial Lake Russell and the overlying late glacial delta and flood deposits derived from Glacial Lake Puyallup is similarly steep and exhibits a marked change in soil types. The contact is called the “Olympia Beds Truncation” (referred to as the “Kitsap cutoff” in some older reports). The location of the Olympia Beds Truncation (Figure 6) is a key geologic and hydrologic feature at the South Parcel Project.

2.1.4 Site Geology

Geologic units of glacial and nonglacial origin were deposited at the South Parcel Project vicinity before, during, and after the Vashon glaciation. The understanding of site geologic conditions was further informed through the boring and monitoring well explorations that are shown on Figure 5 and presented in Appendix A of the Geotechnical Engineering Report (Aspect 2021a). A regional geologic map is shown on Figure 6 and a surficial geologic map of the South Parcel Project is provided on Figure 7. Well and boring logs were used to develop a cross section shown on Figure 8 that provides greater detail and shows the extent of the geologic units. Key well and boring logs are included in Appendix A.

The surface geology of the South Parcel Project area consists primarily of Vashon-age recessional sand and gravel (Qgog) that includes the Steilacoom Gravel (Qvs). The recessional glacial unit is underlain by older Vashon-age glacial deposits that may locally consist of glacial till (very dense consolidated diamict typically comprised of very dense

silty sand with gravel), pre-Vashon nonglacial deposits, and pre-Vashon glacial deposits – all comprised primarily of sand and gravel.

The uppermost pre-Vashon non-glacial sequence at the South Parcel Project area is identified as the Olympia beds. These nonglacial deposits are generally marked by an increase in silt, organics, and wood fragments and are observed in borings. They are termed the Olympia beds since being age-dated by Troost (Borden and Troost, 2001). Strata now known as Olympia beds were previously included within the informally named Kitsap formation (Walters and Kimmel, 1968).

Older unnamed glacial and nonglacial deposits lie below the Olympia beds. These are identified as pre-Olympia nonglacial deposits (Qpon) and a pre-Olympia glacial deposits (Qpog).

Steilacoom Gravel, which is comprised of the late-glacial delta and flood deposits, is a member of the Vashon Recessional Outwash unit and is identified as Qgog on the Project Geologic Map (Figure 7). The proposed mining of the South Parcel Project will occur within the Steilacoom Gravel and is the same geologic unit currently being mined in the existing mine area.

After the end of the Vashon glaciation, nonglacial conditions resumed in the South Parcel Project area. Post-glacial geologic units deposited in the area included beach and shallow marine deposits, colluvium on slopes, and alluvium in drainage bottoms. Topsoil developed on soils in stable and forested uplands areas.

2.1.4.1 Site Reconnaissance and Subsurface Explorations

A site reconnaissance was conducted on November 1, 2019, and later on December 21, 2021. The reconnaissance focused on examining the areas on the north slope of the Sequalitchew Creek ravine for indications of springs, seepage, and instability. Slopes within the existing pit were also evaluated for seeps and springs, and the general nature of the soils exposed in natural and mined excavations. Springs encountered within the Sequalitchew Creek ravine are shown on Figure 7. Natural and mined slope angles were measured and the behavior of historical mine slopes on the active and reclaimed mine slopes in the vicinity was examined. We also looked for evidence of concentrated surface water on the uplands of the Expansion Area and made general observations of surficial soil types.

Field observations were noted on a topographic map, and locations of specific features were recorded with a field GPS for plotting on topographic base maps. Results of the reconnaissance (including observations of hydrology, geology, and slope stability) are incorporated in subsequent sections and figures of this report.

Figure 5 shows the locations of existing subsurface explorations at the site from previous reports and investigation efforts, which were used to inform this study. No subsurface explorations were conducted specifically for this study; logs of previous borings and wells are provided in Appendix A as well as in the Geotechnical Engineering Report (Aspect, 2021a).

2.1.4.2 South Parcel Project Subsurface Conditions

Subsurface conditions for the South Parcel Project were inferred from review of the existing soil boring and well logs, published geologic data and maps, and our geological reconnaissance. Based on the available information, the inferred geologic units at the site are described below.

Topsoil

Topsoil, including up to several inches of forest duff (organic debris), is present in the South Parcel Project area. The duff layer is primarily present within upland forested areas. The South Parcel Project is vegetated with conifer and deciduous trees that will be cleared. The Re-Mine Area has been previously cleared and is vegetated with shrubs and grasses. Undisturbed, native topsoil is generally not present in the Re-Mine Area; however, topsoil has been placed over portions of the Re-Mine Area as a component of mine reclamation.

Steilacoom Gravel subunit of Vashon Recessional Outwash

The majority of near-surface Vashon recessional outwash in the area is composed of the Steilacoom Gravel subunit (Qvs) of the Vashon Recessional Outwash (Qgog) deposit. Soils from the Steilacoom Gravel account for most, if not all, of the soils that will be excavated during mining operations. This soil consists of sandy gravel and gravelly sand with minor amounts of silt, ranging between 2 and 6 percent. Where exposed in the adjacent working mine slopes and on road cuts in the active areas of the existing mine, this unit often has a relatively open matrix between gravel clasts. In other areas, the interstices are filled with sand.

This unit has not been glacially overridden and is anticipated to be medium dense at the surface, grading to dense at depth. Like most outwash deposits, Steilacoom Gravel possesses a minor degree of cohesion apparently resulting from silt and clay binding and slight iron oxide cementation at the grain contacts. This cohesion gives it a good intermediate-term standup time that is exhibited by the near vertical temporary cuts up to 70 feet high in the active area of the existing mine.

2.1.4.3 Olympia Beds

The Olympia Bed (Qob) deposits were observed below the Steilacoom Gravel. This unit is generally composed of interbedded lacustrine (lake sediments) and fluvial (river and stream sediments) deposits. Lacustrine deposits consist of silt and clay. The fluvial deposits consist primarily of sand but may contain oxidized gravelly lenses and layers. Interbed thickness of this unit ranges from inches up to about 10 feet. Some organic silt and peat layers that were deposited in wetlands and bogs are also generally present in this unit. The Olympia Bed unit has been overridden by the Vashon ice sheet and is generally very dense to hard in its natural state. Where exposed to seepage or weathering, its surface degrades and loosens.

The Olympia Bed deposits generally are considerably finer grained than the Vashon deposits above and can perch groundwater. Seepage has been noted at the top of the Olympia Bed unit where exposed in the road cut and natural ravine slopes along Sequalitchew Creek. If a lacustrine bed perches groundwater and is intersected by the surface of the slope, it could result in seepage onto the slope.

The contact between the top of the Olympia Beds and the overlying outwash deposits is understood through an extensive exploration conducted in the 1980s during initial geologic and groundwater studies for the Pioneer Aggregates mine (see Figure 5). Those borings generally encountered the Olympia Beds at 80 to 140 feet below the ground surface.[4] None of the borings encountered the Olympia Beds near the ground surface.

2.1.5 Hydrogeology

Surficial soils in the South Parcel Project area are generally highly transmissive to water. Stormwater will tend to infiltrate into the natural soil surface rather than collect as runoff. The Steilacoom Gravel is generally highly transmissive to groundwater flow and stormwater will infiltrate until it encounters the regional groundwater table, or until it encounters a silty interbed that locally perches groundwater. Additional information on groundwater presence within the Steilacoom Gravel is provided in Section 3.

2.1.6 Geologically Hazardous Areas

Geologically hazardous areas (GHAs) are areas "susceptible to erosion, sliding, or other potentially hazardous geological events" as described in Section 25.105.030 of the DuPont Municipal Code (DMC). The DMC defines four types of GHAs:

- Landslide Hazard Areas
- Steep Slopes
- Erosion Hazard Areas
- Seismic Hazard Areas

Aspect evaluated the presence of GHAs within the South Parcel Project and in surrounding areas as a component of the Critical Areas Report (Anchor and Aspect, 2021). This section summarizes the findings of that report.

GHAs were delineated based on our regional and local geologic knowledge of the area, reconnaissance of the South Parcel, review of published documents, and experience with similar mine sites operating elsewhere, and with reference to DMC.

A key criterion for identifying GHAs is the slope angle. Slopes greater than 15 percent can be Landslide Hazard Areas and Steep Slopes if they also have a geologic contact with a permeable unit overlying a relatively impermeable unit and presence of groundwater seeps or springs. Slopes of 40 percent or greater are GHAs unless they are comprised of competent bedrock or are a properly engineered slope. Slope angles at the South Parcel Project were evaluated using publicly available Light Detection and Ranging (LiDAR) topographic data. There are also other criteria defined in the DMC, but they are generally less applicable to conditions within the South Parcel Project area.

[4] Olympia Beds are found between 87 to 139 feet below the ground surface in the borings closest to Edmond Marsh. Several of the borings closest to the marsh did not encounter the Olympia Beds at their completion depths of 65 to 103 feet. These borings are located in the southeast corner of the South Parcel and in the southern portion of the parcel now occupied by the Amazon Fulfillment Center. In 2002, a boring was completed in the western end of Edmond Marsh and encountered the Olympia Beds at a depth of 84 feet. Boring logs for these explorations are provided in Appendix A.

Although not considered a GHA, aquifer recharge areas used for potable water are included in the list of critical areas in DMC 25.105.030.055, with regulations and performance standards for development within an aquifer recharge area defined in DMC 25.105.050(4). An Aquifer Recharge Area, as defined by the DMC, is not present within the South Parcel Project because the aquifers underlying the project area are not used for potable water.

2.1.6.1 Evaluation of Existing Conditions

This section assesses existing conditions within the South Parcel Project as well as two nearby areas: the Sequalitchew Creek ravine and the reclaimed slopes of the existing mine. The nearby areas would not be modified or impacted by the South Parcel Project, but were evaluated because their soils, geology, and other conditions are similar to those in the South Parcel Project and as such are a good predictor of the performance of the proposed conditions.

Expansion Area

Existing conditions in the Expansion Area do not meet the definition of GHAs (Figure 9). Topography is generally characterized by level ground or gentle slopes, typically inclined at gradients less than 15 percent that do not fall under the GHA criteria.

Aspect observed areas interpreted as old rail grade cut and fill slopes steeper than 40 percent that locally exceed more the 10 feet of vertical relief in the southeast portion of the South Parcel. These do not qualify as GHAs because they do not intersect a geologic contact with relatively impermeable sediment or bedrock and do not have spring or groundwater seepage (DMC 25.105.030.345) and they are stable constructed slopes that have historically performed well.

There are no channels, channel-forming processes, or areas subject to coastal erosion within the Expansion Area so there are no erosion hazard areas as defined by the City.

The existing Expansion Area does not include soils on slopes greater than 40 percent that are expected to be seasonally or perpetually saturated that pose a specific risk of settlement, movement, or liquefaction for seismic hazard areas as defined by the City.

Re-Mine Area

Existing conditions in the Re-Mine Area do not meet the definition of GHAs, although there are areas with slopes steeper than 15 percent (Figure 9). The topography of the Re-Mine Area generally consists of a gentle slope to the northwest descending toward the floor of the existing mine. Steeper slopes are present to the northwest of the Kettle Wetland, where the slope is greater than 40 percent, and along the westernmost portion of the Re-Mine Area, where it typically varies between 15 to 40 percent. Some of the steeper slopes shown on Figure 9 within the Re-Mine Area represent temporary stockpiles or fill placement.

The areas of steeper slopes within the Re-Mine Area do not qualify as GHAs as they are either temporary slopes within an active mine, or were designed and approved by a qualified professional experienced with the site, and are thus exempted from being a GHA.

There are no channels, channel-forming processes, or areas subject to coastal erosion within the Re-Mine Area, so there are no erosion hazard areas as defined by the City.

The Re-Mine Area does not contain seismic hazard areas because the soils on slopes greater than 40 percent are not expected to be seasonally or perpetually saturated and do not pose a specific risk of settlement, movement, or liquefaction.

Existing Mine

The existing mine includes constructed slopes on the south and west sides that have been graded to their final configuration and reclaimed with topsoil and planting. The west slope is about 175 feet high and is smoothly graded at about 30 percent up to 50 percent, as shown on Figure 9. The subsurface soil under the topsoil of the west slope is sand and gravel with a trace of fines. The slope has been planted with grasses and conifer trees.

The west slope has a slope gradient of greater than 40 percent with a vertical relief greater than 10 feet, but it does not meet GHA criteria because it was designed and approved by a qualified professional experienced with the site, and thus is exempted from being a GHA.

During the reconnaissance of the west slope on November 1, 2019, Aspect observed no indication of past or imminent slope failure, landsliding, or erosion. There are no concave or convex topographic features that would suggest slumping or calving, and there are no areas of exposed soil. The vegetation shows no evidence of disturbance from slope instability or erosion.

There are no channels, channel-forming processes, or areas subject to coastal erosion within the existing mine so there are no erosion hazard areas as defined by the City.

The existing mine does not contain seismic hazard areas because the soils on slopes greater than 40 percent are not expected to be seasonally or perpetually saturated and do not pose a specific risk of settlement, movement, or liquefaction.

Sequalitchew Creek Ravine

The Sequalitchew Creek ravine lies outside of the South Parcel Project area, along the southern boundary of the existing mine and the South Parcel. A small portion of the Sequalitchew Creek ravine is located within the South Parcel property boundary, but outside the proposed mining area. The ravine runs westward for about 1.5 miles down to the creek confluence with Puget Sound. The majority of the ravine is outside of the South Parcel. The slopes on the northern side of the ravine range from approximately 30 percent to 75 percent.

The north slope of the Sequalitchew Creek ravine includes a bench cut for a former railroad grade that ran down the full length of the ravine. The railroad grade has been redeveloped into the Sequalitchew Creek Trail, surfaced with asphalt on the upper portion and crushed rock lower down.

Perennial groundwater seeps from the ravine's north slope at several locations, as shown on Figure 9. On the eastern two-thirds of the ravine, the subsurface soil in the upper part of the slope (from the top of the ravine at approximate elevation 200 feet down to about elevation 110 feet) is permeable sand and gravel with minor silt; below approximately elevation 110 feet, the soil is silty and relatively impermeable. In the western third of the

ravine, the subsurface soil is permeable sand and gravel for the entire height of the ravine valley wall.

The channel of Sequalitchew Creek is relatively confined channel formed by historically higher flows (see Section 4). It currently experiences limited flow and thus has limited channel-forming processes. We observed no indication of an active channel migration zone from our reconnaissance or aerial photograph review.

The existing Sequalitchew Creek ravine does include areas with soils on slopes greater than 40 percent that are expected to be seasonally or perpetually saturated that pose a specific risk of settlement, movement, or liquefaction for seismic hazards as defined by the City.

Based on the slope steepness, the presence of the seeps, and the contact between permeable and impermeable soils, the north slope or the Sequalitchew Creek ravine qualifies as a Landslide Hazard Area, Steep Slope, and Seismic Hazard under DMC GHA criteria. The slope is identified by the DNR (Mickelson et al. 2017) as susceptible to shallow landslides.

2.2 Effects of the Proposed Action

2.2.1 Changes in Topography

2.2.1.1 South Parcel Project

Topography within the Expansion Area would be significantly altered as a result of mining as illustrated in the comparison between Figures 9 and 10. The slopes on the eastern edge of the South Parcel would be about 80 to 120 ft tall and would be inclined at 3H:1V (33 percent). Benches would be excavated in the southeast corner of the Expansion Area. The bottom surface of the Expansion Area would generally follow the contours of the top of the Olympia Beds. A thin layer of gravel, several feet thick, would likely be left on top of the Olympia Beds to provide a stable working surface.

Within the Re-Mine Area, topography would also significantly change as the current rolling slopes would be mined down to the Olympia Beds. As with the Expansion Area, a working surface of gravel would be left atop the Olympia Beds. Slopes within the Re-Mine Area would be inclined at 3H:1V (horizontal:vertical; 33 percent), where groundwater is expected to emanate from the toe of the slope and 2H:1V (50 percent), where the slopes are anticipated to be dry.

The proposed finished slopes would be similar or less steep than other areas that have been mined and reclaimed to the west. As observed during the site visit, within the reclaimed mine areas, the slopes steeper than 40 percent (up to 50 percent) and the slopes along the Sequalitchew Creek Trail exceeding 60 percent are all performing well. Existing mine slopes performed well in the 2001 Nisqually Earthquake; no reports of mine slope or natural ravine slope failures were noted in the area after that earthquake. The soils are fairly homogenous across the active mine area and Re-Mine Area and are expected to perform similarly in general.

2.2.1.2 Existing Mine

There would be no change to the topography of the slopes of the existing mine as a result of the South Parcel Project. However, these slopes may be modified under the current permits as mining activity continues and have already been evaluated for potential impacts. Changes to the existing slopes under the current permits are not evaluated in this report.

A constructed mitigation wetland has been proposed near the toe of the west slope at the base of area where mining has already been completed, as shown on Figure 10. The constructed wetland slopes will be at gradients less than 15 percent.

Other minor changes within the existing mine include the construction of stormwater conveyance, treatment and infiltration facilities, and groundwater conveyance and infiltration facilities.

2.2.1.3 Sequalitchew Creek Ravine

Topography in the Sequalitchew Creek ravine will not be altered as a result of mining activities (compare Figures 9 and 10).

The dewatering and grading associated with the South Parcel Project will reduce groundwater flow toward the steep slopes of Sequalitchew Creek ravine along the east portion of the South Parcel. The proposed mine expansion will also route groundwater that would potentially flow toward the creek instead toward the mined areas. Ultimately, this will reduce the potential for landsides and slope failures within the Sequalitchew Creek ravine. The seeps and springs identified on Figure 9 are expected to be reduced or dewatered in their entirety, which may reduce the level of landslide hazard susceptibility within the ravine.

2.2.2 Slope Stability

Aspect completed a geotechnical analysis to evaluate the stability of the proposed cut slopes of the South Parcel Project, as documented in the Geotechnical Engineering Report (Aspect, 2021a). This section summarizes the findings of that report.

The static and seismic stability of proposed slopes was analyzed using the two-dimensional, limit-equilibrium slope stability software program Slide by RocScience and stratigraphy and proposed 3H:1V grading shown on cross section A-A' through D-D'. The locations where stability analyses were performed are shown on Figure 11 and were selected as being representative of critical permanent slope configurations. The slope stability results are presented graphically in Appendix B of the Geotechnical Engineering Report (Aspect, 2021a).

The stability analysis software program performs slope stability computations based on the modeled slope conditions, and calculates a factor of safety (FOS) against slope failure. FOS is defined as:

$$FOS = s/\tau$$

where "s" is the available shear strength of the soil and "τ" is the shear stress generated from gravitational forces acting on the slope mass.

A "just-stable" equilibrium condition would result in a FOS of 1.0, while an unstable condition would result in a FOS less than 1.0, implying failure is imminent or is already occurring.

For static and seismic conditions, FOS of 1.5 and 1.1, respectively, are the recommended minimums for permanent slopes that could affect adjacent structures and property. Soil properties and strength parameters, groundwater and seismic input for the slope stability model are provided in detail in the Geotechnical Engineering Report (Aspect, 2021a).

2.2.2.1 Slope Stability Results

Slope stability results are presented in Table 4 below and also shown on Figure 11. The results are presented graphically in Appendix B in the Geotechnical Engineering Report (Aspect, 2021a).

Table 4. Summary of Factor of Safety Values for Slope Stability Analysis Results

Profile	Static [1]	Seismic [2]
A-A'	2.53	1.19
B-B'	1.69	1.17
C-C'	2.01	1.14
D-D'	2.92	1.30

Notes:
1. Limit equilibrium minimum factor of safety found using Spencer's method in SLIDE
2. Pseudostatic seismic analysis with a reduced PGA due to wave scattering from Table 2 of Geotechnical Engineering Report (Aspect, 2021a)

The results show acceptable FOS values that exceed 1.5 static and 1.1 for seismic conditions for slope stability for the mined condition within the South Parcel Project area and the adjacent Sequalitchew Creek ravine.

2.2.2.2 Effect of Reclamation of Slopes on Stability

Under a reclamation plan approved by DNR (see Section 1.1.2.6), the mine slopes would be progressively reclaimed over the life of the proposed mine development. Mine slopes will be graded to 3H:1V or flatter where groundwater seepage is expected (i.e., on the eastern and southern slopes of the Expansion Area) or flatter once the slope is no longer being mined. Slopes where groundwater is not anticipated to be present, such as along the southern boundary of the Re-Mine Area, will be graded to 2H:1V.

Backfill is not required to achieve the reclaimed configuration; however, backfill may be used to enhance reclamation and has been done elsewhere within the existing mine to improve vegetation performance. The backfill would consist of retained finer South Parcel material and imported clean fill. The proposed slope angles are flatter than the natural angle of repose of the remaining *in situ* soils and would provide the long-term erosion control and landscape base for planting. After establishment of the vegetation growth, any long-term slope stability impact to earth-related features is expected to be low. The already high stability of newly created slopes will generally increase with establishment of vegetation.

2.2.3 Erosion Potential

Due to their generally coarse-grained nature and good infiltration characteristics, the soils in the South Parcel Project area possess a low erosion risk and are generally not moisture sensitive. The erosion potential is increased by the removal of vegetation and construction of mine slopes; however, with proper stormwater management techniques in place, even these conditions are unlikely to result in significant erosion of the coarse soils. The main area of the South Parcel Project potentially susceptible to erosion is the placement of loose topsoil for revegetation on the final cut slopes.

The Olympia Beds are finer-grained and more susceptible to erosion; however, they will not be exposed by mine activity. An approximately 10-foot-thick layer of the overlying outwash will be left in place as an operating surface for heavy equipment. This layer will protect against erosion of the Olympia Beds.

The South Parcel Project, together with the existing mine, will be excavated as a closed depression and all surface runoff will drain internally. Therefore, erosion does not have the potential to cause harm to surface water bodies or aquatic resources; however, management of erosion remains important for establishment of vegetation during reclamation, visual appearance of the slopes, and the long-term performance of the infiltration ponds. The proposed activities included in the South Parcel Project (refer to Pioneer Aggregates South Parcel Project Engineering Plan Set; Aspect, 2021b) include erosion control Best Management Practices (BMPs) consistent with Ecology's Sand and Gravel General Permit and City of Dupont requirements as defined in section 25.105.030.25 (DMC, 2021) that will reduce the potential for offsite transport of sediment.

To reduce the risk for erosion impacts to the Sequalitchew Creek ravine slopes south of the South Parcel Project area, and in general accordance with DMC 25.105.070(2), the Geotechnical Engineering Report (Aspect, 2021a) recommended maintaining at least a 50-foot buffer from the top of steep slopes. Consistent with the 2012 Settlement Agreement, the South Parcel Project includes a 100-foot buffer along the top of the slope along the Sequalitchew Creek ravine. The 100-foot buffer provides ample protection for erosion of steep slopes along with other recommended mitigation measures and BMPs in Section 2.4.

The City requires preparation of an erosion control plan per DMC 22.01.180 for all sites disturbing more than 1 acre. The erosion control plan will identify the specific BMPs to be used during and after mining for erosion and sediment control. The existing wheel wash will continue to be operated and maintained in compliance with City and Ecology requirements.

2.2.4 Steep Slope Buffer

The South Parcel Project includes a 100-foot buffer along the top of the Sequalitchew Creek ravine slope (Figure 10). This buffer exceeds that required by the DMC, which requires a 50-foot buffer between proposed development activity and hillslopes of 40 percent (22 degrees or approximately 2.5H:1V). It is also greater than the buffer recommended in the Geotechnical Engineering Report (Aspect, 2021a) and therefore provides greater protection.

2.2.5 Soil Settlement Potential

2.2.5.1 General Assessment of Soil Settlement Potential

Due to the grain size characteristics, relative density, and lack of compressibility of the underlying recessional glacial outwash deposits, ice contact deposits, and older, glacially-consolidated glacial/non-glacial deposits soils in the mine vicinity (Figures 6 and 8), settlement hazards for structures or underground utilities are generally not anticipated within the proposed dewatering area. Compressible, organic-rich peat soils are present under and immediately adjacent to the marshes (see Figure 3 of Aspect, 2004a); however, such soils are generally not suitable for development and the areas around the marshes where these soils are present are restricted for development by the City of DuPont.

2.2.5.2 Robinson Trail Berm Sewer Line

One segment of Pierce County sewer line (Pierce County, 2024) warrants additional consideration during dewatering due to the presence of underlying potentially compressible organic marsh soils/peat. The 8-inch sewer line is buried approximately 3 to 8 feet below ground surface (ESM, 1989) within fill soils of the Robinson Trail berm, which crosses between East and West Edmond Marsh and overlies peat deposits (Figure 28; Anchor, 2023). Soft, organic-rich soil like peat can compress when physically loaded (e.g., by construction of an overlying berm or structure), or during dewatering, which can also "load" such soils by reducing pore pressures (either in the compressible soil itself or in overlying soils), thereby increasing the effective load carried by the soil.

The DuPont groundwater model indicates that maximum groundwater drawdown at Robinson Trail location will be less than 1 foot (Table 8, Figure 24). Marsh surface water levels on either side of the berm are also anticipated to lower by as much as approximately 3 feet in both East and West Edmond Marsh as a combined result of dewatering and restoration plans (DEIS Figure 3.4-4 or Figure 35 of Appendix B). Groundwater elevations at this location currently fluctuate by about 2.5 feet, between approximately 5 and 7.5 feet in depth.

The Robinson Trail berm has likely been settling due to ongoing biodegradation and secondary compression of the peat from berm loading (and historical use of the previous rail line) over the past ~80+ years since the berm was constructed in the 1940s (or earlier). Due to the loading (timing and magnitude) history of the berm, the majority of potential peat compression may have already occurred; however, the peat will continue to compress at a very slow rate, with or without the proposed project. Due to initial compression plus ongoing long-term biodegradation, it is possible that the sewer line has already experienced measurable settlement since it was installed over three decades ago. Though unlikely, the proposed dewatering (by an amount that is less than the existing seasonal groundwater level fluctuation) could cause some incremental, but difficult to quantify, additional settlement of the sewer line beyond the ongoing slow biodegradation and secondary compression settlement. The potential for settlement will be partially mitigated in the vicinity of the proposed bridge that will be implemented as part of the restoration plan, where the sewer pipe will be encased and suspended from the bridge.

Despite the very low potential for the Proposed Action to cause or contribute to any significant settlement of the existing sewer, CalPortland will develop and include provisions for monitoring the Robinson Trail sewer main in a project monitoring plan document. An initial baseline survey, including utility elevation surveying at selected monitoring points as well as television inspection of the relevant section of pipeline, should be performed prior to project implementation to identify existing sags or leakage. Additionally, Pierce County Public Works and Utilities should provide CalPortland with any existing information about the current sewer condition, any prior video inspections, and history of prior settlement-related maintenance issues, etc. If, during dewatering, new sags or leakage are detected in sewer lines (beyond the rate of anticipated change that would be expected to result from natural conditions alone, based on review/documentation of pre-project conditions), and such damage appears to correlate with measured dewatering-related groundwater drawdown in the vicinity, CalPortland will work with Pierce County to take corrective action to restore the affected areas. Due to a lack of settlement-prone soils in sewer locations outside of the Robinson Trail area, monitoring is not necessary elsewhere.

2.2.6 Topsoil Removal and Replacement

Topsoil contains fines and organic material that is not suitable for construction aggregate and has physical characteristics that are not compatible with efficient use of the equipment used to transport and process saleable materials extracted from the mine. Topsoil is also generally the most fertile part of the soil column, containing soil structure, organic matter, and microorganisms beneficial to plants and an essential component for successful reclamation of the mine.

Washington's laws governing Surface Mine Reclamation (RCW 78.44) require the conservation of topsoil as a critical component of reclaiming surface mines for future uses. The Proposed Action includes the steps typically used to conserve topsoil on aggregate mines. Topsoil would be stripped and stockpiled as the mining operation advances into the property, and topsoil would be replaced as the mined areas are reclaimed following extraction.

Past industrial activities have resulted in elevated metals concentrations in portions of the South Parcel. The Former DuPont Works Site is a cleanup site associated with historical explosives and commercial munitions facility that operated from 1909 through 1976 (Hart Crowser, 1994). The primary contaminants are arsenic and lead in surface soils. Cleanup activities were completed in 1993 to address the highest concentrations of lead, generally found along the foundations of the former buildings. Weyerhaeuser entered a Consent Decree with Ecology that required implementation of a restrictive covenant (Weyerhaeuser, 1997) limiting land use on the Former DuPont Works Site to industrial uses, which is the origin of the Manufacturing and Research Park zoning for much of the South Parcel.

In addition, the South Parcel is located within the Tacoma Smelter Plume in an area where Ecology predicts concentrations of arsenic in surface soils may range between 40 and 100 parts per million (ppm). Ecology has established cleanup levels for properties within the Tacoma Smelter Plume. The cleanup levels are conservative and support residential use. The cleanup level for arsenic in soil is 20 ppm and the cleanup level for lead in soil is 250 ppm (Ecology, 2012). As a basis for comparison, the United States

Environmental Protection Agency (EPA) has established an action level of 230 ppm for arsenic and 500 ppm for lead to guide cleanup decisions in areas near the former smelter. Ecology has pre-approved certain approaches to achieve the established cleanup levels at properties within the Tacoma Smelter Plume. Mixing of impacted surface soils with deeper clean soils is one of the approved approaches under the Final Interim Action Plan (Ecology, 2012).

The proposed mining and reclamation activities would serve as a permanent and final remedy for any lead- and arsenic-impacted soils within the Expansion Area. Under the Proposed Action, topsoil within the Expansion Area would be removed to facilitate extraction, and be conserved and maintained on site to be incorporated into the reclaimed mine landscape and support revegetation and reclamation of mined areas consistent with the anticipated subsequent residential land use identified in the City of DuPont Comprehensive Land Use Plan (City, 2001).

Stripping, stockpiling, and replacement of topsoil would be completed using methods and procedures that are generally the same as those used in the existing mine area, including employment of BMPs to control erosion and fugitive dust. Samples would be collected from stockpiled topsoil for each mine segment and analyzed in accordance with a Cleanup Action Plan developed for the South Parcel Project (Aspect, 2020). If the sample results indicate the topsoil does not contain arsenic in concentrations exceeding 20 ppm (the conservative cleanup level established by Ecology for the Tacoma Smelter Plume) or lead in concentrations exceeding 250 ppm, then the topsoil would be used in reclamation. If the sample results indicate the topsoil contains arsenic in concentrations equal to or greater than 20 ppm, then clean soil would be mixed with the topsoil to reduce the arsenic concentration. Stockpiled topsoil would not be used for reclamation until sample results confirm the concentrations of arsenic and lead meet cleanup criteria.

2.2.7 Effects on Geologically Hazardous Areas

The effects of the Proposed Action relative to landslide and steep slope hazards, seismic hazards and liquefaction hazards are presented below and as shown on Figure 10. Additional discussion is provided in the Geotechnical Engineering Report (Aspect, 2021a).

2.2.7.1 Landslide and Steep Slope Hazards

Landslide and Steep Slope hazards are not present within the South Parcel Project area but are present nearby in the Sequalitchew Creek ravine. The mined slopes have been designed by a geotechnical engineer and are contoured to drain away from the ravine as shown on Figure 10. The slope stability analysis shows acceptable factor-of-safety values (greater than 1.5) for each of the profiles in the Expansion Area and Re-Mine Area as shown on Figure 11. Thus, the mined slopes will not be Landslide or Steep Slope Hazards.

The Proposed Action locally reduce the expression of seeps and springs that have been observed in the ravine as shown on Figure 9, resulting in an improvement in slope stability. The Sequalitchew Creek ravine slope would also have an FOS greater than 1.5 as shown on Figure 11.

The hazard mitigation recommendations listed below in Section 2.4 are intended to protect landslide and steep slope hazards located outside of, but nearby, the South Parcel Project area.

2.2.7.2 Erosion Hazards

DMC 25.105.050 (3) defines erosion hazards as including coastal erosion zones and channel migration zones (areas along a river or stream where the channel can be reasonably predicted to migrate over time) and coastal erosion zones. Coastal erosion zones are not relevant to the Proposed Action.

The channel migration zone within the Sequalitchew Creek ravine will not be impacted by the Proposed Action. The flows from ravine springs will be reduced by the dewatering process, which will reduce the potential for channel migration.

No adverse impacts are anticipated to erosion hazards from the Proposed Action at the South Parcel or adjacent areas.

2.2.7.3 Seismic Hazards

No adverse impacts are anticipated to seismic hazards from the Proposed Action at the South Parcel or adjacent areas. The slope stability analysis for seismic condition shows acceptable factor-of-safety values (greater than 1.1) for each of the profiles in the Expansion Area, Re-Mine Area, and Sequalitchew Creek ravine.

Topography at the Expansion Area would be permanently altered as a result of mining activities. These changes are illustrated by comparing Figures 9 and 10. The proposed conditions would include finished slopes inclined at 3H:1V (33 percent) toward the interior of the existing mine (Figure 10). A 20-foot-high soil berm would be constructed with side slopes at 2H:1V (50 percent) along the south side of the Expansion Area.

The proposed finished slopes would be less steep than other areas that have been mined and reclaimed to the west. As observed during the site visit within the reclaimed mine areas, the slopes steeper than 40 percent (up to 50 percent) and the slopes along the Sequalitchew Creek Trail exceeding 60 percent are all performing well.

Groundwater is anticipated to seep from the toe of graded slopes in the east portion of the Expansion Area. The presence of seepage on slopes greater than 15 percent (proposed at 33 percent) with a potential underlying contact with lower-permeability Olympia Beds does meet the DMC criteria for landslide hazards and steeps slopes. The approximate locations of the potential Geologically Hazardous Areas are mapped on Figure 10.

In general, the proposed graded slopes of 33 percent are far below the angle of repose for sand and gravel that reduce the risk of active landslide or steep slope hazards. Slope stability analysis and mitigation for this potential hazard is provided in the following sections.

The soils are fairly homogenous across the active mine area and Expansion Area, and are expected to perform similarly in general.

There would be no Seismic Hazard Areas created, as slopes in the Expansion Area will be below the 40-percent threshold.

2.3 Effects of the No Action Alternative

Under the No Action alternative, the individual parcels that comprise the South Parcel would be developed under their existing zoning. Mining and reclamation would continue within the currently permitted footprint of the existing mine. The Kettle Wetland and its buffer would remain undisturbed.

Development of the South Parcel would likely occur over time on one or more individual parcels at a time. As each parcel is developed, it would likely be mostly logged and cleared, then graded and developed consistent with applicable zoning regulations. Logging and clearing along with the development would likely leave only a 50-foot buffer along the top of the Sequalitchew Creek ravine as authorized under the DMC rather than the 100-foot buffer required for the mine under the Settlement Agreement. Topography would be expected to remain relatively flat, with the minor topographic depressions filled to level building sites. Under the existing zoning, a portion of each parcel would need to remain vegetated, either as the existing forest or as landscaped areas.

Clearing would increase the potential for surface erosion during construction; however, standard erosion and sediment control BMPs would be sufficient to avoid adverse impacts. Future development would be required to comply with City of DuPont Sensitive Areas Code, and state and local erosion and sediment control requirements.

Development would also increase the volume of stormwater generated as permeable soils with established vegetation (forest) are replaced with the impervious areas, building roofs and pavement, and landscaped areas. Stormwater would likely be managed through infiltration, which would result in an increased volume of groundwater flow, though the change would likely be minor relative to the groundwater flow in the aquifer.

Individual development of the parcels would not be likely to address the metals-contaminated soils as comprehensively as the Proposed Action. It is more likely that capping would be used as a remedy given the lower cost compared with mixing and consistency with the likely developed condition (e.g., paved parking lots and building footprints). The use of capping as, combined with differences in parcel remediation extent and approach as individual parcels are developed separately, would likely prevent lifting of the restrictive covenants from the Former DuPont Works site and rezoning of the Manufacturing and Research Park area.

2.4 Mitigation Measures

The following mitigation measures have been included in the Proposed Action to reduce impacts on slope stability and erosion:

- Preparation and implementation of a reclamation plan under a Surface Mining Act (RCW 78.44). The reclamation plan would be submitted to DNR for review and approval prior to mining.
- Mining would occur in segments; no mass clearing of the South Parcel would occur.

- Preparation and implementation of an erosion and sediment control plan in accordance with the requirements of DMC 22.01.180 and the Sand and Gravel General Permit, a National Pollution Discharge Elimination System (NPDES) and State Waste Discharge Permit issued by Ecology that regulates stormwater management on aggregate mines. Erosion control features would include stormwater drainage into the interior of the South Parcel and on-site stormwater disposal.
- Maintenance of a vegetated buffer between the mine area and the top of steep slopes in accordance with the City of DuPont's Sensitive Areas Code [DMC 25.105.070(2)].
- Maintain the 100-foot setback from the top of slopes greater than 40 percent within the Sequalitchew Creek ravine, consistent with the conditions for the existing mine and the 1994 and 2012 Settlement Agreements.
- Earthwork for excavation and reclamation would be in accordance with the federal and state statutes of the Mine Safety and Health Act and the Surface Mining Act.
- Topsoil would be stockpiled and used for reclamation of mined areas. Consistent with the approved Reclamation Plan, the Cleanup Action Plan developed for the South Parcel Project (Aspect, 2020) and published Ecology guidance (Ecology, 2012), samples would be collected from stockpiled topsoil to confirm arsenic concentrations meet Ecology standards.
- After application of the topsoil, slopes would be revegetated by planting with trees and grass. When reclamation is complete, heavy equipment would generally not operate on the reclaimed slopes except for construction or maintenance of pedestrian paths, access roads, utilities, or other permitted facilities.
- The South Parcel would be cleared in segments corresponding to the mining plan.
- Internal drainage would be maintained during mining.
- Mine slopes would be track-walked to tamp soils and create surface roughness to encourage infiltration of stormwater on the slope.
- Mine slopes would be reclaimed with soil amendments and vegetation according to the DNR-approved Reclamation Plan.
- The existing wheel wash would continue to be used and maintained for vehicles exiting the mine.
- Settling ponds would be constructed upstream of the infiltration ponds.
- Mine slopes would be periodically inspected and repaired or revegetated to reduce erosion or improve surface stability.

2.5 Cumulative Impacts of Proposed Action and Restoration Plan

Cumulative impacts of the Proposed Action and Restoration Plan are described below.

The Proposed Action will reduce the potential for groundwater seepage and spring flow from the northern slope of the Sequalitchew Creek ravine. This will effectively reduce the potential for slope instability within the Sequalitchew Creek ravine.

Following implementation of the Restoration Plan, we anticipate higher streamflows in the Sequalitchew Creek ravine that could locally impact channel bank stability. This represents the return of channel-forming flows to Sequalitchew Creek and is a desired outcome of implementation of the Restoration Plan.

The return of higher flows is not anticipated to result in instability of the ravine side slopes because the restored flows would be similar to the flows present historically that did not impact global ravine stability. Similar flows were historically present during periods of land use disturbance in the ravine (e.g., during the period of railroad grade construction and initial logging of the ravine slope) and did not result in large-scale slope instability.

2.6 Significant Unavoidable Adverse Impacts

No significant unavoidable adverse impacts to geology and slope stability are anticipated from the Proposed Action. There are two general anticipated impacts described below; however, neither rises to the level of significant unavoidable adverse impacts:

1. Natural deposits of sand and gravel would be removed from a 313-acre area, altering the topography and leaving an irregular-shaped bowl feature where the mine operated.

2. Additional slopes would be created in an area where slopes did not previously exist, thus providing more opportunity for shallow slope instability and erosion. However, proper reclamation and erosion control measures as planned for in the Proposed Action would limit any potential slope instability and erosion impacts.

The first impact (removal of material) is significant and unavoidable, but not adverse. The second impact (creation of slopes) is unavoidable, but with the proposed mitigation is not expected to be a significant adverse impact. Therefore, no significant unavoidable adverse impacts are anticipated.

3 Groundwater

Groundwater conditions were examined to understand its occurrence in the vicinity of the Proposed Action. A groundwater monitoring network was established in 1999 and expanded in 2003 to assess aquifer parameters and water level fluctuations. The well network has been monitored approximately monthly since then, and monthly monitoring is ongoing. Table 5 lists the groundwater monitoring wells and current monitoring status. Figure 5 shows the monitoring well locations within the South Parcel, and Figure 12 shows well locations throughout the watershed. Observed groundwater level elevations are shown in time-series graphs on Figure 13. All available groundwater data were compiled and reviewed for this analysis.

Groundwater saturates the aggregate of the South Parcel Project area to within 20 feet of the ground surface. Under the Proposed Action, mining will require pumping groundwater to dewater the gravels that are currently saturated. Dewatering and removal of the aggregate will result in localized changes in groundwater elevations around the South Parcel. Under the No Action alternative, mining of aggregate above the water table will continue to occur within the existing mine without substantially influencing groundwater levels.

The foundation of the groundwater analysis is a numerical groundwater model (DuPont model) developed specifically for the project (Aspect, 2017b). The DuPont model is based on the conceptual model for the groundwater system developed from extensive analysis of project-specific borings and data, as well as compilation and review of other geologic and hydrogeologic data in the surrounding DuPont area. The hydrostratigraphic units are summarized in Table 6.

The DuPont model represents an update to previous groundwater modeling analysis developed for the South Parcel (CH2M Hill, 2003; Aspect, 2004a; Aspect, 2009a; and Aspect, 2009b). The layout of the numerical groundwater model is mapped on Figure 18. It incorporates proposed revisions to the mining plan, expansion of the model area, inclusion of seasonal and annual variability in climate and groundwater levels, and elements of the United State Geological Survey (USGS) groundwater model for the Chambers-Clover Creek watershed, including model boundary conditions and hydrogeologic layers at depth (Savoca et al., 2010; Johnson et al., 2011). The USGS groundwater model was not fully integrated with the DuPont model because the regional scale of the USGS model does not reflect the more detailed information collected for the South Parcel Project. Specifically, the regional groundwater flow direction in the shallow aquifer of the USGS model does not match local observations, the DuPont model incorporates higher stratigraphic data density in the focus area resulting from the borings and wells installed by CalPortland, and the DuPont model offers more refined wetland and surface water body discretization. The model simulates the groundwater/wetland hydraulic connection as detailed in Sections 4.6.3 and 4.6.4 of the Groundwater Model Update Report (Aspect, 2017b).

The DuPont model was first developed and calibrated to match a complete set of existing conditions measured between 2004 and 2010, and then validated to the monitoring data collected through 2015. A representative range of wet- and dry-season conditions were

observed between 2004 and 2015; observed groundwater levels since 2015 (shown on Figure 13) generally fall within this range. Calibrated aquifer parameter values are summarized in Table 6. A comparison of observed and calculated groundwater levels is provided on Figure 19.

While the groundwater model calibration is good (with calculated water levels generally following observed water levels as shown on Figure 19), model results were further refined to better address disagreement between observed and calculated water levels. Please see the Groundwater Model Update Report (Aspect, 2017b) for details on model calibration, validation, and refinement of model results. The model simulation of existing conditions formed the baseline from which changes in future groundwater levels under proposed scenarios can be measured.

Once the DuPont model was able to reliably reproduce historical conditions, the calibrated and validated model was then used to predict the changes in groundwater levels during four different steps of dewatering during the proposed mining plan. The model-calculated groundwater dewatering rates necessary to achieve the target groundwater levels within the mine are listed by step in Table 7 and based on the entire simulation period. The maximum predicted groundwater level changes for each dewatering step are provided by well in Table 8 and based on the entire simulation period. Details on the model uncertainty and the values in Table 8 are provided in Sections 5.5 and 6.5 the Groundwater Model Update Report (Aspect, 2017b).

3.1 Affected Environment

3.1.1 Primary Data Sources

Groundwater conditions in the area around the South Parcel Project have been extensively studied by Woodward-Clyde Consultants (WWC) (1991), Hart Crowser (1990 and 1991), CH2M Hill (2000 and 2003) and Aspect (2004a, 2004b, 2007, and 2017b), to name a few of the larger studies. These investigations focused primarily on concerns about impacts from Fort Lewis's Landfill 5 (WWC, 1991), water supply for the Pioneer Aggregates operations (Hart Crowser, 1991) and obtaining information on the aquifer system in the vicinity of the South Parcel Project (Aspect reports refenced above).

Borings drilled on 500-foot centers throughout the proposed mining area provide valuable data on stratigraphy and depth to water. These data and studies helped to define the occurrence and characteristics of the groundwater and the aquifers in the area of the South Parcel Project. The USGS published information on groundwater conditions in the Chambers-Clover Creek Watershed (Savoca et al., 2010; Johnson et al., 2011).

3.1.1.1 Well Data Inventory

A total of 22 wells in the vicinity of the South Parcel Project have been monitored to assess groundwater conditions, including previously existing monitoring wells and new wells installed for this project. The locations of the monitoring wells are shown on Figure 12. Table 5 presents the construction information for those wells where available.

3.1.1.2 Water Level Monitoring

Monitoring of groundwater levels began in 2000 with a series of groundwater monitoring wells installed within and around the South Parcel. Groundwater monitoring occurs monthly and the program is ongoing. The wells included in the groundwater monitoring program are listed in Table 5. Figures illustrating the groundwater monitoring data collected through September 2022 at key locations are included in Appendix B.

Groundwater levels in the Vashon Aquifer (detailed in Section 3.1.2) typically fluctuate in response to seasonal precipitation patterns and annual variations in precipitation. Figure 14 maps the groundwater level elevations inferred from observations and calculated using the DuPont model for the May 2010 time period, which represents mid-range water level conditions. Figure 15 maps the range in groundwater level fluctuations, showing both observed ranges at specific wells and model calculated ranges as contours. Groundwater levels in the central marsh area fluctuate over a limited range of 2 to 3 feet, whereas groundwater levels in monitoring well CHMW-3S, on the south end of the South Parcel, fluctuate by more than 10 feet. Monitoring conducted for the adjacent Fort Lewis Landfill 5 and DuPont Works Consent Decree area indicate groundwater level variations on the order of 10 feet (URS, 2000; URS, 2003). Seasonal variability in groundwater levels is inferred to be lower near surface water features (such as Sequalitchew Lake and the wetland complex) and greater near drainage features (such as the Sequalitchew Creek ravine and the Olympia Bed Truncation).

3.1.2 Primary Hydrogeologic Units

The primary hydrogeologic units are described in detail in the Groundwater Model Update Report (Aspect, 2017b) and are summarized in Table 6 and the sections below. Cross-section A-A' showing the sequence of hydrogeologic units on a northwest to southeast alignment is presented on Figure 16. Cross section B-B' on Figure 17 shows the hydrogeologic units on a southwest to northeast alignment crossing the Sequalitchew Creek ravine.

The South Parcel Project area lies within a thick glacial outwash sequence near Puget Sound, just north of the Sequalitchew Creek ravine, and east-southeast of the existing mine. The outwash sequence includes the surficial, coarse-grained Steilacoom Gravel flood deposits, an upper confining unit, and an older Vashon outwash. The outwash sequence overlies the low-permeability Olympia Beds (Qob) interglacial unit. The Sea Level Aquifer is composed of pre-Olympia glacial drift deposits consisting of sand and gravel.

For purposes of developing the numerical groundwater model, the Vashon Aquifer is represented by two principal zones with distinct permeabilities, separated by a relatively lower permeability zone. The upper zone is comprised of the Steilacoom Gravel, which occurs from groundwater surface to an elevation of approximately 180 to 168 feet. At that elevation, there is a lithologic change sometimes indicated by a slightly siltier zone or a slight increase in density during drilling. Below this siltier zone lies the deeper portion of the Vashon Aquifer, comprised of sand and gravel. The deeper outwash zone occurs to the depth of the Olympia Beds, which occurs at an average elevation of 110 to 120 feet.

Beneath the Olympia Beds is the regionally extensive and highly productive Sea Level Aquifer, which occurs throughout the DuPont area between elevations of roughly 50 and -100 feet relative to mean sea level. The Sea Level Aquifer is generally confined beneath the Olympia Beds aquitard and has very limited hydraulic connection with the shallower Vashon Aquifer. West of the Olympia Bed Truncation described below, the Sea Level Aquifer becomes unconfined and its groundwater merges with flow from the Vashon Aquifer in the accumulation of Steilacoom Gravel extending below mean sea level (sometimes referred to as the unconfined Sea Level Aquifer; URS, 2003). Groundwater in the Sea Level Aquifer discharges to Puget Sound via intertidal and subtidal seeps. The Sea Level Aquifer is the City of DuPont's primary water supply source (their Bell Hill wells No. 1 and No. 3 and Hoffman Hill wells No. 1 and No. 2 are completed in it [refer to Section 3.1.5]).

Below the Sea Level Aquifer and underlying aquitard unit is a deeper glacial aquifer unit, sometimes termed the Lakewood Aquifer, in which the City of DuPont's Bell Hill No. 2 well is completed. Below the Lakewood Aquifer, two deeper glacial aquifer units separated by interglacial aquitard units were observed during drilling of CalPortland's 1,000-foot-deep water well (TW-1) for the aggregate processing plant. CalPortland's well is completed in the deepest observed aquifer unit, screened between elevations of -685 and -770 feet (Hart Crowser, 1991).

3.1.2.1 Olympia Bed Truncation

The underlying Olympia Beds are absent west of a line (termed Olympia Bed Truncation) located on the order of 1,500 to 3,000 feet inland from the current Puget Sound shoreline. Steilacoom Gravel extends from ground surface to below sea level west of the Olympia Bed Truncation, where they are in contact with the Sea Level Aquifer.

The occurrence/non-occurrence of the Olympia Beds creates a unique hydrogeologic condition. Groundwater in the outwash east of the Olympia Bed Truncation is held up by the occurrence of the thick, low permeability Olympia Bed deposits. A steep hydraulic gradient occurs where the groundwater drops over this feature within the current mine site. As the groundwater flows westerly over the Olympia Bed Truncation, it drops roughly 160 feet vertically in 800 feet horizontally through the permeable gravels to near sea level. Therefore, the water table is typically found at relatively shallow depths of 15 to 25 feet below ground surface (or approximately 185 to 195 feet elevation) in the South Parcel area. West of the Olympia Bed Truncation, the water table is found at a depth of roughly 190 feet below the former ground surface (or at elevation of approximately 15 feet) in the existing mine.

3.1.2.2 Aquifer Testing

Five pumping tests were conducted in wells located along the east side of the proposed South Parcel mine expansion area to determine hydraulic properties of the outwash aquifer throughout its depth (CH2M Hill, 2000). These testing data, along with studies conducted for Fort Lewis Landfill 5 (WCC, 1991) and the Former DuPont Works site (URS, 2003), provide baseline hydraulic parameters for the Vashon Aquifer used as a starting point in development of the numerical groundwater flow model. Table 6 provides the calibrated aquifer parameters used in groundwater simulations.

3.1.3 Groundwater Elevations and Flow Patterns

Observed groundwater elevations in the South Parcel Project area are shown in timeseries graphs on Figure 13. A map with contours of groundwater level elevations for May 2010, which represents mid-range water levels during a typical transition from the high water levels of winter toward the lower water levels of summer, is shown on Figure 14. Seven other groundwater contour maps representing a range of seasonal high and low water levels and antecedent precipitation conditions are included in Appendix C.

A map showing the seasonal range in groundwater levels during wet and dry seasons is shown on Figure 15. These data show that groundwater levels have been seasonally variable with the range dependent on proximity to the wetland complex, in general.

Groundwater underlying the South Parcel Project area primarily originates from upgradient areas in western Pierce County where precipitation (as rainfall and snow) infiltrates the ground surface and forms aquifers. Infiltration from the Fort Lewis Diversion Canal also offers a continuous groundwater source. Seasonal groundwater sources include the Edmond and Bell/McKay/Hamer marsh complex, in addition to rain falling across the South Parcel Project area. Groundwater drainage features include Sequalitchew Creek, the Diversion Canal, and the wetland complex (seasonally).

The surficial Steilacoom Gravel is highly permeable and are known to rapidly infiltrate precipitation and stormwater; the veneer of topsoil covering the Steilacoom Gravel is finer grained (can contain volcanic ash) and thus has lower infiltration capacity. The gravels form a relatively flat outwash plain in the area, in the center of which is a series of large wetlands—referred to as Bell, McKay, Hamer, and Edmond Marshes (Figure 27). These wetlands occur in areas where large ice blocks, stranded during the glacial flood outbursts, later melted and formed kettle depressions lined with finer-grained, lower-permeability materials. These features store water for a much longer time relative to the rapidly infiltrating gravel outwash around these features. The wetland sediments from throughout the wetland complex were sampled and lab tested for permeability, and these data were used for simulating the wetland areas in the numerical groundwater model.

3.1.3.1 Groundwater Interaction with Wetland Complex and Lakes

Since 2000, monitoring data have been collected to understand the hydraulic connection of the groundwater system with the area wetlands and Sequalitchew Creek system (Appendix B). The monitoring data indicate hydraulic connection between surface water and groundwater through the wetland complex within the upper Sequalitchew Creek drainage. Hydraulic connection is observed by similar water elevations, fluctuations, and time-trends at paired surface water and groundwater monitoring stations. Hydraulic connection is also indicated in the middle reaches of Sequalitchew Creek where springs (groundwater) discharge to the ravine throughout most of the year. Sequalitchew Creek infiltrates water to the groundwater system in its lowermost reaches. Details of the conceptual model for the groundwater/wetland connection are provided in Section 3.2 of the Groundwater Model Update Report (Aspect, 2017b).

In Bell, McKay, and Hamer Marshes, surface water levels are typically higher than groundwater levels indicating an influx of surface water in the wet season from stormwater generated on Joint Base Lewis-McChord (JBLM). Surface water and

groundwater monitoring data from these marshes is shown in Figures B-5a through B-5c in Appendix B. In Bell Marsh (Figure B-5a), the surface water level is similar to, but slightly above groundwater level. In McKay Marsh (Figure B-5b), the surface water level was uniformly higher than groundwater until 2011, then the surface water level tracked closely with groundwater until 2019 when seasonal surface water highs started being lower than groundwater. These changes over time are interpreted as associated with removal of beaver dams at the box culvert connecting McKay Marsh to Hamer Marsh.

The relationship between groundwater and surface water in Hamer Marsh varies within the marsh. There are three groundwater wells near Hamer Marsh: MW-HM-1 on the south, SRC-MW-2 on the east, and MW-SL-1 near the Lake Outlet Area (Figure 12). Groundwater level in MW-SL-1 is 1 to 3 feet lower than the surface water level in Hamer Marsh, indicating that the marsh is recharging groundwater along the northwestern edge. On the southern edge, the groundwater level in MW-HM-1 is typically higher than the surface water level, which would result in groundwater discharge to the marsh. On the eastern side, groundwater in SRC-MW-2 is higher in winter and lower in summer. This complicated pattern in Hamer Marsh is largely driven by Sequalitchew Lake and the Diversion Canal acting as large areas of groundwater discharge.

Throughout Edmond Marsh, there is connection between surface water and groundwater; however, the connection is greater in the more easterly monitoring stations than in the west marsh area. In the central and eastern areas, stations EM-3 and EM-2 are located adjacent to roadways that, during their construction, may have excavated out the peat deposits. In addition, the creation and maintenance of a channel for Sequalitchew Creek through Edmond Marsh during the years when a fish hatchery operated in Sequalitchew Lake likely disturbed or removed portions of the peat deposits. The westernmost station EM-1 has the least amount of hydraulic connection, presumably because the underlying peat materials are still in place.

These monitoring data indicate that an influx of surface water in the wet season fills the wetland area. Beaver dams help to maintain marsh surface water levels higher than groundwater levels beneath the marshes during the wet season. During the dry season, the surface water and groundwater levels drop. In the west end of West Edmond Marsh, the groundwater level drops below the marsh bottom (i.e., it becomes perched) and the marsh completely dries each year by late spring. The west end of West Edmond Marsh is typically perched from May through October or later and is dry for most of that period. This condition is interpreted as affecting the western two-thirds of West Edmond Marsh, as water is present year-round at the staff gage west of Robinson Trail. Beaver activity in West Edmond Marsh likely defines the boundary between the areas to the west that become perched and the areas near Robinson Trail that remain in contact with groundwater year-round.

The monitoring data also indicate that the core wetland areas are generally underlain by fine-grained, low-permeability peat and silt deposits that hold water (Aspect, 2004a). Where these peat deposits occur, the amount and rate of surface water that can leak into the groundwater system due to potential future groundwater drawdown would be limited by the natural low permeability of the underlying silts and peats. In other areas, development has removed the naturally low-permeability soils from historical wetland

areas; the removal of peat and/or the natural heterogeneity of the soil materials can create an avenue for greater hydraulic connection and thus wetland response to groundwater level change.

A group of lakes (e.g., Grant Lake, Pond Lake, Old Fort Lake, and several others) are located a few thousand feet south of Sequalitchew Creek (Figure 12). Monitoring data indicates these are water table lakes whose surfaces fluctuate with the groundwater level.

3.1.4 Groundwater Quality

The unconfined Sea Level Aquifer was tested for water quality in late 1991 by Hart Crowser as part of water supply exploration work for the mine, and by Woodward-Clyde Consultants as part of Landfill 5 monitoring. In 2005, samples were collected from selected wells completed in the Steilacoom Gravel for analysis of nitrate (Aspect, 2005).

The data indicate generally good groundwater quality. Nitrate as nitrogen concentrations were below the primary standard for drinking water (i.e., the Maximum Contaminant Levels–MCLs). Secondary MCLs (based on aesthetics) for drinking water were exceeded for iron and manganese. Hart Crowser (1991) indicated it to be a regional phenomenon as it was seen in other wells in the area.

During initial permitting of the existing mine, water quality was a concern because of the mine's location downgradient from JBLM Landfill 5, a portion of which had been listed as a Superfund Site. Since that time, the Landfill was closed in accordance with applicable laws and regulations and removed from the Superfund Site listing in 1992, with a Record of Decision that indicated "no further remedial action required".

Recent groundwater quality monitoring (through 2022) indicates remaining contaminants of concern (such as iron, manganese, arsenic, and vinyl chloride) have been detected in groundwater monitoring wells between Landfill 5 and the project area (INNOVEX-ERRG Joint Venture, 2023), with concentrations decreasing and approaching applicable groundwater quality standards[5] or background concentrations. For example, arsenic in wells upgradient of Landfill 5 has been observed at concentrations above the groundwater quality standard, reflecting the regionally high background concentration of arsenic (Ecology, 2022). The City of DuPont and the South Parcel are within an area of the Tacoma Smelter Plume for which Ecology has determined the predicted arsenic concentrations in soil (less than 200 ppm) are unlikely to pose a threat to groundwater (Ecology, 2012). The nature of observed groundwater contamination for Landfill 5 is consistent with unlined landfills approaching functional stability where little to no leachate generation and/or landfill gas generation is observed.

3.1.5 Drinking Water Supplies

There are two significant public water supplies in the general area: the City of DuPont's and JBLM's. The characteristics of these water supplies are described below.

[5] Cleanup at JBLM Landfill 5 is being administered under CERCLA. We understand Landfill 5 is exempt from Ecology (2005) guidance on implementing groundwater standards for landfills, however, for the purpose of the Proposed Action, we assume this Ecology guidance is applicable and that concentrations of remaining contaminants of concern may be compared to values provided in Chapter 173-200 WAC and Chapter 246-290 WAC.

3.1.5.1 City of DuPont

The City of DuPont uses six wells for its municipal water supply. The closest water supply wells to the South Parcel Project are Bell Hill Wells No. 1, No. 2, and No. 3, located on Bell Hill roughly 1 mile south-southeast (regionally upgradient) of the South Parcel. The Bell Hill No. 1 and No. 3 wells are completed in the deep confined Sea Level Aquifer beneath the Olympia Beds. The Bell Hill No. 2 well is completed in a still-deeper confined aquifer. The City's Hoffman Hill wells No. 1 and No. 2 are located more than 1 mile southwest of the South Parcel and are also completed in the Sea Level Aquifer. Each of the City's water supply wells withdraw groundwater from deep confined aquifers that are hydraulically isolated from surface influence and are at locations hydraulically upgradient (Bell Hill) or cross-gradient (Hoffman Hill) of the Proposed Action.

The City of DuPont holds water right authorizations to withdraw up to 5,390 gallons per minute (gpm), and 3,360 acre-feet per year. In 2020, the City's actual water production was 1,359 acre-feet. The City has a pending water right application with a priority date of December 15, 2004, on file with Ecology. The proposed source for the new water right is two future wells to be situated near Center Drive within the NW ¼ NE ¼ of Section 35, T. 19 N., R. 1 E.W.M. and/or the SE ¼ SW ¼ of Section 26, T. 19 N., 1 E.W.M. These locations in the general vicinity of Grant Lake or Pond Lake, respectively. The wells will withdraw water from the Sea Level Aquifer. As with the existing wells, the City's proposed new wells will be constructed in a unit that is hydraulically isolated from surface influence and upgradient.

The City has additionally filed an Application for Change of Water Right (G2-GWC 170@2) requesting that a portion of Water Right Certificate 170 be transferred to the Hoffman Hill wells. This change would result in an increase of 450 gpm, and 320 acre-feet of water that could be produced from the Hoffman sources.

3.1.5.2 Joint Base Lewis-McChord

JBLM receives most of its water supply from Sequalitchew Springs (see Section 3.1.6.1), which are reported to yield as much as 9,000gpm, or approximately 20 cubic feet per second. Other portions of JBLM are supplied by groundwater wells that range widely in depth and are completed in all three of the area's major aquifer.

JBLM's legal access to water is embedded in the base's federal status as a military base, as such it is allowed to access water for the base's primary purposes which includes the drinking water system that serves its population. Sequalitchew Springs generally provides more flow that needed by JBLM for water supply.

3.1.6 Springs

There are three identified sets of springs in the general vicinity of the South Parcel Project, including Sequalitchew Springs at the east end of Sequalitchew Lake (on JBLM), springs along the Sequalitchew Creek ravine, and intertidal springs observed along the shoreline of Puget Sound. Each set of springs is described below.

3.1.6.1 Sequalitchew Springs

The Sequalitchew Springs are located on the eastern shore of Sequalitchew Lake, just west of American Lake and are formed where the water table between American Lake

and Sequalitchew Lake intersects ground surface. American Lake is maintained at an elevation of approximately 224 feet through an overflow channel near Sequalitchew Springs, and Sequalitchew Lake is maintained at an elevation of approximately 211 feet controlled by a weir at the west end of the lake.

As mentioned above, Sequalitchew Springs are the principal water supply for JBLM. Most of the time the springs provide more flow than needed by JBLM for water supply, resulting in surface water outflow from Sequalitchew Lake passing over the Diversion Weir and into the Diversion Canal. There are periods, typically in dry summers, when spring flow is fully consumed by JBLM and no water flows over the Diversion Weir. The periods occurred approximately 7.7 percent of the time during the monitoring period as described in Section 4.5.3.1. The DuPont model tracks overflow from Sequalitchew Springs.

3.1.6.2 Springs in Sequalitchew Creek Ravine

Groundwater discharges from the Vashon Aquifer as springs in the Sequalitchew Creek ravine below elevations of approximately 195 feet down to the top elevation of the Olympia Bed deposits at elevation between approximately 100 to 120 feet, which spans a creek reach of approximately 0.7 miles. These springs provide baseflow to Sequalitchew Creek. Based on stream gaging data, this groundwater discharge to the creek varies between approximately 0.5 cubic feet per second (cfs) in the summer to 1.5 cfs in the winter. Progressing downstream past the Olympia Bed Truncation, Sequalitchew Creek becomes a losing stream as the water table drops through the outwash to near sea level.

3.1.6.3 Intertidal Springs

Springs are located at multiple points along the shoreline of the Nisqually Reach. Two springs are located along the beach just north of the Sequalitchew Creek estuary and directly west of the area of the proposed South Parcel mine development (Figure 27). The largest of these springs, the Large Spring, was reported to flow between 11 and 18 cfs based on monthly data collected by the USGS in 1942. Spot measurements by CH2M HILL in 1999 and 2000 indicated flows of 9.1 and 14.9 cfs, respectively (CH2M HILL, 2001). The makeup of the water (saltwater versus freshwater) discharging from the springs is influenced by tidal stage and season. The sources of freshwater to the intertidal springs are summarized in Table 9. It is estimated that the Vashon Aquifer contributes up to approximately 15 percent of the intertidal spring discharge and the Sea Level Aquifer contributes up to approximately half of the intertidal spring discharge, with the remainder being salt water (Aspect, 2015; Aspect, 2004b).

Table 9. Sources of Water to the Intertidal Springs

Source	Estimated Percentage of Intertidal Spring Flow
Vashon Aquifer	0–2 - 14
Sea Level Aquifer	0–8 - 49
Puget Sound	–6 - 99

3.2 Effects of the Proposed Action

3.2.1 Groundwater Elevations and Flow Patterns

The groundwater table will be significantly lowered in the vicinity of the South Parcel Project area as a result of the dewatering activities included in the Proposed Action. Following calibration and validation, the DuPont model was used to predict decreases in groundwater levels during the four sequential future steps of proposed dewatering and mining activity in the South Parcel. A summary of the model predictions for all four dewatering steps is shown on Figure 20. As described in Section 4.6.5, dewatering Steps 1, 2, and 3 simulated 10, 24, and 66 active dewatering wells, respectively. Step 4 simulated the post-mining condition with pumping terminated and groundwater passively discharging at the toe of the newly mined slope. For direct comparison with baseline model results, predictive models used the same baseline boundary conditions as the validation model, except for pumping at active dewatering wells or drainage at the toe of the newly mined slope.

Model results indicate that pumping rates will equilibrate within 1 month, and water levels will largely equilibrate within 60 days, of a change in pumping rates. Baseline groundwater levels are sensitive to seasonal and longer-term precipitation patterns (e.g., see Figure 9 in the Groundwater Model Update Report [Aspect, 2017a]), and groundwater levels during the four dewatering phases are predicted to likewise remain sensitive to precipitation patterns.

Results of the predictive models are discussed below by dewatering phase, in terms of predicted decreases in groundwater levels compared to baseline conditions. To support the discussion, predicted decreases in groundwater levels are presented in a table, graphs, and maps.

3.2.1.1 Future Mining Step 1: Initial 10-well Dewatering Test

Step 1 dewatering will include 10 active wells located in the northern portion of the South Parcel, as shown on Figure 21. To simulate Step 1, the validated model was modified by adding 10 wells screened across the Steilacoom Gravel and Vashon Recessional Outwash. Wells were simulated to pump up to 1 cfs each unless the available drawdown in the well limited the pumping rate. After the first month of pumping all 10 wells, the combined pumping rate is predicted to be approximately 3.6 cfs, on average, and up to approximately 5.5 cfs during the wet season. See Table 7 for average monthly, overall average, and minimum and maximum dewatering rates.

Groundwater level decreases are predicted to stabilize within approximately 60 days after pumping starts based on model results. During Step 1, the model-predicted decreases in groundwater levels shown on Figure 22 are most evident at monitoring wells CHMW-2S and CHMW-2D, which are the closest monitoring wells to the proposed location of the Step 1 dewatering wells. At more distant monitoring wells, the predicted groundwater level decreases are less than half the observed range in baseline groundwater levels.

Table 8 lists the maximum decrease in groundwater level at each well during Step 1. For the purposes of communicating refined model results, we focus on the values on the left half of Table 8, which are the maximum decreases in groundwater level without

including model uncertainty. The maximum groundwater level decrease at CHMW-2D is predicted to be approximately 8.8 feet, which is more than half the range in observed water levels during baseline monitoring. The maximum groundwater level decrease at upgradient monitoring well MW-D-3 (adjacent to the Diversion Canal east of the mine expansion) is predicted to be approximately 1.8 feet. The maximum groundwater level decrease at monitoring wells MW-EM-1D and MW-EM-2D (in Edmond Marsh) is predicted to be approximately 0.5 foot and 0.1 foot, respectively. Note that the maximum predicted groundwater levels changes shown on Figure 22 at individual wells reflect the incorporation of model uncertainty and correspond with the values presented in the righthand columns of Table 8.

During Step 1, little or no effects on wetlands or groundwater discharge to Sequalitchew Creek were predicted by the model (see Figure 21 in the Groundwater Model Update report [Aspect, 2017b]). The overall average wetland infiltration rate is predicted to remain similar to baseline conditions. The predicted average rates of wetland infiltration to groundwater, and discharge from wetland to surface water, are similar to baseline conditions. The timing of net wetland flow (wetland infiltration to groundwater plus discharge from the wetland to surface water) is predicted to be approximately the same as baseline conditions. During Step 1, the JBLM water supply overflow showed no significant change in flow rates compared to baseline conditions.

3.2.1.2 Future Mining Step 2: Active Dewatering in Preparation for Mining

During Step 2, the dewatering well network will be expanded to the south along the South Parcel mine perimeter as well as adding a few wells in the interior as shown on Figure 21. To simulate Step 2, the validated model was modified by adding 24 wells screened across the Steilacoom Gravel and Vashon Recessional outwash. The dewatering wells are arranged in two lines on either side of the initial mine trough, with 19 boundary wells and 5 inner wells. Wells were simulated to pump up to 1 cfs each unless the available drawdown in the well limited the pumping rate. After the first month of pumping all 24 wells, the combined pumping rate is predicted to be approximately 5.2 cfs, on average, and up to approximately 8.8 cfs during the wet season as shown in Table 7.

Groundwater level decreases at upgradient monitoring wells are predicted to stabilize within approximately 60 days after pumping starts based on model results. As shown in Table 8 and on Figure 23, the maximum groundwater level decreases during Step 2 at CHMW-2D and CHMW-1 are predicted to be approximately 45 feet and 5.2 feet, respectively. At this step, monitoring well CHMW-2D will be interior to the dewatering well network. The maximum groundwater level decrease at upgradient monitoring well MW-D-3 is predicted to be approximately 4.3 feet. The maximum groundwater level decreases at MW-EM-1D and MW-EM-2D are predicted to be approximately 1.5 feet and 0.2 feet, respectively. The maximum predicted groundwater levels changes shown on Figure 23 at individual wells reflect the incorporation of model uncertainty and correspond with the values presented in the righthand columns of Table 8.

During Step 2, the predicted overall wetland infiltration rate will be approximately 0.2 cfs greater than baseline conditions, assuming wetland water levels are maintained (see Figure 21 in the Groundwater Model Update Report [Aspect, 2017b]). Most of the predicted changes in infiltration will occur in the East Edmond Marsh area. The predicted

timing of net wetland flow will remain approximately the same as baseline conditions. Groundwater discharge to Sequalitchew Creek during Step 2 is predicted to remain similar to baseline conditions. During Step 2, the JBLM water supply overflow showed no significant change in flow rates compared to baseline conditions.

3.2.1.3 Future Mining Step 3: Active Dewatering During Mining

Step 3 dewatering was simulated with 66 active wells along the eastern and southern South Parcel mine boundary, as shown on Figure 21. The dewatering wells are arranged in two lines on either side of the initial mine trough, with 54 boundary wells and 12 interior wells. The combined pumping rate is predicted to be approximately 6.9 cfs, on average, and up to approximately 12.2 cfs during the wet season as shown in Table 7. It may not be necessary to operate all dewatering wells as the mine trough progresses once an alternative (passive) dewatering system is in place. However, for the purposes of evaluating the maximum effects of dewatering during Step 3, the DuPont model simulated all dewatering wells operating simultaneously as a conservative assumption.

Groundwater level decreases are predicted to stabilize within approximately 60 days after pumping starts, based on model results. The maximum predicted decreases summarized in this paragraph are shown in the Step 3 column on the left side of Table 8. The maximum groundwater level decreases during Step 3 at CHMW-2D, CHMW-1, CHMW-4D, and CHMW-3D are predicted to be approximately 51 feet, 60 feet, 15 feet, and 57 feet, respectively. The maximum groundwater level decreases at MW-EM-1D and MW-EM-2D are predicted to be approximately 5.1 feet and 0.4 feet, respectively. The maximum groundwater level decreases at upgradient monitoring wells MW-D-3 and MW-93-MFS-C-5 are predicted to be approximately 7.7 feet and 4.2 feet, respectively. The groundwater levels during Step 3 are predicted to be approximately 10 to 20 feet above the Olympia Beds along the mine trough. The maximum predicted groundwater levels changes shown on Figure 24 at individual wells reflect the incorporation of model uncertainty and correspond with the values presented in the righthand columns of Table 8.

During Step 3, the predicted overall wetland infiltration rate will be approximately 0.6 cfs greater than baseline conditions, assuming wetland water levels are constant (see Figure 21 in the Groundwater Model Update Report [Aspect, 2017b]). Most of the predicted changes in infiltration will occur in the East Edmond Marsh area. Based on model results, the lower groundwater levels under West Edmond Marsh will reduce groundwater discharge to surface water during Step 3. Groundwater discharge to Sequalitchew Creek during Step 3 is predicted to be 83 percent less than baseline conditions, on average, with the greatest decreases during the dry season. As with Steps 1 and 2, the JBLM water supply overflow showed no significant change in flow rates in Step 3 compared to baseline conditions.

3.2.1.4 Future Mining Step 4: Post-Mining Conditions

During Step 4, pumping from the dewatering well network will cease, and groundwater will emanate from the toe of the mined slope. Groundwater emanating from the southern portion of the slopes will be collected and conveyed to provide the primary water source for a constructed wetland in the southwest corner of the existing mine. Groundwater seeping from the toe of the northern slopes will be collected and conveyed to an

infiltration pond on the floor of the existing mine. Overflow from the wetland will flow to this same infiltration pond. The Step 4 ground surface (model top) elevation was modified to reflect the final mine grade to simulate passive groundwater discharge into the mine. The flow rate of groundwater discharging into the mine is predicted to be 6.9 cfs, on average, and up to 13.7 cfs during the wet season. Collected groundwater discharging into the mine will be re-infiltrated in the western portion of the mine area. The re-infiltration of collected groundwater seeping into the mine will recharge the Sea Level Aquifer and will not affect groundwater levels in the Vashon outwash aquifer. As such, re-infiltration was not simulated in the DuPont model.

Groundwater levels within the Vashon aquifer are predicted to recover slightly relative to the active pumping of Step 3. Those changes within the Vashon aquifer are predicted to stabilize within approximately 60 days after pumping stops based on model results. As shown in Table 8, the maximum groundwater level decreases at monitoring wells along the mine trough (CHMW-2D, CHMW-1, CHMW-4D, and CHMW-3S), are predicted to be approximately 32 feet, 30 feet, 14 feet, and 50 feet, respectively. The maximum groundwater level decreases at upgradient monitoring wells MW-D-3 and MW-93-MFS-C-5 are predicted to be approximately 6.6 feet and 3.6 feet, respectively. The maximum groundwater level decreases at MW-EM-1D and MW-EM-2D are predicted to be approximately 4.7 feet and 0.4 feet, respectively (see Figure 25). The maximum predicted groundwater levels changes shown on Figure 25 at individual wells reflect the incorporation of model uncertainty and correspond with the values presented in the righthand columns of Table 8. Figure 20 presents the calculated groundwater level elevations, the monthly ranges in calculated water levels, and the monthly change in calculated water levels. Model uncertainty is graphically presented by the error bars on Figure 20.

During Step 4, the predicted overall wetland infiltration rate will be approximately 0.5 cfs greater than baseline conditions, assuming stream restoration efforts maintain wetland water levels (see Figure 21 in the Groundwater Model Update Report [Aspect, 2017b]). Most of the predicted changes in infiltration will occur in the East Edmond Marsh area. Based on model results, the lower groundwater levels under West Edmond Marsh during Step 4 will reduce groundwater discharge to surface water. Groundwater discharge to Sequalitchew Creek during Step 4 is predicted to be 79 percent less than baseline conditions, on average, with the greatest decreases during the dry season.

During Step 4, the JBLM water supply overflow showed no significant change in flow rates compared to baseline conditions.

3.2.1.5 Comparison of Water Levels during Mining Steps 1 through 4

Figure 20 provides a collection of graphs comparing groundwater levels (elevations) for each dewatering step by monitoring well. The upper graphs on Figure 20 compare time-series of baseline groundwater levels and predicted groundwater levels for each of the four dewatering phases. The lower ends of the whiskers illustrate the minimum groundwater levels including model uncertainty.

The middle graphs on Figure 20 show the ranges in monthly groundwater level elevations for baseline conditions and each of the four dewatering phases. The color bars reflect the

potential effects of annual hydrologic variability. The lower ends of the whiskers illustrate the minimum groundwater level including model uncertainty.

The lower graphs on Figure 20 show the range in monthly groundwater levels decrease from baseline for each of the four dewatering steps. The color bars reflect the potential effects of annual hydrologic variability. The lower ends of the whiskers illustrate the minimum groundwater level including model uncertainty.

During Step 3, it likely will not be necessary to continue operating all of dewatering wells as the mine trough progresses. As the passive groundwater conveyance ditches are installed in areas mined earlier, the wells upgradient of these areas can be turned off allowing groundwater to passively discharge from the toe of the mined slope. However, for the purposes of evaluating the maximum possible effects of dewatering during Step 3, the DuPont model simulated all dewatering wells operating simultaneously as a conservative assumption.

3.2.1.6 Model Uncertainty

The DuPont model validation timeframe was 11 years, including a 6-year calibration timeframe. This is a longer calibration and validation timeframe than typically incorporated in similar groundwater models. By comparison, the USGS model calibration timeframe was 2 years with no validation timeframe.

Model uncertainty for the DuPont model results was calculated as the 95-percent confidence interval using the 1-tailed test and the well-specific standard deviation of residuals from the residual statistics for the entire 11-year model validation period. For predictive model results, the 95-percent confidence interval was increased proportional to the average water level decrease at that location. Additional discussion of model uncertainty is provided in Section 6.5 of the Groundwater Model Update Report (Aspect, 2017b).

Model uncertainty was incorporated into predictions of the minimum groundwater levels for each month in each dewatering Step. These values are shown in Table 10 and are used as thresholds in the Monitoring Plan (Aspect, 2017a) for triggering the adaptive management process during dewatering. A similar approach was also used for calculating the groundwater levels with mining used in the marsh water balances described in Section 4.2.3.2.

3.2.2 Groundwater Quality

Groundwater quality in the South Parcel Project area will not be significantly affected if BMPs are responsibly implemented throughout the Proposed Action. Groundwater quality impacts are rare at properly managed aggregate mining sites. The principal concern relates to the direct access to highly permeable aggregate materials. Current mining permits require that best management practices include implementation of stormwater pollution prevention, spill control and cleanup procedures, frequent monitoring of stormwater quality, and management of operations to minimize the use of materials in the mine that could generate potential contaminants.

3.2.2.1 Dewatering

Dewatering is not anticipated to have an impact on upgradient water quality. Installation, operation, and decommissioning of dewatering wells, pumps, conveyance lines, and supporting infrastructure will be conducted in accordance with the mine plan to protect both surface water and groundwater resources. Dewatering will not introduce new potential sources of groundwater contamination, and engineering controls at nearby JBLM Landfill 5 (including landfill gas collection from seven covered and/or lined zones) will not be affected by water level decreases from dewatering; therefore, groundwater dewatering will not provide a mechanism to increase the rate of leachate production, mobilization, or landfill gas generation.

Dewatering may reduce groundwater levels by up to 9 feet in the vicinity of Landfill 5. In this case, the water table in some shallow monitoring wells could drop below the sampling pump intake or the bottom of the well, necessitating modification or replacement of the well(s). This condition will be assessed and addressed as necessary based on observed conditions during the initial dewatering testing period. The steeper hydraulic gradient associated with groundwater level declines will accelerate groundwater flow near the Project Area before the groundwater enters the dewatering system (wells and/or drains). For existing or future sources of groundwater quality impacts upgradient and near the Project area, such as Landfill 5, greater groundwater flow rates may result in lower concentrations downgradient of the source.

The dewatering system will be capturing all groundwater above the Olympia Beds, and any groundwater impacted by Landfill 5 will be thoroughly mixed with unimpacted groundwater during the dewatering process. For these reasons, no significant adverse impacts to groundwater quality are likely to result from the proposed action.

3.2.2.2 Chemical Spills, Leaks, and Drips within the Mine

Spills, leaks, and drips of chemical products are not typically a significant groundwater quality concern for mining sites like the South Parcel Project because of the limited use of chemicals, and small number of heavy equipment operating in a large area. Petroleum products (diesel fuel, motor oil, and hydraulic fluid) used to operate the mining equipment are the only chemical constituents used within the mining area and mining companies are uniquely able to excavate and contain small spills because heavy equipment is always on site. Thus, in the event of a spill they can quickly excavate contaminated soil and contain it in the bed of a dump truck.

To assess the risk of an accidental fuel spill from a piece of mining equipment, numerical modeling was performed using the EPA Hydrocarbon Spill Screening Model (HSSM). The model was setup to evaluate a reasonable thickness for an unsaturated soil buffer zone that would protect the groundwater should an accidental release of petroleum hydrocarbons occur on the floor of the existing mine. This is a conservative assumption because the mining of the South Parcel Project will occur in areas underlain by the lower permeability Olympia Beds, which are much less conducive to transport of spilled hydrocarbons. The modeling evaluated the migration of light, non-aqueous phase liquids (LNAPL) through the unsaturated zone to the water table. This modeling analysis was conducted for equivalent mining conditions during permitting for the North Parcel mine expansion, and the HSSM model setup and results for that permitting process (Aspect, 2013) are adopted here.

HSSM model results indicate it would take approximately 3 days for a release of 500 gallons of diesel to migrate to a depth of 5 feet below the base of the active aggregate mine. If a scenario existed where the spill was not cleaned up, the modeling indicates the diesel front would reach a depth of 8.5 feet in 30 days, and a depth of 10 feet in 89 days. It is unlikely that a full diesel tank would rupture. In accordance with the mine's Spill Response Plan, required under the Sand and Gravel General NPDES/SWD permit, any spills would be cleaned up immediately so it is unlikely that a spill would go without a cleanup response for more than 1 day.

3.2.3 Drinking Water Supplies

Drinking water supplies identified near the South Parcel Project area will not be significantly affected by the Proposed Action. Figures 22 through 25 show little to no effect on groundwater conditions in the unconfined aquifer at the southwestern model boundary. Based on the proximity of the City of DuPont water supply wells to the model boundary condition, and the completion of those wells in the Sea Level Aquifer, we anticipate no effect of the Proposed Action on groundwater conditions at these water supply wells.

JBLM's water supply at Sequalitchew Springs would also not be affected by the Proposed Action. Figures 22 through 25 show the drawdown effects of dewatering and post-mining condition do not extend to Sequalitchew Springs or its source American Lake. The model calculates a decrease of approximately 0.03 cfs (15 gallons per minute) in overflow from Sequalitchew Springs to Sequalitchew Lake, which is small relative to the 10 cfs outflow (on average) from the lake measured at the Diversion Weir. While there would be a minor decrease in the overflow volume, the amount withdrawn for water supply would not be affected.

3.2.4 Springs

The predicted effects of the Proposed Action on spring flow in the vicinity of the South Parcel Project vary. The following sections describe the predicted effects on Sequalitchew Springs, the spring along Sequalitchew Creek ravine, and intertidal springs observed along the shoreline.

3.2.4.1 Sequalitchew Springs

As described above, the model predicts no effect of the Proposed Action on the water supply from Sequalitchew Springs. Figures 22 to 25 show the drawdown effects of dewatering and post-mining condition do not extend to the east end of Sequalitchew Lake or the Springs' source, American Lake.

3.2.4.2 Springs in Sequalitchew Creek Ravine

The model predicts that the Proposed Action will decrease flow rates from some of the springs in Sequalitchew Creek ravine. The affected springs in Sequalitchew Creek ravine are those sourced by the Vashon Aquifer where dewatering and the post-mining condition results in lower groundwater levels.

3.2.4.3 Intertidal Springs

The model predicts that the Proposed Action will not have a significant impact on intertidal springs flows because there is no consumptive use of groundwater as water

produced during dewatering and the post-mining condition is reinfiltrated within the mine upgradient of these springs. Because the total quantity of groundwater flowing westward from the re-infiltration pond area would not change, the Proposed Action would not markedly change the makeup of water (freshwater versus saltwater) discharging from the intertidal springs, which is controlled primarily by tidal stage and season (Aspect, 2015, included in Appendix D; Aspect, 2004b).

3.3 Effects of the No Action Alternative

Under the No Action alternative, the individual parcels that comprise the South Parcel would most likely be cleared and developed for manufacturing and research and/or residential land use based on existing land use and zoning designations, as detailed in Section 1.2.

Manufacturing and research and residential development would replace vegetated areas with impervious surfaces, which decreases evapotranspiration and increases stormwater runoff. Assuming that all stormwater is infiltrated, given the porous surficial soils, there would be an increase in groundwater recharge. Any water obtained from the City of DuPont water supply and used within the future South Parcel developments for irrigation or other outdoor purposes could also increase recharge.

Risks to groundwater quality in the South Parcel would increase during future development; however, a 10- to 20-foot-thick unsaturated zone of sand and gravel would remain, providing some protection for the aquifer.

3.4 Mitigation Measures

Mitigation measures have been included in the Proposed Action to reduce impacts to groundwater quantity and quality:

- Steps 1 and 2 of the Dewatering Plan are completely reversible and allow for real-world testing of the groundwater model predictions and impacts to groundwater quantity at scale.
- The Dewatering Plan is structured to begin dewatering at the locations furthest from sensitive receptors, then slowly proceed closer only if the changes in groundwater are consistent with predictions.
- The Monitoring Plan details a series of adaptive management actions during each step of dewatering to monitor water levels, assess results by comparing with predictions, and take corrective actions, if necessary. Dewatering would not proceed if impacts to groundwater are not consistent with predictions.
- The Sequalitchew Creek Watershed Restoration Plan would mitigate for the impacts of the Proposed Action on Edmond Marsh and flows in Sequalitchew Creek (see Section 4).
- Re-infiltration of collected groundwater within the floor of the existing mine preserves the flow to the intertidal springs.

- Erosion and sediment controls and stormwater treatment, described in the Geology and Surface Water sections respectively, would protect groundwater quality and long-term performance of the proposed infiltration ponds.
- Revegetation of the proposed mine slopes and floor as a part of reclamation would stabilize soils and reduce effects on quantity and timing of groundwater recharge.
- The Dewatering Plan may lower the water level in some of the JBLM Landfill 5 monitoring wells below the pump intake setting or the bottom of the well. If this occurs, deepening or replacement of monitoring wells may be necessary.

3.5 Significant Unavoidable Adverse Impacts

3.5.1 Groundwater Elevations and Flow Patterns

The unavoidable impact of the Proposed Action's dewatering and post-mining condition is that the groundwater table will be lowered in the vicinity of the South Parcel Project. Edmond Marsh is located closest to the South Parcel Project. At the center of Edmond Marsh, the model-predicted maximum decreases in groundwater levels are 0.52 feet, 0.63 feet, 0.87 feet, and 0.84 feet during mining Steps 1, 2, 3, and 4, respectively. For the entire wetland complex, seepage rates to groundwater will increase 0.0 cfs, 0.2 cfs, 0.6 cfs, and 0.5 cfs during dewatering Steps 1, 2, 3, and 4, respectively, based on DuPont model results.

3.5.2 Groundwater Quality

No significant unavoidable adverse impacts on groundwater quality are anticipated if best management practices are responsibly implemented throughout the Proposed Action. Best management practices include implementing stormwater pollution prevention, spill control and cleanup procedures, monitoring stormwater quality, and managing operations to minimize the use of materials in the mine that could generate potential contaminants.

3.5.3 Drinking Water Supplies

No significant unavoidable adverse impacts from the Proposed Action to the drinking water supplies of the City of DuPont or JBLM are anticipated, as the wells and springs tapped for supply either withdraw water from a different aquifer or are outside the area that would be affected by dewatering.

3.5.4 Springs

The Proposed Action will cause no significant unavoidable adverse impacts to flows at Sequalitchew Spring or at the intertidal springs. The Proposed Action will cause significant unavoidable adverse impacts to some springs and seeps in the Sequalitchew Creek ravine as the water table is lowered during dewatering and during the post-mining condition.

4 Surface Water and Stormwater

The effects of the South Parcel Project on surface water hydrology were evaluated from three perspectives:

1. The effects within the South Parcel Project resulting from mining activities, which generally focused on stormwater management and changes in the site water balance
2. The effects of mine dewatering on Sequalitchew Creek and the upgradient watershed
3. The cumulative effects of mining and watershed restoration on the creek and marshes.

Within the South Parcel Project area, existing conditions were examined through several site reconnaissance visits, hydrologic modeling, and compilation of other available data sources (climatic data, NPDES discharge data, etc.) Proposed conditions were simulated using the same hydrologic model to simulate the proposed changes in land use and the stormwater management system.

Within the broader Sequalitchew Creek watershed, the understanding of existing conditions is based primarily on monitoring data collected monthly from staff gages, wells, and flow monitoring stations since 2004. These data inform the groundwater analyses discussed in Section 3 as well as a marsh water balance model used to predict effects on the marshes and Sequalitchew Creek. This water balance model is used for predicting the effects of mining alone and the cumulative effects with watershed restoration.

4.1 Affected Environment

4.1.1 Climate

The existing mine and proposed South Parcel Project are located on the eastern shoreline of Puget Sound and experience the mild marine climate typical of the Puget Sound region. Average temperatures are typically in the mid-50s to upper 70s (in degrees Fahrenheit) during the summer months, and mid-30s to upper 40s during the winter months (Figure 26).

Precipitation tends to fall predominantly as rain with occasional snowfall during winter storms. The closest long-term precipitation gage to the North Parcel is Tacoma Public Utilities' McMillin Reservoir station (NCDC COOP ID# 455224) located about 20 miles northeast of the North Parcel. Beginning in January 2013, the McMillin Reservoir weather station became less reliable as measurements were not taken as frequently and there are significant data gaps. After that date, the best available precipitation data is from the Oregon State University's Parameter Regression against Slopes Model (PRISM), which spatially interpolates between weather station observations, accounting for elevation and aspect among other factors. A timeseries of daily precipitation data for the McMillin Reservoir location was used to extend the precipitation record beyond December 2012.

Average annual precipitation from the combination of the McMillin Reservoir observations and the PRISM timeseries for the same location from 1941 to 2021 was 41.58 inches. Monthly precipitation totals vary from around 6 inches per month in November through January down to around 1 inch per month in July and August, as shown on Figure 26.

The potential for evaporation was estimated using long-term pan evaporation data from the Puyallup 2W Experimental Station (NCDC COOP ID# 456803) from 1931 to 1995. The Puyallup station was one of few long-term evaporation stations in the Puget Sound region until it ceased operations in 1995 and historical data from that station is often used for representing evaporation in the region. Mean annual pan evaporation measured at the Puyallup station was 28.7 inches for the period of record. Applying a pan coefficient of 0.8 (NOAA, 1982), converts the measured pan evaporation into potential evaporation of 23 inches per year.

Precipitation from McMillin Reservoir and potential evaporation based on Puyallup 2W Experimental Station are the key climatic inputs into the hydrologic model used to simulate hydrology within the South Parcel Project and the water balance model used to evaluate the marshes and Sequalitchew Creek under existing and proposed conditions

4.1.2 Surface Water Features

This section provides a description of the surface water features within the South Parcel Project area and existing mine, then within the Sequalitchew Creek watershed.

4.1.2.1 South Parcel Project Area and Existing Mine

The Kettle Wetland is the only notable surface water feature within the South Parcel Project area (Figure 27). Generally, the coarse recessional outwash soils present within the South Parcel and Existing Mine result in rapid infiltration of precipitation, so no surface water features form from rainfall and runoff.

The Kettle Wetland is a 1.78-acre wetland located within a glacial kettle in the Expansion Area, outside of the mining limits of the existing mine. Kettles form during glacial retreat, where glacial meltwater deposits its river-borne sediments around a large block of stranded glacial ice. When the ice block eventually melts, the kettle is left in the former footprint of the ice block as a closed topographic depression. The kettle where the Kettle Wetland formed is deep enough that it encounters the Vashon Aquifer, and the hydrology of the Kettle Wetland is driven by the seasonal fluctuations of the Vashon Aquifer. There are no tributaries or other surface water inputs to the Kettle Wetland. The Kettle Wetland is described in additional detail in the Plants and Animals Technical Report (Anchor QEA, 2022).

No streams or natural drainage channels were identified within the South Parcel Project area during site reconnaissance or on the DNR Forest Practices Application Mapping Tool (DNR, 2022) for the area.

Stormwater drainage features are present within the existing mine, particularly in the area of active backfill on the floor of the existing mine. CalPortland incorporates infiltration facilities consisting of curtains of coarse rock to infiltrate stormwater and encourage drainage from backfilled areas. Ditches and small infiltration areas are also present in

other portions of the existing mine. Generally, precipitation infiltrates within the mine without requiring significant stormwater infrastructure.

A kettle in the southeast corner of the North Parcel is used by CalPortland as an infiltration pond for discharge of treated process water from their water treatment system under Sand and Gravel General Permits #501178 and #501406, which permit discharges from the aggregate wash plant and concrete batch plant, respectively. This kettle is located west of the Olympia Bed truncation and does not encounter groundwater. It is not a wetland and would be dry if not for its use as an infiltration facility.

4.1.2.2 Sequalitchew Creek Watershed

The South Parcel Project is located within the Sequalitchew Creek subbasin of Water Resource Inventory Area (WRIA) 2–Chambers-Clover Watershed. The Sequalitchew Creek watershed is relatively complex because of the interaction between groundwater and surface water. The dominant features of the watershed are flat terrain, coarse outwash soils, and a series of wetlands and lakes that have formed in depressions and areas of lower permeability soils left by the receding glaciers.

Figure 27 presents an overview of the multiple waterbodies and channels located in the Sequalitchew Creek watershed. Geologic cross sections of Edmond Marsh and Bell, McKay, and Hamer Marshes are shown on Figures 28 and 29, respectively. Water surface elevations within the Sequalitchew Creek watershed are primarily understood through a monthly monitoring program that has been ongoing since 2004. Surface water monitoring locations are shown on Figure 12 and are summarized in Table 11.

Sequalitchew Lake is the headwaters of Sequalitchew Creek. Historically, springs at the east end of the lake would flow into the relatively low-gradient channel of Sequalitchew Creek that wandered through Edmond Marsh before entering a steep ravine leading to Puget Sound. Construction of the Diversion Canal (running from north to south as shown on Figure 27) and beaver activity has changed the creek hydrology such that continuous flow from the lake through the marshes to Puget Sound seldom occurs. Currently, a portion of Sequalitchew Creek and the adjacent marsh flow eastward into the Diversion Canal, rather than westward along their historical path.

The Diversion Canal is an engineered channel that conveys stormwater from JBLM through Bell, McKay, and Hamer Marshes before crossing under Sequalitchew Creek via culverts and picking up additional flow from the Sequalitchew Lake Diversion Weir. The Diversion Canal then skirts the perimeter of Fort Lewis Landfill 5 and continues north, where it descends in a concrete-lined channel to reach the Puget Sound near Tatsolo Point.

Bell, McKay, and Hamer Marshes are connected to Edmond Marsh through one culvert and several interpreted subsurface flow pathways. Bell, McKay, and Hamer Marshes are at higher elevations than the other marshes, and the influx of Fort Lewis stormwater encourages shallow subsurface flow to the lower elevation Edmond Marsh.

The waterbodies and channels that comprise the surface water system are discussed in subsequent sections, starting from the headwaters of the watershed and working downstream to Puget Sound.

4.1.2.3 Sequalitchew Lake

Sequalitchew Lake is an approximately 85-acre lake located on JBLM between American Lake and Hamer Marsh and Sequalitchew Creek. The lake is fed by the springs at its eastern end that provide the primary water supply for JBLM (see Section 3.1.5.2). At normal water level of 211.5 feet, Sequalitchew Lake has an average depth of about 6 feet and a maximum depth of 11.5 feet (Western Engineers, 1952).

The Washington State Department of Fish and Wildlife (WDFW) operated a salmon rearing facility in Sequalitchew Lake from 1976 (Mills, 1994) to about 1997 (Anteon, 2003). During this period, approximately 1 to 2.3 million coho salmon were reared in the lake. In spring, the fish would migrate out Sequalitchew Creek to Puget Sound. Mills (1994) noted that beaver dams would occasionally dam Sequalitchew Creek sufficiently to reverse the flow of the creek, similar to recent observations. The beaver dams were removed by hand during the 2- to 4-week period of smolt outmigration. In addition, a "cookie cutter" machine was used on at least two occasions to clear Sequalitchew Creek of thick wetland vegetation through Edmond Marsh.

Sequalitchew Lake has one surface water outlet at its western end, leading to a moderately complex culvert and weir configuration constructed in the 1950s to control the water elevation in Sequalitchew Lake and bypass flow from Hamer Marsh to the Diversion Canal. The flows in this area are controlled by four structures:

- **Sequalitchew Creek culverts:** Four 42-inch-diameter culverts connect the lake outlet with Sequalitchew Creek. These culverts were intended to convey the normal outflow from the lake to Sequalitchew Creek.
- **Diversion Weir:** An 18-foot-wide concrete structure with wooden stop logs that can be raised or lowered to adjust the elevation of the lake. The Diversion Weir was intended to divert water from Sequalitchew Creek to the Diversion Canal during periods of high flow to prevent high water in the lake from affecting the Sequalitchew Springs water supply. The current elevation of the top of the Diversion Weir is about 210.2 feet.
- **Diversion Canal culverts:** Three 48-inch-diameter culverts cross under the four Sequalitchew Creek culverts. These culverts convey the outflow from Hamer Marsh to the Diversion Canal.
- **Beaver Dams:** Beavers have constructed a large dam across Sequalitchew Creek. This dam retains water in the easternmost portion of Edmond Marsh at an elevation typically 1 or more feet higher than the lake. This dam and the higher elevations behind prevent flow from the lake to Sequalitchew Creek. Several other beaver dams in the area also influence water levels.

As originally designed, outflow from Sequalitchew Lake would continue to flow into Sequalitchew Creek and would only overflow to the Diversion Canal if the lake elevation exceeded 211.15 feet. However, the construction of beaver dams in Sequalitchew Creek has prevented flow from the lake to the creek and instead all of the outflow from the lake is flowing to the Diversion Canal.

Since 2003, flow over the Diversion Weir has been monitored at a flow monitoring station installed immediately upstream of the outlet diversion weir. A hydrograph of measured streamflow at the Diversion Weir gage is presented on Figure 30.

Average monthly flows vary seasonally from a low of 2.4 cfs in September to a high of 21.5 cfs in March. In some drier years (e.g., 2005 and 2015), there are periods with no flow over the weir in late summer and early fall. Peak flows have exceeded 40 cfs on multiple occasions.

4.1.2.4 Bell, McKay, and Hamer Marshes

Bell, McKay, and Hamer Marshes are three naturally occurring marshes that were significantly altered by the construction of the Diversion Canal in the 1950s. The primary surface water outlet of all three marshes is now the Diversion Canal.

Bell Marsh is an approximately 18-acre L-shaped marsh located within the City of DuPont, between Bell Hill, the historic Village of DuPont, and DuPont-Steilacoom Road (Figure 27). Bell Marsh receives stormwater runoff from 1,928 acres of the main cantonment area of JBLM into the marsh (Washington Engineering, 2001). Prior to entering Bell Marsh, the runoff passes through an infiltration pond and water quality treatment facility operated by JBLM to remove sediments and oil and grease and reduce peak flows prior to discharge into the marsh. Washington Engineering (2001) estimated that 4 to 7 percent of the total runoff would be infiltrated with the remainder being discharged into Bell Marsh.

The northwestern tip of Bell Marsh is located approximately 800 feet from the center of Edmond Marsh. The water level in Edmond Marsh is typically 6 to 7 feet lower than that of Bell Marsh, and as Bell Marsh receives a high volume of stormwater inflow, it is likely water infiltrates from Bell Marsh and flows beneath the ground surface into Edmond Marsh.

McKay Marsh is an approximately 37-acre marsh located on JBLM between DuPont-Steilacoom Road and I-5. A series of four small wetlands lead from the eastern portion of Edmond Marsh toward McKay Marsh. Shapiro and Associates (1991) concluded that these four wetlands were "probably hydrologically connected" to Edmond Marsh. Although surface topography suggests that it is unlikely that Edmond and McKay were previously connected, it is possible that subsurface flow from McKay to Edmond occurs along a path indicated by the chain of wetlands.

Hamer Marsh is an approximately 69-acre marsh located on JBLM immediately downstream of McKay Marsh. There are two main inflows to Hamer Marsh: the box culvert from McKay Marsh and a stormwater outfall from JBLM.

The stormwater outfall from JBLM collects runoff from 1,675 acres of JBLM including a portion of main cantonment area and Grays Army Airfield (Washington Engineering, 2001). The inflow to Hamer Marsh passes through a stormwater treatment and infiltration facility before being discharged to the marsh.

The main outflow from Hamer Marsh is the Diversion Canal. There is significant beaver activity in this section of the Diversion Canal with numerous active beaver dams

controlling water levels between Hamer Marsh and the Lake Outlet Area. The first of these beaver dams is the primary control of the water level in Hamer Marsh.

A small culvert leading from the western tip of Hamer Marsh to the easternmost portion of East Edmond Marsh provides a secondary outlet. The culvert is set relatively high and is partially obstructed by debris, which only allows flow when the water surface elevation in Hamer Marsh is at higher levels 214 feet.

The area near the small culvert is also of interest from a subsurface connection perspective. In this area, Hamer Marsh is separated from East Edmond Marsh by approximately 125 feet that includes a gravel roadway. The roadway dips right at the location of the small culvert, which is also where the two marshes are closest together. It is suspected that this area may have been a former surface connection between the two marshes that was filled to allow construction of the roadway. A 1940 U.S. Army Corps of Engineers map (Figure A-6 in Appendix A of Aspect 2004a) shows the two marshes connected in this location. The difference in water levels between the marshes is approximately 2 feet, which given the close proximity is enough to allow subsurface flows from Hamer Marsh to Eastern East Edmond Marsh.

The marshes have a seasonal water pattern, with a high wet season water level typically from November through June or July followed by a lower water period through summer. The typical seasonal range in water levels is 2 to 3 feet. Water levels step down from Bell to McKay to Hamer Marsh as summarized in Table 12. The average water level in Bell Marsh is 218.58 feet. McKay Marsh is about 3 feet lower, with an average water level of 215.43 feet. Hamer Marsh is a little over 1 foot lower than McKay Marsh with an average water level of 214.02 feet.

4.1.2.5 Edmond Marsh

Edmond Marsh extends from the outlet of Sequalitchew Lake to about 700 feet east of Center Drive and is located on JBLM and within the City of DuPont. For discussion purposes in this report, Edmond Marsh is divided into three segments:

- Eastern East Edmond Marsh is located on JBLM east of DuPont-Steilacoom Road.
- East Edmond Marsh is located in DuPont between the Robinson Trail and DuPont-Steilacoom Road.
- West Edmond Marsh is located in DuPont west of the Robinson Trail.

Eastern East Edmond Marsh

Eastern East Edmond Marsh is approximately 32 acres in size and has an open channel through the center of the marsh. It is bounded by uplands on the north and south and DuPont-Steilacoom Road on the west. The east end of the marsh is the outlet area for Sequalitchew Lake. A large beaver dam separates the marsh from the lake outlet. A series of small beaver dams along an abandoned road grade form the northeast edge of the marsh. Water flows over these beaver dams into the Diversion Canal, a reversal of the original flows down Sequalitchew Creek to Puget Sound. At the west end, a box culvert under DuPont-Steilacoom Road connects the marsh with East Edmond Marsh and allows flow in either direction through the culvert.

Eastern East Edmond Marsh receives inflow from Hamer Marsh via the 12-inch culvert and potential subsurface connection with Hamer Marsh. It also may receive inflow from East Edmond Marsh through the connecting culvert discussed above. No other inflows are known. With the beaver dam retaining water levels the marsh above the elevation of Sequalitchew Lake, it is not possible for outflow from the lake to enter the marsh.

Water has been observed flowing over the beaver dams on the eastern end of the marsh and into the Diversion Canal. The only other potential surface water outflow is the connecting culvert to East Edmond Marsh. At times, water levels have been higher in East Edmond Marsh, indicating flow back through this culvert toward the Diversion Canal. Water levels in East Edmond Marsh have been lower at other periods, indicating westward flow from the connecting culvert.

The water level in the Eastern East Edmond Marsh is monitored at staff gages behind the beaver dam on the eastern end and at DuPont-Steilacoom Road on the western end. The average water level is about 212.40 feet, with little difference between the two locations. This water level is over 1 foot higher than the average water level in Sequalitchew Lake.

East Edmond Marsh

The East Edmond Marsh segment is approximately 55 acres and includes scrub-shrub and open water habitats between DuPont-Steilacoom Road to the west and Robinson Trail (a public trail built on a former railroad grade) to the west. Sequalitchew Creek follows a meandering channel through East Edmond Marsh that has been previously excavated and cleared. Generally, the channel is more open on the eastern end of the marsh and becomes brushy close to the trail.

Inflows to East Edmond Marsh include the culvert under DuPont-Steilacoom Road, the potential subsurface inflows from Bell Marsh and McKay Marsh described in previous sections, and inflow from a small stormwater system draining a portion of Center Drive where roadside ditches and catch basins convey runoff to a drainage swale that leads directly into the northern boundary of the marsh.

The outflows from East Edmond Marsh are either to West Edmond Marsh through a culvert (often blocked by beavers),through the railroad grade itself, or eastward to through the culvert under DuPont-Steilacoom Road.

A significant beaver dam is located approximately 150 feet east of Robinson Trail and controls the water level in East Edmond Marsh. This beaver dam connects two upland areas and impounds water behind it to the east, forming the western end of a continuous body of water with roughly the same water surface elevation that extends to the east end of Eastern East Edmond Marsh. The beaver dam was breached in 2016 and water levels remained lower for multiple years before returning to similar levels in 2010 to 2011.

Two staff gages are used to monitor water levels in East Edmond Marsh: one on the westside of DuPont-Steilacoom Road (SG-EM-3W), and one located just north of an upland area near Robinson Trail (SG-EM-2E).

Water levels in East Edmond Marsh average 212.39 feet at SG-EM-3W and 212.20 feet at SG-EM-2E, indicating a slight gradient toward the west on average. There is little difference between water levels at the staff gages on the east and west sides of DuPont-Steilacoom Road. The water level in East Edmond Marsh is typically high from November or December through May or June, then declines gradually to a low typically in September before refilling as rains return.

West Edmond Marsh

West Edmond Marsh is an approximately 80-acre wetland bounded by the railroad grade on the east, historic DuPont to the south, and ringed by recent development on the north and west. Sequalitchew Creek follows a relatively straight path along the northern boundary of the marsh.

Multiple beaver dams actively control water levels in West Edmond Marsh and several inactive dams can be found throughout the marsh. The water level steps down typically around a foot at each beaver dam. The most significant of the beaver dams is the westernmost dam, which defines the western extent of the marsh.

Outflow from this beaver dam typically only occurs during the winter months and infiltrates in the broad grassy channels of Sequalitchew Creek on both sides of Center Drive. Outflow from West Edmond Marsh has only been observed flowing under Center Drive on rare occasions and seldom extends to the downstream reaches of Sequalitchew Creek.

West Edmond Marsh receives inflow from East Edmond Marsh through the culvert under Robinson Trail and likely from flow through the trail grade as well. In addition, several stormwater infiltration ponds that infiltrate runoff from the adjacent developments are located near the marsh perimeter. Infiltrated runoff may reach West Edmond Marsh through shallow subsurface pathways. No direct stormwater discharges into West Edmond Marsh are known.

Water levels in West Edmond Marsh are monitored at two locations: SG-EM-2W, which is at the outlet of the culvert under Robinson Trail, and a pair of staff gages (SG-EM-1 and -1A) which are located on the western end behind the westernmost beaver dam. The average water level at SG-EM-2W is 211.35 feet, which is slightly higher than the average water level in Sequalitchew Lake. The average water level at SG-EM-1/1A is 207.91 feet. The seasonal variability in water levels is more amplified in the western portion of West Edmond Marsh, with a typical range of 1 foot or less observed near Robinson Trail and 4 to 5 feet at the westernmost end. The westernmost portion of West Edmond Marsh becomes dry in the summer of most years.

4.1.2.6 Wetland 1D

Wetland 1D is an approximately 2.1-acre wetland, located immediately north of West Edmond Marsh, with no surface water connection between it and Edmond Marsh. Water levels in Wetland 1D have ranged from 208.6 to 211 feet, with a typical seasonal range of 1 to 2 feet. The water levels typically peak in December or January and begin to decline earlier than West Edmond Marsh.

4.1.2.7 Isolated Kettle Wetlands (Pond, Strickland, Grant, Old Fort Lake, and Wetlands #8 through #11)

Isolated wetlands, typically forming in kettles created during the recessional period of the Vashon glaciation, are present in the Sequalitchew Creek watershed. Most notably, a group of kettle lakes and wetlands, including Pond Lake, Strickland Lake, Grant Lake, Old Fort Lake, and Wetlands #8 through #11, lies south of Sequalitchew Creek and west of the historic village of DuPont (Figure 27).

Water level data collected as a component of the stormwater management program for the Northwest Landing development indicate that the southern group of kettle wetlands have large seasonal variations in water levels and most go dry during extended dry periods (Shapiro, 1991; Hart Crowser, 1999; ESM Consulting Engineers, 2004). They also fluctuate similarly to the water table fluctuations, and have been inferred by numerous investigators to be expressions of the water table of the Vashon Aquifer in their respective project areas (WCC, 1991; Hart Crowser, 1999; and URS, 2003).

However, as with the wetlands around Sequalitchew Creek, silts, clays and organics build up over time in the stagnant water leaving a layer of low permeability peat and silty muck soils at the bottom of the pond areas. These accumulating fine-grained materials were observed in the kettle lake wetland bottoms (Newling and Smith, 2004). As such, it is likely that the hydraulic connection between the aquifer and wetland water levels is reduced with some delay in the response time of the surface water to groundwater changes.

A couple of the kettle wetlands are interconnected by culverts, but otherwise, the kettle wetlands do not have outlet drainages. Water leaves the kettle wetlands only through evapotranspiration or infiltration to groundwater.

4.1.2.8 Sequalitchew Creek

Sequalitchew Creek is a 3.3-mile-long creek traveling from the eastern end of East Edmond Marsh through Edmond Marsh and down a steep ravine to Puget Sound. Historically, Sequalitchew Lake was the headwaters of Sequalitchew Creek; however, construction and maintenance of the Diversion Weir restricts the potential flows to the creek, and beaver dams further prevent outflow from the lake to the creek. Through the marshes, the creek is a channel of open water or less dense vegetation, but little flow is present. After leaving the marshes, the creek channel maintains its broad width but becomes dry and grassy. Outflow from West Edmond Marsh typically infiltrates in this grassy reach upstream of Center Drive.

Downstream of the grassy reach is a road grade and culvert near the remains of the wooden dam for the old DuPont Works hydropower facility. Downstream of the culvert, springs from the Vashon Aquifer return flow to Sequalitchew Creek as it begins its descent through a 1.3-mile steep ravine to Puget Sound. Multiple springs are present in the upper half of the ravine (see Figure 7). After the stream crosses through the Olympia Beds and the Kitsap Cutoff midway through the ravine, no more springs are present. Near Puget Sound, the ravine widens and gradient decreases. The creek discharges to Puget Sound through a 5-foot by 5-foot box culvert under the BNSF railroad grade. Construction of the railroad grade limited the connection of the mouth of the creek to Puget Sound. A brackish marsh is located immediately upstream of the railroad grade.

Currently, streamflow is monitored continuously at two locations in the ravine (Figure 12): the mid-ravine gage (formerly referred to as the "upper gage"), which is located just above the Olympia Beds truncation approximately 3,900 feet upstream of the mouth, and the lower gage located approximately 700 feet upstream of the mouth. The lower gage was installed in 1999 and the mid-ravine gage was installed in 2003.

Average annual streamflow is about 2.8 cfs at the lower gage and 1.6 cfs at the mid-ravine gage over their common period of record (calendar years 2004 to 2021). The hydrograph of measured stream flows (Figure 30) indicates seasonally varying baseflow that ranges from 0.5 cfs in late summer up to around 2.5 cfs in wet winters. Individual storm peaks are present in rainy periods, but the peaks are not particularly flashy. The highest observed daily average flow was 13.8 cfs in December 1999.

Comparison of recent flow monitoring results with earlier gaging efforts in 1977-1978 (Thut et al., 1978) and 1984-1987 (Firth, 1991) indicates that the streamflow is about 75 percent lower now. Those periods correspond with WDFW's use of Sequalitchew Lake for fish rearing, so it is likely that the higher flows in the 1970s and 1980s represent a higher portion of the outflow from Sequalitchew Lake reaching Sequalitchew Creek instead of the Diversion Canal, particularly in winter and spring months. Average monthly flow rates near the mouth of Sequalitchew Creek are shown in Table 13.

4.1.3 Surface Water Quality

4.1.3.1 South Parcel and Existing Mine

The only surface water body within the South Parcel Project area is the Kettle Wetland, which has not been monitored for water quality. Because the hydrology of the Kettle Wetland is driven by the Vashon Aquifer, the water quality is anticipated to be similar to the that of the aquifer, but slightly modified by wetland processes and direct exposure to the atmosphere. Water temperature in the Kettle Wetland can be anticipated to be slightly warmer in summer and slightly cooler in winter. Turbidity is likely marginally higher because of natural processes in the wetland (e.g., disturbance of marsh sediments by biota). Dissolved oxygen (DO) could be higher or lower than in the aquifer depending on the season and balance between of different factors. Exposure to the atmosphere would act to increase DO as would lower winter temperatures and growth of aquatic plants; however, higher summer temperatures, plant respiration, and the decay of organic material would act to lower DO. Regardless, the water quality in the Kettle Wetland is likely quite good.

4.1.3.2 Sequalitchew Creek Watershed

This section reviews the regulatory status and water quality criteria applicable to the natural water bodies within the Sequalitchew Creek watershed, then summarizes existing water quality based on the results of several water quality monitoring programs.

Regulatory Status

Washington State water quality standards for surface waters consist of designated uses and criteria and other provisions (e.g., anti-degradation) to protect those uses. Chapter 173-201A of the Washington Administrative Code (WAC) water quality standards are based on the designated uses (type of aquatic life, recreation, water supply, etc.) of a surface water body.

Sequalitchew Creek and Sequalitchew Lake have a designated aquatic life use of "core summer salmonid habitat" as they are tributary to a marine water designated for "extraordinary aquatic life" per WAC 173-201A-600 (1)(a)(iv). The State Water Quality Standards for core summer salmonid habitat for key parameters are shown in Table 14.

Table 14. State Water Quality Standards Applicable to Sequalitchew Creek and Sequalitchew Lake

Parameter	Criterion	Allowable Change
Temperature (7-DADMax)	16.0 °C	0.3 °C when T >= 16.0 °C, else 28/T+7 Total change not to exceed 2.8 °C
Dissolved Oxygen (1-day minimum)	9.5 mg/L	<0.2 mg/L
Turbidity	NA	5 NTU over background when <= 50 NTU, otherwise 10%.
pH	6.5 to 8.5	< 0.5 within range

Notes:
7-DADMax is the 7-day average of daily maximum temperatures.
T = background temperature unaffected by project.
NTU = nephelometric turbidity units; mg/L = milligrams per liter

Ecology has published supplement spawning/incubation criteria (Ecology, 2011) that modifies the temperature criteria applicable to some fresh water bodies. Sequalitchew Creek and Sequalitchew Lake have not been identified for supplemental temperature criteria.

Sequalitchew Creek and Sequalitchew Lake are not on Ecology's EPA-approved 2012 list of impaired waterways ("303(d) list") for any parameters, nor on the draft 2018 303(d) list that is with EPA for review.

Water Quality Monitoring Results

Surface water quality in the natural waterbodies of the Sequalitchew Creek watershed is primarily understood through four studies and monitoring efforts:

- Ongoing monitoring for CalPortland - monthly monitoring for key aquatic life parameters at the Diversion Weir and upper Sequalitchew Creek.
- Citizen monitoring data collected from 2008 to 2012 by Don Russell – periodic monitoring in and downstream of Edmond Marsh for key aquatic life parameters and select metals and nutrients.
- Surface Water Investigation Report, North Sequalitchew Creek Project (CH2M Hill, 2001) – monitoring of the Diversion Canal and Sequalitchew Creek ravine for a broader suite of parameters.
- Fort Lewis Landfill No. 5 Remedial Investigation/Feasibility Study (WCC, 1991) –monitoring multiple locations in Sequalitchew Creek, isolated wetlands, and intertidal springs for a broader suite of parameters.

At a broad level, water quality in the watershed can be understood by grouping waterbodies in three categories: Sequalitchew Creek, the marshes, and Sequalitchew Lake. A summary of water quality monitoring results is shown in Table 15. These samples were collected by multiple parties and are instantaneous grab samples.

Sequalitchew Creek generally has excellent and very consistent water quality, with cool temperatures (< 15 °C), high dissolved oxygen levels (> 9 milligrams per liter [mg/L]), and low turbidity (< 15 NTU). These results are representative of a steady groundwater input and shaded forest setting. The seasonal variation in temperature is much less in the reaches of Sequalitchew Creek in the ravine than in the marshes or lake. Metals concentrations in Sequalitchew Creek are consistently low.

Water quality in the marshes is more typical of stagnant water bodies exposed to the life cycle of aquatic plants. Dissolved oxygen concentrations are lower (typically < 4 mg/L), pH is slightly acidic (median of 6.5), and temperature highs and lows are more extreme, ranging from 2.7 to 22.2 °C. Turbidity is still low (< 10 NTU). Generally, the individual marshes have similar water quality, although East and West Edmond Marshes have elevated iron concentrations, particularly in the vicinity of the railroad grade trail where groundwater seeps entering the marsh; where concentrations have been measured above 1 mg/L. Concentrations of other metals important as indicators of potential stormwater pollution, such as copper and zinc, have been low, even in marshes receiving direct stormwater inputs.

Water quality in Sequalitchew Lake is generally representative of groundwater, except that temperature is warmer in summer (typically above 20 °C) and cooler in winter (below 6 °C) due to exposure to the atmosphere during the longer retention time in the lake. Dissolved oxygen concentrations are generally high (typically > 9 mg/L). pH is neutral and turbidity is low. Metals have not been measured in the lake, with the exception of one sample analyzed for iron at 0.13 mg/L.

Earlier sampling (CH2M Hill, 2001 and WCC, 1991) for broader suites of parameters did not identify significant or unusual pollutant issues in surface waters of the watershed.

4.2 Effects of the Proposed Action

This section examines the effects of the South Parcel Project on issues with surface water quantity and quality that are typically evaluated in permitting of mine sites.

Gravel mining has the potential to change the hydrology of an area by altering topography, changing the size and shape of drainage basins, removing vegetation, and exposing or placing deposits of lower permeability material. These changes generally result in increased stormwater runoff and a decrease in evapotranspiration. Depending on the stormwater management system used, mining can either increase groundwater recharge (if infiltration facilities are used to discharge stormwater to ground) or decrease groundwater recharge (if detention ponds are used to release stormwater to surface waters).

This section describes the changes in site water balance that would occur with the South Parcel Project and predicts stormwater volumes and peak flow rates, then presents a preliminary design of a stormwater system for the Proposed Action. We then evaluate the effects of the stormwater system on groundwater mounding and water quality.

4.2.1 Site Water Balance

A water balance is an approximate accounting of the hydrologic inputs and outputs from a project area. The inputs can include precipitation (as both rain and snow), groundwater discharge from springs, or surface water inflows from streams or rivers or stormwater run-on. The outflows include evapotranspiration, groundwater recharge, and stormwater runoff or stream flow leaving a site.

Three water balances related to the South Parcel Project have been developed to answer different questions about the surface water and groundwater bodies. The water balances were developed using different modeling techniques and software, and are focused on different water bodies. For clarity, the three water balances are:

1. A groundwater water balance developed as part of the groundwater modeling effort and described in the Groundwater Model Update Report (Aspect, 2017b).
2. A site water balance that focuses on the fate of precipitation falling on the South Parcel Project area, presented in this section, and the changes that would occur with mining. This water balance is primarily focused on stormwater within the mine site.
3. A wetland water balance, presented in Section 4.2.3.2, that was developed in Excel with the focus of predicting changes in water levels in the marshes with mining and restoration.

The site water balance for the South Parcel Project was calculated for existing and proposed conditions using the Western Washington Hydrologic Model (WWHM). WWHM is a complex hydrologic model developed by Clear Creek Systems for Ecology. It simulates watershed hydrology based on land use characteristics and historical meteorologic records. The primary purpose of WWHM is to predict stormwater flows for the design of stormwater management facilities, but it can also provide other elements of the water balance, such as groundwater recharge, evaporation, and changes in soil moisture.

Within Pierce County, WWHM uses a 158-year synthetic precipitation series with a mean annual precipitation of 42 inches per year. Because it is a synthetic precipitation record, the period of record does not represent a specific range of actual years. Evaporation data in WWHM is based on pan evaporation measurements from the Puyallup 2W Experimental Station.

Three scenarios were analyzed representing existing conditions along with the Proposed Action and No Action alternatives. For each scenario, the land use characteristics are entered into WWHM to represent the different soil types, vegetative cover, and slope characteristics created by that scenario. A summary of the land use information entered into WWHM to represent existing and proposed conditions is shown in Table 16.

The existing scenario represents the current state of the South Parcel Project area, which consists of a flat, forested land with coarse surface soils in the South Parcel, the Kettle Wetland and buffer, and the vegetated areas of the eastern slope of the existing mine.

The Proposed Action scenario represents the maximum potential for the South Parcel Project to affect surface hydrology. It assumes that the area has been completely mined to

the topography shown on Figure 31, but limited vegetation has regrown. This condition was assumed in the model as a worst case and represents a situation that would never occur because segmental reclamation will be used to limit the amount of time any cleared land is not reclaimed. For the proposed model scenario, the bottom of the mine was modeled as till soils to represent the Olympia Beds, even though in practice a layer of sand and gravel approximately 10 feet thick would be left in place. Mine side slopes were simulated as outwash soils with a lawn cover (the vegetative cover that generates the highest runoff) to represent bare soils during mining, or recently seeded slopes in reclamation.

These three scenarios were analyzed in WWHM, which simulates site hydrology on a 15-minute time step for the 158-year period of record of the synthetic precipitation time series. The results were exported as annual averages for each of the 158 years and an overall average calculated. Annual results are presented in Appendix E and the overall average results are described below.

The water balance distinguishes between direct groundwater recharge and infiltrated stormwater. Direct groundwater recharge is defined as precipitation that infiltrates to groundwater at or near the location it falls, thus providing diffuse recharge. In contrast, infiltrated stormwater occurs where precipitation generates stormwater that is conveyed to an infiltration facility providing focused recharge. Direct groundwater recharge and stormwater infiltration were separated in WWHM using separate points of compliance: direct recharge was calculated as the groundwater generated from the site drainage basins; infiltrated stormwater was calculated as the surface runoff and interflow that infiltrates in the stormwater facilities.

Groundwater inflows at the toe of the mined slope were included in the site water balance by adding an annual average of 6.9 cfs (based on Step 3 results in Table 7) as an inflow and adding a corresponding outflow to the volume of total groundwater recharge to create the groundwater outflow.

Results from the WWHM model indicate that under existing conditions, an average of approximately 744 acre-feet of water (or 44 percent of precipitation) evaporates or is transpired by vegetation (Table 17) on an annual basis and 944 acre-feet (or 56 percent of precipitation) recharges groundwater either as direct groundwater recharge or infiltration of stormwater. WWHM predicts that a very small amount of stormwater runoff (104 acre-feet, or 6 percent of precipitation) is generated under existing conditions. This stormwater is infiltrated within the existing mine.

The Proposed Action would cause a minor reduction in evapotranspiration as the forested South Parcel and Kettle and Buffer Areas are cleared for mining. Under the Proposed Action, 706 acre-feet (or 42 percent of precipitation) would evaporate or be transpired. The reduction in evapotranspiration results in an increase in stormwater volume. Because all stormwater will be infiltrated, the Proposed Action results in increased groundwater recharge. The Proposed Action would result in 982 acre-feet of groundwater recharge per year from direct recharge and infiltrated stormwater compared to 944 acre-feet under the existing condition, a 3.8 percent increase. The nature of groundwater recharge would

shift with less distributed recharge and greater infiltration of stormwater in discrete locations.

4.2.2 Mine Stormwater Management

CalPortland has prepared a Preliminary Stormwater Management Report (Aspect, 2021) documenting the preliminary design of the stormwater management system for the proposed South Parcel Project. This section summarizes the hydrologic calculations used in the preliminary design and the key components of the resulting proposed drainage system.

4.2.2.1 Peak Flows and Volumes

WWHM was also used to predict the peak flow rates and volumes of stormwater generated under the existing conditions and Proposed Action. To analyze stormwater volumes, the South Parcel Project area was divided into three drainage basins—Basins C, D, and E—based on the proposed stormwater facilities and conveyance network (Figure 31).

Basins C and D include about 390 acres of the existing mine and South Parcel Project area. When mining is completed, each basin will include mine side slopes, large areas of rolling terrain where sand and gravel will be excavated exposing the lower-permeability Olympia Beds, and a relatively flat area at elevation 25 to 50 feet in the bottom of the existing mine. These basins will drain to new stormwater management facilities to be located on the floor of the existing mine. These facilities will expand on, and replace, the existing stormwater management system.

Basin E consists of 92.6 acres of the mine side slopes and mitigation wetland which drain to the ditches designed to capture and convey groundwater emanating from the toe of the mined slope once active dewatering has ceased. Basin E was further divided into three subbasins, E1 through E3, to allow for calculation of peak flows for conveyance design purposes. All three subbasins ultimately drain to the same infiltration facility, which also receives intercepted groundwater and overflow from the constructed mitigation wetland. Basin E1 consists of the slopes on the southern and southwestern corner of the mine as well as the mitigation wetland itself. Basin E1 drains to the mitigation wetland, then eventually infiltration pond E. Basin E2 includes the western slopes that will drain to the ditch that conveys outflow from the wetland to the infiltration pond; it also includes infiltration pond E. Basin E3 consists of the eastern slopes that drain to the groundwater capture trench running along the toe of those slopes.

Peak flow output from WWHM is shown in Table 18 and indicates that the South Parcel Project would increase stormwater peak flows relative to existing conditions. For example, the 100-year return period flow could increase from 23.5 cfs to 66.5 cfs in Basin C, and from 20.2 cfs to 94.6 cfs in Basin D. The primary reason that mining activity causes an increase in peak flows is the removal of the porous outwash soils (which do not generate much runoff) down to the level of the Olympia Beds (which are lower permeability and generate more runoff). Peak stormwater flows would be managed through infiltration, resulting in the increase in groundwater charge described in Section 4.2.1.

4.2.2.2 Proposed Drainage System

As the area is mined, it will expand the closed depression of the existing mine so all stormwater generated within the South Parcel Project area will either infiltrate or evaporate. Stormwater runoff will be collected and conveyed to stormwater ponds in permeable soils on the floor of the existing mine for treatment and infiltration.

Each stormwater pond group will consist of a two-celled lined wetpond designed to remove sediments and provide spill control and an infiltration pond to dispose of stormwater and recharge groundwater. Pond locations and the conceptual drainage patterns are shown on Figure 31.

Two-celled wetponds are proposed as the water quality treatment technology because they are low maintenance, and well suited for removal of suspended solids, which are the primary potential stormwater pollutant at mining operations. The two-celled design improves the sediment removal efficiency and allows for spill control and trapping of floatables in the first cell.

The wetponds were designed to treat 91 percent of the total runoff under developed conditions in accordance with Ecology guidance (Ecology, 2014). Key pond dimensions are shown in Table 19. The ponds were designed to be 7 feet deep, which includes one foot of sediment storage at the bottom of the first cell, and 1 foot of freeboard in both cells.

Table 19. Summary of Proposed Stormwater Water Quality Ponds

Pond	Cell	Depth (feet)	Volume Provided (cubic feet)	Volume Required (cubic feet)
C	1	6	79,704	79,453
	2	7	187,614	185,391
D	1	6	111,816	111,731
	2	7	263,739	260,707

The infiltration ponds were designed to infiltrate all stormwater generated within the mine. Pond E was also designed to infiltrate intercepted groundwater during and after active dewatering. Key dimensions of the infiltration ponds are summarized in Table 20. For preliminary design, the ponds were assumed to be rectangular, with 3H:1V slopes, and a total depth of 5 feet (4 feet of active depth and 1 foot of freeboard).

The infiltration properties of soils in the pond areas were estimated based on grain size data from borings at the location and depth closest to the proposed pond locations following guidance in the *Stormwater Management Manual for Western Washington* (Ecology, 2014). A correction factor of 0.12 was applied to adjust the infiltration rate estimated from grain-size properties to a long-term design infiltration rate. The resulting long-term design infiltration rates were 8.1 to 8.2 inches per hour for all three ponds.

Table 20. Summary of Proposed Infiltration Ponds

Pond	Depth in feet (without freeboard)	Bottom Area (square feet)	Top Area at Max Water Level (square feet)	Side Slopes
C	5	50,762	66,748	3H:1V
D	5	37,655	68,755	3H:1V
E	6	57,807	82,120	3H:1V

The drainage system would be constructed as mining advances according to the following general sequence:

1. During active mining, temporary, often informal, drainage facilities would be used to treat and infiltrate stormwater. During the early stages of each segment, little runoff would be generated as mine side slopes are very pervious, allowing for infiltration. Overtime, the mine bottom would be compacted by equipment traffic, increasing runoff.
2. Permanent drainage facilities would be constructed when mining had reached final grade near the pond location.
3. Drainage facilities would continue to function throughout the life of the mine. CalPortland would be responsible for maintenance of drainage facilities through mining and completion of reclamation.
4. After reclamation of each segment, the drainage facilities would remain on-site and continue to function. Long-term maintenance of the drainage facilities would be the responsibility of the landowner. The volume of runoff entering the drainage facilities would decrease as vegetation planted during reclamation matures.

4.2.2.3 Water Quality

CalPortland would manage water quality for the North Parcel under a Sand and Gravel General Permit issued by Ecology. The Sand and Gravel General Permit combines the protections of an NPDES Permit for surface water discharge and a State Waste Discharge Permit for discharges to groundwater. The existing mine currently operates under two separate Sand and Gravel Permits: permit #501178 covers discharges from the aggregate wash plant, processing area, and mine; and permit #501406 covers discharges from the concrete batch plant. Permit #501178 would be expanded to include the Expansion Area.

Under the Sand and Gravel General Permit, CalPortland would take the following actions:

- Implement a Stormwater Pollution Prevention Plan (SWPPP) specific to the North Parcel
- Implement BMPs to prevent stormwater pollution
- Meet water quality standards for stormwater discharged to any surface water or groundwater through infiltration ponds

- Monitor surface water quality in stormwater ponds at least quarterly
- Monitor process water discharges monthly
- Frequently inspect the facility for erosion and oil sheen

Mines constructed as closed depressions typically have little impact on surface water quality as all water is contained internally. The remaining water quality concerns relate to preventing stormwater contamination that could impact groundwater. Two areas of potential concern are spills from heavy equipment and sediment from erosion. These concerns are managed through implementation of BMPs described in the SWPPP and erosion and sediment control plan.

Spills

Spills, leaks, and drips of chemical products are not typically a significant problem for mining sites like the existing mine because of limited use of chemicals and the small number of pieces of heavy equipment operating in a large area. However, the potential exists that spills, if not quickly cleaned up, could contaminate stormwater and groundwater (either directly or through the infiltration of stormwater).

Petroleum products (diesel fuel, motor oil, and hydraulic fluid) are the primary chemicals used on-site. Chemical storage and equipment maintenance areas are already established in the existing processing area, and would continue to be used.

CalPortland's spill plan, developed under the Sand and Gravel NPDES permit, includes controls to be used on-site that significantly reduce the likelihood that a small spill or leak would impact water quality. Mining companies are uniquely able to respond to excavate and contain small spills because heavy equipment is always on-site. In the event of a spill, they can quickly excavate contaminated soil and contain it in the bed of a dump truck.

In addition, the stormwater system includes spill control devices in the wetponds to prevent floatable contaminants, such as oil or grease, from reaching the infiltration pond. Finally, the mining plan includes a soil buffer above the water table. The 10-foot thickness provides sufficient time for cleanup of a spill before contaminants could reach groundwater, as evaluated in Section 3.2.2.

Erosion

Removal of vegetation and creation of slopes by mining increases the potential for soil erosion. Erosion within the closed depression of the mine would not affect Sequalitchew Creek or Puget Sound, but could affect the constructed wetland or the long-term performance of the stormwater and groundwater infiltration ponds. It could also affect the ability to successfully reclaim mine slopes. Soil erosion is typically managed through a combination of source control BMPs to prevent erosion and treatment BMPs to remove sediments suspended in stormwater.

Source control BMPs, such as segmental clearing and revegetation of slopes, will be the primary technique for preventing soil erosion, and are discussed in Section 2.2.3. The Proposed Action also includes runoff treatment BMPs as a secondary step to prevent impacts from erosion. Each infiltration pond will be proceeded by a two-cell wetpond to

remove sediment and prevent clogging of the infiltration pond. In the long term, erosion and sediment control would be provided through implementation of the Reclamation Plan in accordance with surface mine reclamation permit conditions issued and enforced by DNR.

Topsoil would be stripped and stockpiled for reuse for reclamation on completed mine areas. BMPs (such as surface roughening, mulching, temporary cover, or longer-term vegetative cover) will be used to prevent erosion from stockpiles. These BMPs would also protect against erosion of topsoil potentially containing metals attributable to the former Asarco smelter. Samples would be collected from the stockpiled topsoil to confirm arsenic concentrations meet cleanup levels before the topsoil is placed on mined areas for reclamation. After application of the topsoil, erosion control BMPs such as surface roughening and permanent vegetative cover would be implemented as with any newly created slope. The preceding measures combined with the fact that no stormwater discharge to surface water is proposed or would be authorized for the Proposed Action, eliminate any risk of the topsoil contaminating surface waters.

4.2.3 Sequalitchew Creek Watershed

4.2.3.1 Sequalitchew Lake and Marshes on JBLM

Sequalitchew Lake would not be affected by the South Parcel Project for three reasons:

1. The lake is located well east of the area of appreciable change in groundwater levels (see the 0.5-foot drawdown contours on Figures 22 through 25). Model predictions for all dewatering steps indicate the 0.5-foot drawdown contour would be located west of DuPont-Steilacoom Road.
2. The water level in the lake is controlled by the Diversion Weir and there is typically discharge from the lake throughout the year.
3. The lake is an area of groundwater discharge throughout the year, which means that groundwater levels around the lake are higher than the lake water surface.

There also would be no change in the flow from Sequalitchew Springs as the springs are located at the far eastern end of Sequalitchew Lake.

4.2.3.2 Marsh Water Levels

The effects of mining on wetland hydrology of the Bell-McKay-Hamer and Edmond Marsh complexes were investigated by developing a water balance model of the key wetland areas.

Water Balance Overview

A water balance is a method of accounting for the individual hydrologic processes that add water to, or take water away from, the area being studied. The basic concept of a water balance is that the change in the volume of water in a waterbody over a period of time can be calculated as the difference between the amount of water that entered and left the waterbody during that time. The challenging part of a water balance is quantifying the individual inflows and outflows. For the key elements of the Sequalitchew Creek watershed surface-water network (i.e., the wetlands), the following individual inflows and outflows need to be quantified:

Inflows:

- Precipitation falling directly on the water surface
- Surface water inflows such as stormwater or creeks
- Shallow subsurface inflows from nearby higher waterbodies
- Groundwater seeping into the marsh

Outflows:

- Evapotranspiration from open water and marsh vegetation
- Surface water outflows
- Shallow subsurface outflows to other nearby lower waterbodies
- Groundwater recharge

The water balance simulated the six main interconnected wetlands, grouping the upper marshes and simulating the lower marshes individually as shown on Figure 32:

- Bell, McKay and Hamer Marshes, with a focus on Hamer Marsh for calibration
- East Edmond Marsh, both east and west of DuPont-Steilacoom Road
- West Edmond Marsh

The water balance simulates the individual hydrologic processes based on fundamental data sources (e.g., measured precipitation and evaporation data) and scientific approaches. Precipitation is based on the PRISM data series for McMillin Reservoir as described in Section 4.1.1.

The primary surface water inflows under existing conditions are the stormwater inputs to Bell and Hamer Marshes from JBLM. These were estimated using WWHM and a correlation between monthly stormwater discharge and monthly precipitation that was developed to extend the stormwater predictions beyond WWHM's period of record. More minor stormwater inputs, including a small portion of Center Drive that drains to East Edmond Marsh, were estimated using a similar approach. Under Restoration Scenarios, the historical record of outflow from Sequalitchew Lake to the Diversion Canal was used as an input to East Edmond Marsh.

Shallow subsurface inflows between the higher marshes (Bell, McKay, and Hamer) and East Edmond Marsh[6] were calculated using Darcy's law, which estimates groundwater flow based on the gradient, cross sectional area of the flow path and hydraulic conductivity. Gradient was calculated as the difference in water levels in the marshes divided by the distance between them. Gradient changed monthly and between water balance scenarios based on the water levels predicted by the water balance. Hydraulic conductivity was estimated at 400 feet per day, which is about the lower 25th percentile of

[6] Shallow subsurface inflows were not included in the water balance for West Edmond Marsh because there is no apparent subsurface pathway from Bell Marsh (the nearest higher-level marsh).

the hydraulic conductivities for Steilacoom Gravel used in the DuPont groundwater model (see Table 1 in Aspect, 2017a). The cross-sectional area of the flow path was estimated based on width of topographic channels at locations where the marshes are closest and a depth of flow equal to the difference in marsh elevations.

Groundwater discharge into a marsh was also calculated with Darcy's law where the vertical gradient is based on the difference in the marsh water level and the underlying groundwater elevation, hydraulic conductivity is based on the marsh sediments, and cross-sectional area is the wetted area of the marsh. Wetted area for each marsh varies based on water level and was estimated from topographic information.

Potential Evapotranspiration (PET) is calculated based on the pan evaporation data from the Puyallup Experimental Station (described in Section 4.1.1) and a pan coefficient of 0.8 to convert pan evaporation to open water evaporation. PET from vegetation assumed a "crop" coefficient of 1.

Surface water outflows were calculated by estimating the hydraulic properties of the structures (typically beaver dams or a culvert) controlling the water level in a marsh. Beaver dams were composite structures, with some leakage occurring through the dam itself according to Darcy's law, and flow over the top as a partially obstructed broad-crested weirs. Weir elevations were modified during calibration of the water balance model to match observed water levels. Only a couple changes over the period of record were used.

Shallow subsurface outflows were calculated using the same approach as shallow subsurface inflows, with the outflow from the upgradient marshes being the same as the inflow to a downgradient marsh.

Groundwater recharge (i.e., flow from a marsh into groundwater) was calculated using the same approach as groundwater discharge into a marsh. Groundwater recharge only occurs when the marsh water level is higher than groundwater. Similarly, groundwater discharge into a marsh only occurs when the marsh water level is lower than groundwater. Thus, groundwater recharge/discharge is calculated as a single term in the water balance, and either occurs as recharge or discharge, but not both, in any given month.

The water balance model simulates wetland hydrology on a monthly time step for the period from March 2003 (the start of the monitoring program) to September 2021 (the end of the most recent water year).

The water balance model was calibrated by qualitative comparison of predicted marsh water levels with the observed water levels from the monitoring period. The water balance model was able to reproduce the seasonal trends in water levels and capture differences between wetter and drier years under existing conditions. Figures 33 and 34 compare the observed water level measurements with the model predictions for existing conditions for Hamer and East Edmond Marsh, and West Edmond Marsh, respectively. For example, the model simulated years where West Edmond Marsh was completely dry in summer versus years where some water remained; however, in some years the period that West Edmond Marsh was dry was underestimated. Generally, the model fit is best for East and West Edmond Marshes and weakest for Hamer Marsh.

The combination of scientific basis for the model construction and good success of the model at simulating existing conditions provides a credible basis for using the model to evaluate the consequences of the mining and restoration projects operating simultaneously.

The primary outputs from the water balance are:

1. Predictions of marsh water levels on a monthly time step
2. An estimate of the losses/gains that occur when the flow from Sequalitchew Lake is directed through the marshes under the Mining and Restoration scenario

Water Balance Scenarios

Following calibration to existing conditions, the model was used to simulate three scenarios:

- **Existing Conditions:** This scenario simulates existing conditions in the marshes using observed groundwater levels from the monitoring network.
- **With Mining – Low Groundwater:** This scenario simulates the effects of the predicted groundwater drawdown at Step 4 (i.e., the long-term condition after active dewatering has ceased). The groundwater levels used are the model results for Step 4.[7] It also subtracts the model uncertainty from the groundwater levels, providing a lower bound estimate of the predicted water levels. Only the groundwater levels beneath the marshes are changed in this scenario.
- **With Mining and Restoration – Low Groundwater:** This scenario and its results are described in the Cumulative Effects discussion in Section 4.5.1.

The marsh water balance model was not used to evaluate a No Action scenario because there is no mechanism by which the No Action alternative would affect marsh water levels.

Marsh Water Balance Results

The water balance indicates that mining, if done without the Restoration Plan, would result in lower water levels in the marshes, with the greatest change occurring in West Edmond Marsh, followed by Hamer Marsh, then East Edmond Marsh. Average monthly water levels for the 19-year period of record for the existing and mining scenarios are shown on Figure 35 and presented in Appendix F, along with results for each individual month. These results are based on the conservatively low estimate of groundwater levels resulting from mining.

On average the water level in West Edmond Marsh would be 1.9 feet lower with mining. Hamer Marsh would be 0.3 feet lower, and East Edmond Marsh would be 0.1 feet lower. The magnitude of the change would vary seasonally. For West Edmond Marsh, the greatest change in water levels would occur during the spring months, when the decrease in water level would be up to almost 3 feet in May. The smallest difference would be

[7] The monthly average of the groundwater model results was for groundwater levels beyond the end of the period of record of the DuPont groundwater model.

0.35 feet in the late summer when West Edmond Marsh is typically dry under existing condition in most, but not all, years.

Conversely, the predicted change in Hamer and East Edmond Marsh water levels, which typically retain water year-round under existing conditions, is greatest in the summer. The average decrease in Hamer Marsh water levels would be over 0.5 feet from June to November, peaking at 0.8 feet in September. The minimum decrease would be about 0.2 feet in March. Hamer Marsh receives a high volume of stormwater input in winter months, which dampens the change. The decrease in East Edmond Marsh water levels ranges from 0.13 feet in June down to 0.005 feet in February.

The water balance model predicts that Hamer Marsh would experience a greater decrease in water level than East Edmond Marsh for two reasons. First, Hamer Marsh and East Edmond Marsh have different water sources and different relationships to the groundwater table. Groundwater levels near Hamer Marsh are typically higher than the marsh by a foot or more through the winter, whereas groundwater levels are typically below the marsh water level at the east and west ends of East Edmond Marsh and similar to the marsh water level in the middle. As a result, Hamer Marsh is more dependent on groundwater inflows, particularly during the dry season. Secondly, the DuPont model uncertainty is greater in the vicinity of Hamer Marsh. Model uncertainty in the vicinity of Hamer Marsh is 0.67 feet compared with 0.18 feet for East Edmond Marsh, which results in a relatively lower groundwater elevation for Hamer Marsh under the With Mining–Low Groundwater scenario since uncertainty is subtracted from the model-predicted groundwater elevation estimates.

The percent contribution of flows to and from the subsurface (which represents the combination of shallow subsurface flows and groundwater recharge or discharge) under existing conditions, with Mining alone, and with Mining and Restoration is shown in Table 21 below. These results indicate that under existing conditions Bell, Hamer, and McKay Marshes, East Edmond Marsh, and to a lesser extent West Edmond Marsh, receive some inflow from the subsurface, but also lose water to the subsurface, and the net result is a loss of water to the subsurface. Under the Mining scenario, this pattern persists.

Table 21. Percent Contribution of Subsurface Inflows/Outflows to the Total Inflows/Outflows for Marshes

Scenario	Percent Contribution to Inflows/ Outflows		
	Bell, Hamer, and McKay Marshes	East Edmond Marsh	West Edmond Marsh
Existing			
Inflows from Subsurface	4%	26%	1%
Outflows to Subsurface	-12%	-42%	-81%
Net	-8%	-16%	-80%
Mining - Low Groundwater			
Inflows from Subsurface	2%	26%	2%
Outflows to Subsurface	-15%	-38%	-89%
Net	-13%	-12%	-87%
Mining and Restoration - Low Groundwater			
Inflows from Subsurface	2%	15%	0%
Outflows to Subsurface	-31%	0%	-7%
Net	-28%	15%	-7%

Note: Inflow and outflow values may not add to net due to rounding.

4.2.3.3 Sequalitchew Creek Flow

Under existing conditions, the only regularly flowing reach of Sequalitchew Creek occurs in the ravine, where springs provide the primary water source to the creek. The effect of mining on Sequalitchew Creek flows was evaluated by predicting streamflows at two locations in the ravine: the mid-ravine gage (formerly termed the "upper gage") located approximately 2,500 feet downstream from the top of the ravine and the lower gage, located just before the creek enters the brackish marsh near its mouth.

As described in Section 3.1.6.2, dewatering conducted as part of the South Parcel Project would reduce the flow of springs in the Sequalitchew Creek ravine. The groundwater model results indicate that there would be no observable change in spring flows during the initial 10-well test (Step 1). During preparation for mining/expanded pumping test (Step 2), the reduction in spring flow is predicted to be 9 to 14 percent, with the greater reduction generally occurring in summer months and the smaller reductions occurring in winter.

At the peak of active dewatering during mining (Step 3), the reduction in spring flow would average 83 percent, ranging from 76 percent in January up to 86 percent in summer. Spring flow would return slightly in the ravine after active dewatering has ceased. The predicted reduction in Step 4 is an average of 79 percent, varying from 73 percent in January to 86 percent in summer (Aspect, 2017b). Reductions in spring flow are assumed to result in a 1:1 reduction in streamflow.

The effect of these reductions on flow in Sequalitchew Creek was accounted for by scaling the average daily flow records from the mid-ravine gage record by the corresponding monthly percent reductions in spring flow. This analysis conservatively

overestimates the impact of mining on streamflows, particularly during winter months, as the entire flow in the creek is assumed to result from a spring source and was scaled down accordingly. The hydrograph indicates that surface and stormwater contribute a portion of the flows in Sequalitchew Creek during rainy periods. These inflows would not be affected by mining, but nonetheless were scaled down in this analysis.

The resulting hydrograph of predicted flows in Sequalitchew Creek at the mid-ravine gage if mining were to occur without mitigation is shown on Figure 36. This hydrograph represents long-term conditions after the cessation of active dewatering (Step 4). The average flow in Sequalitchew Creek would be reduced from 1.6 cfs to 0.34 cfs.

4.2.3.4 Isolated Lake and Wetland Water Levels

Wetland 1D and the isolated kettle water bodies, such as Old Fort Lake, Pond Lake, and the similar lakes and wetlands located farther south, would potentially be affected by the change in groundwater levels associated with mining. The effects on these water bodies would vary depending on the proximity to the South Parcel Project.

Surface water levels in Wetland 1D and the isolated kettle wetlands have generally been identified as fluctuating with the groundwater system. Since these wetlands do not have surface water outlets, for simplicity sake, the change in surface water levels in them can conservatively be assumed to be comparable to the decline in groundwater level. In actuality, lower permeability sediments in the water bodies will likely dampen and delay the magnitude of the change in groundwater levels.

Wetland 1D is the closest isolated water body to the South Parcel Project. The groundwater model predicts that groundwater levels beneath Wetland 1D would decrease by about 3 feet in the long term (Figure 25). The surface water level in Wetland 1D is, thus, expected to be lowered by about 3 feet with the Proposed Action. The change in water levels would be negligible in Step 1 of dewatering, about 1 foot in Step 2, and about 3 feet in Step 3 (see Figures 22 to 24, respectively).

There is also the potential for aquifer drawdown to extend south to the isolated kettle wetlands. For the long term/post-mining dewatering scenario (Step 4), the groundwater model predicts about 2 feet of aquifer drawdown beneath Pond Lake decreasing to closer to 1 foot near Wetlands #8 through #11. Old Fort Lake would experience about 0.5 feet of groundwater drawdown. As with Wetland 1D, these changes in groundwater levels are expected to result in essentially equivalent changes in surface water levels in the water bodies.

Figure 37 presents the hydrographs for Pond Lake and Old Fort Lake illustrating the existing water levels and predictions with the Proposed Action. Pond Lake typically dries up in spring and summer. With the Proposed Action, Pond Lake would go dry earlier and refill later in some years depending on the amount of rainfall in that particular year. In addition, the high water levels would be lowered by the change in groundwater. Old Fort Lake retains water year-round. With the Proposed Action, its water level would be lowered by the change in groundwater levels, predicted to be 0.5 feet or less in the long term. Because of the large natural fluctuation, the analysis indicates the predicted change will be effectively masked by natural variability.

4.3 Effects of the No Action Alternative

Under the No Action alternative, the South Parcel could be developed for a manufacturing and research park or residential land use based on existing zoning. There would be no changes to use of the existing mine under the No Action alternative; the Kettle Wetland and Buffer Area would remain intact.

If built out under existing zoning, the No Action alternative would result in creation of a substantial amount of impervious area within the South Parcel from roads and building roofs. Presumably, given the extremely porous soils, all stormwater from this development would be managed with infiltration. The land use characteristics for the No Action alternative are shown in Table 16.

A water balance was developed for the No Action alternative using WWHM similar to the approach described in Section 4.2.1. Results from the water balance are shown in Table 17. The water balance indicates that the No Action alternative would reduce evapotranspiration by about 25 percent relative to existing conditions (i.e., from 744 to 595 acre-feet per year) as forest is replaced with impervious areas and landscaping. Precipitation that is not evaporated or transpired either recharges groundwater directly or generates stormwater. Because all stormwater is assumed to be infiltrated, the total groundwater recharge increases from 944 acre-feet per year under existing conditions to 1,093 acre-feet per year with the No Action alternative. This is also higher than recharge that would occur under the Proposed Action. As with the Proposed Action, the nature of the groundwater recharge would shift from broadly distributed recharge under existing conditions to focused infiltration in discrete locations.

Potential impacts to stormwater quality include increased sediment during construction or land disturbing activity and potential contamination from future uses. Standard source control measures (construction BMPs, education efforts, proper storage, etc.) would reduce the potential for impacting stormwater quality. All stormwater generated would likely be infiltrated. The large separation between the land surface and the aquifer would provide significant protection for the aquifer. That separation would likely be reduced, but not eliminated, under any future mining actions.

4.4 Mitigation Measures

This section describes the mitigation measures included in the Proposed Action to mitigate impacts to surface water and stormwater. The mitigation measures are presented in three subsections:

- **Mine Best Management Practices**–Describes the BMPs used within the mine to manage stormwater and prevent erosion.
- **Monitoring Plan**–Summarizes the monitoring and adaptive management plan developed to ensure that the impacts of dewatering on groundwater levels are consistent with the model predictions.
- **Sequalitchew Creek Watershed Restoration Plan**–Provides an overview of the restoration plan that more than mitigates for the impacts to surface water of the Proposed Action through watershed-wide action to restore flows in Sequalitchew Creek from Sequalitchew Lake to Puget Sound.

4.4.1 Mine Best Management Practices

The following mitigation measures within the mine area are included in the Proposed Action:

- The mine area would be excavated as a closed depression, preventing off-site runoff of stormwater.
- Mine stormwater would be infiltrated in ponds located on the mine bottom.
- A minimum vertical separation of at least 5 feet would be maintained between the pond bottom and the seasonal high groundwater table.
- Water quality treatment facilities would be provided upstream of the infiltration ponds to protect their long-term infiltration capacity.
- The proposed stormwater management system must comply with Ecology and City of DuPont stormwater regulations.
- A Reclamation Plan, pursuant to the Surface Mining Act (RCW 78.44), would be prepared and implemented. The Reclamation Plan would be submitted to DNR for review and approval prior to issuing a revised surface mine reclamation permit required for mining. Implementation of the reclamation plan is guaranteed by posting of financial security required by RCW 78.44.
- An erosion and sediment control plan would be prepared and implemented in accordance with the requirements of DMC 22.01.180.
- Compliance with the NPDES Sand and Gravel General Permit would continue. Required actions include preparation and implementation of a SWPPP, erosion and sediment controls, monitoring, compliance with effluent limits, and specific BMPs for industrial activities. These actions would be subject to inspection and review by Ecology as required by the Sand and Gravel General Permit.

4.4.2 Monitoring Plan

The South Parcel Monitoring Plan (Monitoring Plan; Aspect, 2017a) defines the groundwater monitoring program and adaptive management plan aimed at ensuring that the actual changes in groundwater levels during dewatering are consistent with predicted values. The Monitoring Plan is part of the Proposed Action.

The overall goal of the Monitoring Plan, as specified in the 2011 Settlement Agreement, is to *"…include a series of monitoring actions to allow a comparison of predicted and actual changes in groundwater draw-down levels, and a process for the Parties to meet and confer if groundwater monitoring results do not meet the criteria provided in the Monitoring Plan."*

The Monitoring Plan articulates a series of goals, objectives, and performance thresholds. Goals are the overarching principles behind the Monitoring Plan. Objectives identify specific, measurable elements that are undertaken to meet the goals of a project. The performance threshold defines the measure of success used to assess whether an objective is met. Failure to meet a performance threshold will trigger the adaptive management process and require iterative additional actions until it is met.

The goals, objectives and performance thresholds of the Monitoring Plan for the South Parcel Project are:

Goal 1. Maintain groundwater at or above predicted levels beneath Edmond Marsh and Sequalitchew Creek.

- **Objective 1A.** Groundwater levels at monitoring wells near Edmond Marsh and Sequalitchew Creek are at or above predicted levels.
- **Performance Threshold.** Monthly groundwater level measurements are at or above target levels established for each step of the dewatering process at each well and for each month of the year, based on statistical analysis of groundwater model predictions over a range of historical climate conditions. Initial target levels are included in Appendix A of the Monitoring Plan.

Goal 2. Maintain groundwater conditions conducive to safe and efficient mining and processing of the South Parcel aggregates.

- **Objective 2A**. Moisture content of mined aggregate is at appropriately low levels for safe and efficient mining and processing.

Groundwater levels will be monitored during dewatering. The monitoring network will include 18 of the existing monitoring wells and the proposed new dewatering wells and observation wells to be installed as a component of the Proposed Action. The existing monitoring wells are located throughout the Sequalitchew Creek watershed as shown on Figure 12 and include wells in DuPont and on JBLM, near each of the major marshes, and on the South Parcel itself. Water level monitoring will vary during the different dewatering steps but will generally consist of continuous monitoring in the wells on the South Parcel and the closest marsh wells, and monthly or twice monthly manual measurements in the remaining wells.

The groundwater levels observed during dewatering will be compared with predicted groundwater elevations for the appropriate dewatering step. The Monitoring Plan defines the predicted groundwater levels at each well during each month of the year for each dewatering step in Appendix A of the Monitoring Plan. The predictions were developed from the DuPont model results for the maximum decrease in water level for the relevant dewatering step plus an estimate of model uncertainty. As such they represent a conservatively low set of groundwater levels on which to base the assessment of environmental impacts to surface water bodies. As long as actual groundwater levels remain above these thresholds during mining, reviewers can be confident that impacts to surface water will be less than or equal to what was predicted.

The Monitoring Plan (Aspect, 2017a) also defines an adaptive management process for the key parties to follow throughout the dewatering and mining. The process is based on five steps:

A. Assess – Information is compiled from monitoring data, geologic investigations, groundwater modeling, and other available sources. The compiled information is used to identify issues, refine objectives, and screen potential alternative

approaches. Predictions of the potential effects of the action on groundwater levels are developed.

B. Design – Based on the results of the assessment stage, design of the Proposed Action proceeds. Design will result in a specific plan of action, and supporting evaluations to ensure that the anticipated results are consistent with the identified objectives, the Monitoring Plan, and prior environmental assessments. Predictions of groundwater levels are refined as the design evolves. Analyses conducted during the design stage could result in an iterative process of assessment and design. Any required permitting is also included in the design stage.

C. Implement & Monitor – The approved plan is put into action, concurrently with monitoring focused on key indicators tied to the identified objectives. Monitoring data indicating conditions worse than forecasted are acted on rapidly, moving into the evaluation and adjustment stages.

D. Evaluate – Monitoring data are evaluated relative to the objectives and forecasted results developed in the assessment and design stages. Differences between forecasts and results are identified and the causes for those differences investigated.

E. Adjust – Information learned in previous steps is used to adjust the actions, if necessary. The Monitoring Plan provides an initial identification of potential adjustments in each dewatering step, but additional adjustments could be developed to fit specific situations.

The adaptive management process is iterative and would repeat until the South Parcel Project is completed. If an adjustment is identified, the process would begin again from the assessment and design stages, followed by implementation of the adjustment and associated monitoring, then evaluation and further response (if necessary). If an adjustment is not necessary, then the process still repeats. In this case, the assessment and design stages would largely rely on the previously approved plans, but there is still potential for more minor refinements based on the information learned.

Throughout the adaptive management process, status updates, monitoring data, and final reports will be shared. If adjustments are unsuccessful in meeting predicted groundwater levels, the Monitoring Plan defines the Meet and Confer process required under the 2011 Settlement Agreement for determining the appropriate additional steps.

The adaptive management process is a little different during each step of the dewatering process, as, for example, Steps 1 and 2 are completely reversible and more limited in extent than the later steps. The Detailed Adaptive Management Plan section of the Monitoring Plan outlines the specifics of how adaptive management would be implemented during each step of the mining and dewatering process.

4.4.3 Sequalitchew Creek Watershed Restoration Plan

The Sequalitchew Creek Watershed Restoration Plan (Restoration Plan; 2018) was developed as a component of the 2011 Settlement Agreement to restore flows and ecological functions in Sequalitchew Creek and Edmond Marsh. The Settlement Agreement articulates five required components of the Restoration Plan:

1. Improvement of gradients so water discharges from Hamer and Bell Marshes flow into Edmond Marsh rather than into the diversion canal.
2. Improvements to create significant flows from Sequalitchew Lake into the Edmond Marsh complex to support a functional creek ecosystem, and provide for the passage of migratory fish in the Sequalitchew Creek system. To achieve this goal, the Parties to the 2011 Settlement Agreement will consider, at minimum, modification of the diversion canal flood control structure and gradients.
3. Rehabilitation of Edmond Marsh by removal of sufficient fill and other flow impediments to provide the hydraulic gradients and capacity necessary to achieve and maintain adequate flows through the Marsh.
4. Rehabilitation of Sequalitchew Creek below Edmond Marsh to reduce seepage, improve fish habitat, and help restore year-round flows.
5. Active management of beaver activities to maintain the hydraulic gradients that provide flows through Hamer, Bell, and Edmond Marshes.

Through a public process, led by the South Puget Sound Salmon Enhancement Group (SPSSEG) followed by work with the Environmental Caucus and CalPortland, the required components were honed into 12 specific restoration elements, listed in Table 22 for elements within the City of DuPont and Table 23 for elements on JBLM. The locations of Restoration Plan elements throughout the watershed are shown on Figure 38.

The elements of the Restoration Plan can be grouped into five categories of actions:

1. Regulatory Actions
2. Flow Restoration
3. Flow Maintenance and Enhancement
4. Habitat Restoration

Regulatory actions are a precursor to implementation of the Restoration Plan, involving updates to the City of DuPont's critical areas ordinance to support the restoration activities. This element has been completed in June 2021 through the City's update to the Critical Areas code (Ordinance 21-1094).

The next three categories directly align with the objectives of the Restoration Plan. Restoring flows would primarily occur through beaver management and modifications in the lake outlet area to seasonally raise the Sequalitchew Lake level and remove potential channel obstructions. Flow maintenance and enhancement involves removal of channel constrictions (e.g., replacing a portion of the trail that bisects Edmond Marsh with a pedestrian bridge) to reduce the potential for ongoing beaver obstructions and evaluation of Hamer Marsh as a potential source of additional water. Habitat restoration would remove several potential barriers to fish passage and restore or enhance aquatic habitat in important portions of the watershed.

4.5 Cumulative Effects of Proposed Action and Restoration Plan

This section describes the cumulative effects of the Proposed Action and implementation of the related Restoration Plan on surface water bodies in the Sequalitchew Creek watershed. The effects of the Proposed Action alone were previously described in Section 4.2.

4.5.1 Marsh Water Levels

The cumulative effects of Mining and Restoration scenario on marsh water levels were estimated using the water balance model described in Section 4.2.3.2. The water balance model was run with an additional scenario representing the combination of mining and implementation of the Restoration Plan and includes the following:

- **Low Groundwater Levels** – The Mining and Restoration scenario uses the estimates of groundwater levels for Step 4 that incorporate uncertainty (i.e., are conservatively low) described in Section 3.2.1.
- **Beaver Management** – Consistent with element 2.B of the Restoration Plan, flexible levelers are installed with the goal of maintaining marsh water levels at the following targets, recommended in SPSSEG (2014). For the model run, these elevations are assumed to represent fixed spillways throughout the year:
  - East Edmond Marsh, east of DuPont-Steilacoom Road = 210.5 feet
  - East Edmond Marsh, west of DuPont-Steilacoom Road = 209 feet
  - West Edmond Marsh = 206.5 feet
- **Sequalitchew Lake** – The monthly observed outflows from the lake are routed into Eastern East Edmond Marsh.
- **Hamer Marsh Weir** – Consistent with element 3.E of the Restoration Plan, a weir is installed in the main outlet of Hamer Marsh. Prior documents are not specific about the target elevation of the weir, so it was assumed to be at elevation 215 feet, which is about 0.5 feet higher than winter water levels at the start of the monitoring period and about the same as later winter water levels.
- **Hamer Marsh Culvert to Edmond Marsh** – Since replacing the Hamer Marsh culvert connecting to Edmond Marsh is a contingent action, depending on a study of water quality in Hamer Marsh, it was assumed not to be replaced. No additional surface water flow was assumed to be routed from Hamer Marsh to Edmond Marsh.
- **Dry Reach** – Consistent with element 3.G of the Restoration Plan, infiltration of flowing water into the channel bottom of the normally dry reach was assumed to be zero, either through natural or constructed lining of this reach.

Results from the marsh water balance analysis of the with Mining and Restoration – Low Groundwater scenario are included in Appendix F.

Marsh Water Levels with Mining and Restoration

The water balance model predicts that the water levels in East and West Edmond Marshes would generally be controlled at their restoration target elevations (see Figure 35) under the Mining and Restoration scenario. These elevations are significantly lower than the current water levels in these marshes. The decrease in marsh water levels is primarily influenced by beaver management under the Restoration Plan aimed at achieving water levels necessary to ensure east-to-west flow through the marsh system into Sequalitchew Creek. The changes in water surface elevations in the marshes are necessary to allow for flow from Sequalitchew Lake to reach Sequalitchew Creek ravine. Currently, the water levels in East Edmond Marsh are higher than the typical lake level of about 210.5 to 211.5 feet, preventing any outflow from the lake from reaching the marshes.

Generally, there would be little variation in marsh water levels, as there would almost always be more than enough flow from Sequalitchew Lake to keep the wetlands full to their target elevations. However, there are several summers during the simulation period when water levels in Edmond Marsh would dip below the target elevations for a month or more. These events are visible on Figure 35 as the slight dips in July and August below the relatively constant elevation line. The hydraulic gradient through the marshes would always be maintained, however, as the water level in East Edmond never dips below the water level in East Edmond Marsh.

The target water levels of the Mining and Restoration scenario achieve a difference in water surface elevations of 4 to 5 feet between the lake (typically 210.5 to 211.5 feet) and West Edmond Marsh (target elevation 206.5 feet). Over the 8,700-foot flow path through the marshes, these water levels would result in a hydraulic gradient of 0.0006 feet per foot. This is a very low gradient; however, one or more broad (20+ feet), shallow (< 2 feet) channels at this gradient would have sufficient capacity to convey the peak outflows from Sequalitchew Lake. Flow velocities in this system would be low (<1 foot per second).

The water balance may overestimate the change in marsh water levels because it treats large areas of the marsh as single, contiguous water body with the same elevation. When implementing the Restoration Plan, the restoration managers could adaptively manage wetland water levels through the use of flexible levelers and other beaver management devices at more locations throughout the marshes, creating smaller steps in water level. In addition, beaver ponds off the main channel through the marshes from Sequalitchew Lake could be maintained at higher elevations without impeding flow along the channel.

Gains/Losses in the Marshes

Under the Mining and Restoration scenario, the outflow from Sequalitchew Lake would once again enter the marshes, given that the barriers to flow have been removed or lowered to provide a positive gradient to the Sequalitchew Creek ravine. As water travels through the marshes, it would still be subject to potential gains from precipitation, stormwater inflows, or discharge from groundwater, as wells as losses to evapotranspiration or infiltration to groundwater.

With Mining and Restoration, losses to the subsurface would be a greater portion of the water balance for Bell, Hamer, and McKay Marshes. The increase in relative importance

of losses to the subsurface is driven by the lower water levels in East Edmond Marsh resulting in greater shallow subsurface outflows from Bell, Hamer, and McKay Marshes. East Edmond Marsh gains water from the subsurface, because the water level in the marsh would be controlled at a lower level resulting in greater inflows from Bell, Hamer, and McKay Marshes. Finally, the relative importance of losses to the subsurface would decrease in West Edmond Marsh as more surface water flows through it, dominating its water balance.

Gains and losses to flow from Sequalitchew Lake as it passes through the marshes varies throughout the year. In most months (September to June), the marsh system would add to the flow, as shown in Table 24. In drier months (July and August), the gain would be negligible, or some flow would be lost in the wetlands (up to 3 percent) to evapotranspiration or infiltration. Losses during the drier months balanced with gains during the winter result in an average annual increase in flow of 12 percent. Summertime losses are also important because they occur at times when less water is present in the system and so highlight periods of net reduction in flow through the marsh system.

Table 24. Average Gains/Losses in Wetlands with Proposed Action and Restoration Plan

Month	Average Inflow from Sequalitchew Lake in cfs	Average Outflow to Sequalitchew Creek in cfs	Gain (+) or Loss (-)	
			in cfs	Percent
January	15.8	18.5	2.7	17%
February	19.8	22.0	2.2	11%
March	22.2	24.3	2.1	10%
April	20.4	21.9	1.6	8%
May	13.4	14.6	1.2	9%
June	7.7	8.5	0.8	10%
July	3.4	3.5	0.0	1%
August	2.5	2.4	-0.1	-3%
September	2.2	2.4	0.2	10%
October	3.7	4.7	1.0	26%
November	7.1	8.8	1.7	25%
December	11.0	13.2	2.2	20%
Average	10.75	12.05	1.3	12%

Note: cfs = cubic feet per second

4.5.2 Edmond Marsh Water Quality

The proposed mining and restoration projects would affect water quality in East Edmond and West Edmond Marsh through flushing with a high volume of water with better quality than the water in the marshes under existing conditions. The anticipated changes were evaluated qualitatively by comparing the water quality conditions in the outflow from Sequalitchew Lake with water quality conditions in the marshes.

The residence time in the wetlands would reduce significantly, decreasing from weeks to months under existing conditions to days with the Mining and Restoration scenario. As a result, the water quality in the wetlands would be dominated by the input from Sequalitchew Lake. Dissolved oxygen would be higher and the pH slightly more neutral.

Temperature and turbidity have been about the same between the lake and the marshes, so little change would be anticipated.

It is anticipated that the elevated iron concentrations observed in the center of Edmond Marsh would be resolved through flushing and dilution with Sequalitchew Lake water. The iron concentration in the outflow from Sequalitchew Lake has been measured on only one occasion (at 0.13 mg/L), well below the elevated levels of 3 to 5 mg/L observed in Edmond Marsh near the railroad trail bridge and related seeps. Iron concentrations in the marshes receiving flow from Sequalitchew Lake could be expected to have iron concentrations near, but slightly above, the concentration in the lake.

Iron is necessary for aquatic life but can be toxic at higher concentrations. There is no state water quality criterion for iron in surface waters, but British Columbia has established a water quality guideline for total iron of 1 mg/L in surface water (Phippen et al, 2008). As the iron concentration in Sequalitchew Lake outflow is nearly an order of magnitude lower that this criterion, the iron concentration in the Edmond Marsh during and after mining and restoration is anticipated to be well below 1 mg/L.

4.5.3 Sequalitchew Creek Streamflow

The cumulative effects of the Proposed Action and Restoration Plan were predicted for two reaches of Sequalitchew Creek: the normally dry reach between the outlet of West Edmond Marsh and the top of the ravine, and the upper portion of the ravine.

4.5.3.1 Dry Reach

Under existing conditions, the reach of Sequalitchew Creek between the outlet of West Edmond Marsh and the top of the ravine experiences no consistent flow passing through the entire reach. This occurs because there is little outflow from West Edmond Marsh and the bottom of the channel in this reach is above the groundwater levels and has been disturbed by prior human activity, so any outflow readily infiltrates into the coarse native soils.

Together, the Proposed Action and Restoration Plan are predicted to result in an average flow of 12.6 cfs in the dry reach. The flow would vary seasonally from a monthly average of 2.5 cfs in August to 25.7 cfs in March as shown on Figure 39. Peak flows could be as high as 65 cfs if all water is routed through the wetlands during peak flow events. To avoid flooding during peak flows, JBLM may seek to continue to route a portion of peak flows to the Diversion Canal. The results presented here do not account for the diversion of peak flows.

With the Proposed Action and Restoration, there would be some periods when water would not flow from West Edmond Marsh or in the dry reach. Water balance model results, based on hydrologic conditions observed over the 19-year period of record, indicate that water would not flow through the dry reach due to dry conditions on 401 days (or 7.7 percent of the time). These dry periods were predicted to last for multiple weeks to several months and occurred in five of the 19 years simulated by the model (2004, 2005, 2015, 2017, and 2018). These reflect periods in the historical record when there was no flow over the Diversion Canal weir.

Streamflow in the dry reach was calculated by adjusting the daily average outflows from Sequalitchew Lake from 2003 to 2021 by the estimates of the gains or losses that would occur in the wetlands based on the results of the water balance model. The dry reach was assumed to have a sealed bed under restored conditions (either naturally or through contingent restoration actions), so no gains or losses were assumed to occur within the dry reach.

The predictions of streamflow in the dry reach are subject to uncertainty resulting from several sources including: (1) the historical measurement of streamflow at the Diversion Weir, (2) the estimates of gains and losses from the water balance model, and (3) the temporal effects of streamflow routing as water travels through the marshes. The uncertainty associated with streamflow measurement at the weir is anticipated to be low (<10 percent) as weirs provide a reliable hydraulic section for streamflow measurement. However, as the outflow from Sequalitchew Creek is by far the largest factor affecting streamflow in Sequalitchew Creek, once the Restoration Plan is implemented even low uncertainty in the flow measurement can be important.

Uncertainty in the water balance stems from multiple factors including the application of precipitation and evaporation historical observations to the project site; challenges in estimating hydraulic conductivity throughout a large, submerged area; errors with estimating the storage-surface area-elevation relationships of the marshes; changing hydraulic controls over time through beaver activity, difficulties estimating parameters like the hydraulic conductivity of beaver dams or the locations where shallow subsurface flow between marshes may occur; and uncertainties in the estimates of groundwater levels with mining (see discussion in Section 3.2.1.6).

To reduce the potential impact of these uncertainties, several conservative assumptions (i.e., assumptions which overestimate losses in the marshes, or otherwise underestimate flow through the marshes) were used:

1. Low Groundwater Levels – The groundwater levels subtract the estimate of model uncertainty, resulting in a low estimate of groundwater levels and thus higher losses from the marshes. In addition, no additional surface water flow was assumed to come from Hamer Marsh under the Restoration Plan.

2. Restoration of Surface Flows from Hamer Marsh Not Included – Additional surface water flow from Hamer Marsh was not included in the With Mining and Restoration – Low Groundwater scenario because it is a contingent element. If this element is implement, and initial indications are that JBLM plans to route surface water outflows from Hamer Marsh to Eastern East Edmond Marsh, additional flow would pass through the marshes and benefit Sequalitchew Creek.

Finally, these predictions do not account for the effects of storage in the wetlands as flow from Sequalitchew Lake is routed through them. This uncertainty only affects the With Mining and Restoration – Low Groundwater scenario. The effects of storage will likely be beneficial to streamflow by attenuating flows and spreading it over multiple days, which in some cases may reduce the number of days of periods without flow in the Dry Reach.

4.5.3.2 Upper Sequalitchew Creek Ravine

Streamflow passing through the dry reach of Sequalitchew Creek would continue into the top of the Sequalitchew Creek ravine. In this reach groundwater discharges from the ravine springs, augmenting flow in the creek. The dewatering component of the Proposed Action would significantly decrease the flow from the springs as described in Sections 3.2.4.2 and 4.2.3.3, but there would continue to be some spring discharge to the creek.

Streamflow in Sequalitchew Creek with the Proposed Action and Restoration Plan can be predicted by starting with the flows in Sequalitchew Creek from the dry reach (see Section 4.5.3.1) and adding the predicted flows in upper Sequalitchew Creek with the Proposed Action alone. The Restoration Plan would have no effect on the ravine spring flows.

The annual average flow in upper Sequalitchew Creek ravine would be 12.9 cfs and the monthly average would vary from a low of 2.5 cfs in August to a high of 26.3 cfs in March. The resulting hydrograph of predicted flows in the upper Sequalitchew Creek ravine with the Proposed Action and Restoration Plan is shown on Figure 40 and the predicted monthly average flows are summarized in Table 25.

Table 25. Predicted Flows in Sequalitchew Creek with Mining and Restoration

Month	Predicted Flows with Mining and Restoration in cfs			Percent of Mid-Ravine Flow from Seeps and Springs
	Dry Reach	Ravine Seeps and Springs	Mid-Sequalitchew Creek Ravine	
October	5.4	0.1	5.5	3%
November	9.8	0.4	10.2	4%
December	13.4	0.5	13.9	3%
January	19.0	0.7	19.7	4%
February	22.9	0.6	23.5	3%
March	25.7	0.6	26.3	2%
April	22.9	0.5	23.4	2%
May	14.5	0.4	14.8	2%
June	8.7	0.3	9.0	3%
July	3.9	0.2	4.0	4%
August	2.5	0.1	2.6	5%
September	2.8	0.1	2.9	4%
Annual Average	12.6	0.4	12.9	3%

Table 25 also includes the percentage of flow that originates from seeps and springs within the Sequalitchew Creek ravine. On an annual average, 3 percent of streamflow in Sequalitchew Creek would originate from ravine seeps and springs. The remaining 97 percent of flow would originate from Sequalitchew Lake and the marshes. The

percentage of flow originating from seeps and springs varies slightly from 2 to 5 percent, with the greatest contributions during the dry season.

There would be periods when the cumulative effects of the Proposed Action and Restoration Plan are predicted to result in a reduction in flows at the mid-ravine gage when compared with the observed existing condition. Post-project flows are predicted to be lower during 45 periods, lasting a total of 475 days over the 19 years evaluated, or about 10 percent of the time. During 24 of those days, there would be no flow at the mid-ravine gage. Under observed existing conditions, there were 7 days with no measurable flow at the gage.

The median duration of a period when flows would be lower with the Proposed Action and Restoration Plan (hereafter referred to as a "lower flow event") would be 3 days, but there were 7 lower flow events lasting more than 2 weeks long. The longer events occurred in 6 of the 19 years simulated (2004, 2005, 2015, 2016, 2017, and 2018). The longest single lower flow event was 98 days ending in October 2017. However, lower flow events dominated the summer and fall of 2005, when there were four lower flow events between July 20 and December 23 lasting a total of 134 days. Lower flow events occurred most commonly in July, August, September, and October, but occasionally occurred in all months except March. The average streamflow during lower flow events was 0.83 cfs under existing conditions and would be 0.44 cfs with the Proposed Action and Restoration Plan. The decrease in streamflow during lower flow events ranged from less than 0.1 cfs up to 1.6 cfs.

Streamflow in the lower reach of Sequalitchew Creek can be expected to be similar to the upper reach. Once Sequalitchew Creek crosses the truncation of the Olympia Beds, neither the Proposed Action nor the Restoration Plan would affect the spring discharge to the creek nor infiltration from the creek to groundwater. Flows in the lower ravine reach are higher than in the upper ravine reach as gains from stormwater and spring discharge exceed losses to infiltration. This condition can be expected to continue, though the magnitude of the gains will be minor relative to the restored flow.

4.5.4 Sequalitchew Creek Water Quality

The Mining and Restoration projects would affect stream temperature in the Sequalitchew Creek ravine by introducing a large quantity of water of different temperature. The effects would vary seasonally as the volume of water from Sequalitchew Lake, and its associated temperature varies. In summer, the outflow from Sequalitchew Lake is warmer than Sequalitchew Creek; in winter, it is colder.

The change in stream temperature was evaluated quantitatively by using a linear mixing equation to calculate average monthly temperatures based on observed temperature data and predicted streamflows from the outflow from the marshes and the groundwater discharge from the ravine springs. Generally, the outflow from Sequalitchew Lake has higher summer temperatures and lower winter temperatures due to exposure to the atmosphere.

The outflow from the marshes was represented by the monthly average flow rates from West Edmond Marsh from the water balance and the observed temperature data for Sequalitchew Lake plus an additional 1°C added to conservatively account for warming

that may occur in the marshes (even though monitoring data indicate that water temperatures in the marshes are generally similar to lake temperatures). The groundwater discharge to Sequalitchew Creek was based on the estimate of post-mining spring discharges to the ravine and the observed Sequalitchew Creek temperature data.

This analysis is limited by the quality of the available temperature data. Grab samples are representative of the specific time and location they were taken, but do not represent the diurnal temperature variation, or spatial variations within a water body. As such, care should be taken in comparing the results of this analysis with temperature criteria based on multiple day averages of daily maximum temperatures.

Sequalitchew Creek would experience warm temperatures in June, July, and August, with temperatures reaching up to 21°C and cool temperatures in winter, down to 5 to 6°C. The seasonal pattern of average monthly temperatures in Sequalitchew Creek with mining and restoration are shown on Figure 41. The predicted stream temperatures would be considerably warmer than the current spring discharge in the creek for most of the year. The surface water quality criterion for temperature applicable to Sequalitchew Creek is 16°C for the 7-day average of daily maximums. The analysis based on grab samples suggests that this threshold may be exceed from May through September.

The change in stream temperature reflects a return toward historical conditions when the warmer outflow from Sequalitchew Lake would pass through marshes before flowing down the Sequalitchew Creek ravine.

4.6 Significant Unavoidable Adverse Impacts

The Proposed Action in conjunction with the Restoration Plan would result in the following significant, unavoidable adverse impacts to surface waters within the Sequalitchew Creek watershed:

- Water levels in Edmond Marsh would be lower than existing conditions by up to 3 feet. This impact is primarily attributable to the Restoration Plan and is necessary to achieve flow from Sequalitchew Lake to the Sequalitchew Creek ravine. However, the change in water level also includes the impact of changes in groundwater levels from dewatering for mining.
- Water levels in isolated lakes and kettle wetlands would be lower by the amount of the change in groundwater levels from dewatering. The decrease would be 3 feet for Wetland 1D, 2 feet for Pond Lake, 1 foot for Wetlands #8 to #11, and 0.5 feet for Old Fort Lake.
- There would be periods, approximately 10 percent of the time, when flows in Sequalitchew Creek with the Proposed Action and Restoration Plan would be lower than under existing conditions.
- Water temperature in Sequalitchew Creek would be warmer than under existing conditions from April through September and would likely exceed the 7-day average of daily maxima criterion of 16°C in multiple months between May and September.

No significant unavoidable adverse impacts to surface waters are anticipated from direct effects of the Proposed Action (i.e., activities within the mine area acting directly on stormwater or surface water).

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6 Limitations

Work for this project was performed for the CalPortland (Client), and this report was prepared in accordance with generally accepted professional practices for the nature and conditions of work completed in the same or similar localities, at the time the work was performed. This report does not represent a legal opinion. No other warranty, expressed or implied, is made.

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TABLES

Table 1. Summary of Existing and Post-Reclamation Land Uses for Proposed Action

Project No. 040001, Pioneer Aggregates South Parcel Project, DuPont, Washington

Land Use	Area [1] in Acres									
	Existing Conditions					Proposed Action - Post-Reclamation				
	Expansion Area			Re-Mine Area	Total	Expansion Area			Re-Mine Area	Total
	South Parcel	Kettle Area	Buffer Strip			South Parcel	Kettle Area	Buffer Strip		
Built Areas										
Buildings	--	--	--	--	0.00	--	--	--	--	0.00
Roads, Access, and Parking	--	--	0.4	9.2	9.55	--	--	--	--	0.00
Processing Areas	--	--	0.2	17.9	18.08	--	--	--	--	0.00
Active Mining	--	--	--	--	0.00	--	--	--	--	0.00
Active Reclamation	--	--	0.2	20.5	20.62	--	--	--	--	0.00
Cleared for Mining	--	--	--	--	0.00	--	--	--	--	0.00
Water Management Ponds	--	--	--	--	0.00	--	--	--	--	0.00
Total Built Areas	0	0	0.8	47.5	48.26	0	0	0.00	0.00	0.00
Natural & Reclaimed Areas										
Areas Reclaimed as Forest	--	--	--	3.3	3.3	29.4	0.6	0.6	35.8	66.3
Areas Reclaimed as Grass	--	--	--	68.5	68.5	138.2	10.2	8.6	89.4	246.4
Wooded Areas	146.2	5.6	7.4	5.8	165.1	--	--	--		0.0
Grass Areas	21.3	--	1.0	0.21	22.5	--	--	--		0.0
Wetland	--	1.8	--		1.8	--	--	--		0.0
Wetland Buffer	--	3.4	--		3.4	--	--	--		0.0
Total Natural & Reclaimed Areas	167.5	10.8	8.4	77.7	264.5	167.5	10.8	9.2	125.2	312.7
Total	167.5	10.8	9.2	125.2	312.7	167.5	10.8	9.2	125.2	312.7

Notes:

-- Indicates no area of this type.

1) Totals may not exactly equal the sum of their components due to rounding.

Table 5. Well Data Inventory

Project No. 040001-I-018, Pioneer Aggregates South Parcel Project, DuPont, Washington

Name	Owner	Installation Date	Easting (ft, WA State Plane South, NAD83)	Northing (ft, WA State Plane South, NAD83)	Measurement Point Elevation (ft, NGVD29)	Ground Surface Elevation (ft, NGVD29)	Total Depth (ft, bgs)	Total Depth Elevation (ft, NGVD 29)	Bottom of screen elevation (ft, NGVD29)	Top of screen elevation (ft, NGVD29)	Monitoring Status
CHMW-1	CalPortland	9/24/1999	1106696.99	656314.27	211.41	209.41	85	124.41	124.91	136.41	Active
CHMW-2D	CalPortland	11/18/1999	1106700.16	658200.38	209	207.2	73	134.2	134.7	146	Active
CHMW-2S	CalPortland	11/19/1999	1106705.29	658216.29	209.39	207.94	43	164.94	165.44	176.39	Active
CHMW-3D	CalPortland	11/5/1999	1105047.94	655341.87	218.35	216	85	131	131.5	140.5	Active
CHMW-3S	CalPortland	11/5/1999	1105040.23	655354.29	218.49	216	40	176	176.5	185.5	Active
CHMW-4D	CalPortland	11/11/1999	1106579.69	654911.11	215.91	214	85	129	129.5	138.5	Active
CHMW-4S	CalPortland	11/23/1999	1106568.15	654917.67	215.765	214	37	177	177.5	186.5	Active
OB-1	CalPortland	2/15/1991	1106246.36	661167.18	210.72	208.72	239.5	-30.78	-20.58	-0.18	Active
MW-BM-1	CalPortland	8/3/2004	1110307.50	651349.59	232.32	229.37	25	204.37	204.37	214.37	Active
MW-93-MFS-C5-3	JBLM	2/23/1993	1108505.09	659437.53	219.32	216.52	30.2	186.32	186.52	196.32	Active
MW-D-3	JBLM	8/5/1996	1108925.35	657457.41	212.47	209.94	24	185.94	185.94	195.94	Active
MW-EM-1D	CalPortland	12/11/2002	1107470.10	653789.74	210.29	207.3	32	175.3	175.3	185.3	Active
MW-EM-1S	CalPortland	12/11/2002	1107470.10	653789.74	210.23	207.3	5	202.3	202.3	204.8	Active
MW-EM-2D	CalPortland	12/2/2002	1109620.41	653048.09	214.2	212.1	50	162.1	162.1	172.1	Active
MW-EM-2S	CalPortland	12/2/2002	1109620.41	653048.09	214.95	212.1	5	207.1	207.1	209.6	Active
MW-EM-3	CalPortland	3/11/2004	1111866.67	653569.41	217.38	214.63	20	194.63	194.63	204.63	Inactive*
MW-HM-1	CalPortland	8/2/2004	1113393.29	652867.84	221.06	217.75	20.3	197.45	197.75	207.45	Active
MW-PL-1	CalPortland	7/26/2006	1106163.60	651040.56	205.51	202.76	4.15	198.61	198.61	201.61	Active
MW-SRC-2	JBLM	NA	1116574.08	653674.67	234.62	232.76					Active
88-2-VD	JBLM	11/17/1988	1111621.47	657093.03	221.74	219.31	49	170.31	181.31	173.74	Inactive
MW-SL-1	CalPortland	3/11/2004	1113520.44	655737.40	217.74	214.94	20.3	194.64	194.94	199.64	Active
MW-WL1D-1	CalPortland	7/26/2006	1108902.03	653804.55	212.31	209.56	3.9	205.66	205.66	208.66	Active

Note:

* EM-3 is temporarily inaccessible due to unknown lock.

Table 6. Summary of Hydrostratigraphic Units and Calibrated Parameter Values

Project No. 040001, Pioneer Aggregates South Parcel Project, DuPont, Washington

Hydrostratigraphic Unit in DuPont Model	Correlated USGS Hydrogeologic Unit and Partial Description	Principal Layers in DuPont Model	Horizontal Hydraulic Conductivity (feet/day)					Vertical Anisotropy (-)	Specific Yield (-)	Specific Storage (1/foot)	for Horizontal Hydraulic Conductivity (feet per day)	
			Max.	75 percentile	Average	25 percentile	Min.	horizontal: vertical			USGS median	Dupont Works RI
Steilacoom Gravel	A1 – "recessional outwash…sand and gravel deposited by large meltwater streams…"	1,2	3,900	1,600	1,100	350	36	2.7	0.07	6.1E-05	933	18
Upper Confining Unit	A2 – "low-permeability unit composed of Vashon till and lesser amounts of ice-contact, moraine and fine-grained glaciolacustrine deposits…"	3	1.61	0.47	0.33	0.16	0.017	1.0	0.07	5.0E-05	18	
Vashon Outwash	A3 – "aquifer composed of Vashon advance outwash…"	4,5	49	11	7.7	2.4	0.27	15.1	0.09	2.7E-05	122	34
Olympia Beds (Qob)	B – "low-permeability unit composed of fine-grained silts and clays deposited during the Olympia interglacial…"	6,7	0.018 (uniform)					10.0	0.09	1.1E-04	21	
Sea Level Aquifer	C – "aquifer composed of pre-Olympia glacial drift deposits consisting of sand and gravel…"	8,9	690 (uniform)					6.3	0.18	6.0E-05	96	63

Notes:

1 USGS reference: Savoca et al., 2010.

2 Dupont Works RI reference: Hart Crowser, 1994.

Table 7. Predicted Groundwater Dewatering Rates by Step

Project No. 040001, Pioneer Aggregates South Parcel Project, DuPont, Washington

Month	Dewatering Pumping Rate in cfs			
	Step 1	Step 2	Step 3	Step 4
January	4.1	6.2	8.2	0
February	3.9	5.7	7.6	0
March	3.9	5.7	7.6	0
April	3.8	5.6	7.4	0
May	3.6	5.3	7.0	0
June	3.4	4.9	6.5	0
July	3.1	4.4	5.8	0
August	3.0	4.2	5.5	0
September	3.0	4.2	5.6	0
October	3.3	4.6	6.0	0
November	4.0	5.9	7.8	0
December	4.1	6.1	8.1	0
Average	3.6	5.2	6.9	0
Minimum	2.6	3.6	4.7	0
Maximum	5.5	8.8	12.2	0

Notes:

1. Monthly values represent average for that month throughout the simulation period.
2. Average row represents the average of all months in the simulation period.
3. Minimum and maximum represent the lowest and highest individual values from the entire simulation period.

Table 8. Well-Specific Maximum Water Level Changes

Project No. 040001, Pioneer Aggregates South Parcel Project, DuPont, Washington

Well	Predictive Model Results													
	Maximum Decrease in Water Level in feet based on Refined Model Results				Calculating Adjustment for Model Uncertainty						Maximum Decrease in Water Level in feet based on Refined Model Results and including Model Uncertainty			
					Standard Deviation	Range in Observed Values	Model Uncertainty in Feet							
	Step 1	Step 2	Step 3	Step 4			Step 1	Step 2	Step 3	Step 4	Step 1	Step 2	Step 3	Step 4
MW-EM-1S	0.50	1.61	5.44	5.00	1.75	7.56	2.39	2.72	3.86	3.73	2.90	4.33	9.29	8.73
MW-EM-1D	0.47	1.51	5.12	4.71	0.98	7.90	1.34	1.50	2.08	2.01	1.81	3.01	7.20	6.72
MW-EM-2S	0.06	0.15	0.35	0.33	0.35	2.39	0.46	0.48	0.52	0.51	0.52	0.63	0.87	0.84
MW-EM-2D	0.07	0.17	0.39	0.36	0.30	2.54	0.39	0.41	0.44	0.43	0.46	0.58	0.83	0.80
MW-EM-3	0.01	0.02	0.02	0.02	0.14	3.00	0.19	0.19	0.19	0.19	0.20	0.21	0.21	0.21
CHMW-1	1.30	5.23	59.79	30.47	0.92	9.48	1.34	1.83	8.62	4.97	2.64	7.06	68.41	35.44
CHMW-2S	7.37	45.45	50.98	29.92	0.71	7.55	1.79	6.37	7.04	4.50	9.17	51.82	58.01	34.43
CHMW-2D	8.80	45.20	50.79	31.76	0.66	6.89	1.91	6.35	7.03	4.71	10.71	51.55	57.83	36.47
CHMW-3S	0.83	3.24	53.86	52.76	1.55	10.80	2.14	2.58	11.87	11.67	2.97	5.82	65.73	64.43
CHMW-3D	0.10	2.70	57.02	50.29	1.51	10.43	1.96	2.44	12.53	11.28	2.05	5.14	69.56	61.57
CHMW-4S	0.95	3.14	14.33	13.79	1.03	9.54	1.45	1.76	3.31	3.23	2.40	4.90	17.64	17.02
CHMW-4D	0.76	2.96	15.03	14.01	0.92	9.40	1.27	1.55	3.06	2.94	2.03	4.51	18.10	16.95
MW-SRC-2	0.29	0.33	0.30	0.34	0.61	6.70	0.82	0.82	0.82	0.82	1.11	1.15	1.12	1.16
MW-D-3	1.79	4.27	7.68	6.55	0.97	7.77	1.54	1.93	2.48	2.30	3.33	6.20	10.16	8.85
MW-93-MFS-C5-3	1.40	2.73	4.21	3.63	1.01	7.26	1.55	1.79	2.05	1.95	2.96	4.52	6.27	5.58
88-2-VD	0.40	0.57	1.41	1.35	0.69	2.85	1.01	1.06	1.31	1.30	1.41	1.63	2.72	2.64
MW-BM-1	0.21	0.35	0.39	0.74	0.46	5.72	0.62	0.63	0.64	0.67	0.83	0.98	1.03	1.41
MW-HM-1	0.25	0.41	0.27	0.41	0.59	5.95	0.78	0.80	0.79	0.80	1.03	1.21	1.05	1.22
MW-PL-1	0.10	0.35	1.10	1.01	1.55	6.04	2.02	2.10	2.34	2.32	2.11	2.45	3.44	3.33

Notes:

1. Model predictions are presented at the typical field-measurement precision (0.01 ft).
2. Refined model results correct for calibration offset.
3. Model uncertainty calculated for 95% lower confidence interval for 1-tailed test.
4. Shaded values indicate forecasted change in water level exceeds half the range in observed values.
5. Calculated water levels may be below bottom of well.

Table 10. Minimum Predicted Groundwater Levels for Each Dewatering Step

Project No. 040001, Pioneer Aggregates South Parcel Project, DuPont, Washington

Step 1 - Initial Pumping Test

Well	Groundwater Elevation in Feet (NGVD 29)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
MW-EM-1S	203.6	202.4	202.9	202.2	202.3	201.4	200.4	200.4	199.5	199.5	202.1	202.9
MW-EM-1D	204.6	203.4	203.9	203.2	203.3	202.5	201.5	201.5	200.7	200.7	203.1	203.9
MW-EM-2S	210.6	210.3	210.4	210.3	210.2	210.0	209.7	209.6	209.3	209.5	210.2	210.4
MW-EM-2D	210.8	210.4	210.6	210.5	210.4	210.2	209.8	209.7	209.4	209.6	210.4	210.5
MW-EM-3	212.1	211.9	211.8	211.9	212.0	211.6	211.4	210.8	210.2	210.3	211.5	211.9
MW-SRC-2	213.2	212.4	212.7	212.6	212.8	212.0	211.4	210.2	209.6	210.5	212.3	212.7
MW-BM-1	218.0	217.0	216.6	217.4	217.3	216.6	216.1	213.1	213.3	214.2	216.8	217.4
MW-HM-1	214.2	213.5	213.3	213.8	213.6	212.7	211.8	211.2	210.6	211.1	213.1	213.6
MW-PL-1	200.8	200.1	200.4	200.1	200.0	199.4	198.6	198.7	198.0	197.7	199.6	200.2
CHMW-1	191.3	189.9	190.4	189.6	189.7	189.0	188.1	188.0	187.4	187.5	190.0	190.7
CHMW-2S	184.6	183.3	183.7	183.0	183.0	182.5	181.7	181.6	181.2	181.4	183.5	184.0
CHMW-2D	183.4	181.8	182.4	181.4	181.5	180.8	179.8	179.7	179.3	179.4	182.1	182.7
CHMW-3S	193.3	191.7	192.4	191.3	191.5	190.6	189.6	189.5	188.7	188.8	191.7	192.6
CHMW-3D	193.2	191.5	192.2	191.1	191.3	190.4	189.2	189.1	188.3	188.4	191.5	192.5
CHMW-4S	196.1	194.7	195.3	194.4	194.6	193.7	192.7	192.6	191.9	191.9	194.6	195.5
CHMW-4D	194.3	192.9	193.5	192.6	192.7	191.9	190.9	190.8	190.1	190.1	192.8	193.6
MW-D-3	196.5	195.3	195.7	195.0	195.1	194.6	193.9	193.7	193.3	193.5	195.6	195.9
MW-93-MFS-C5-3	192.3	191.2	191.7	191.0	191.0	190.5	190.0	189.9	189.5	189.8	191.6	191.7

Table 10. Minimum Predicted Groundwater Levels for Each Dewatering Step

Project No. 040001, Pioneer Aggregates South Parcel Project, DuPont, Washington

Step 2 - Preparation for Mining/Expanded Dewatering Test

Well	Groundwater Elevation in Feet (NGVD 29)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
MW-EM-1S	202.3	201.1	201.6	200.9	201.1	200.1	199.1	199.2	198.4	198.3	200.8	201.5
MW-EM-1D	203.4	202.3	202.8	202.2	202.3	201.4	200.5	200.5	199.7	199.7	202.0	202.7
MW-EM-2S	210.6	210.2	210.3	210.2	210.1	210.0	209.6	209.5	209.2	209.4	210.1	210.3
MW-EM-2D	210.8	210.4	210.5	210.4	210.3	210.1	209.7	209.6	209.3	209.5	210.3	210.5
MW-EM-3	212.1	211.9	211.8	211.9	212.0	211.6	211.4	210.8	210.2	210.3	211.5	211.9
MW-SRC-2	213.2	212.4	212.6	212.6	212.8	212.0	211.4	210.2	209.5	210.5	212.0	212.7
MW-BM-1	218.0	217.0	216.5	217.3	217.2	216.6	216.1	213.0	213.3	214.1	216.8	217.3
MW-HM-1	214.2	213.4	213.3	213.8	213.6	212.7	211.8	211.2	210.5	211.1	213.0	213.6
MW-PL-1	200.4	199.7	200.1	199.8	199.8	199.1	198.2	198.4	197.7	197.4	199.2	199.8
CHMW-1	187.0	185.7	186.3	185.5	185.6	184.9	184.0	184.0	183.3	183.4	185.8	186.4
CHMW-2S	143.8	141.4	142.2	141.0	141.0	140.1	139.1	138.9	138.3	138.6	141.8	142.9
CHMW-2D	142.5	141.0	141.6	140.7	140.7	140.0	139.1	138.9	138.3	138.5	141.2	141.9
CHMW-3S	190.6	189.0	189.8	188.8	189.0	188.1	187.0	187.0	186.2	186.2	189.0	189.8
CHMW-3D	190.2	188.6	189.4	188.3	188.5	187.5	186.3	186.3	185.4	185.3	188.4	189.3
CHMW-4S	193.7	192.3	193.0	192.1	192.3	191.4	190.4	190.4	189.6	189.6	192.2	193.0
CHMW-4D	191.8	190.5	191.2	190.3	190.5	189.6	188.6	188.6	187.8	187.8	190.4	191.1
MW-D-3	193.7	192.5	193.0	192.3	192.3	191.9	191.2	191.1	190.7	190.9	192.9	193.4
MW-93-MFS-C5-3	190.8	189.8	190.3	189.6	189.6	189.1	188.7	188.5	188.2	188.5	190.2	190.5

Table 10. Minimum Predicted Groundwater Levels for Each Dewatering Step

Project No. 040001, Pioneer Aggregates South Parcel Project, DuPont, Washington

Step 3 - Active Dewatering during Mining

Well	Groundwater Elevation in Feet (NGVD 29)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
MW-EM-1S	197.5	196.4	196.9	196.4	196.5	195.6	194.7	194.8	194.1	194.1	196.1	196.8
MW-EM-1D	199.4	198.4	198.9	198.3	198.4	197.6	196.8	196.9	196.2	196.2	198.1	198.7
MW-EM-2S	210.3	210.0	210.1	209.9	209.9	209.7	209.4	209.3	209.0	209.2	209.9	210.0
MW-EM-2D	210.5	210.1	210.3	210.1	210.0	209.8	209.5	209.4	209.1	209.3	210.0	210.2
MW-EM-3	212.1	211.9	211.8	211.9	212.0	211.6	211.4	210.8	210.2	210.3	211.5	211.8
MW-SRC-2	213.2	212.4	212.7	212.6	212.8	212.0	211.4	210.2	209.5	210.5	212.0	212.7
MW-BM-1	217.8	216.8	216.4	217.2	217.1	216.4	215.9	212.8	213.1	213.9	216.7	217.2
MW-HM-1	214.2	213.4	213.3	213.8	213.6	212.7	211.8	211.2	210.4	211.1	213.0	213.6
MW-PL-1	199.4	198.7	199.0	198.8	198.7	198.0	197.1	197.3	196.6	196.2	198.1	198.8
CHMW-1	129.8	129.1	129.4	128.9	128.9	128.5	127.8	127.8	127.3	127.4	129.2	129.5
CHMW-2S	136.0	134.5	135.0	134.1	134.1	133.5	132.9	132.8	132.3	132.5	134.9	135.5
CHMW-2D	135.9	134.7	135.1	134.3	134.2	133.7	133.1	132.9	132.4	132.6	134.9	135.5
CHMW-3S	131.1	128.4	130.3	128.9	129.2	127.9	126.6	127.0	126.2	126.3	129.0	130.2
CHMW-3D	128.3	127.4	127.9	127.6	127.6	126.8	125.8	126.1	125.4	125.1	127.0	127.6
CHMW-4S	181.0	179.7	180.4	179.6	179.7	178.8	177.7	177.8	176.9	176.9	179.5	180.3
CHMW-4D	178.5	177.3	178.0	177.1	177.3	176.4	175.3	175.4	174.5	174.4	177.1	177.8
MW-D-3	189.9	188.6	189.1	188.4	188.4	187.9	187.4	187.3	186.9	187.3	189.1	189.6
MW-93-MFS-C5-3	189.5	188.5	189.0	188.4	188.3	187.9	187.5	187.4	187.2	187.5	189.0	189.3

Table 10. Minimum Predicted Groundwater Levels for Each Dewatering Step

Project No. 040001, Pioneer Aggregates South Parcel Project, DuPont, Washington

Step 4 - Cessation of Active Dewatering

Well	Groundwater Elevation in Feet (NGVD 29)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
MW-EM-1S	198.1	197.0	197.6	197.0	197.1	196.2	195.4	195.3	194.8	194.7	196.8	197.4
MW-EM-1D	199.9	198.9	199.4	198.8	199.0	198.2	197.3	197.3	196.7	196.7	198.7	199.3
MW-EM-2S	210.3	210.0	210.1	210.0	209.9	209.7	209.4	209.3	209.0	209.2	209.9	210.1
MW-EM-2D	210.5	210.2	210.3	210.1	210.1	209.9	209.5	209.4	209.1	209.3	210.1	210.2
MW-EM-3	212.1	211.9	211.8	211.9	212.0	211.6	211.4	210.8	210.2	210.3	211.5	211.8
MW-SRC-2	213.2	212.4	212.7	212.6	212.8	212.0	211.4	209.9	209.4	210.4	212.0	212.7
MW-BM-1	217.9	216.9	216.4	217.2	217.1	216.5	216.0	212.3	213.0	213.8	216.7	217.2
MW-HM-1	214.2	213.4	213.3	213.8	213.6	212.7	211.8	211.0	210.3	211.1	213.0	213.6
MW-PL-1	199.5	198.8	199.2	198.9	198.9	198.2	197.3	197.5	196.8	196.4	198.2	198.9
CHMW-1	163.2	162.7	162.9	162.7	162.6	162.4	162.1	162.1	161.8	162.0	162.9	163.1
CHMW-2S	169.3	165.0	168.1	163.2	162.8	158.9	157.1	157.2	156.2	156.9	167.9	168.8
CHMW-2D	160.3	158.5	159.2	158.1	157.9	156.9	155.4	155.5	154.6	155.2	159.1	159.8
CHMW-3S	140.4	140.2	140.3	140.2	140.2	140.0	139.7	139.7	139.5	139.7	140.3	140.3
CHMW-3D	141.9	141.6	141.8	141.6	141.6	141.4	141.1	141.1	140.9	141.0	141.6	141.8
CHMW-4S	183.0	181.9	182.5	181.8	181.9	181.3	180.5	180.5	179.9	180.0	181.9	182.4
CHMW-4D	181.0	180.0	180.6	179.9	180.0	179.4	178.7	178.7	178.2	178.2	180.0	180.5
MW-D-3	191.4	190.2	190.7	190.0	189.9	189.5	188.9	188.8	188.5	188.9	190.7	191.1
MW-93-MFS-C5-3	190.1	189.1	189.5	188.9	188.8	188.4	187.9	187.9	187.6	188.0	189.6	189.9

Table 11. Surface Water Monitoring Station Inventory

Project No. 040001, Pioneer Aggregates South Parcel Project, DuPont, Washington

	Name	Water Body	Equipment Owner	Installation Date	Type of Station	Easting (ft, WA State Plane South, NAD83)	Northing (ft, WA State Plane South, NAD83)	Elevation Reference Point		Monitoring Status
								Elevation (ft, NGVD29)	Description	
Existing	SC-Lower	Sequalitchew Creek	CalPortland	Jul-1999	Flow (Continuous)	1101642.74	657543.91	NA	NA	Active
	SC-MidRavine*	Sequalitchew Creek	CalPortland	Nov-2003	Flow (Continuous)	1103973.25	655338.83	NA	NA	Active
	SG-PL-1	Pond Lake	CalPortland	Nov-2006	Stage	1106120.45	651239.82	201.52	0 ft stage	Active
	SG-WL1D-1	Wetland 1D	CalPortland	Jul-2006	Stage	1108981.52	653867.36	208.69	0 ft stage	Active
	SG-EM-1A	West Edmond Marsh	CalPortland	May-2004	Stage	1107329.98	653655.47	210.98	0 ft stage	Active
	SG-EM-1	West Edmond Marsh	CalPortland	Mar-2004	Stage	1107490.44	653659.66	209.87	3.0 ft mark on gage plate	Active
	SG-EM-2W	West Edmond Marsh	CalPortland	Mar-2004	Stage	1109561.81	653049.07	211.48	3.0 ft mark on gage plate	Active
	SG-EM-2E	East Edmond Marsh	CalPortland	Mar-2004	Stage	1109729.75	653546.46	213.43	2.0 ft mark on gage plate	Active
	SG-EM-3W	East Edmond Marsh	Unknown	Unknown	Stage	1111778.38	653532.65	212.31	33 3/4" mark on gage plate	Active
	SG-EM-3E	Eastern Edmond Marsh	CalPortland	Mar-2004	Stage	1111965.63	653528.97	213.43	3.0 ft mark on gage plate	Active
	SG-SCM-1	Eastern Edmond Marsh	CalPortland	Mar-2004	Stage	1113265.44	655679.85	213.20	3.0 ft mark on gage plate	Inactive*
	Diversion Weir	Sequalitchew Lake Outlet	CalPortland	Jul-1999	Flow (Continuous)	1113401.28	655929.72	NA	NA	Active
	SG Bubbler	Sequalitchew Lake Outlet	CalPortland	Jul-1999	Stage	1113401.28	655929.72	213.43	3.0 ft mark on gage plate	Active
	SG-DC-1	Diversion Canal	CalPortland	Mar-2004	Stage and Flow (Spot)	1111721.14	656276.19	207.15	3.0 ft mark on gage plate	Active
	SG-DC-2	Diversion Canal	CalPortland	Mar-2004	Stage and Flow (Spot)	1108840.82	657413.52	205.80	3.0 ft mark on gage plate	Active
	SG-DC-3	Diversion Canal	CalPortland	Mar-2004	Stage and Flow (Spot)	1108512.74	659518.19	202.60	3.0 ft mark on gage plate	Active
	SG-HM-1	Hamer Marsh	CalPortland	Mar-2004	Stage	1113805.80	654636.68	215.25	3.0 ft mark on gage plate	Active
	SG-MKM-1	McKay Marsh	CalPortland	Mar-2004	Stage	1113599.35	652792.46	216.27	3.0 ft mark on gage plate	Active
	SG-BM-1	Bell Marsh	CalPortland	Aug-2004	Stage	1110518.87	651232.41	215.31	2.0 ft mark on gage plate	Active

Notes:

NA - Not applicable

1) Mid-Ravine gage was formerly known as SC-Upper.

2) Staff gage has been stolen or removed by unknown party.

3) Future monitoring locations are identified in the Monitoring Plan or Reclamation Plan.

Table 12. Surface Water Elevations in Sequalitchew Creek Watershed

Project No. 040001, Pioneer Aggregates South Parcel Project, DuPont, Washington

Water Body	Monitoring Location	Water Surface Elevation in ft NGVD 29		
		Average	Minimum	Maximum
Sequalitchew Lake	SG at Bubbler	211.17	209.51	211.91
Bell Marsh	SG-BM-1	218.58	213.31	219.91
McKay Marsh	SG-MKM-1	215.43	213.27	217.35
Hamer Marsh	SG-HM-1	214.02	211.67	215.58
Eastern East Edmond Marsh	SG-SCM-1	212.44	210.20	213.46
	SG-EM-3E	212.39	211.07	213.54
East Edmond Marsh	SG-EM-3W	212.39	210.44	213.29
	SG-EM-2E	212.10	210.20	212.93
West Edmond Marsh	SG-EM-2W	211.35	209.64	212.14
	SG-EM-1/1A	207.91	205.27	210.22
Pond Lake	SG-PL-1	203.90	201.65	207.36
Wetlands 1D	SG-WL1D-1	209.98	208.63	211.00

Notes:

Period of record varies by location, but most began in March 2004 and include data through January 2022

Table 13. Summary of Surface Water Flows in Sequalitchew Creek

Project No. 040001, Pioneer Aggregates South Parcel Project, DuPont, Washington

Month	Average Flow in cfs				
	Diversion Weir	Mid-Sequalitchew Creek Ravine	Lower Sequalitchew Creek Ravine		
	2003 to 2021	2004 to 2021	1977 to 1978	1984 to 1987	1999 to 2021
January	15.6	2.5	9.7	5.9	4.0
February	19.6	2.6	12.8	8.5	4.2
March	21.5	2.2	12.2	8.7	3.8
April	19.8	2.0	0.7	9.4	3.2
May	12.7	1.6	1.6	7.8	2.7
June	7.4	1.2	1.5	3.7	1.9
July	3.2	0.9	0.2	1.3	1.3
August	2.8	0.8	0.1	1.0	1.1
September	2.4	0.8	0.1	1.0	1.1
October	3.7	0.8	0.1	1.4	1.4
November	7.1	1.3	2.4	3.7	2.6
December	10.9	1.9	10.5	5.1	3.5
Mean Annual Flow	10.5	1.6	4.3	4.8	2.7

Note: cfs = cubic feet per second

Table 15. Summary of Surface Water Quality in Sequalitchew Creek Watershed

Project No. 040001, Pioneer Aggregates South Parcel Project, DuPont, Washington

Location	Temperature in °C			Dissolved Oxygen in mg/L			pH			Turbidity in NTU			Iron in µg/L		
	Median	Range	n	Median	Range	n	Median	Range	n	Median	Range	n	Median	Range	n
Sequalitchew Lake	12.8	3.2 to 26.4	100	9.2	0 to 14.3	99	6.9	5.6 to 8.9	97	3.0	0 to 121	92	130	--	1
Marshes	10.5	2.7 to 22.2	74	4.0	0.0 to 11.3	58	6.5	5.6 to 8.1	72	1.85	0.7 to 7.7	41	409	5 to 5000	35
Sequalitchew Creek	10.8	4 to 16.5	157	10.6	0 to 14.3	152	7.0	4.1 to 8.2	162	1.4	0 to 10.1	136	16	5 to 617	21

Notes:
n = number of samples
mg/L = milligrams per liter
µg/L = micrograms per liter

Table 16. Land Use Scenarios Used in Mine Area Water Balance

Project No. 040001, Pioneer Aggregates South Parcel Project, DuPont, Washington

	Area in Acres												
	Till Lawn			Outwash Forest			Outwash Pasture	Outwash Lawn			Saturated, Forest, Flat	Impervious		
Scenario	Flat	Mod.	Steep	Flat	Mod.	Steep	Flat	Flat	Mod.	Steep		Flat	Steep	Total
Existing Conditions	38.5	0.0	0.0	145.9	10.0	3.3	21.7	60.6	74.0	109.6	1.8	13.6	3.4	482.4
Proposed Action	79.2	193.4	47.0	0.0	0.0	0.0	0.0	25.7	41.5	90.4	4.3	0.0	1.0	482.5
No Action	38.5	0.0	0.0	13.8	10.0	3.3	1.2	94.8	74.0	109.6	1.8	131.9	3.4	482.4

Notes:

The total area represents basins C, D,E which include the disturbed area of the South Parcel Project as well as portions of the existing mine that drain to the proposed stormwater facilities. The same total area was used for each scenario to allow for consistency in comparison between scenarios

Till Lawn is used to represent portions of the floor of the existing mine, as well as the Olympia Beds in the Proposed Action

Outwash Forest is used for the undisturbed South Parcel

Outwash Lawn represents bare and reclaimed mine slopes (prior to tree growth) as well as lawn and landscaping under No Action.

Saturated Forest Flat represents the Kettle Wetland and the constructed mitigation wetland

Impervious areas are used for the main access road in the Proposed Action and paved roads and buildings under No Action.

Table 17. Annual Average Mine Area Water Balance

Project No. 040001, Pioneer Aggregates South Parcel Project, DuPont, Washington

Water Balance Component	Water Quantity in Acre Feet and Percent of Annual Precipitation			Basis for Estimate
	Existing	Proposed Action	No Action	
Water Sources				
Precipitation	1688 (25%)	1688 (25%)	1688 (25%)	WWHM - Pierce County158-year synthetic precipitation series
Run-on/Springs	0 (0%)	4995 (75%)	0 (0%)	Field observations, topography and geology for Existing and No Action; groundwater model for Proposed Action
Groundwater Inflow	4995 (75%)	0 (0%)	4995 (75%)	Groundwater model predictions
Water Losses				
Evapotranspiration	744 (10%)	706 (6%)	595 (8%)	Calculated by balance
Direct Groundwater Recharge	840 (11%)	542 (4%)	648 (8%)	WWHM model results
Infiltrated Stormwater	104 (1%)	440 (3%)	445 (6%)	WWHM model results, assuming all stormwater is infiltrated under development scenarios
Inflitrated Groundwater	0 (0%)	4995 (39%)	0 (0%)	Groundwater model predictions
Total Groundwater Recharge	944 (12%)	5977 (47%)	1093 (14%)	Sum of direct groundwater recharge, infiltrated stormwater, and infiltrated groundwater
Groundwater Outflow	5939 (78%)	5977 (47%)	6088 (78%)	Equal to groundwater inflow + total groundwater recharge

Notes:

1) Quantities presented for precipitatoin, evapotranspiration, direct groundwater recharge and infiltrated stormwater represent the overall average from the 158-year WWHM model runs.

2) Quantities presented for run-on/springs and groundwater inflow are based on the estimated annual average of dewatering water during Step 3 from the DuPont groundwater model.

Table 18. Peak Surface Runoff Flows

Project No. 040001, Pioneer Aggregates South Parcel Project, DuPont, Washington

Recurrence Interval	Annual Exceedance Probability	Peak Flow in cfs								
		Basin C			Basin D			Basin E		
		Existing Conditions	Proposed Action	No Action	Existing Conditions	Proposed Action	No Action	Existing Conditions	Proposed Action	No Action
2 year	0.5	4.3	9.6	8.1	3.6	13.9	39.5	1.7	0.9	7.3
5 year	0.2	7.2	18.4	12.1	6.1	26.9	53.3	3.4	2.5	10.5
10 year	0.1	9.9	26.5	15.4	8.3	38.6	63.4	5.0	4.5	13.0
25 year	0.04	14.2	39.6	20.4	12.1	57.3	77.2	8.0	8.9	16.8
50 year	0.02	18.4	51.9	24.7	15.7	74.4	88.4	11.0	14.2	19.9
100 year	0.01	23.5	66.5	29.7	20.2	94.6	100.2	15.0	22.2	23.4

cfs = cubic feet per second

Table 22. Restoration Plan Elements in City of DuPont

Project No. 040001, Pioneer Aggregates South Parcel Project, DuPont, Washington

Element	Components
1. Regulatory Actions	
A. DuPont CAR	Update the City of DuPont's Critical Areas Regulations - Completed in June 2021
2. Flow Restoration	
B. Beaver Management	Manage beaver and beaver dams Monitor flows and adaptively manage flexible levelers
3. Flow Maintenance and Enhancement	
F. Railroad Trail Bridge	Planning for DuPont Railroad Trail bridge Install DuPont Railroad Trail bridge
G. Losing Reach	Remove trash and invasive vegetation Monitor Losing Reach Seal Losing Reach (?) and restore habitat
4. Habitat Restoration	
H. City Hall Culvert	Replace the culvert near City Hall
I. Center Drive Culvert	Evaluate Center Drive culvert Modify Center Drive culvert (?)
J. Ravine Habitat	Monitor habitat changes after flow restoration *Add large woody debris (LWD) to ravine (?)* *Replace footbridge/remove berm (?)*
L. Southern alignment	Evaluate scope and feasibility of southern alignment Southern alignment implementation (?)

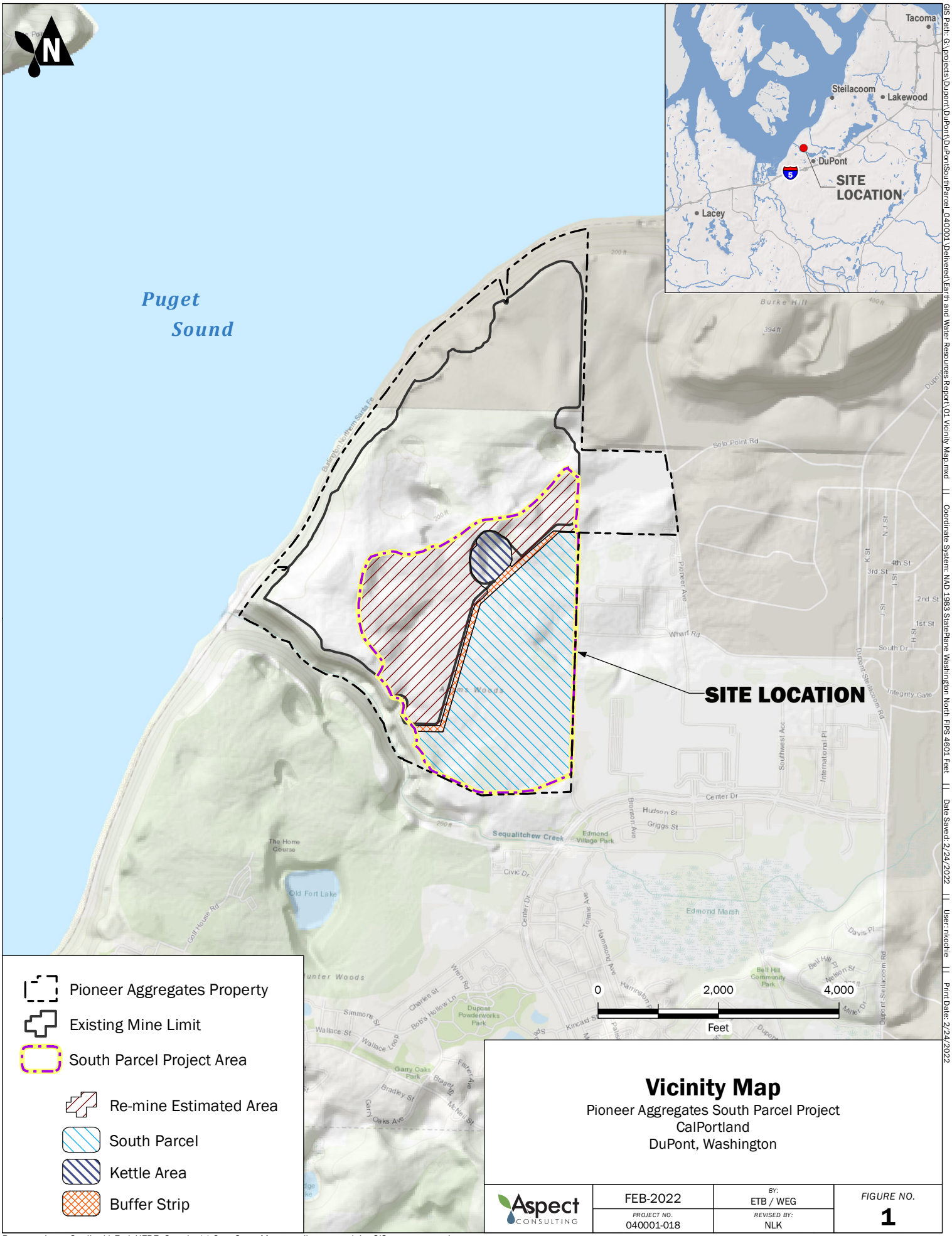
Notes:
(?) = action contingent on prior monitoring/evaluation.
Bold font indicates initial actions.
Underlined font indicates the second stage of actions (following partial restoration of flows).
Italic font indicates the final stage of actions (following full restoration of flow

Table 23. Restoration Plan Elements on JBLM

Project No. 040001, Pioneer Aggregates South Parcel Project, DuPont, Washington

Element	Components
2. Flow Restoration	
B. Beaver Management	Remove dam at east end of Edmond Marsh
	Clear culverrt at DuPont-Steilacoom Road and install beaver exclusion device
C. Adjustment of Sequalitchew Lake Levels	Install an additional stop log in weir or gate valve to allow for seasonal adjustment of lake water level
D. Improvements in Lake Outlet Area (Part 1)	Planning for removal of crossover culverts
	Repair cross-over culverts by replacing the bottom set and replacing the top set with an open channel. Remove some fill to increase channel width and reduce obstructions
3. Flow Maintenance and Enhancement	
E. Hamer Marsh	Install weir at outlet
	Study water quality in Hamer Marsh
	Repair culvert between Hamer Marsh and Edmond Marsh if water quality is adequate
4. Habitat Restoration	
K. Improvements in Lake Outlet Area (Part 2)	Repair Lake Outlet Area by relocating diversion weir a few hundred feet downstream then improving wetland area behind it by removing old weir and secondary weir, extending lower set of cross-over culverts, removing fill, and regrading and planting wetland vegetation.

FIGURES



Vicinity Map

Pioneer Aggregates South Parcel Project
CalPortland
DuPont, Washington

Aspect CONSULTING	FEB-2022	BY: ETB / WEG	FIGURE NO. 1
	PROJECT NO. 040001-018	REVISED BY: NLK	

Basemap Layer Credits || Esri, HERE, Garmin, (c) OpenStreetMap contributors, and the GIS user community
Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community

GIS Path: G:\projects\Dupont\DuPont\DuPontSouthParcel_040001\Delivered\Earth and Water Resources Report\01 Vicinity Map.mxd || Coordinate System: NAD 1983 StatePlane Washington North FIPS 4601 Feet || Date Saved: 2/24/2022 || User: nkochle || Print Date: 2/24/2022

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N

Puget Sound

Infiltration Ponds

Stormwater Treatment Ponds

Processing Area

Proposed Constructed Mitigation Wetland

Existing Mine

Infiltration Pond

Stormwater Treatment Ponds

South Parcel Project

Noise/Visual Screening Berm

Sequalitchew Creek

CENTER DRIVE

- Existing Mine Limit
- Ponds
- South Parcel
- Proposed Constructed Mitigation Wetland
- South Parcel Project Area
- Pierce County Tax Parcel
- 10-ft. Contour
- Proposed Mine 25-ft Contour

Note: Existing topography based on aerial photogrammetric survey conducted on 10/30/2021 by David C. Smith & Associates, Inc. Vertical datum = NGVD29

0 600 1,200
Feet

Project Site Plan

Pioneer Aggregates South Parcel Project
CalPortland
DuPont, Washington

Aspect Consulting	FEB-2022	BY: ETB / WEG	FIGURE NO. 2
	PROJECT NO. 040001-18	REVISED BY: NLK	



No Action Site Plan

Pioneer Aggregates South Parcel Project
CalPortland
DuPont, Washington

Aspect CONSULTING	FEB-2022	BY: ETB / WEG	FIGURE NO. 3
	PROJECT NO. 040001-18	REVISED BY: NLK	

GIS Path: G:\projects\Dupont\DuPont\DuPontSouthParcel_040001\Delivered\Earth and Water Resources Report\03 No Action Site Plan.mxd || Coordinate System: NAD 1983 StatePlane Washington South FIPS 4602 Feet || Date Saved: 2/24/2022 || User: nkochie || Print Date: 2/24/2022



Existing Mine Limit
South Parcel
South Parcel Project Area
Pierce County Tax Parcel
20-ft. Contour

Note: Existing topography based on aerial photogrammetric survey conducted on 10/30/2021 by David C. Smith & Associates, Inc. Vertical datum = NGVD29

0 600 1,200
Feet

Existing Topography

Pioneer Aggregates South Parcel Project
CalPortland
DuPont, Washington

Aspect CONSULTING	FEB-2022	BY: ETB / WEG	FIGURE NO. 4
	PROJECT NO. 040001-18	REVISED BY: NLK	

GIS Path: G:\projects\Dupont\DuPont\DuPontSouthParcel_040001\Delivered\Earth and Water Resources Report\04 Existing Topography.mxd || Coordinate System: NAD 1983 StatePlane Washington South FIPS 4602 Feet || Date Saved: 2/24/2022 || User: nkochle || Print Date: 2/24/2022

GIS Path: G:\projects\Dupont\DuPont\DuPontSouthParcel_040001\Delivered\Earth and Water Resources Report\05 Site Explorations Map.mxd || Coordinate System: NAD 1983 StatePlane Washington South FIPS 4602 Feet || Date Saved: 2/17/2022 || User: nkochie || Print Date: 2/17/2022

Puget Sound

0B-1
TW-1
NW013
NW018
NW025
NW023
NW024
WY014
WY018
WY016
WY024
WY022
WY023
WY063
WY010
WY015
WY019
WY020
WY025
WY028
WY061
84-PA-264
WY062
WY009
WY011
WY027
WY021
WY017
WY057
WY087
WY088
WY126
WY127
WY013
WY008
WY012
WY026
WY059
WY058
WY073
WY030
WY089
WY066
WY128
WY005
WY007
WY074
WY078
WY060
WY056
WY072
WY093
WY081
WY083
WY124
CHMW-2S
CHTW-2
TW-2
WY004
WY006
WY075
WY076
WY077
WY079
WY080
WY055
WY064
WY082
WY129
WY039
WY041
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WY068
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WY113
WY043
WY046
WY049
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WY102
WY118
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WY123
TW-1
CHMW-1
WY052
WY100
WY050
WY119
WY121
WY035
WY053
TW-3
WY099
WY105
WY107
WY036
WY037
WY051
CHMW-3S
CHTW-3
CHMW-3D
TW-4S
WY108
WY106
WY120
WY032
CHMW-4S
WY038
TW-4D
CHTW-4D
Sequalitchew Creek

0 500 1,000
Feet

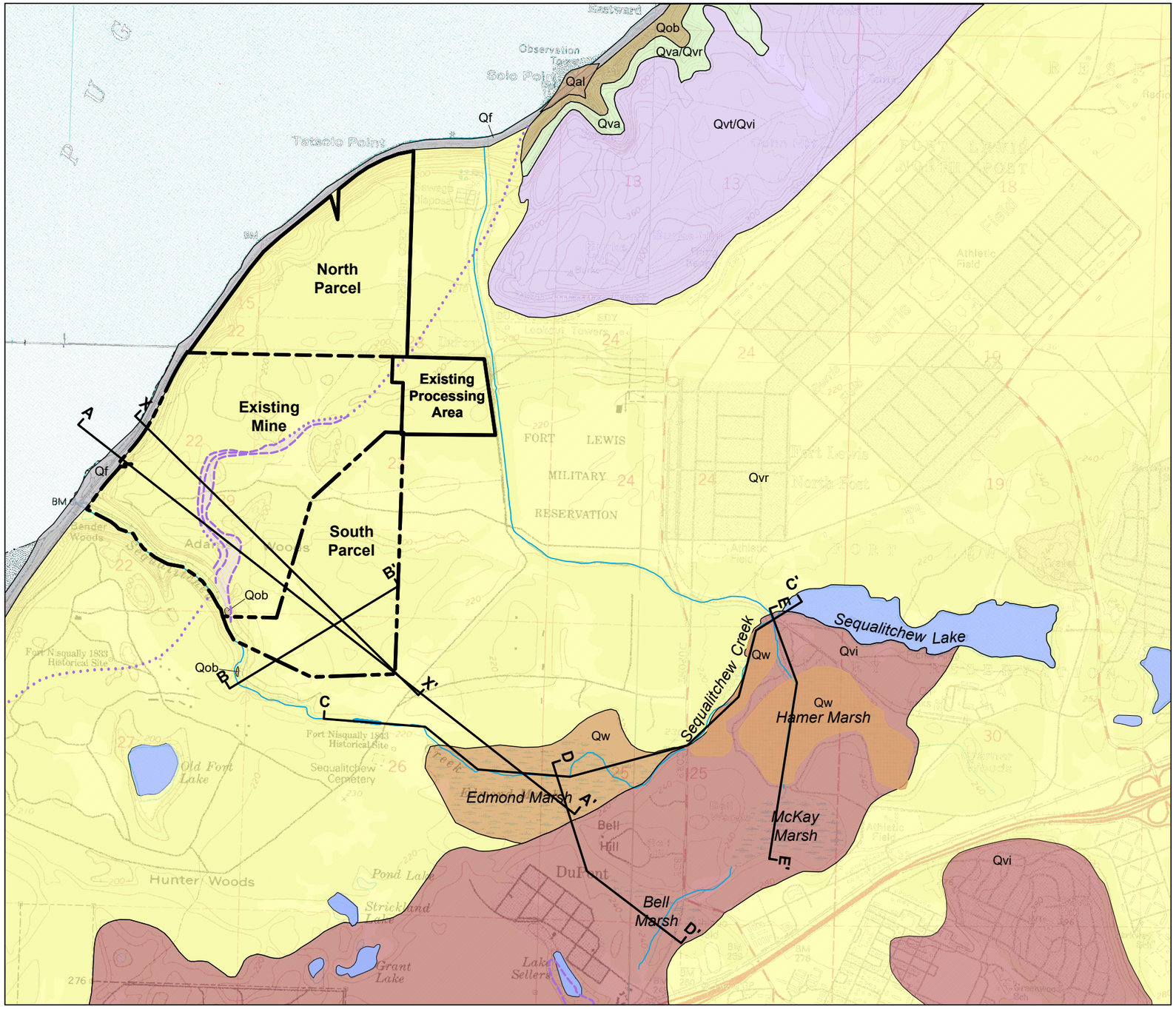
- Boring
- Monitoring Well
- Test Well
- Water Supply Well
- South Parcel Project Area
- South Parcel

Note: Existing topography based on aerial photogrammetric survey conducted on 10/30/2021 by David C. Smith & Associates, Inc.

Site Explorations Map

Earth and Water Resources Report
Pioneer Aggregates South Parcel Project
DuPont, Washington

Aspect Consulting	FEB-2022	BY: ETB / WEG	FIGURE NO. 5
	PROJECT NO. 040001-I-018-02	REVISED BY: ---	



Legend

- **Qf (Fill)**
  Artificial fill. Likely consists primarily of crushed rock and rip-rap placed for railroad embankment.
- **Qw (Wetland Deposits)**
  Peat, organic-rich muck, silt and clay.
- **Qal (Recent Alluvium)**
  Silt, sand, gravel, and peat deposited in stream beds and estuaries, includes some lacustrine and beach deposits.
- **Qvr (Vashon Recessional Glacial Outwash)**
  Medium dense to dense, slightly silty to clean sand and gravel. Includes some silty beds. The majority of near-surface Vashon recessional outwash on the Project Site is made up of the Steilacoom Gravel member, which is composed of sandy gravel and gravelly sand, with minor amounts of silt.
- **Qvi (Ice-Contact Deposits)**
  Water-worked sands and gravels with interbeds and lenses of silty, till-like deposits.
- **Qvt/Qvi (Till and Ice Contact Deposits)**
  Dense to very dense discontinuous layers of silty, sandy, and gravelly basal till. Ice contact deposits contain water-worked sands and gravels with interbeds and lenses of silty, till-like deposits.
- **Qva (Vashon Advance Glacial Outwash)**
  Sand and gravel, and lacustrine clay, silt, and sand of northern source, deposited during Vashon glacial advance.
- **Qob (Olympia Beds)**
  The Olympia Beds Qob unit is generally composed of interbedded lacustrine silt and clay and fluvial deposits.
- **Olympia Beds Truncation (Surface Projection)**
  Approximate surface projection line showing the northwestward lateral subcrop extent of the Olympia Beds unit. Dashed where approximate, dotted where inferred.

Notes: See Figures 8, 16, 17, 28, 29 for cross sections.
Map modified based on subsurface data and geologic interpretation from Walsh, Logan and Polenz 2003; Walsh et al. 2003, Walters and Kimmel, 1968, and Troost, Booth, and Borden, in review.

N

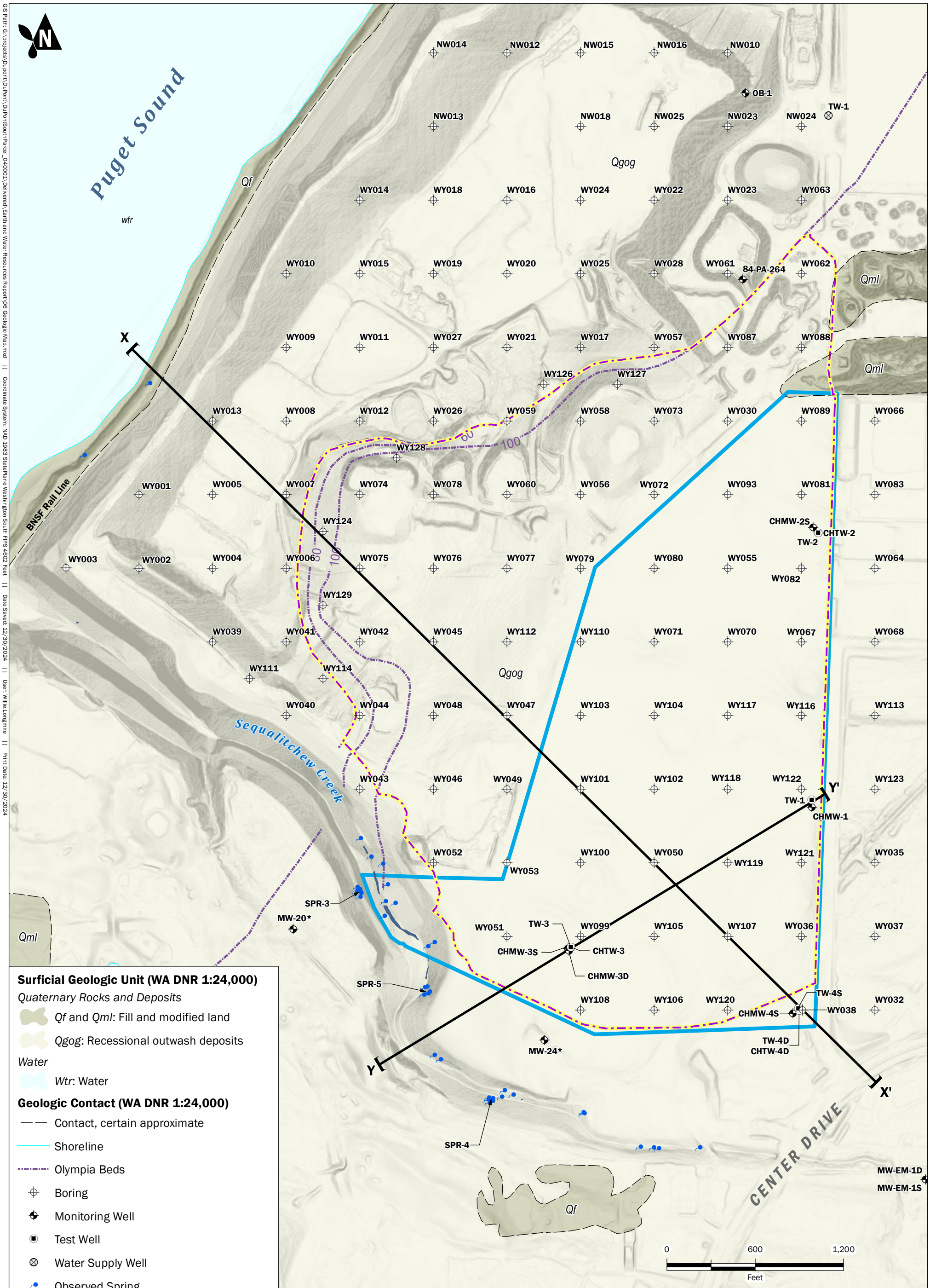
0 2000 4000
Feet

Regional Geologic Map

Earth and Water Resources Report
Pioneer Aggregates South Parcel Project
DuPont, Washington

Aspect Consulting	Dec-2024	BY: DFR/SCC	FIGURE NO. 6
	PROJECT NO. 040001-I-018	REV BY: OGR/SCC/WBL	

CAD Path: Q:\CalPortland\040001 DuPont Hydrologic Study\2022-10 Earth and Water Resources Report\040001-05 Geologic Map.dwg 05 Regional Geologic Map 11x17 L || Date Saved: Dec 30, 2024 5:14pm || User: Willie.Longmire



Surficial Geologic Unit (WA DNR 1:24,000)

Quaternary Rocks and Deposits

- *Qf* and *Qml*: Fill and modified land
- *Qgog*: Recessional outwash deposits

Water

- *Wtr*: Water

Geologic Contact (WA DNR 1:24,000)

- Contact, certain approximate
- Shoreline
- Olympia Beds
- Boring
- Monitoring Well
- Test Well
- Water Supply Well
- Observed Spring
- Observed Seepage Area
- Generalized Geologic Cross-Section
- South Parcel Project Area
- South Parcel

Notes:
- See Figures 8 and 17 for cross sections.
- Existing topography based on aerial photogrammetric survey conducted on 10/30/2021 by David C. Smith & Associates, Inc.
* Locations of MW-20 and MW-24 are approximate.

Geologic Map

Earth and Water Resources Report
Pioneer Aggregates South Parcel Project
DuPont, Washington

Aspect Consulting	DEC-2024	BY: ETB / WEG	FIGURE NO. 7
	PROJECT NO. 040001-I-018-02	REVISED BY: ETB / SJG / WBL	

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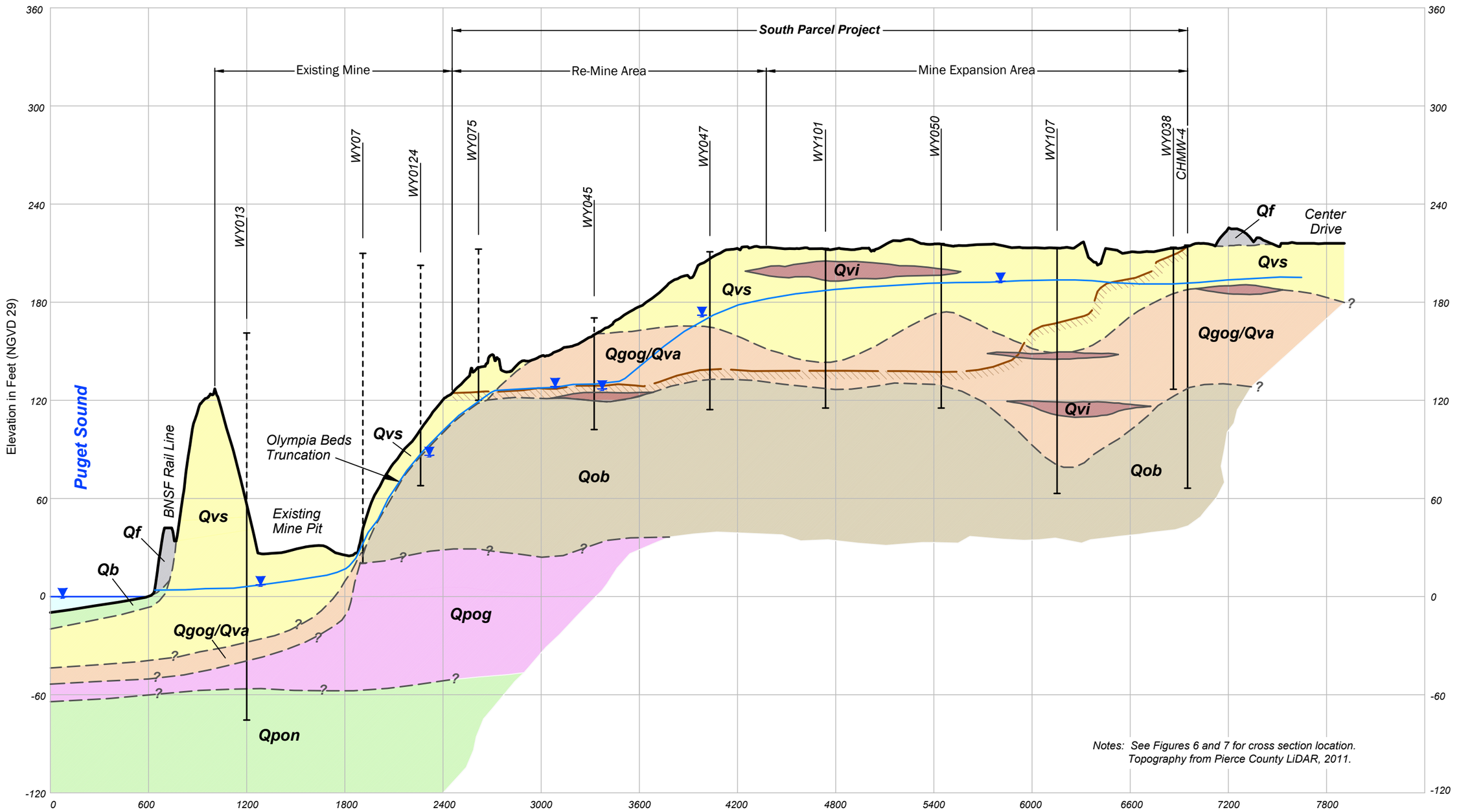
X Northwest — Southeast **X'**



Notes: See Figures 6 and 7 for cross section location.
Topography from Pierce County LiDAR, 2011.

Legend

Qf	Fill	***Qvi***	Silty Lenses and/or Ice Contact Till-like Deposits
Qb	Beach and Shallow Marine Deposits	***Qob***	Olympia Beds
Qvs	Steilacoom Gravel Member of Vashon Recessional Outwash (Qgog)	***Qpog***	Pre-Olympia glacial Deposits
Qgog/Qva	Vashon Recessional Outwash and/or Advance Outwash	***Qpon***	Pre-Olympia Non glacial Deposits

Existing Ground Surface
Proposed Mined Surface
Existing Groundwater Level
Explorations

0 600 1,200
Feet

Horizontal Scale (1" = 600')
Vertical Scale (1" = 60')
Vertical Exaggeration x 10

Generalized Geologic Cross Section X-X'

Earth and Water Resources Report
Pioneer Aggregates South Parcel Project
DuPont, Washington

Aspect Consulting	Dec-2024	BY: DHM/PMB/CMV	FIGURE NO. 8
	PROJECT NO. 040001	REV BY: CMV/OGR/WBL	

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Puget Sound

Oversteepened slope from historical mining

Active Railroad Corridor

Active Mining Slope

West Slope

East Slope

Reclaimed Slopes

Sequalitchew Creek

Approximate contact with a permeable sediment over an impermeable sediment

Localized Cut and Fill Slopes for Old Rail Grade

Old Rail Grade/ Sequalitchew Creek Trail

100

200

300

0 500 1,000

Feet

Note: Existing topography of the mined based on aerial photogrammetric survey conducted on 10/30/2021 by David C. Smith & Associates, Inc.

Existing topography in forested areas outside the existing mine (e.g., South Parcel, Sequalitchew Creek Ravine, and Puget Sound bluffs) is based on 2011 LiDAR topography from the Puget Sound LiDAR Consortium.

Aerial photograph dated 10/30/2021.

Vertical Datum = NGVD 29

- Geologically Hazardous Area
- Slope 40% or Greater
- Slope Between 15% and 40%
- Observed Spring
- Observed Seepage Area
- South Parcel
- Clearing Limits for Mine Expansion
- South Parcel Project Area
- 20-ft. Contour
- Watercourse Centerline (WA DNR)
- Pierce County Tax Parcel

Geologic Hazards Map Existing Conditions

Earth and Water Resources Report
Pioneer Aggregates South Parcel Project
DuPont, Washington

Aspect Consulting	FEB-2022	BY: ETB / MAV / WEG	FIGURE NO. 9
	PROJECT NO. 040001-I-018-02	REVISED BY: NLK	

GIS Path: G:\projects\Dupont\DuPont\DuPontSouthParcel_040001\Delivered\Earth and Water Resources Report\09 Geologic Hazards Map - Proposed Conditions.mxd || Coordinate System: NAD 1983 StatePlane Washington South FIPS 4602 Feet || Date Saved: 2/24/2022 || User: nkochie || Print Date: 2/24/2022

Puget Sound

Active Railroad Corridor

Reclaimed West Slope

East Slope

Proposed Constructed Mitigation Wetland

Sequalitchew Creek

Proposed Mine Slopes (Graded into Pit) are not GHAs because they are engineered slopes and have been evaluated for stability.

Old Rail Grade/ Sequalitchew Creek Trail

Noise/Visual Screening Berm

Recommended Minimum 50-ft. Setback from Top of Sequalitchew Creek Ravine Slopes

0 500 1,000 Feet

- Geologically Hazardous Area
- Slope 40% or Greater
- Slope Between 15% and 40%
- Watercourse Centerline (WA DNR)
- Recommended Minimum 50-ft Setback
- Proposed Mine 25-ft Contour
- Proposed Mine 5-ft Contour
- South Parcel
- Clearing Limits for Mine Expansion
- South Parcel Project Area
- Pierce County Tax Parcel

Note: Existing topography of the mined based on aerial photogrammetric survey conducted on 10/30/2021 by David C. Smith & Associates, Inc.

Existing topography in forested areas outside the existing mine (e.g., South Parcel, Sequalitchew Creek Ravine, and Puget Sound bluffs) is based on 2011 LiDAR topography from the Puget Sound LiDAR Consortium.

Aerial photograph dated 10/30/2021.

Vertical Datum = NGVD 29

Geologic Hazards Map
Proposed Conditions

Earth and Water Resources Report
Pioneer Aggregates South Parcel Project
DuPont, Washington

Aspect Consulting	FEB-2022	BY: ETB / MAV / WEG	FIGURE NO. 10
	PROJECT NO. 040001-I-018-02	REVISED BY: SCC / EAC / NLK	

GIS Path: G:\projects\Dupont\DuPont\DuPontSouthParcel_040001\Delivered\Earth and Water Resources Report\10 Slope Stability Sections.mxd || Coordinate System: NAD 1983 StatePlane Washington South FIPS 4602 Feet || Date Saved: 12/30/2024 || User: Willie.Longmire || Print Date: 12/30/2024

Puget Sound

Sequalitchew Creek

D' D

Static FOS = 2.92
Seismic FOS = 1.30

B' B

Static FOS = 1.69
Seismic FOS = 1.17

C'

Static FOS = 2.01
Seismic FOS = 1.14

A' A

Static FOS = 2.53
Seismic FOS = 1.19

C

0 500 1,000
Feet

Slope Stability Section
Factors of Safety (FOS) from slope stability analysis are indicated alongside each section, see Table 4.

Geotechnical Recommended 50-ft Setback from Top of Slope

Olympia Beds

South Parcel Project Area

South Parcel

Proposed Mine 25-ft Contour

20-ft Contour

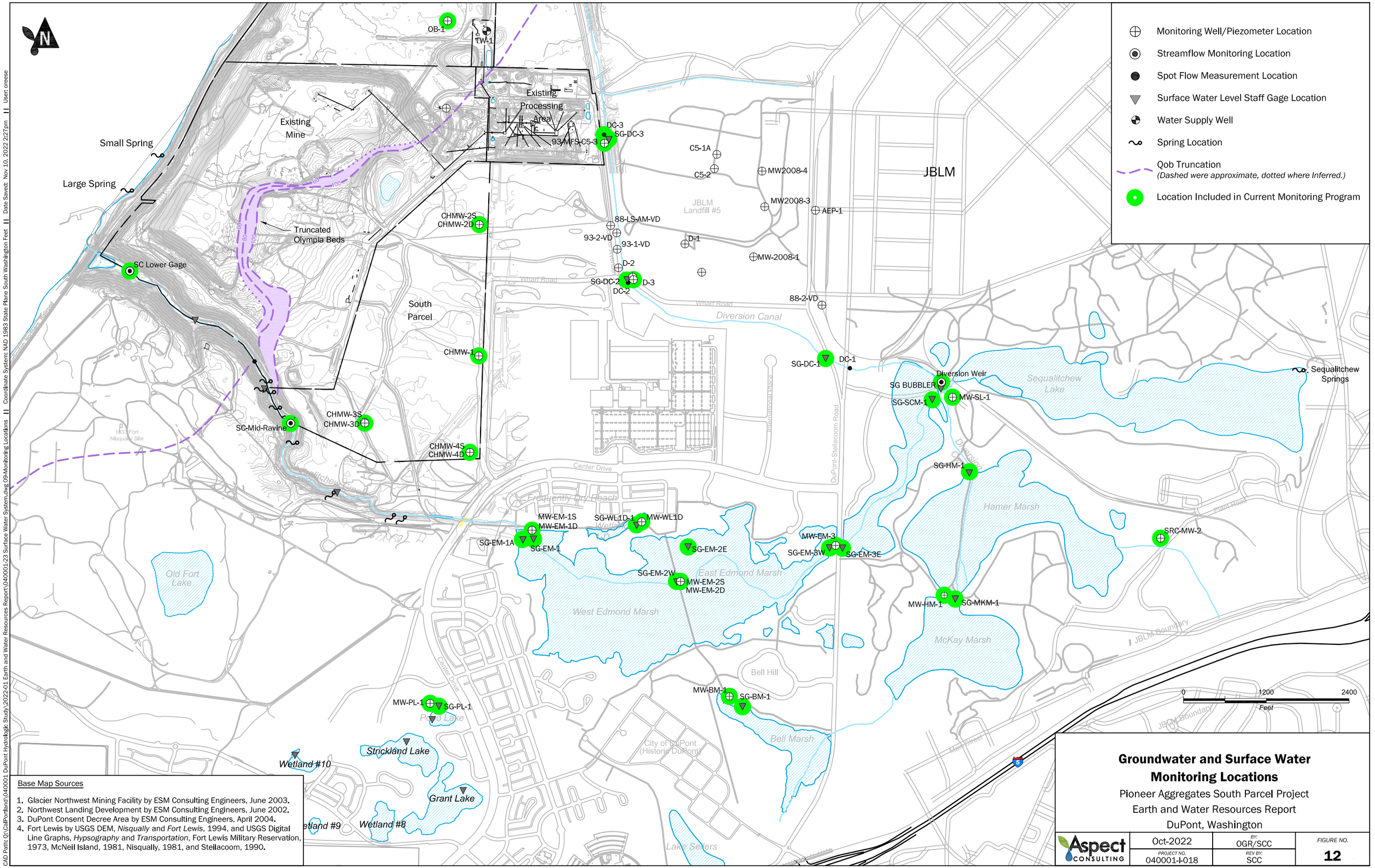
Pierce County Tax Parcel

Note: Existing topography based on aerial photogrammetric survey conducted on 10/30/2021 by David C. Smith & Associates, Inc. Vertical Datum = NGVD29

Slope Stability Sections
Proposed Conditions

Earth and Water Resources Report
Pioneer Aggregates South Parcel Project
DuPont, Washington

Aspect Consulting	DEC-2024	BY: CRS / WEG	FIGURE NO. 11
	PROJECT NO. 040001-I-018-02	REVISED BY: ETB / WEG / NLK / WBL	



Base Map Sources

1. Glacier Northwest Mining Facility by ESM Consulting Engineers, June 2003.
2. Northwest Landing Development by ESM Consulting Engineers, June 2002.
3. DuPont Consent Decree Area by ESM Consulting Engineers, April 2004.
4. Fort Lewis by USGS DEM, *Nisqually* and *Fort Lewis*, 1994, and USGS Digital Line Graphs, *Hypsography* and *Transportation*, Fort Lewis Military Reservation, 1973, McNeil Island, 1981, Nisqually, 1981, and Steilacoom, 1990.

Groundwater and Surface Water Monitoring Locations

Pioneer Aggregates South Parcel Project
Earth and Water Resources Report
DuPont, Washington

Aspect Consulting	Oct-2022	BY: OGR/SCC	FIGURE NO. 12
	PROJECT NO. 040001-I-018	REV BY: SCC	

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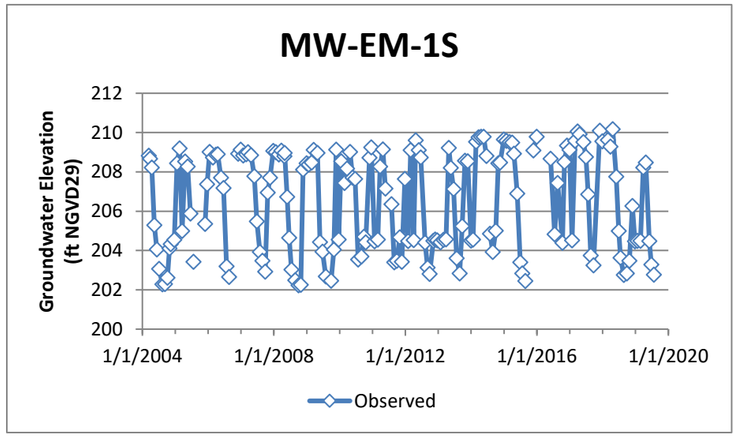
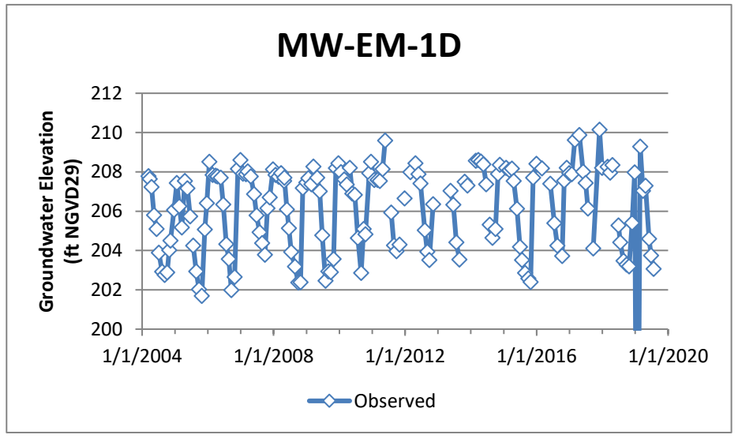
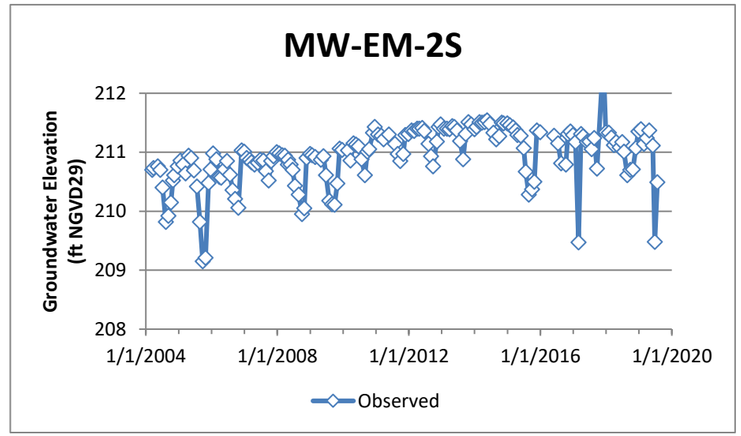
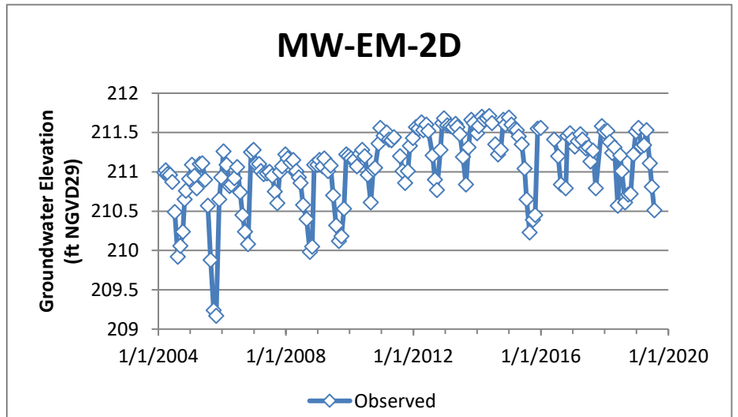
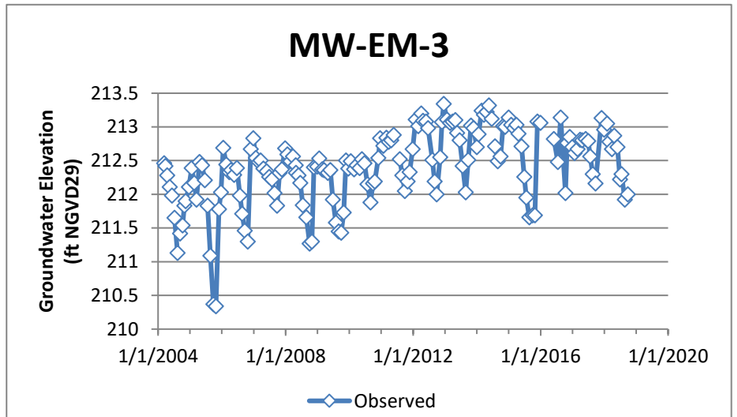
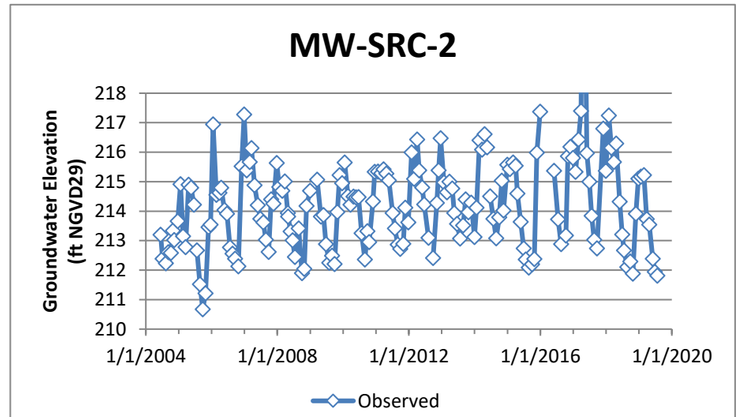


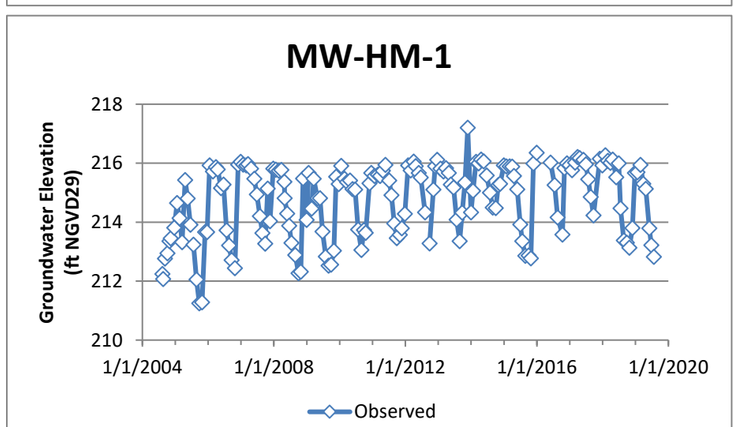


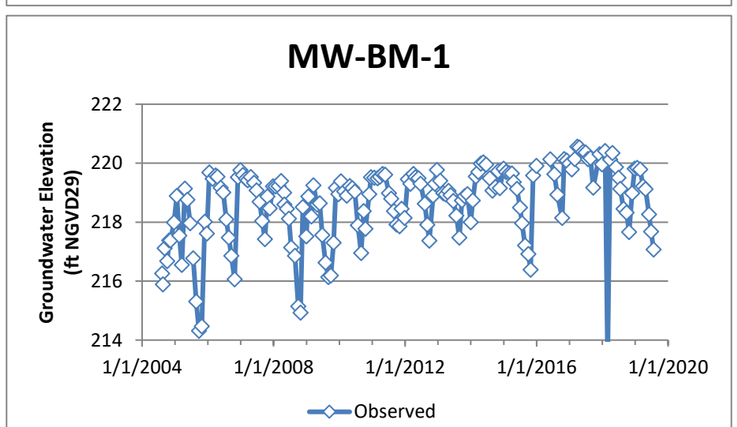


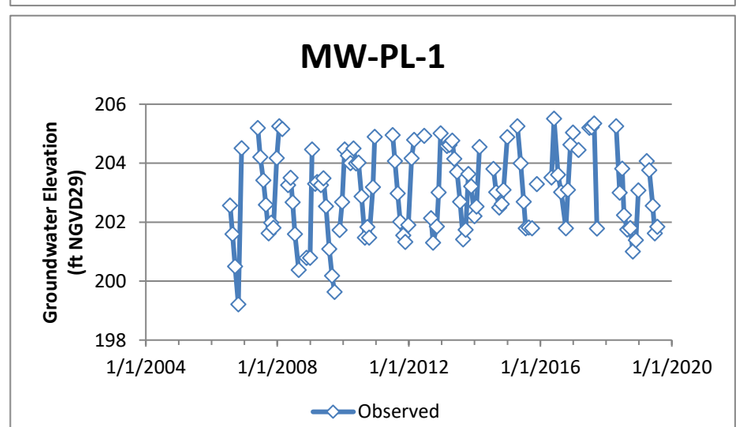






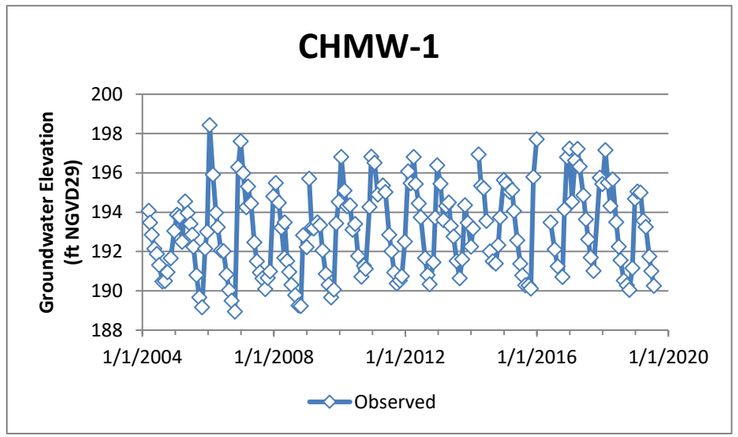


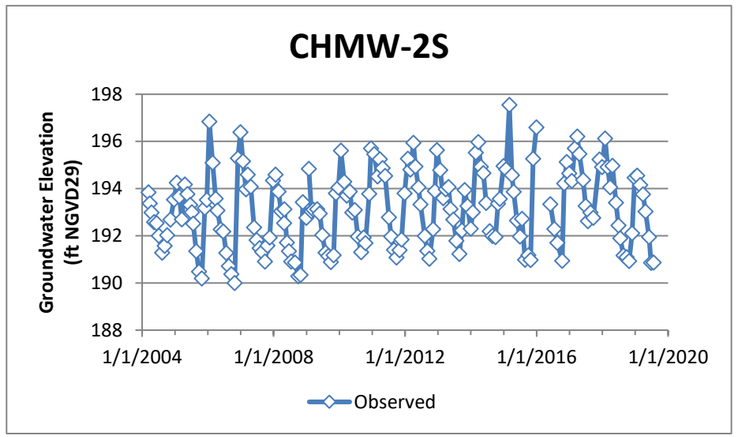


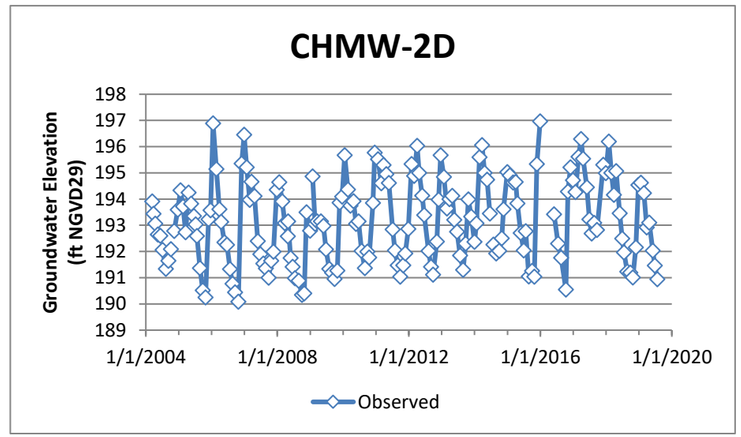


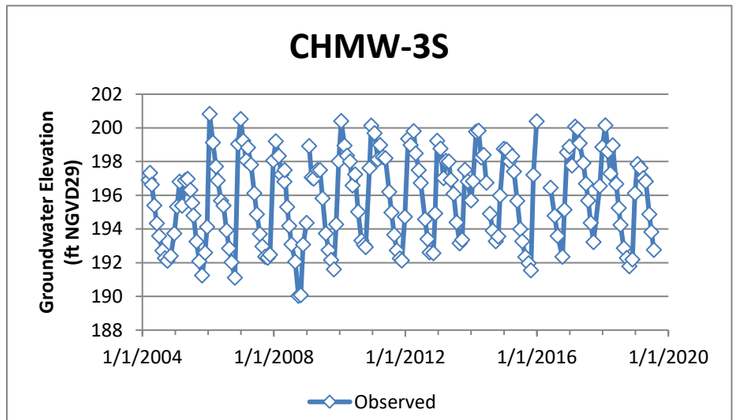
Aspect Consulting, LLC
1/27/2022
S:\CalPortland\DuPont\South Parcel\Groundwater Modeling\DRAFT_20170327\StatusUpdate_20211122.xlsm

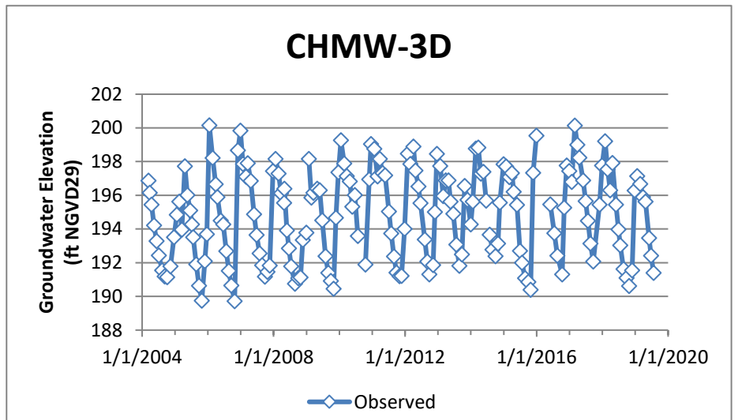
Figure 13
Observed Groundwater Levels
Earth and Water Resources Report

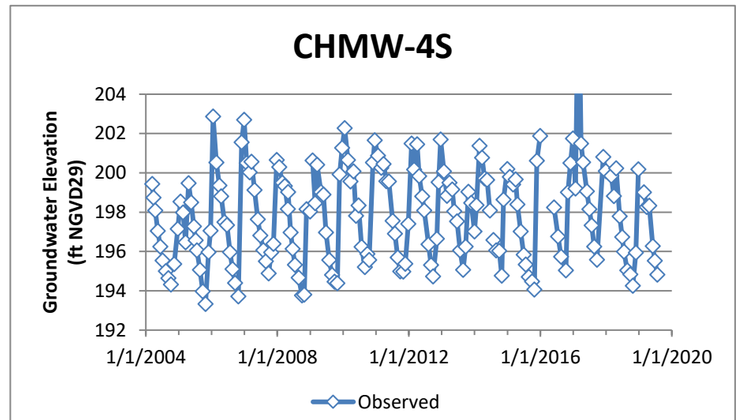

CHMW-1
Groundwater Elevation (ft NGVD29)
200
198
196
194
192
190
188
1/1/2004
1/1/2008
1/1/2012
1/1/2016
1/1/2020
Observed

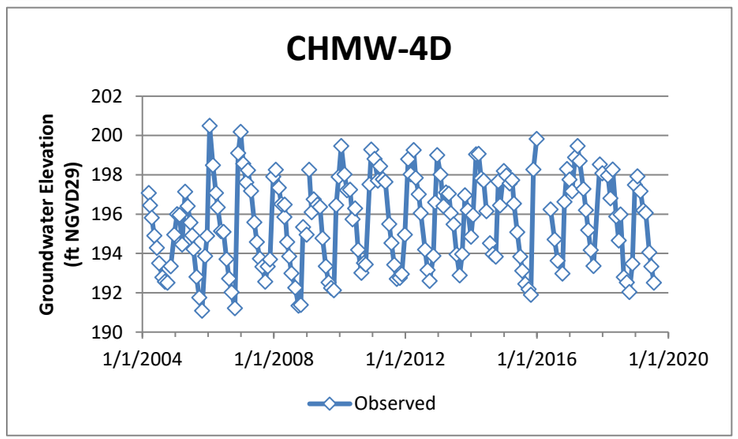

CHMW-2S
Groundwater Elevation (ft NGVD29)
198
196
194
192
190
188
1/1/2004
1/1/2008
1/1/2012
1/1/2016
1/1/2020
Observed

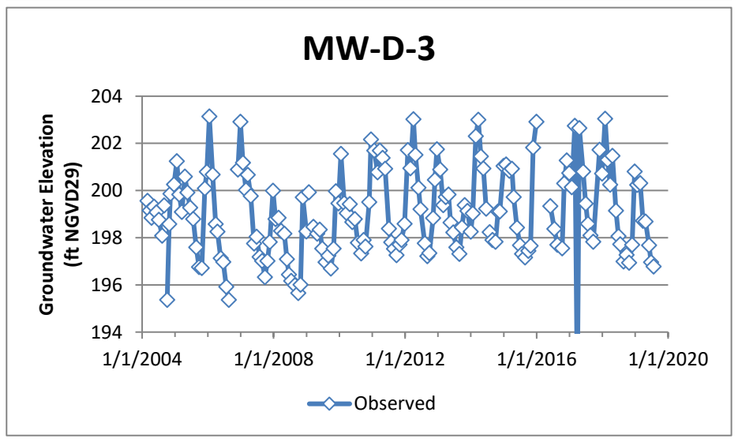

CHMW-2D
Groundwater Elevation (ft NGVD29)
198
197
196
195
194
193
192
191
190
189
1/1/2004
1/1/2008
1/1/2012
1/1/2016
1/1/2020
Observed

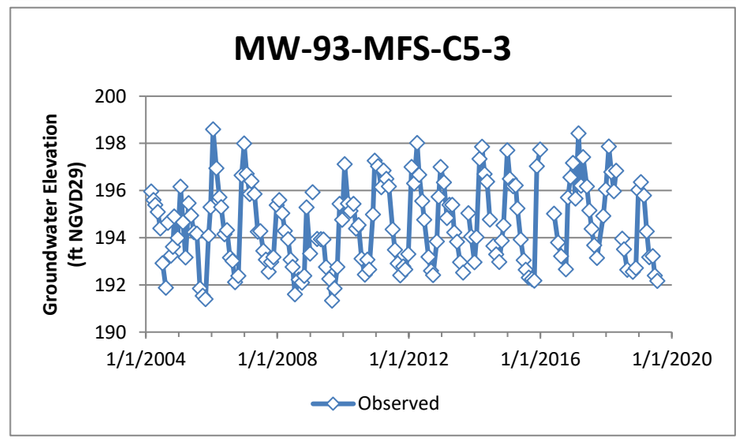

CHMW-3S
Groundwater Elevation (ft NGVD29)
202
200
198
196
194
192
190
188
1/1/2004
1/1/2008
1/1/2012
1/1/2016
1/1/2020
Observed

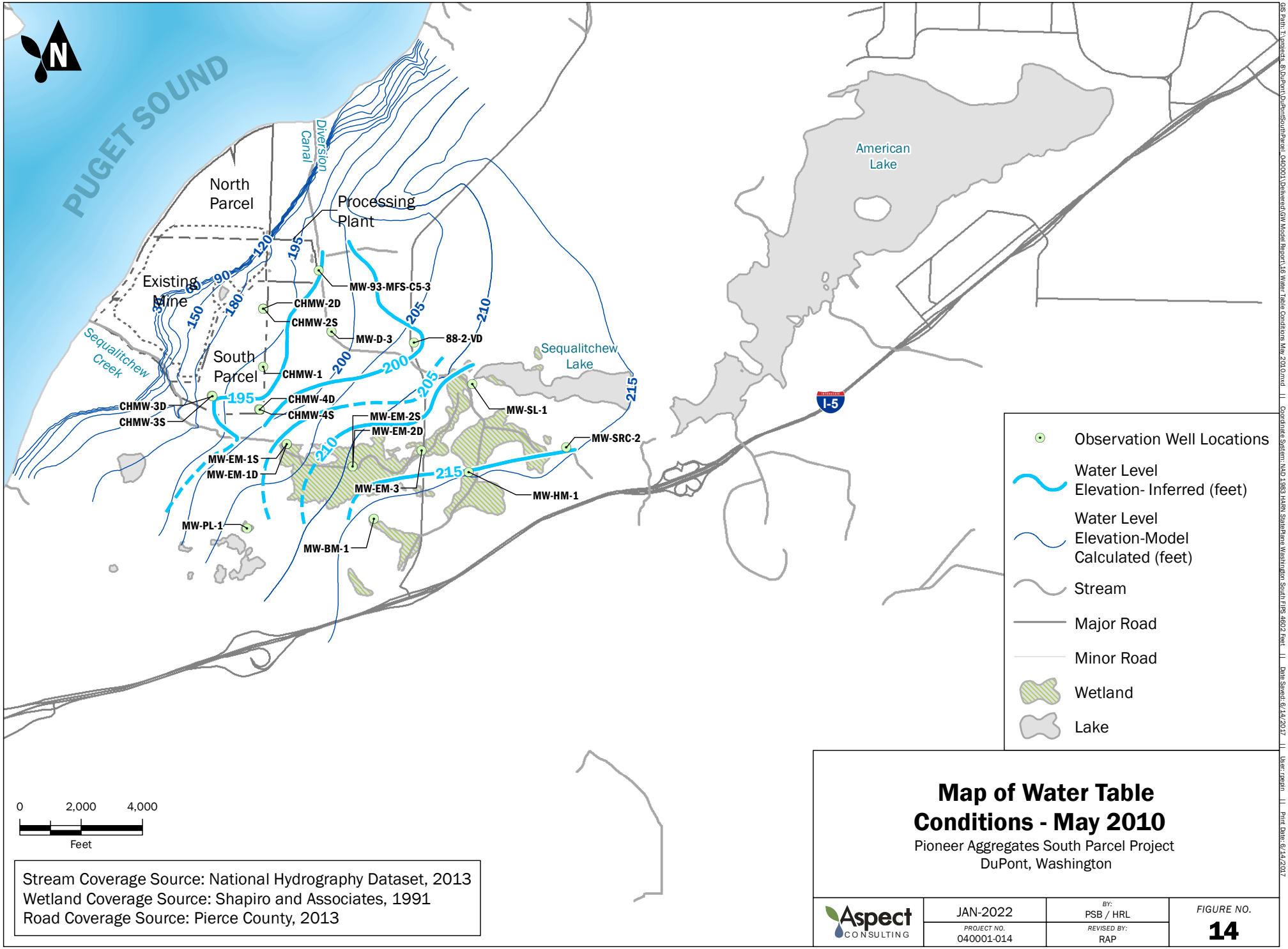

CHMW-3D
Groundwater Elevation (ft NGVD29)
202
200
198
196
194
192
190
188
1/1/2004
1/1/2008
1/1/2012
1/1/2016
1/1/2020
Observed


CHMW-4S
Groundwater Elevation (ft NGVD29)
204
202
200
198
196
194
192
1/1/2004
1/1/2008
1/1/2012
1/1/2016
1/1/2020
Observed


CHMW-4D
Groundwater Elevation (ft NGVD29)
202
200
198
196
194
192
190
1/1/2004
1/1/2008
1/1/2012
1/1/2016
1/1/2020
Observed


MW-D-3
Groundwater Elevation (ft NGVD29)
204
202
200
198
196
194
1/1/2004
1/1/2008
1/1/2012
1/1/2016
1/1/2020
Observed


MW-93-MFS-C5-3
Groundwater Elevation (ft NGVD29)
200
198
196
194
192
190
1/1/2004
1/1/2008
1/1/2012
1/1/2016
1/1/2020
Observed

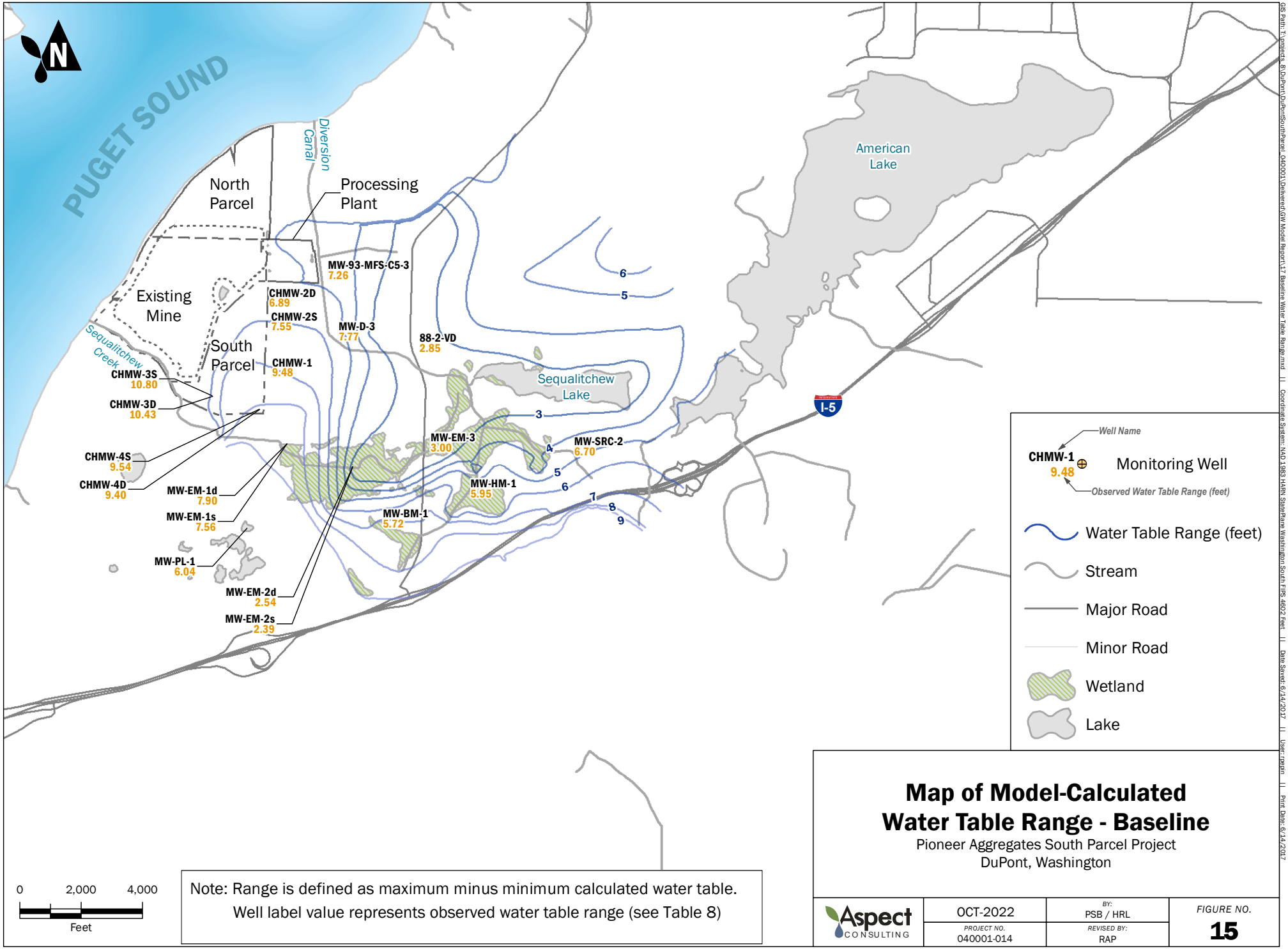


Map of Water Table Conditions - May 2010

Pioneer Aggregates South Parcel Project
DuPont, Washington

Aspect CONSULTING	JAN-2022	BY: PSB / HRL	FIGURE NO. 14
	PROJECT NO. 040001-014	REVISED BY: RAP	

GIS Path: T:\projects_8\DuPont\DuPontSouthParcel_040001\Delivered\GW Model Report\16 Water Table Conditions May 2010.mxd LL Coordinate System: NAD 1983 HARN StatePlane Washington South FIPS 4602 Feet LL Date Saved: 6/14/2017 LL User: rpegin LL Print Date: 6/14/2017



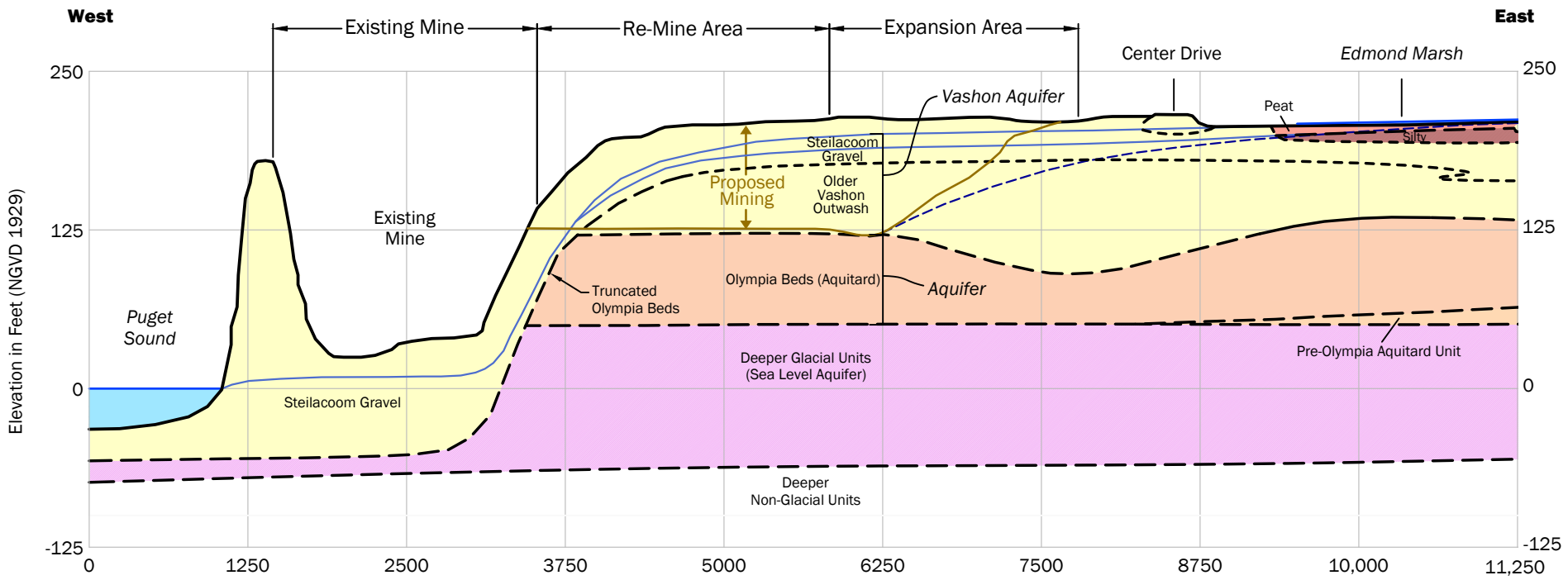
Note: Range is defined as maximum minus minimum calculated water table.
Well label value represents observed water table range (see Table 8)

Map of Model-Calculated Water Table Range - Baseline

Pioneer Aggregates South Parcel Project
DuPont, Washington

Aspect Consulting	OCT-2022	BY: PSB / HRL	FIGURE NO. 15
	PROJECT NO. 040001-014	REVISED BY: RAP	

GIS Path: T:\projects_8\DuPont\DuPontSouthParcel_040001\Delivered\GW Model Report\17 Baseline Water Table Range.mxd || Coordinate System: NAD 1983 HARN StatePlane Washington South FIPS 4602 Feet || Date Saved: 6/14/2017 || User: rpain || Print Date: 6/14/2017



Legend

- Existing Groundwater Table (range indicates seasonal variation)
- Predicted Groundwater Table with South Parcel Project

Notes: 10x Vertical vs. Horizontal Exaggeration for Illustration.
See Figure 6 for cross section location.

Horizontal Scale: 0 — 1250 Feet

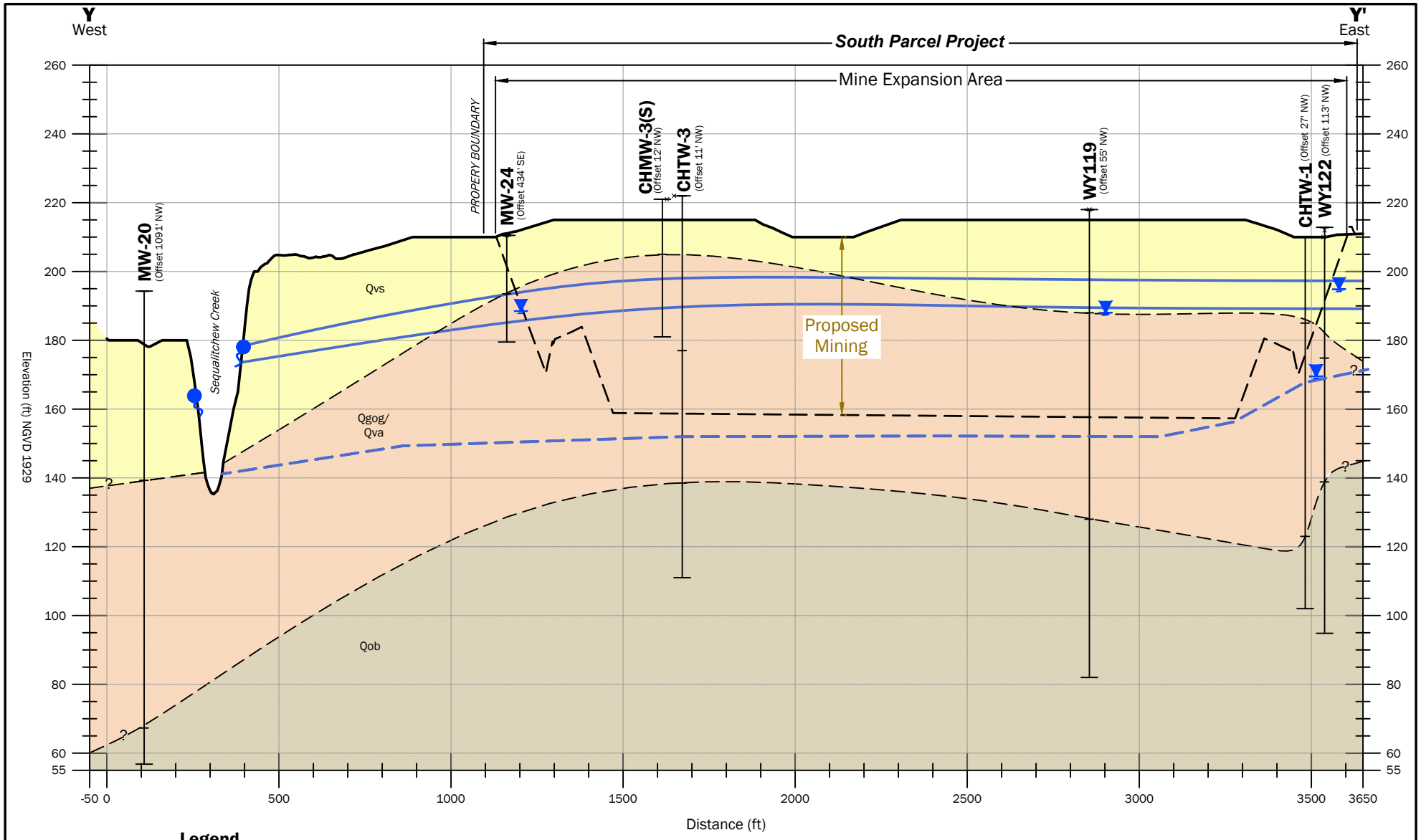
Vertical Scale: 0 — 125 Feet

Hydrogeologic Cross Section - A-A'

CalPortland DuPont South Parcel
Monitoring Plan
DuPont, Washington

Aspect Consulting	Dec-2024	BY: OGR/SCC/CMV	FIGURE NO. 16
	PROJECT NO. 040001-014	REVISED BY: WBL	

CAD Path: Q:\CalPortland\040001 DuPont Hydrologic Study\2022-01 Earth and Water Resources Report\040001-14 Hydrogeologic x-sec.dwg || Date Saved: 12/30/2024 11:56:56 PM || User: willie.longmire



Legend

- Geologic Contact
- ***Qvs*** — Steilacoom Gravel Member of Vashon Recessional Outwash
- ***Qgog/Qva*** — Vashon Recessional Outwash and/or Advance Outwash
- ***Qob*** — Olympia Beds
- Existing Water Level at Time of Drilling (ATD)
- Seep
- Existing Groundwater Table (range indicates seasonal variation)
- Predicted Groundwater Table with South Parcel Project

Horizontal Scale: 0 — 400 Feet

Vertical Scale: 0 — 40 Feet

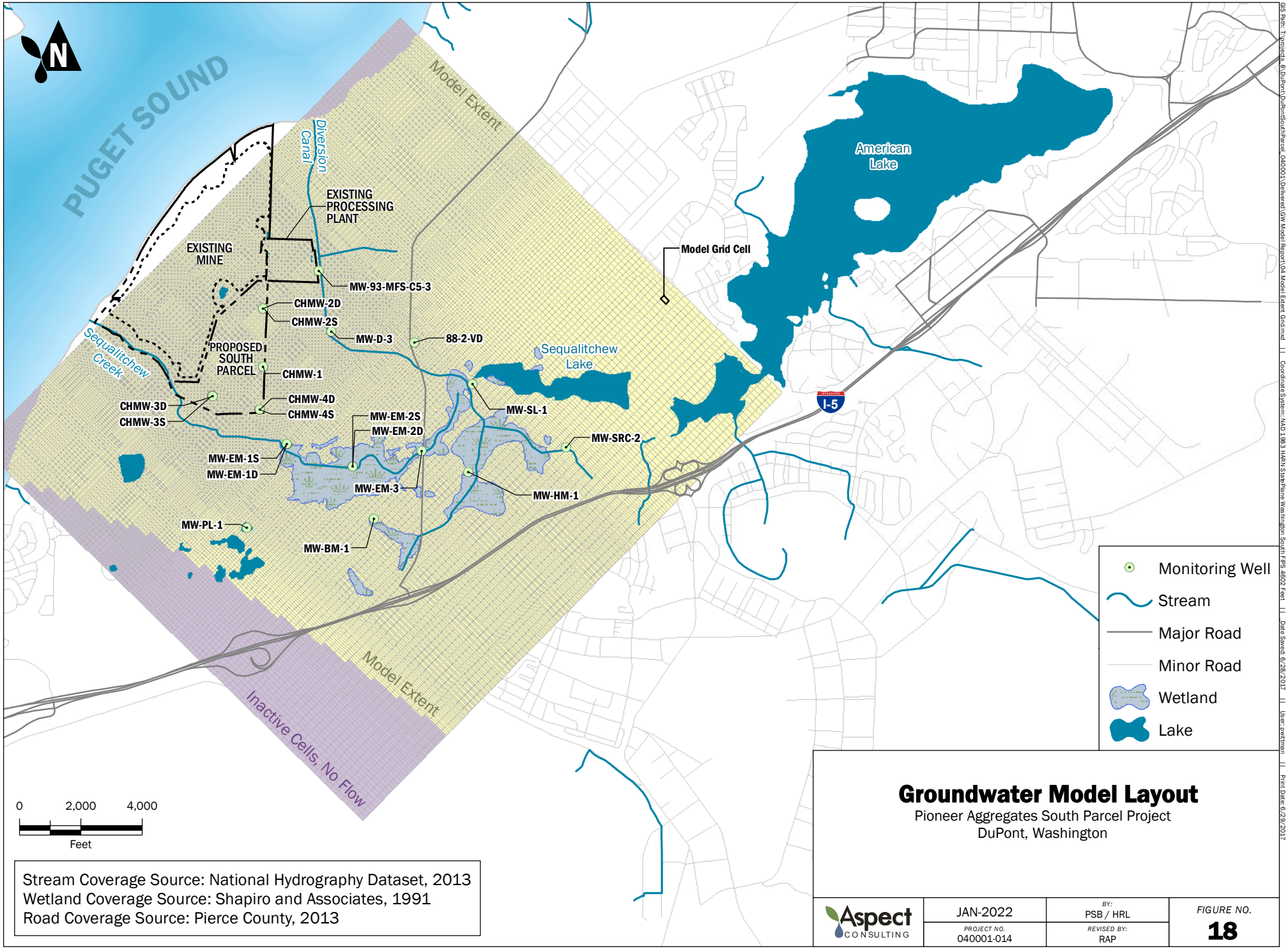
Notes: **10x Vertical vs. Horizontal Exaggeration for Illustration.**
See Figures 6 and 7 for cross section location.

Source: Topography from Pierce County LiDAR, 2011.

Hydrogeologic Cross Section - B-B'

CalPortland DuPont South Parcel
Monitoring Plan
DuPont, Washington

Aspect Consulting	Dec-2024	BY: ETB/CMV	FIGURE NO. 17
	PROJECT NO. 040001	REVISED BY: WBL	



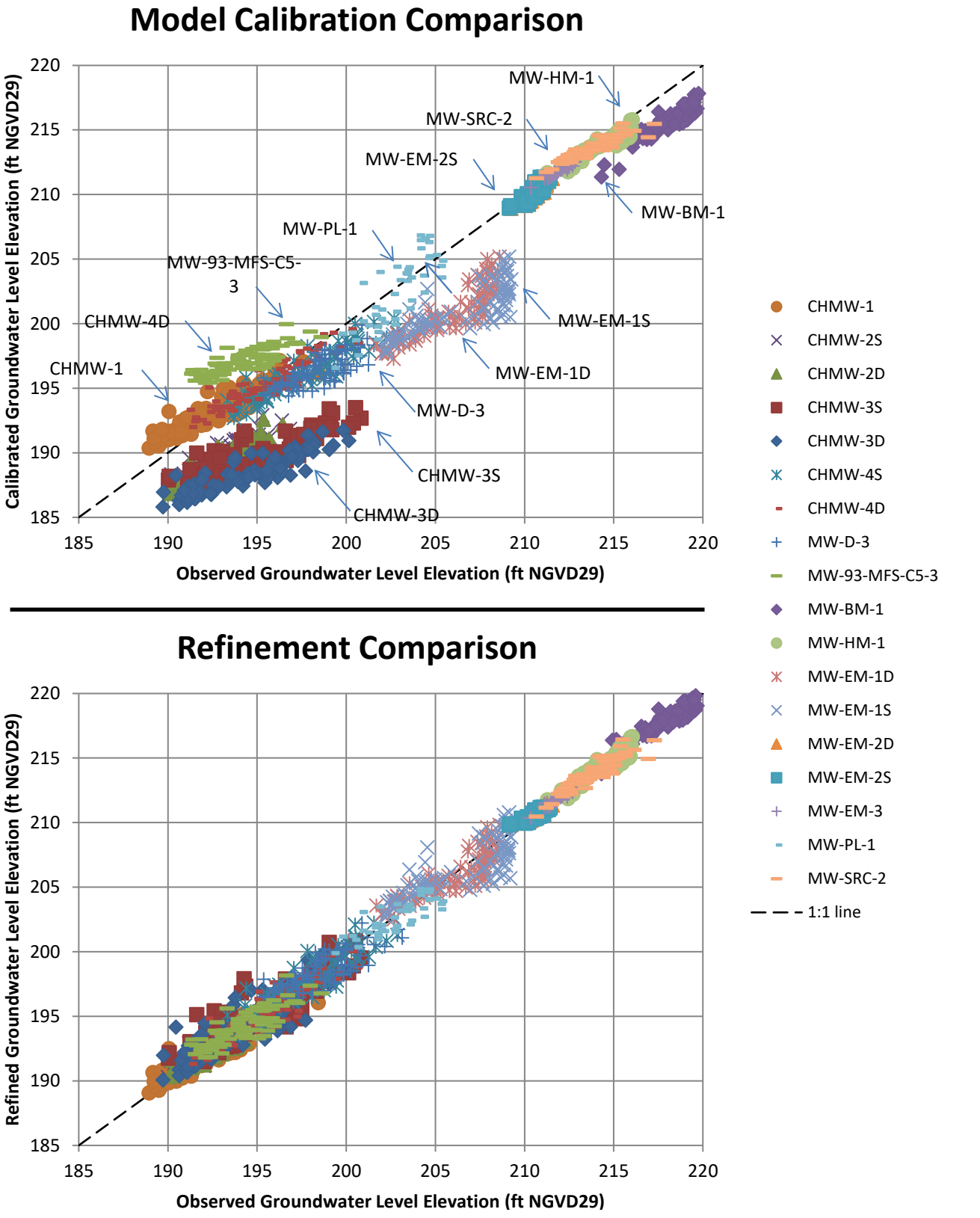
Stream Coverage Source: National Hydrography Dataset, 2013
Wetland Coverage Source: Shapiro and Associates, 1991
Road Coverage Source: Pierce County, 2013

Groundwater Model Layout

Pioneer Aggregates South Parcel Project
DuPont, Washington

Aspect CONSULTING	JAN-2022	BY: PSB / HRL	FIGURE NO. 18
	PROJECT NO. 040001-014	REVISED BY: RAP	

GIS Path: T:\projects_8\DuPont\DuPontSouthParcel_040001\Deliverest\GW Model Report\04 Model Extent Grid.mxd LL Coordinate System: NAD 1983 HARN StatePlane Washington South FIPS 4602 Feet LL Date Saved: 6/28/2017 LL User: pwitman LL Print Date: 6/29/2017



Aspect Consulting, LLC

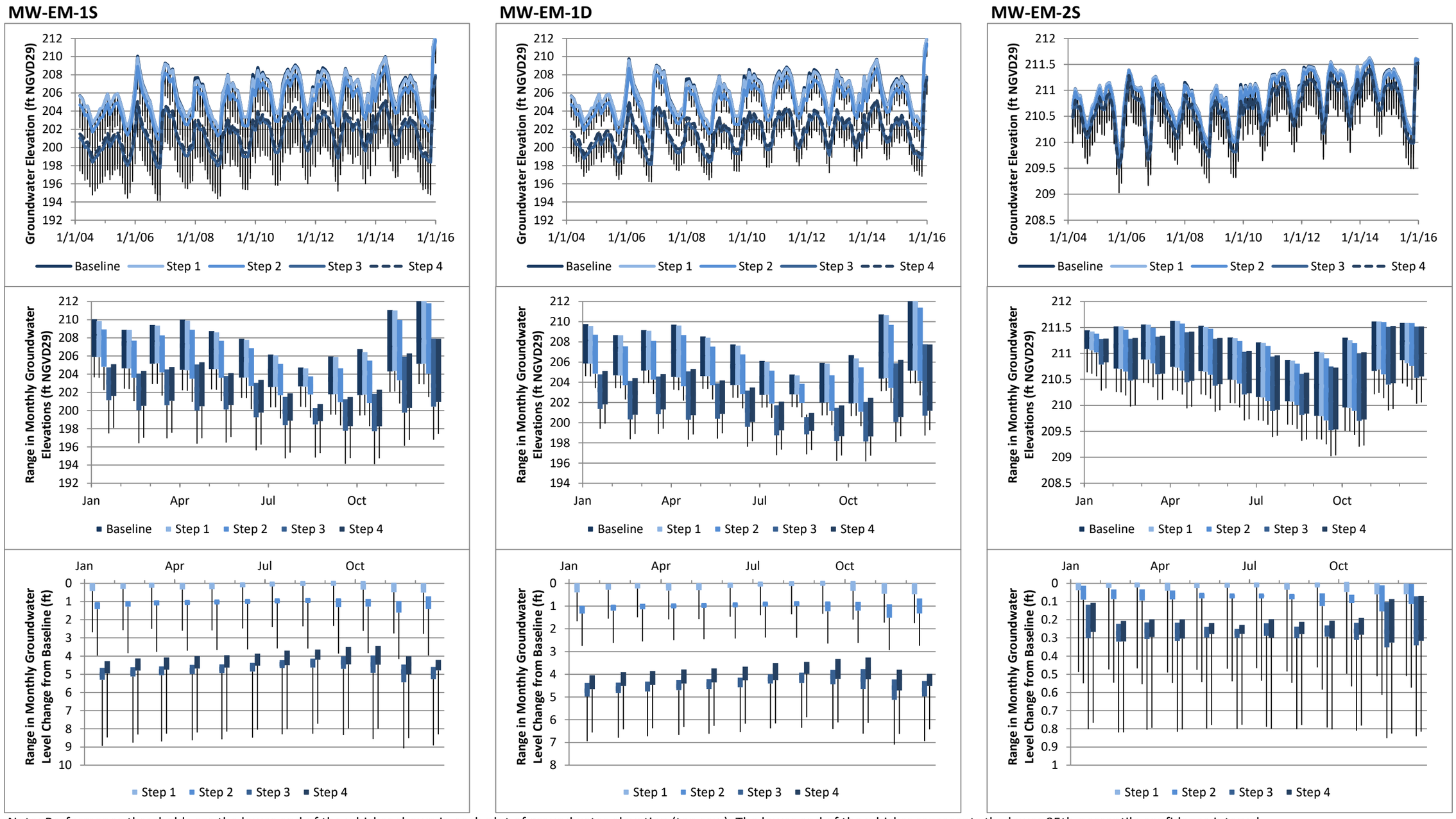
1/27/2022

S:\CalPortland\DuPont\South Parcel\Groundwater Modeling\DRAFT_20170327\StatusUpdate_20211122.xlsm

Figure 19

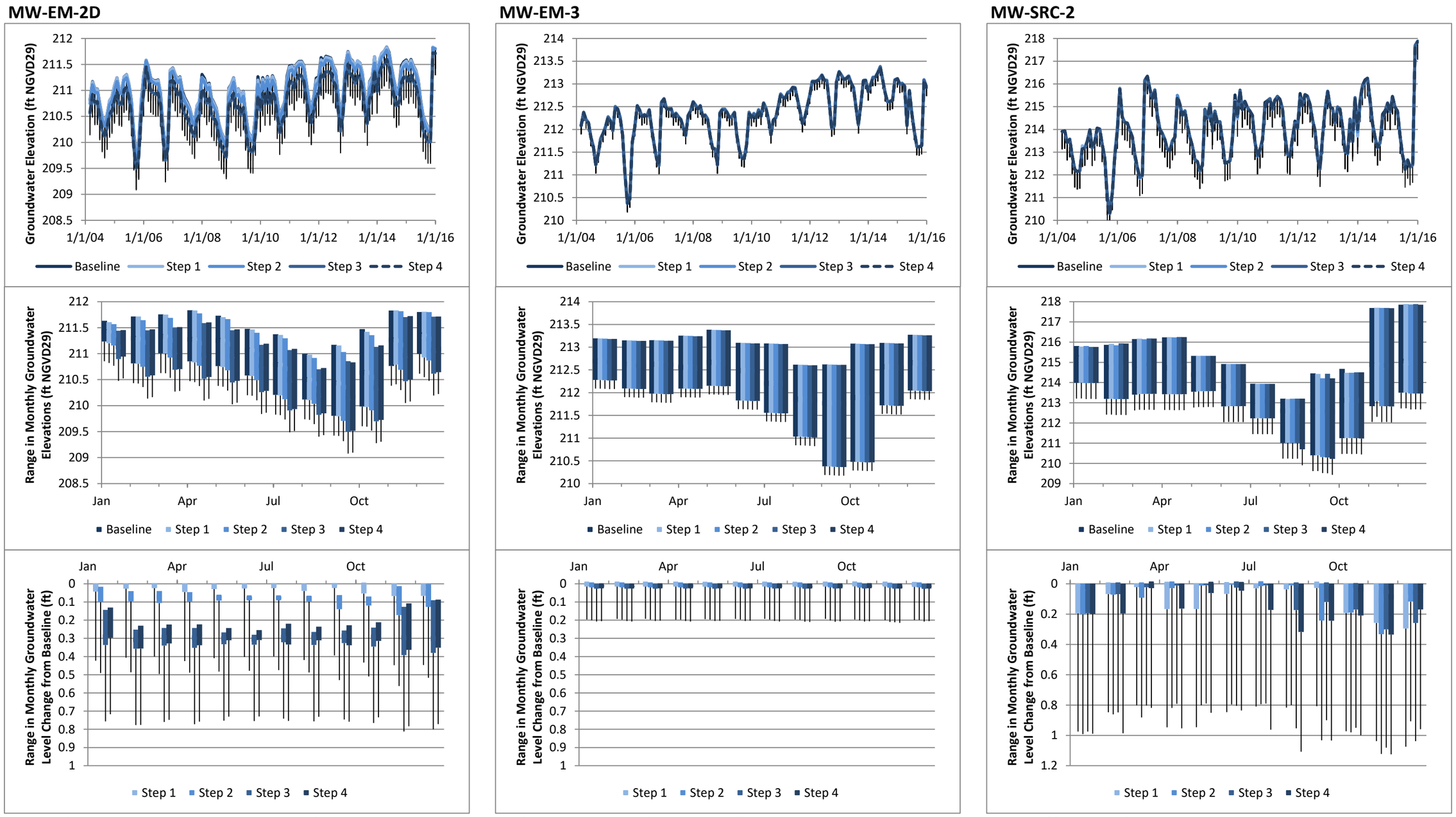
Comparison of Observed and Calculated Groundwater Levels

Earth and Water Resources Report



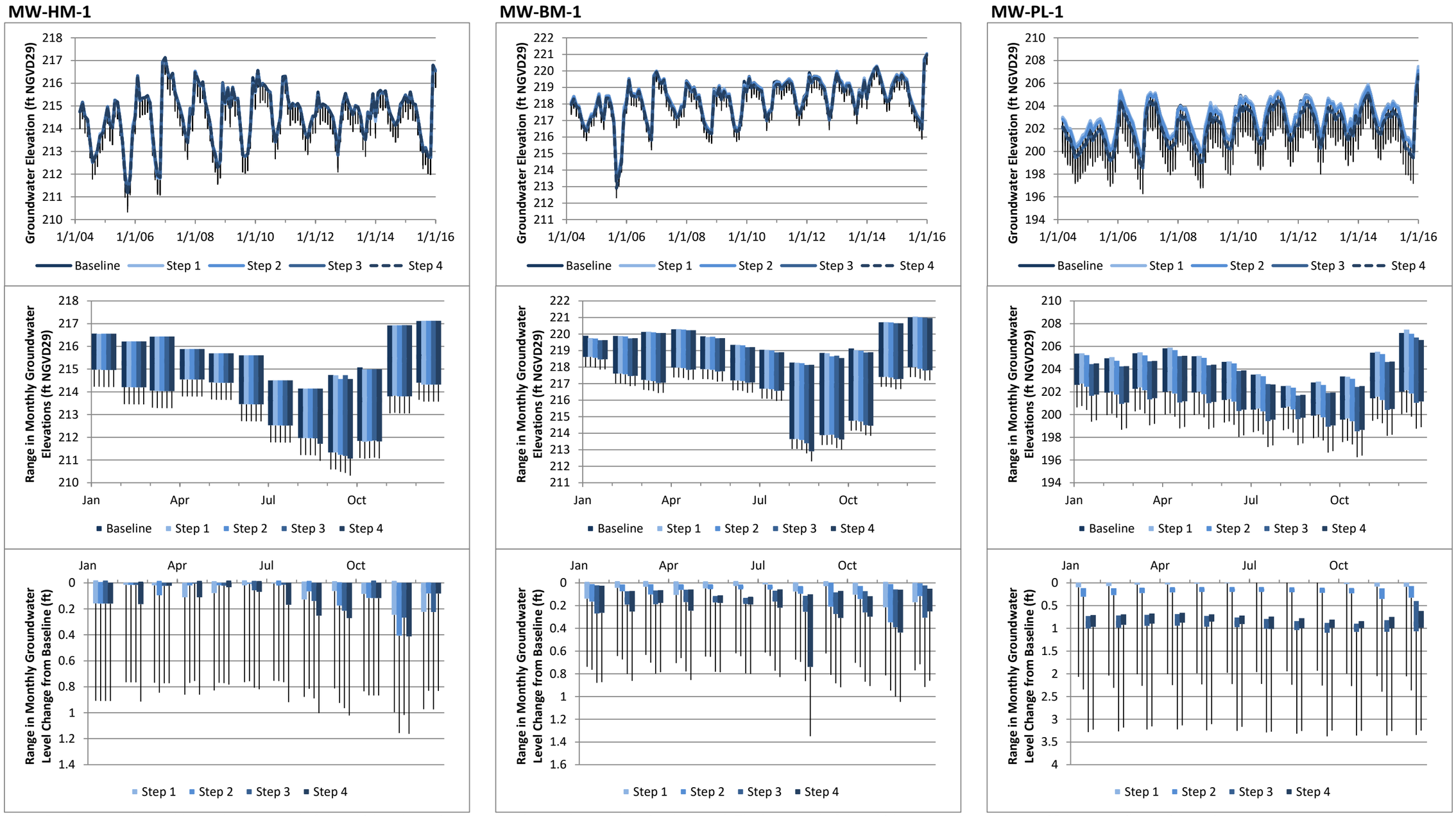
Note: Performance thresholds are the lower end of the whisker shown in each plot of groundwater elevation (top row). The lower end of the whisker represents the lower 95th-percentile confidence interval.

Figure 20
Predicted Changes and Ranges in Groundwater Levels
Earth and Water Resources Report



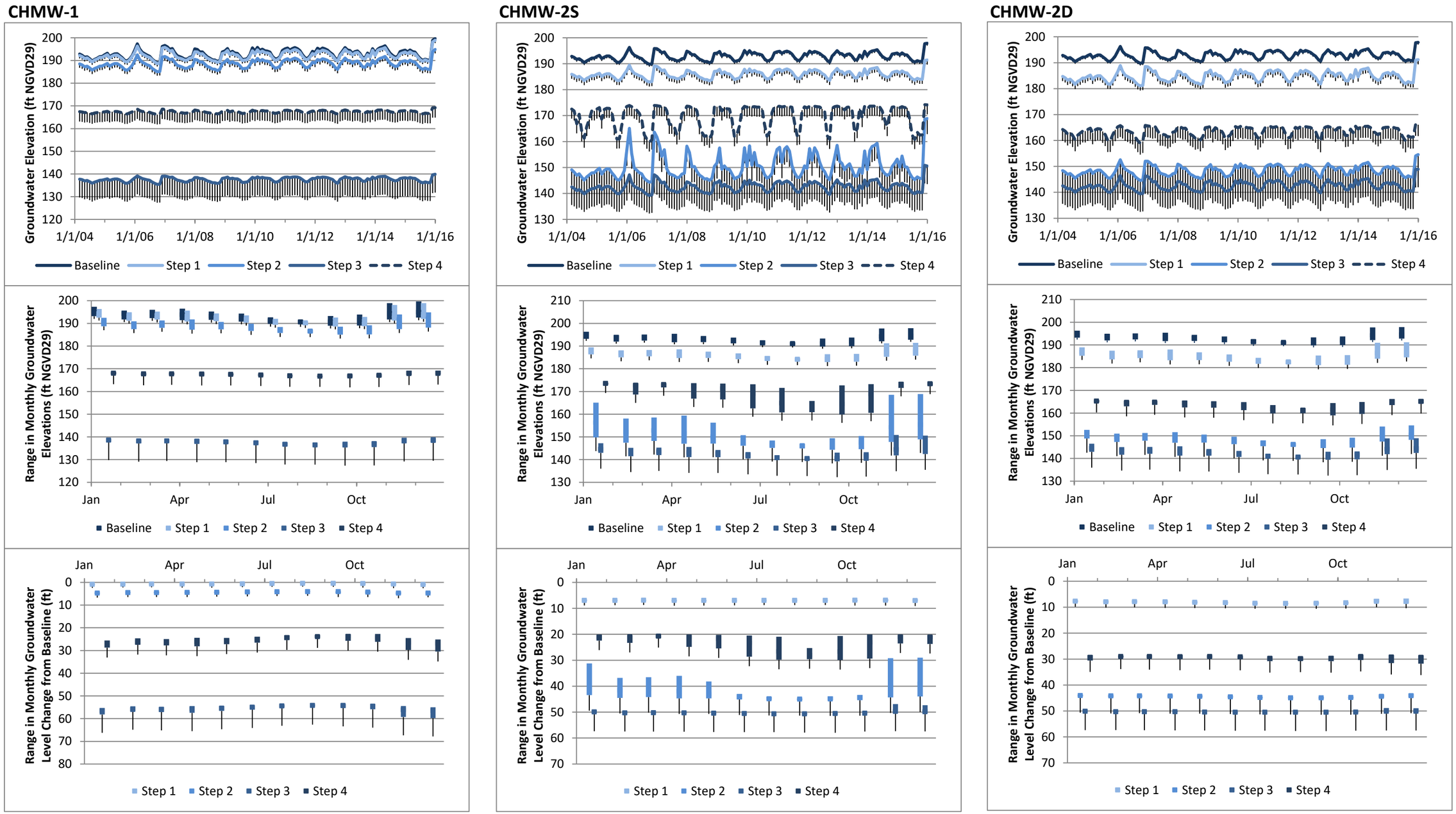
Note: Performance thresholds are the lower end of the whisker shown in each plot of groundwater elevation (top row). The lower end of the whisker represents the lower 95th-percentile confidence interval.

Figure 20
Predicted Changes and Ranges in Groundwater Levels
Earth and Water Resources Report



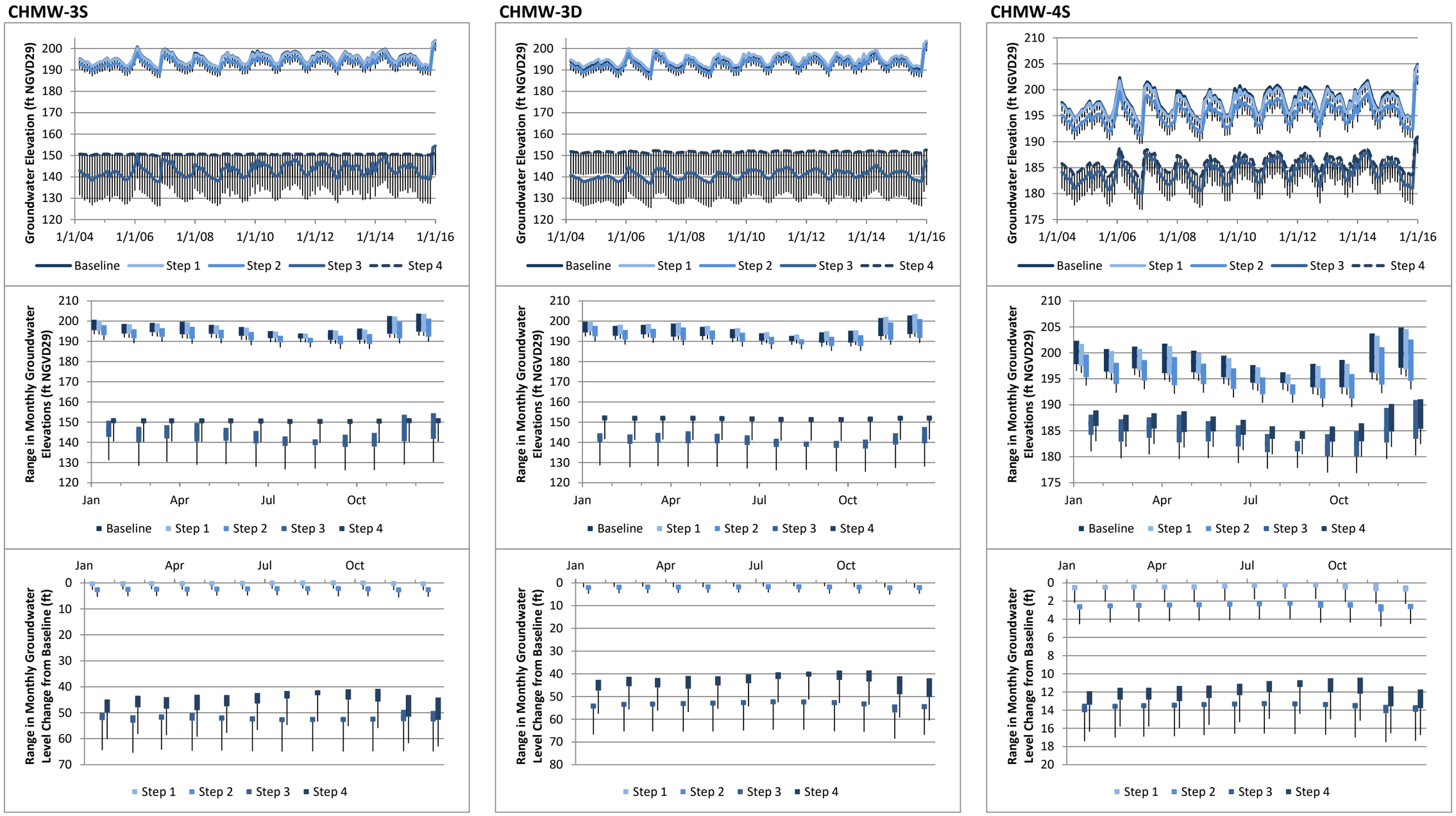
Note: Performance thresholds are the lower end of the whisker shown in each plot of groundwater elevation (top row). The lower end of the whisker represents the lower 95th-percentile confidence interval.

Figure 20
Predicted Changes and Ranges in Groundwater Levels
Earth and Water Resources Report



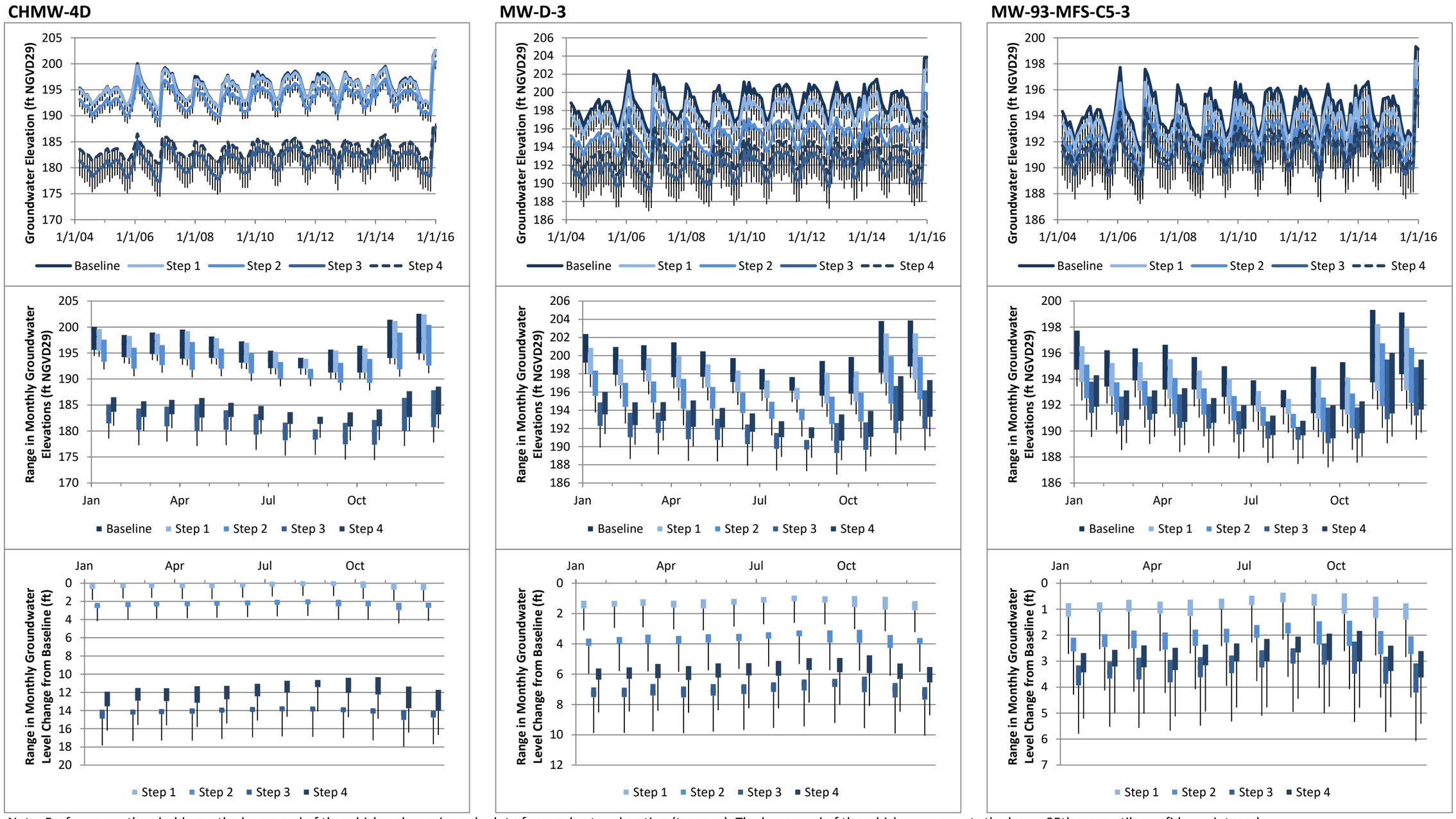
Note: Performance thresholds are the lower end of the whisker shown in each plot of groundwater elevation (top row). The lower end of the whisker represents the lower 95th-percentile confidence interval.

Figure 20
Predicted Changes and Ranges in Groundwater Levels
Earth and Water Resources Report



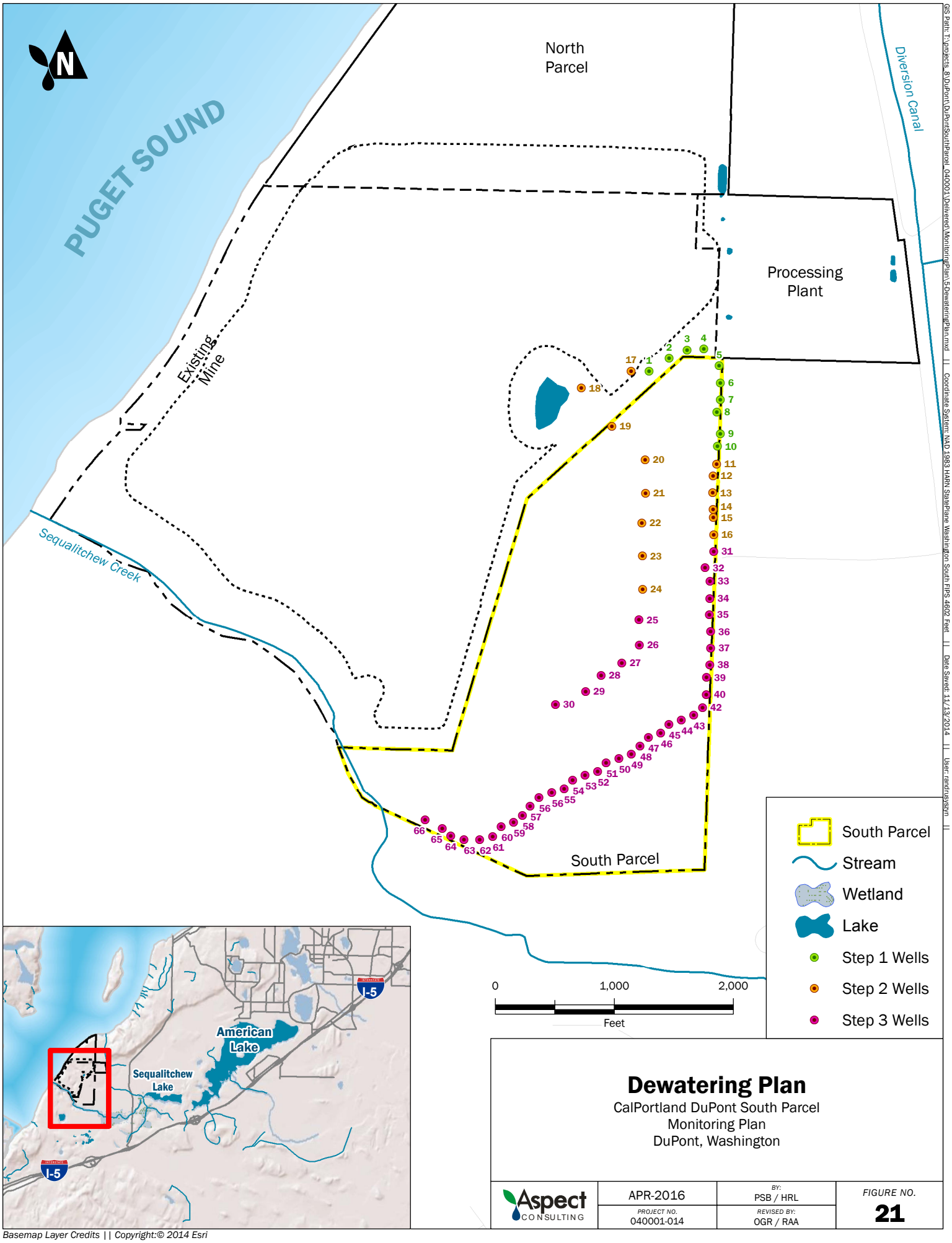
Note: Performance thresholds are the lower end of the whisker shown in each plot of groundwater elevation (top row). The lower end of the whisker represents the lower 95th-percentile confidence interval.

Figure 20
Predicted Changes and Ranges in Groundwater Levels
Earth and Water Resources Report



Note: Performance thresholds are the lower end of the whisker shown in each plot of groundwater elevation (top row). The lower end of the whisker represents the lower 95th-percentile confidence interval.

Figure 20
Predicted Changes and Ranges in Groundwater Levels
Earth and Water Resources Report



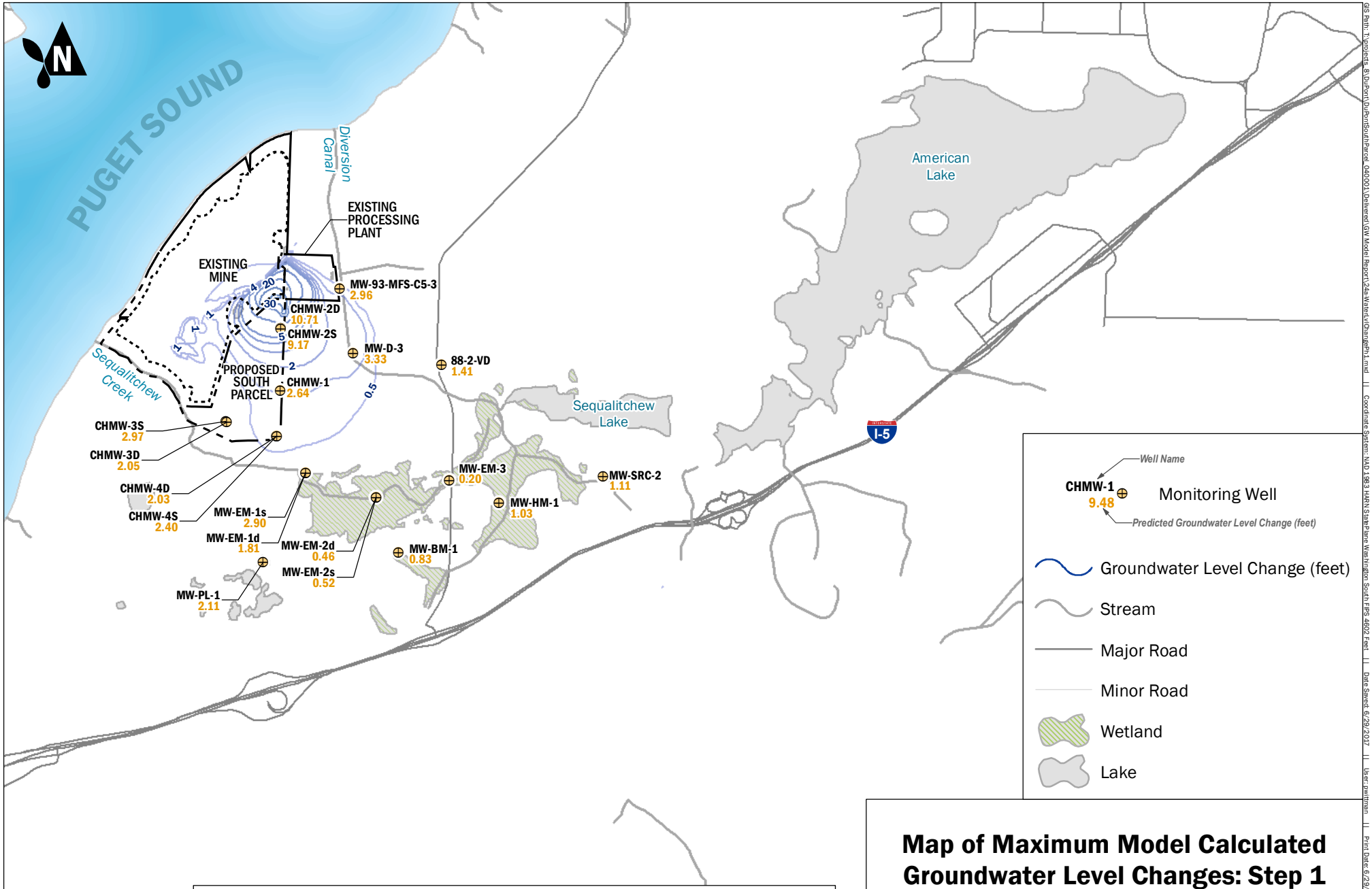
Dewatering Plan

CalPortland DuPont South Parcel
Monitoring Plan
DuPont, Washington

Aspect CONSULTING	APR-2016	BY: PSB / HRL	FIGURE NO. 21
	PROJECT NO. 040001-014	REVISED BY: OGR / RAA	

Basemap Layer Credits || Copyright:© 2014 Esri

GIS Path: T:\projects_8\DuPont\DuPontSouthParcel_040001\Delivered\MonitoringPlan\5DewateringPlan.mxd || Coordinate System: NAD 1983 HARN StatePlane Washington South FIPS 4602 Feet || Date Saved: 11/13/2014 || User: randrusyszyn ||



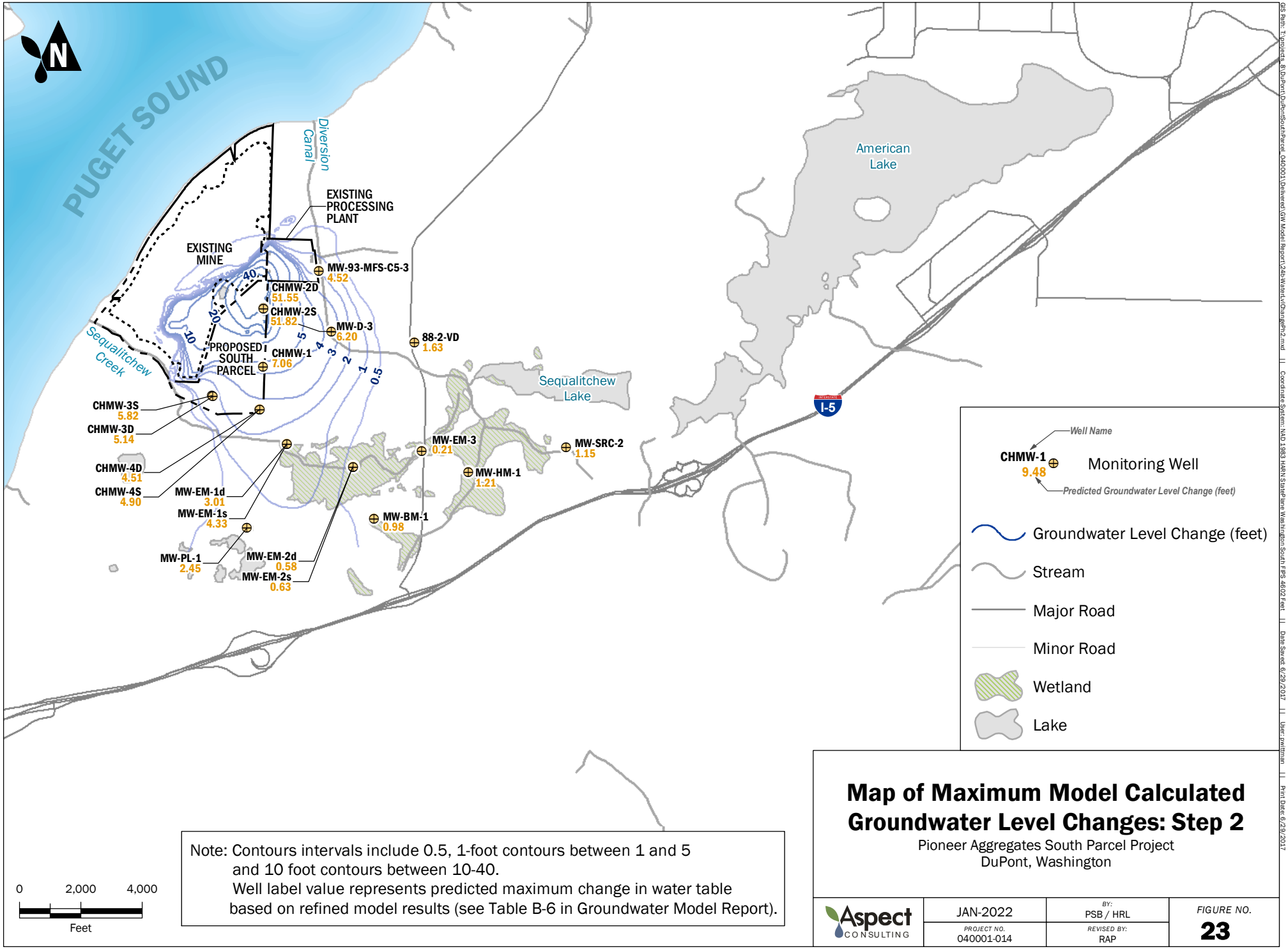
Note: Contours intervals include 0.5, 1-foot contours between 1 and 5 and 10 foot contours between 10-40.
Well label value represents predicted maximum change in water table based on refined model results (see Table B-6 in Groundwater Model Report).

Map of Maximum Model Calculated Groundwater Level Changes: Step 1

Pioneer Aggregates South Parcel Project
DuPont, Washington

Aspect CONSULTING	JAN-2022	BY: PSB / HRL	FIGURE NO. 22
	PROJECT NO. 040001-014	REVISED BY: RAP	

GIS Path: T:\projects_8\DuPont\DuPontSouthParcel_040001\Deliverable\GW Model Report\24a-WaterLvlChangePh1.mxd || Coordinate System: NAD 1983 HARN State Plane Washington South FIPS 4602 Feet || Date Saved: 6/29/2017 || User: pwittman || Print Date: 6/29/2017



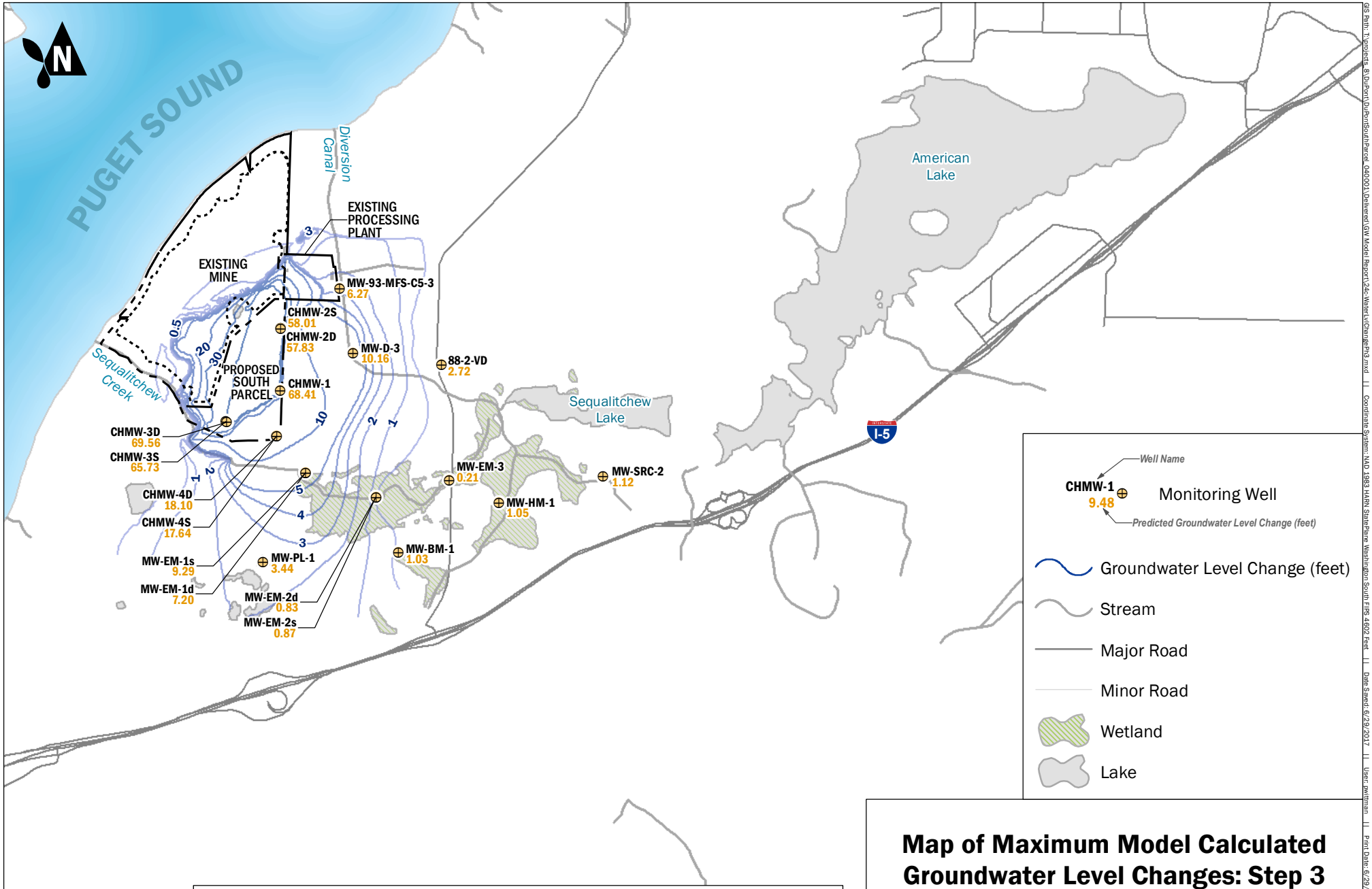
Note: Contours intervals include 0.5, 1-foot contours between 1 and 5 and 10 foot contours between 10-40.
Well label value represents predicted maximum change in water table based on refined model results (see Table B-6 in Groundwater Model Report).

Map of Maximum Model Calculated Groundwater Level Changes: Step 2

Pioneer Aggregates South Parcel Project
DuPont, Washington

Aspect CONSULTING	JAN-2022	BY: PSB / HRL	FIGURE NO. 23
	PROJECT NO. 040001-014	REVISED BY: RAP	

GIS Path: T:\projects_8\DuPont\DuPontSouthParcel_040001\Deliverable\GW Model Report\24b Waterlvl\ChangePh2.mxd || Coordinate System: NAD 1983 HARN StatePlane Washington South FIPS 4602 Feet || Date Saved: 6/29/2017 || User: jwitman || Print Date: 6/29/2017



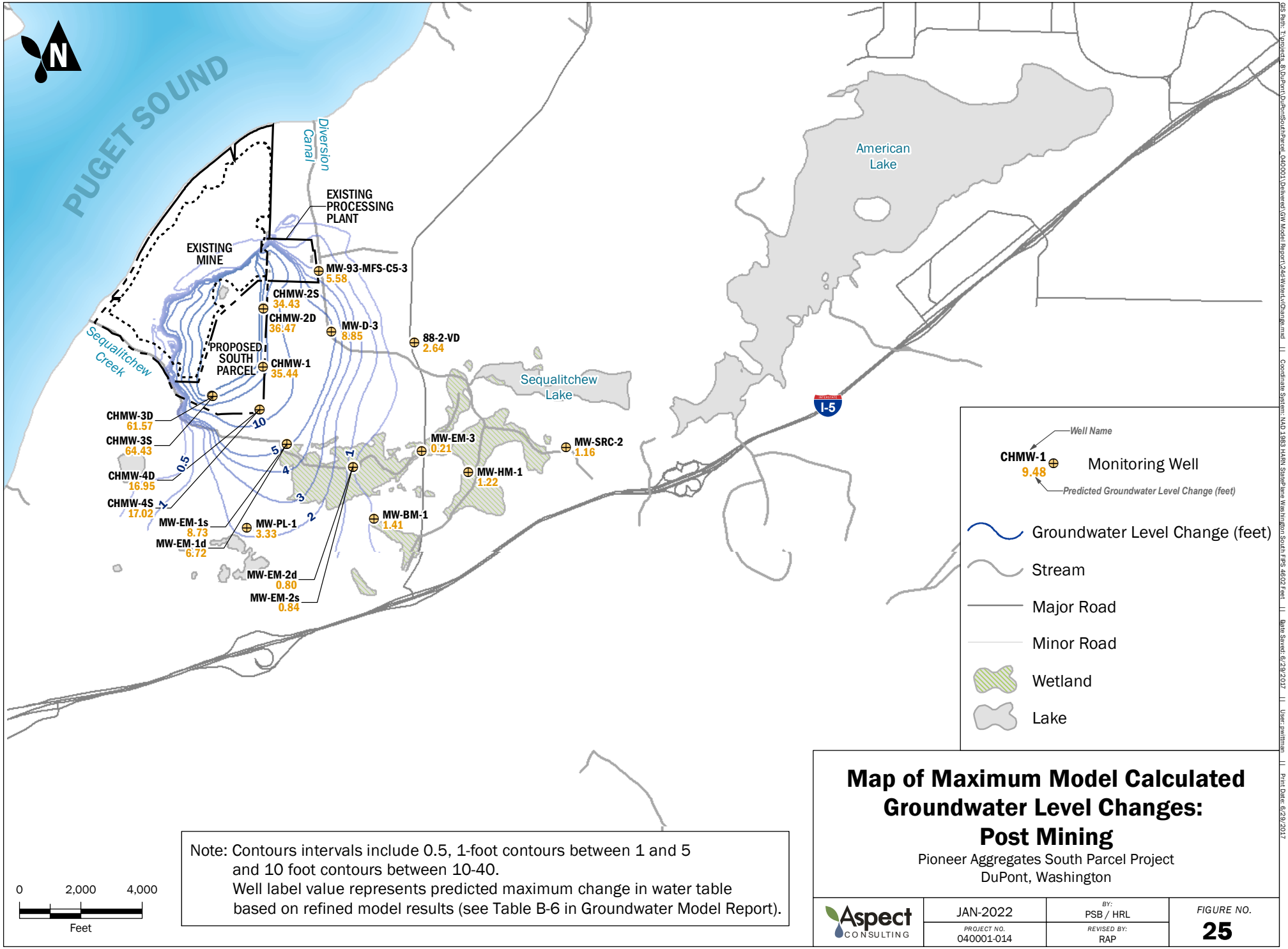
Note: Contours intervals include 0.5, 1-foot contours between 1 and 5 and 10 foot contours between 10-40.
Well label value represents predicted maximum change in water table based on refined model results (see Table B-6 in Groundwater Model Report).

Map of Maximum Model Calculated Groundwater Level Changes: Step 3

Pioneer Aggregates South Parcel Project
DuPont, Washington

Aspect CONSULTING	JAN-2022	BY: PSB / HRL	FIGURE NO. 24
	PROJECT NO. 040001-014	REVISED BY: RAP	

GIS Path: T:\projects_8\DuPont\DuPontSouthParcel_040001\Deliverest\GW Model Report\24c-WaterLvlChangeStp3.mxd LL Coordinate System: NAD 1983 HARN StatePlane Washington South FIPS 4602 Feet LL Date Saved: 6/29/2017 LL User: pwittman LL Print Date: 6/29/2017



Note: Contours intervals include 0.5, 1-foot contours between 1 and 5 and 10 foot contours between 10-40.
Well label value represents predicted maximum change in water table based on refined model results (see Table B-6 in Groundwater Model Report).

Map of Maximum Model Calculated Groundwater Level Changes: Post Mining

Pioneer Aggregates South Parcel Project
DuPont, Washington

Aspect CONSULTING	JAN-2022	BY: PSB / HRL	FIGURE NO. 25
	PROJECT NO. 040001-014	REVISED BY: RAP	

GIS Path: T:\projects_8\DuPont\DuPontSouthParcel_040001\Deliverable\GW Model Report\24d\WaterLvlChange.mxd || Coordinate System: NAD 1983 HARN StatePlane Washington South FIPS 4602 Feet || Date Saved: 6/29/2017 || User: pwittman || Print Date: 6/29/2017

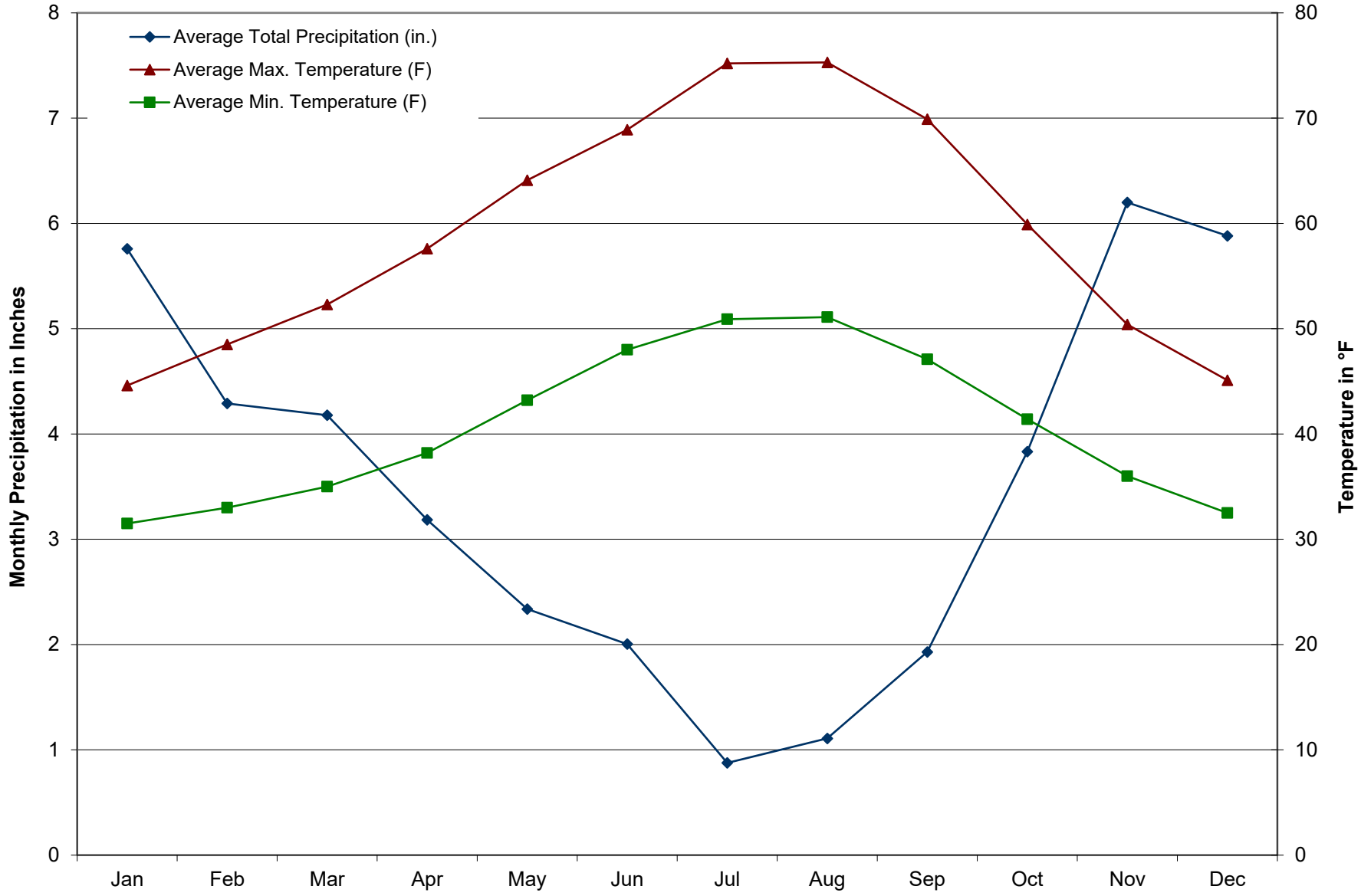


Figure 26

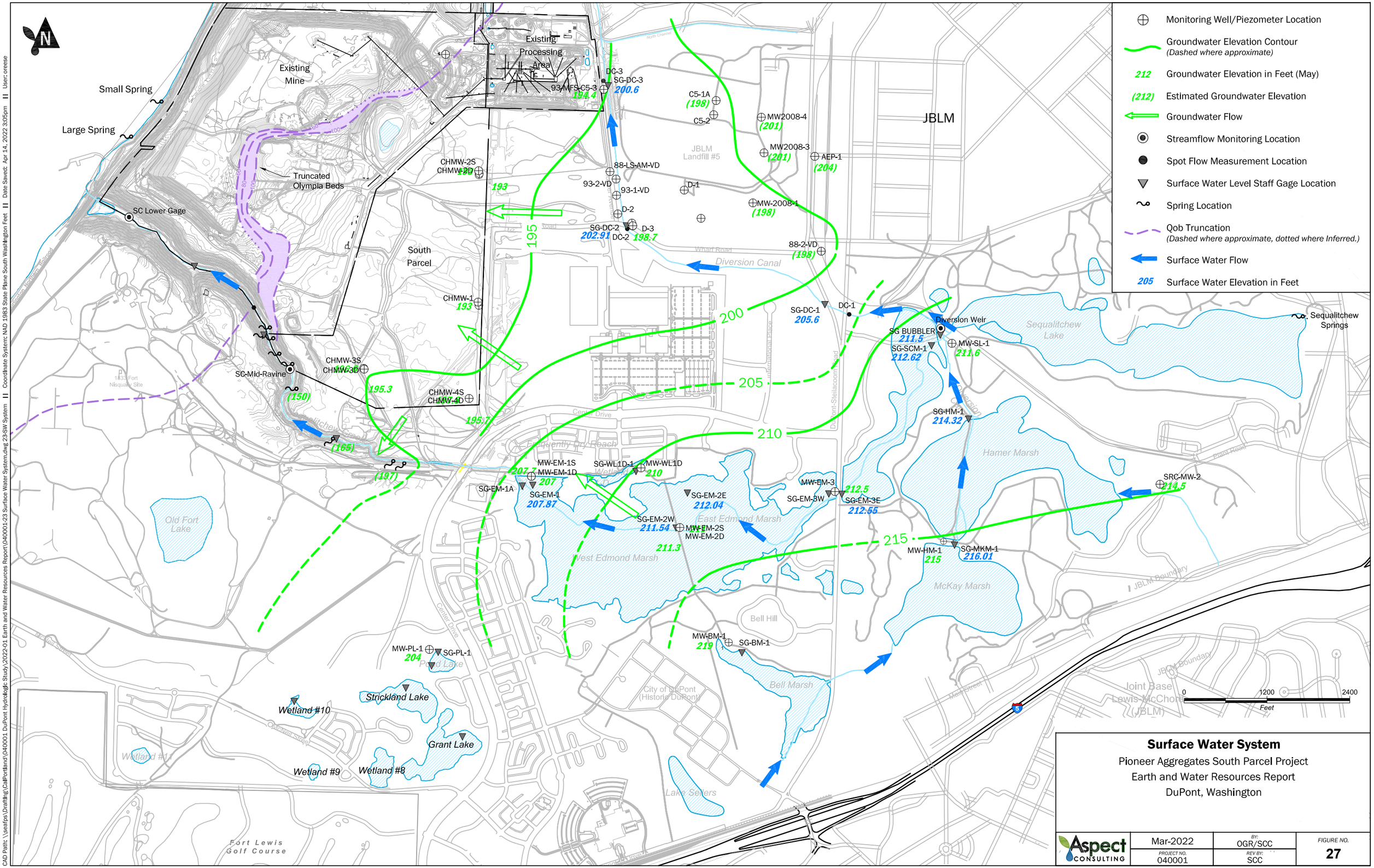
Average Precipitation and Temperature by Month

Pioneer Aggregates South Parcel Project

Aspect Consulting

02/23/22

S:\CalPortland\DuPont\South Parcel\Report Drafts\Earth and Water Resources Report 2021\Analysis\Water Balance\Figure 22.xlsm

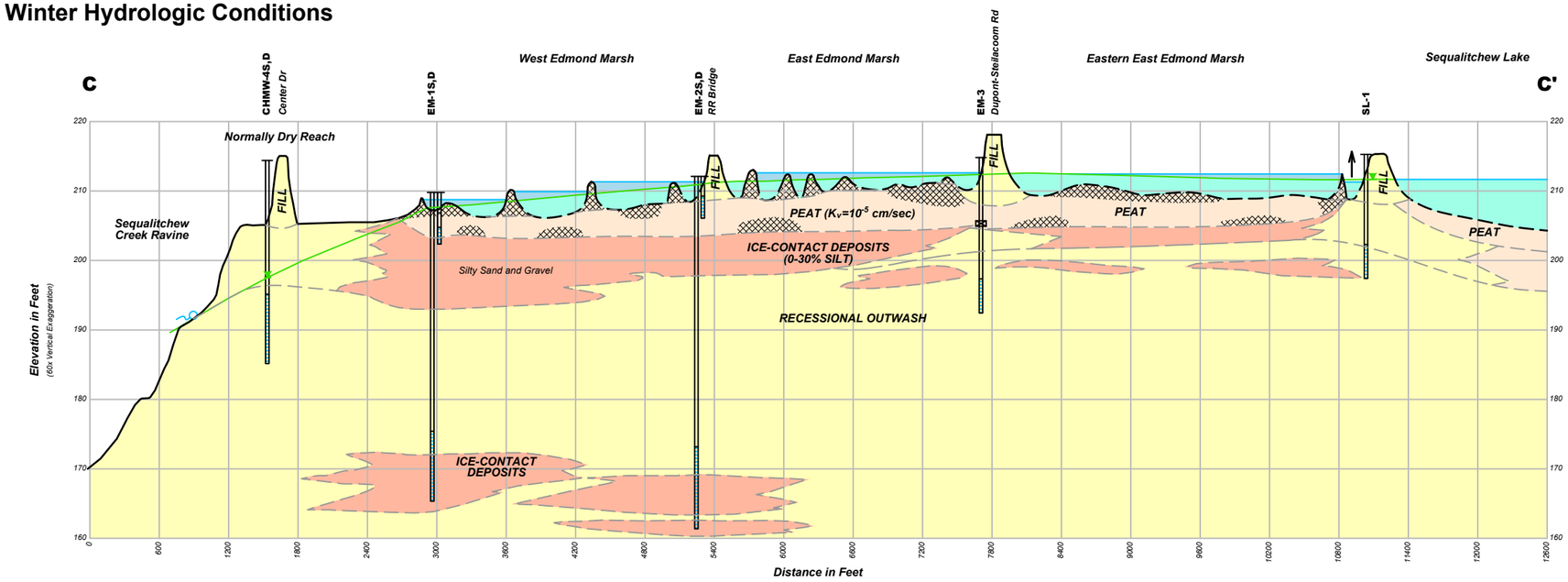


Surface Water System

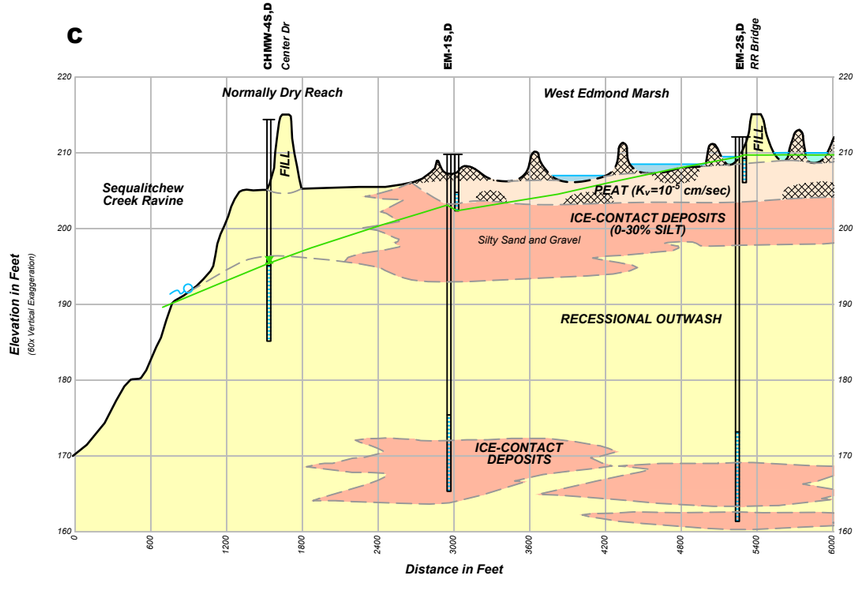
Pioneer Aggregates South Parcel Project
Earth and Water Resources Report
DuPont, Washington

Aspect Consulting	Mar-2022	BY: OGR/SCC	FIGURE NO. 27
	PROJECT NO. 040001	REV BY: SCC	

Winter Hydrologic Conditions



Summer Hydrologic Conditions
West Edmonds



Legend

- Groundwater Elevation
- Surface Water Elevation
- Beaver Dam

0 1200 2400
Horizontal Feet

0 20 40
Vertical Feet

Notes: See Figure 6 for cross section location.

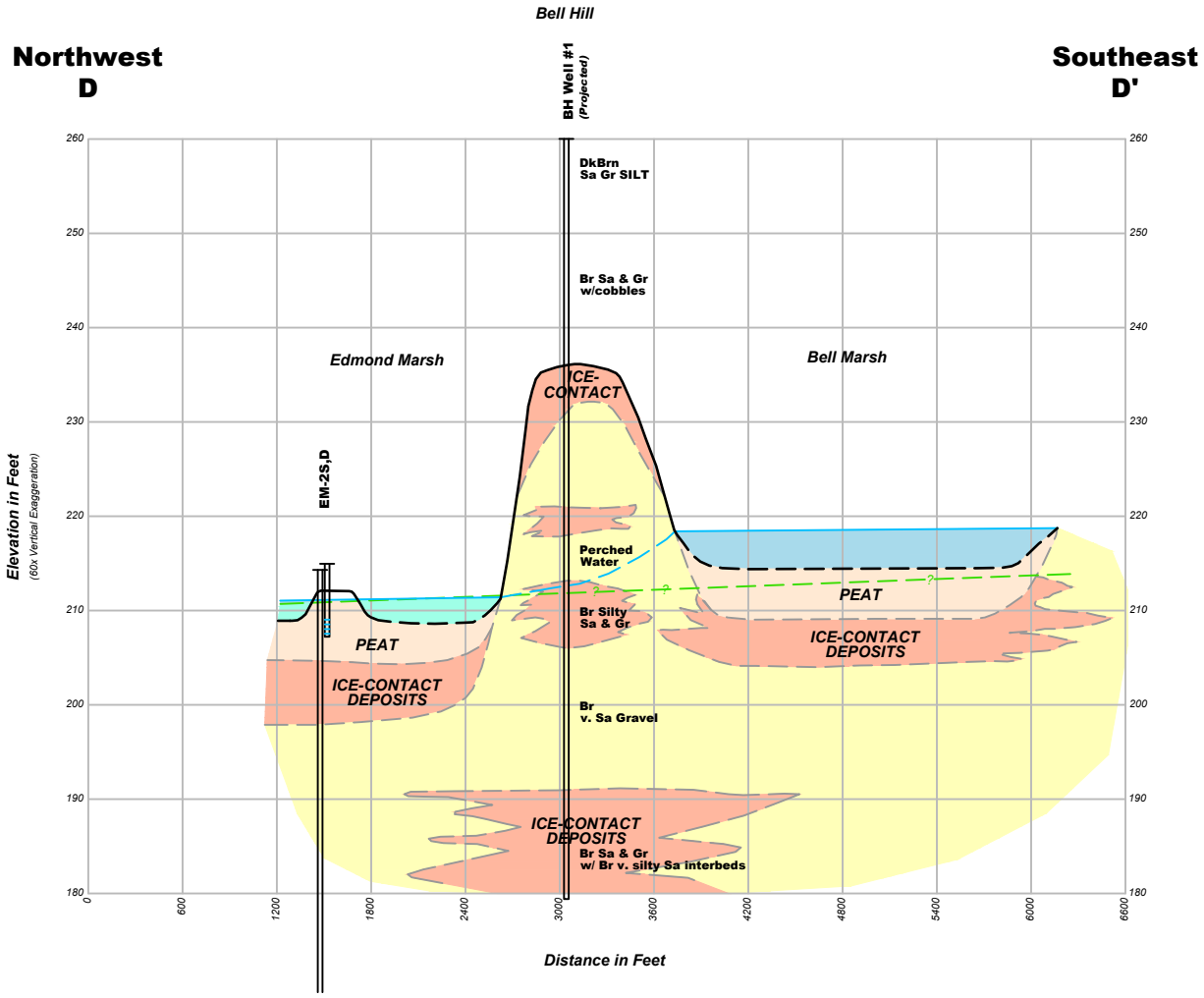
Edmond Marsh Cross Section - C-C'

Earth and Water Resources Report
Pioneer Aggregates South Parcel Project
DuPont, Washington

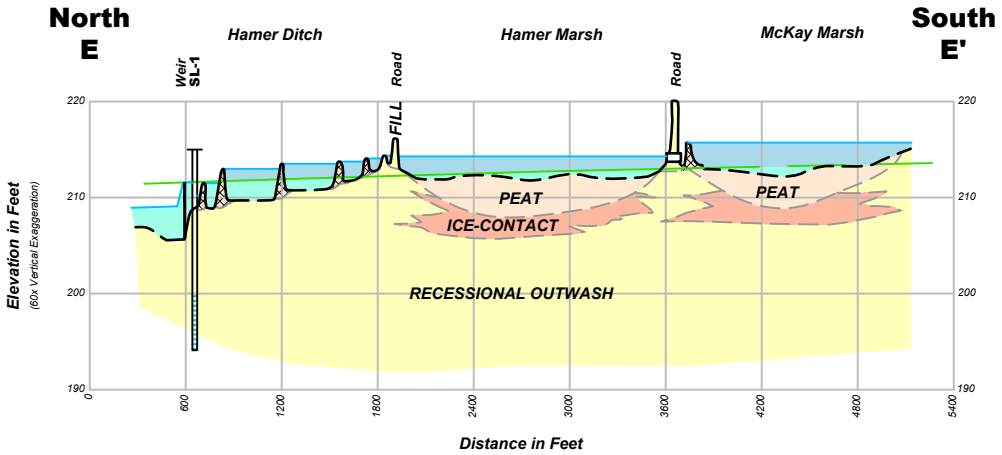
Aspect CONSULTING	Dec-2024	BY: OGR/SCC	FIGURE NO. 28
	PROJECT NO. 040001-I-018	REVISED BY: WBL	

CAD Path: Q:\CalPortland\040001 DuPont Hydrologic Study\2022-10 Earth and Water Resources Report\040001-08.dwg 27 Edmond Marsh Cross Section - C-C' || Date Saved: Dec 30, 2024 11:39pm || User: Willie.Longmire

Winter Hydrologic Conditions - Bell/Edmond Marsh



Winter Hydrologic Conditions - Hamer/McKay Marsh



Legend

- Groundwater Elevation
- Surface Water Elevation
- Beaver Dam

0 1200 2400
Horizontal Feet

0 20 40
Vertical Feet

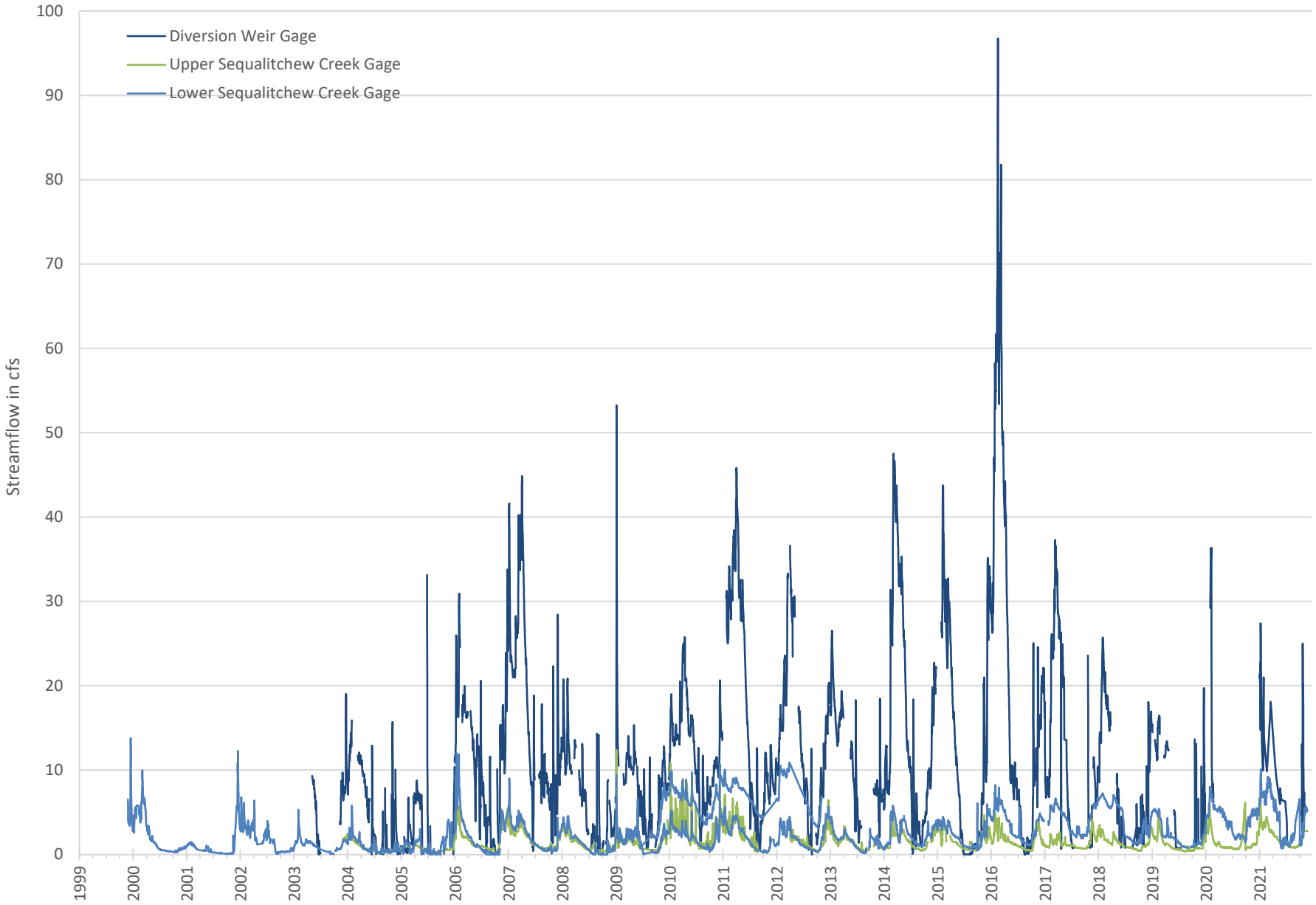
Notes: See Figure 6 for cross section locations.

Bell, McKay and Hamer Marsh Cross Sections - D-D' and E-E'

Earth and Water Resources Report
Pioneer Aggregates South Parcel Project
DuPont, Washington

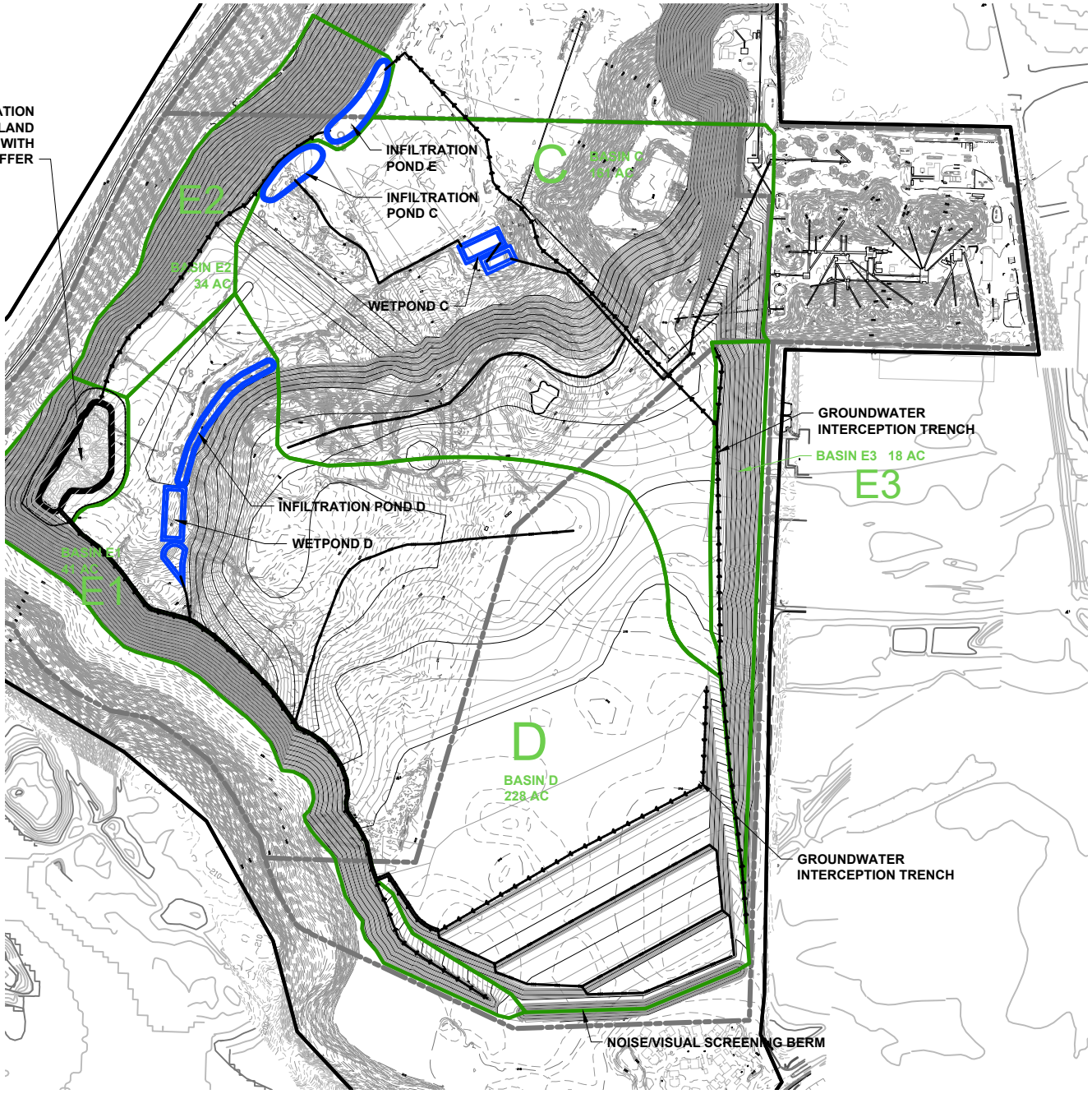
Aspect Consulting	Dec-2024	BY: OGR/SCC	FIGURE NO. 29
	PROJECT NO. 040001-I-018	REVISED BY: WBL	

CAD Path: Q:\CalPortland\040001 DuPont Hydrologic Study\2022-10 Earth and Water Resources Report\040001-08.dwg 28 Bell-McKay-Hamer Marsh Cross Sections - D-D' and E-E' || Date Saved: Dec 30, 2024 11:44pm || User: Willie.Longmire



Aspect Consulting
02/27/2022
S:\CalPortland\DuPont\South Parcel\Data\Flows\Flow Data Summary 3_v1.2.xlsm

Figure 30
Streamflow Hydrograph for Diversion Weir and Sequalitchew Creek
South Parcel Project



Legend

- Stormwater Management Facility
- Groundwater Interception Trench
- Drainage Ditch
- 8 — Location and Identifier of Soil Borings Used in Assessing Infiltration Rates
- A — Drainage Basin Label
- Drainage Basin Boundary

0 1000 2000 Feet

Proposed Drainage Basins and Stormwater Management Facilities

Pioneer Aggregates South Parcel Project
CalPortland
Dupont, Washington

Aspect CONSULTING	Feb-2022	BY: BMG/CMV	FIGURE NO. 31
	PROJECT NO. 040001	REVISED BY: -	

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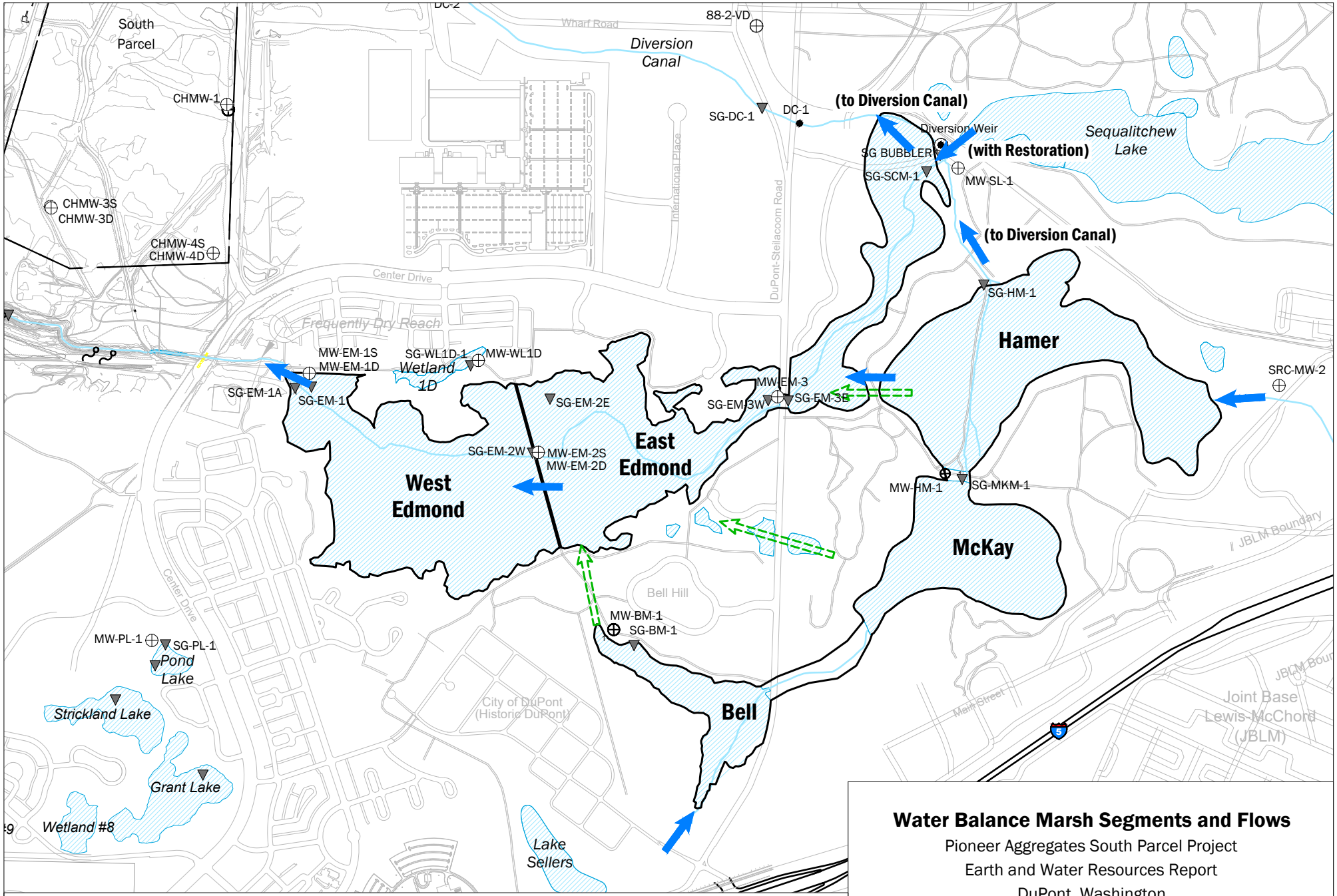


Water Balance Marsh Segments and Flows

Pioneer Aggregates South Parcel Project
Earth and Water Resources Report
DuPont, Washington

Aspect Consulting	Oct-2022	BY: OGR/SCC	FIGURE NO. 32
	PROJECT NO. 040001-I-018	REV BY: -	

CAD Path: Q:\CalPortland\040001 DuPont Hydrologic Study\2022-10 Earth and Water Resources Report\040001-03 Water Balance Marsh Segments and Flows.dwg 31 Water Balance Marsh Segments and Flows || Date Saved: Oct 26, 2022 12:18pm || User: scudd

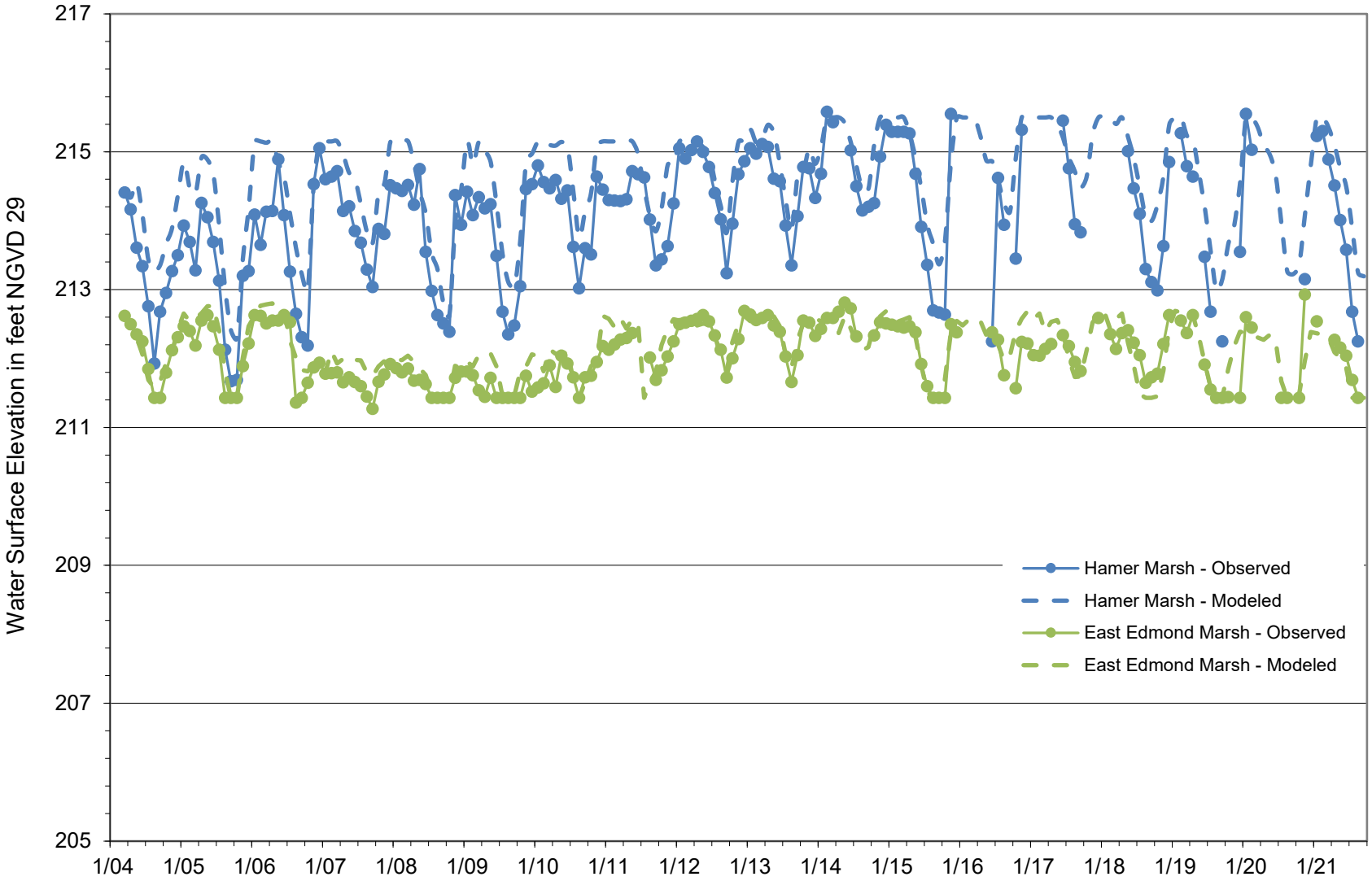


Figure 33

Water Balance Calibration for Hamer and East Edmond Marshes

Pioneer Aggregates South Parcel Project

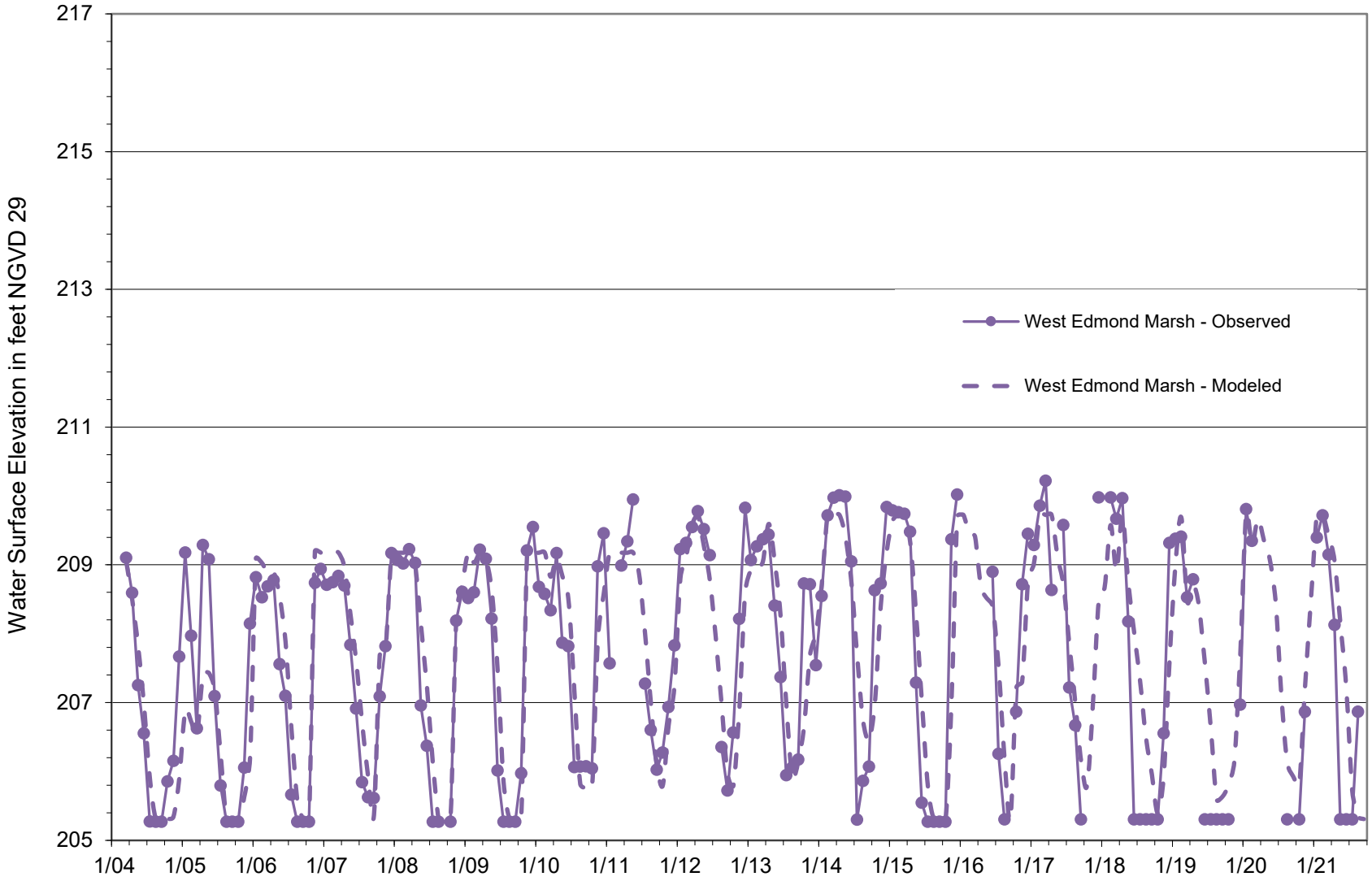
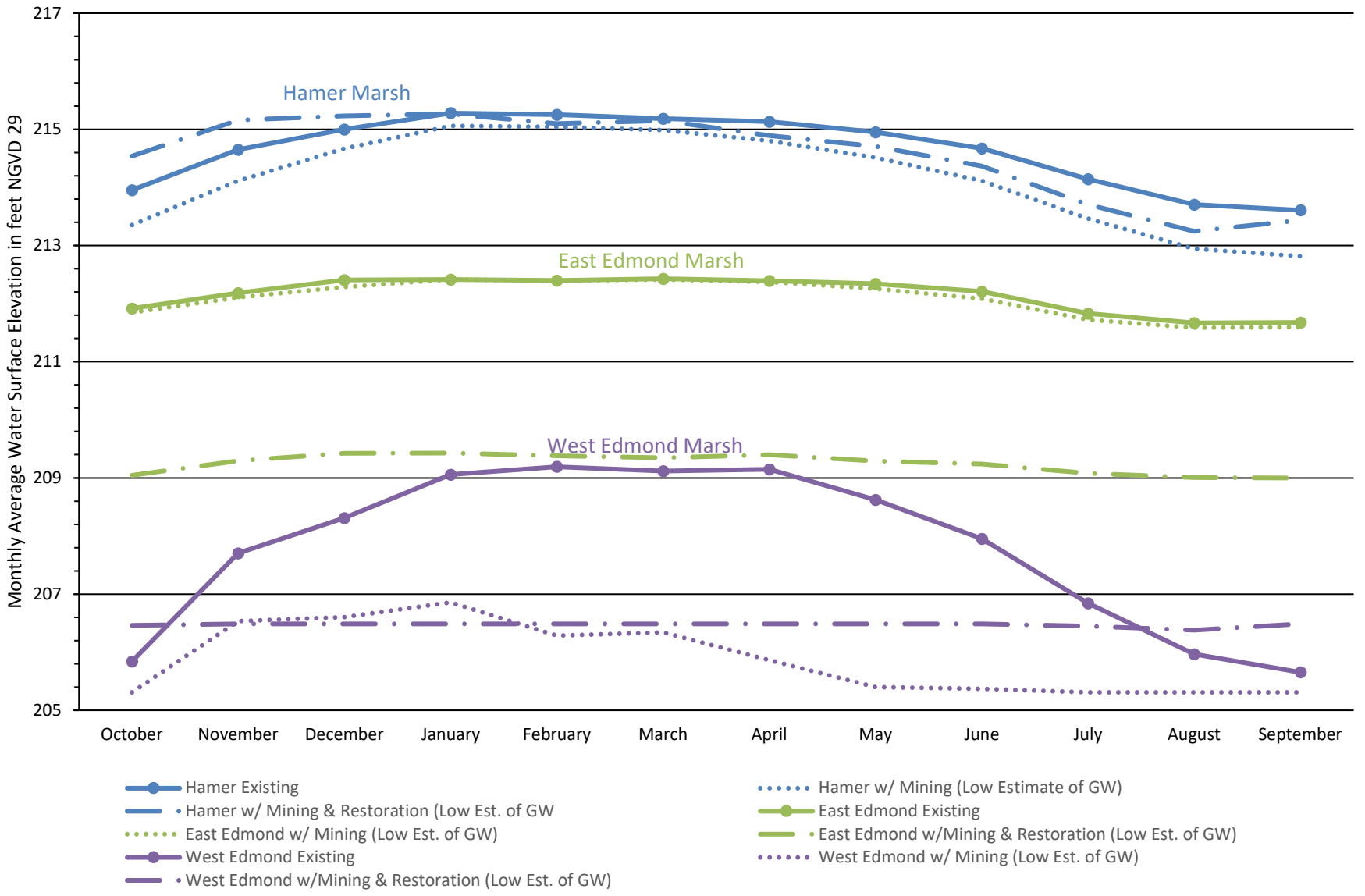


Figure 34

Water Balance Calibration for West Edmond Marsh Under Existing Conditions



Aspect Consulting
11/1/2022
S:\CalPortland\DuPont\South Parcel\Water Balance Analyses\Water Balance -2022 - Mining&Restoration.xlsm

Figure 35
Predicted Marsh Hydrographs with Mining and Restoration
Pioneer Aggregates South Parcel Project

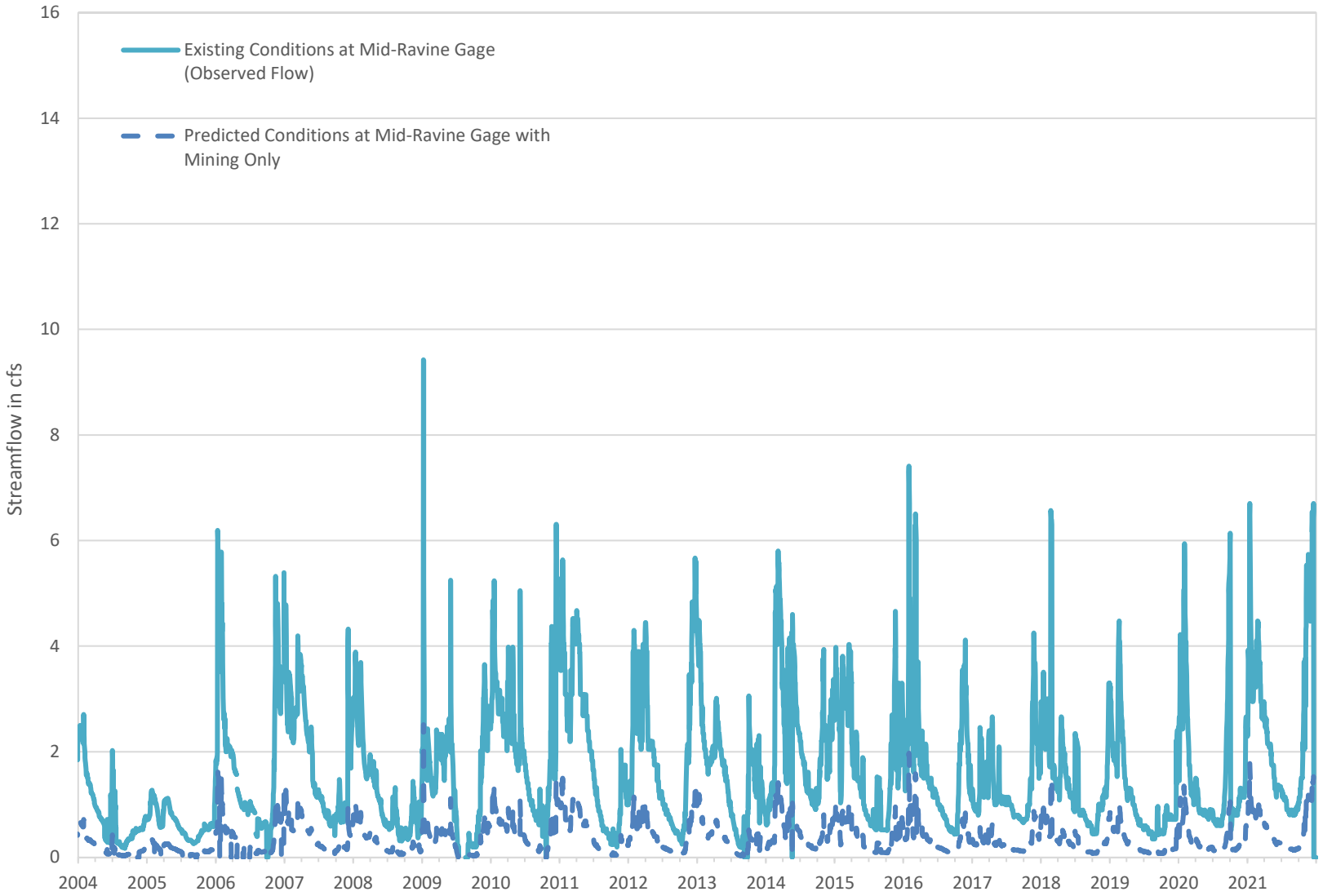


Figure 36

Predicted Streamflow Hydrograph for Sequalitchew Creek with Mining Only

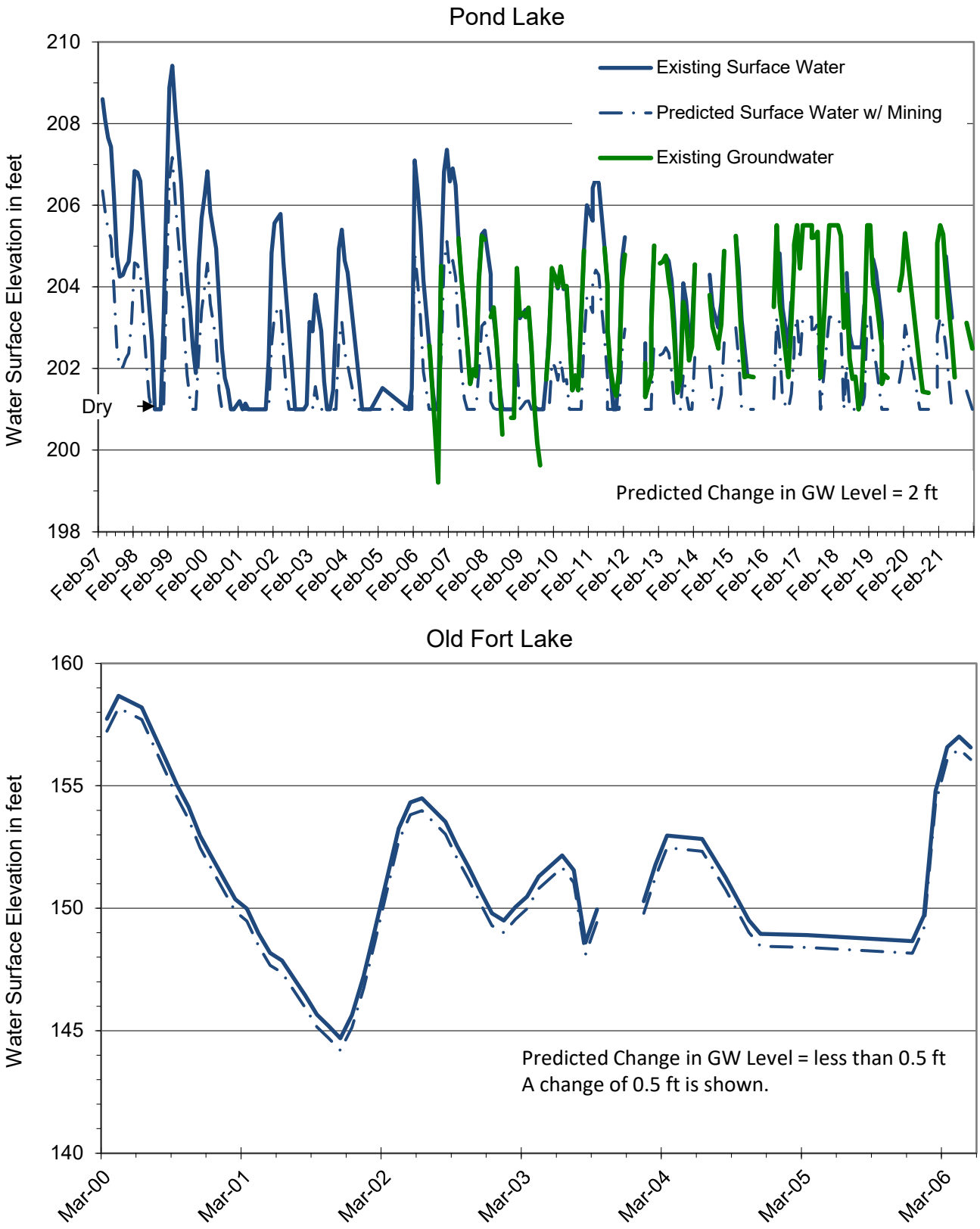


Figure 37

Predicted Hydrographs for Pond and Old Fort Lakes

Aspect Consulting
03/23/2022
S:\CalPortland\DuPont\South Parcel\Report Drafts\Earth and Water Resources Report 2021\Analysis\WetlandWLs.xlsx

Nisqually Reach

Joint Base Lewis-McChord

J: Ravine Habitat

H: City Hall Culvert
Replace the culvert near City Hall with one designed for fish passage

I: Center Drive Culvert
Evaluate and improve channel in culvert under Center Drive

G: Losing Reach
Monitor flow loss in losing reach Seal stream bed, if needed Restore channel structure and riparian vegetation

K: Lake Outlet Area - Part 2
Improve wetland habitat

C: Sequalitchew Lake Water Levels
Seasonally manage lake levels

Sequalitchew Lake

D: Lake Outlet Area - Part 1
Remove crossover culverts and reduce barriers to flow

Sequalitchew Creek

Homer Marsh

E: Hamer Marsh
Install weir in Hamer Marsh

B: Beavers
Install flexible levelers and beaver exclusion devices at multiple locations in Edmond Marsh

Old Fort Lake

West Edmond Marsh

East Edmond Marsh

E: Hamer Marsh
Replace the 12-inch culvert btwn Hamer and Edmond Marsh if water quality meets standards

B: Beavers
Install flexible levelers and beaver exclusion devices at multiple locations in Edmond Marsh

F: Railroad Trail Bridge
Replace portion of trail with pedestrian bridge

Bell Marsh

Definite Elements – core initial elements, well-defined and known

Contingent Elements -- specific additional information is necessary to design

Adaptive Management Elements– actions optional depending on conditions observed during restoration

Restored Flow Direction

Water Body

Joint Base Lewis - McChord Boundary

Notes:
1. Element numbering per Sequalitchew Creek Watershed Restoration Plan (2017).
2. Implementation of elements on JBLM will be permitted and led by JBLM.

N

0 1,300 2,600

Feet

Restoration Plan Elements

Earth and Water Resources Report
Pioneer Aggregates South Parcel Project
DuPont, Washington

Aspect CONSULTING	FEB-2022	BY: OR / SBM	FIGURE NO. 38
	PROJECT NO. 040001-I-018-02	REVISED BY: NLK	

Basemap Layer Credits || Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

GIS Path: G:\projects\Dupont\DuPont\DuPont\SouthParcel_040001\Delivered\Earth and Water Resources Report\28 Restoration Plan Elements.mxd || Coordinate System: NAD 1983 StatePlane Washington South FIPS 4602 Feet || Date Saved: 2/17/2022 || User: nkochie || Print Date: 2/17/2022

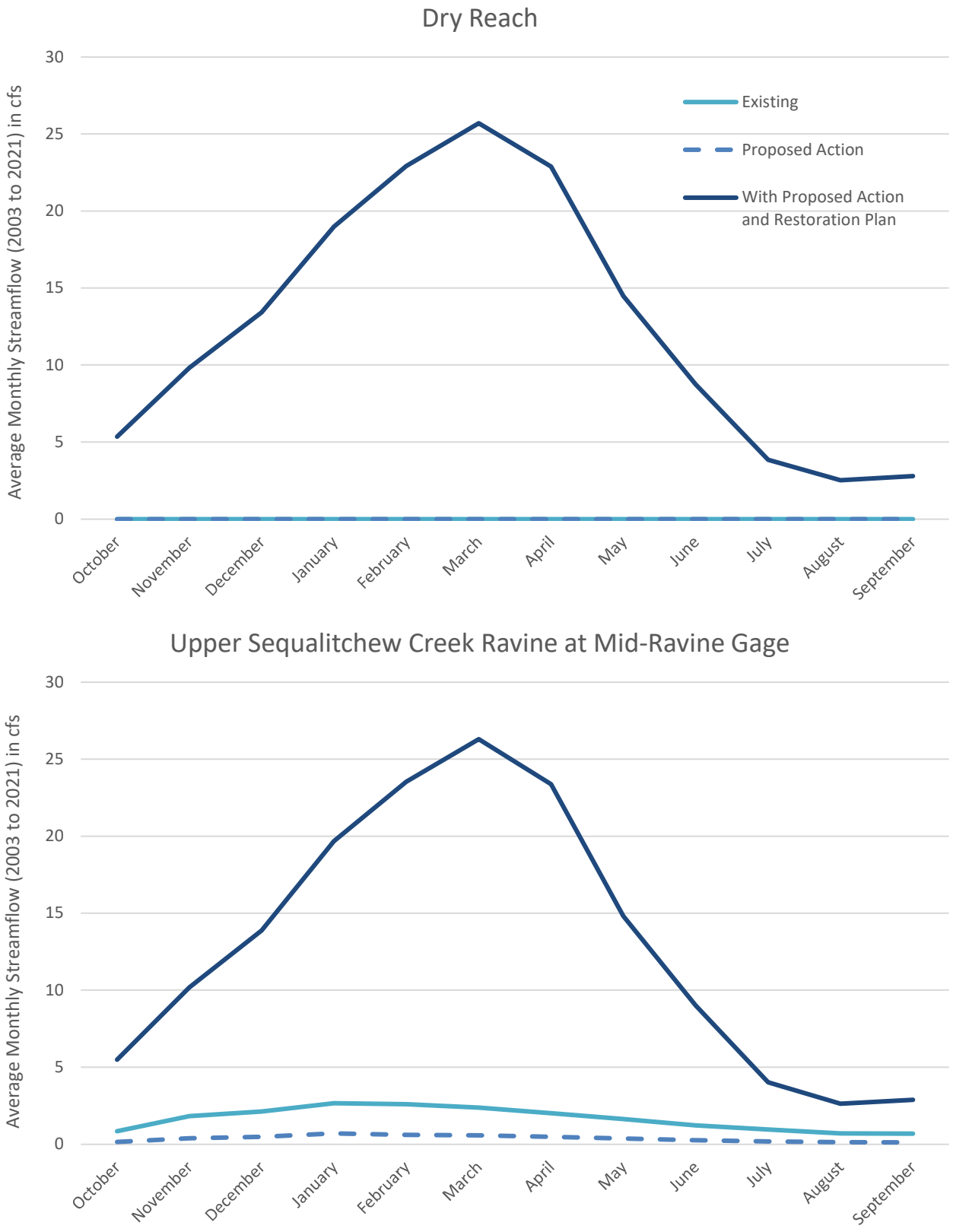


Figure 39
Predicted Streamflow Hydrograph for Sequalitchew Creek with Mining and Restoration

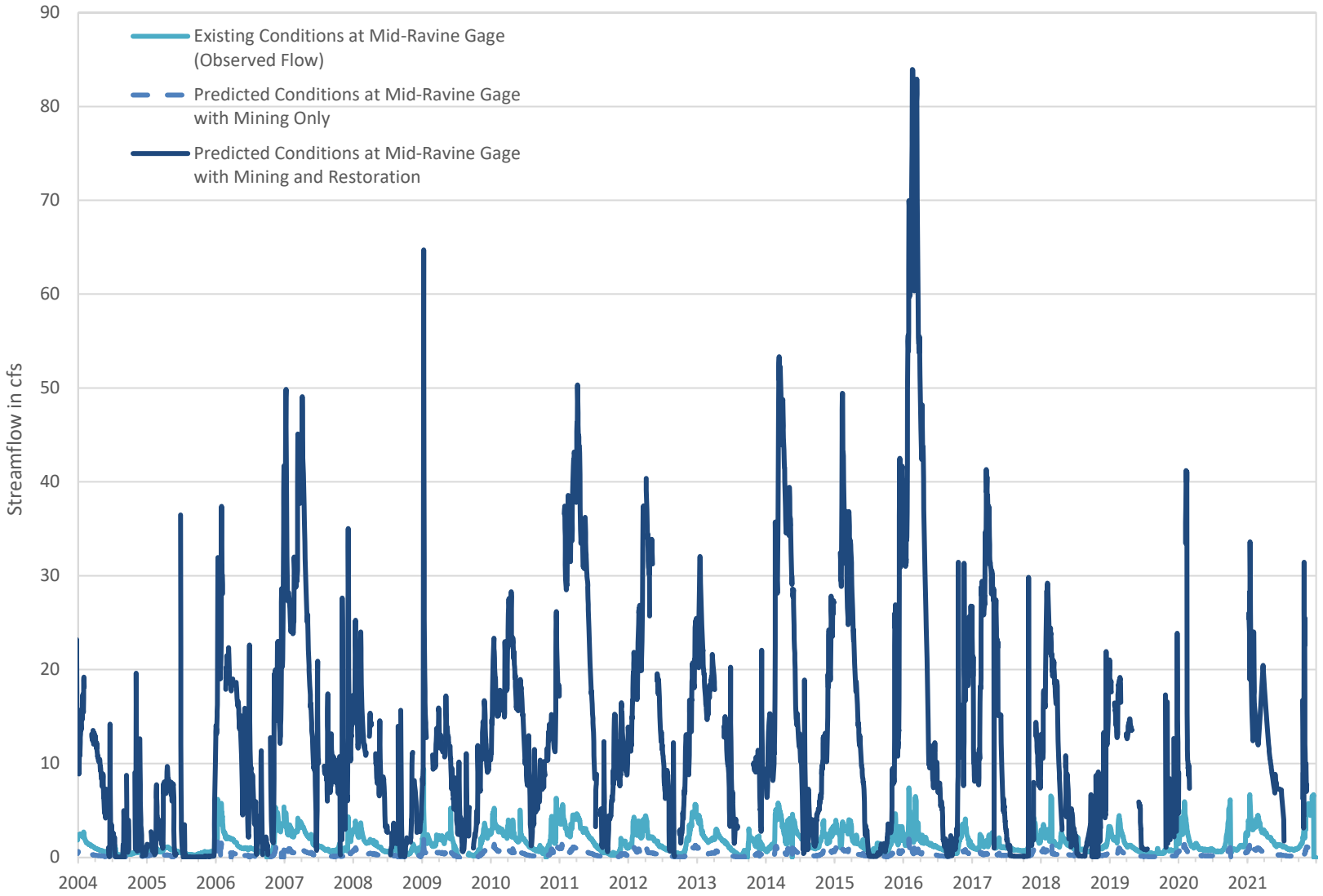
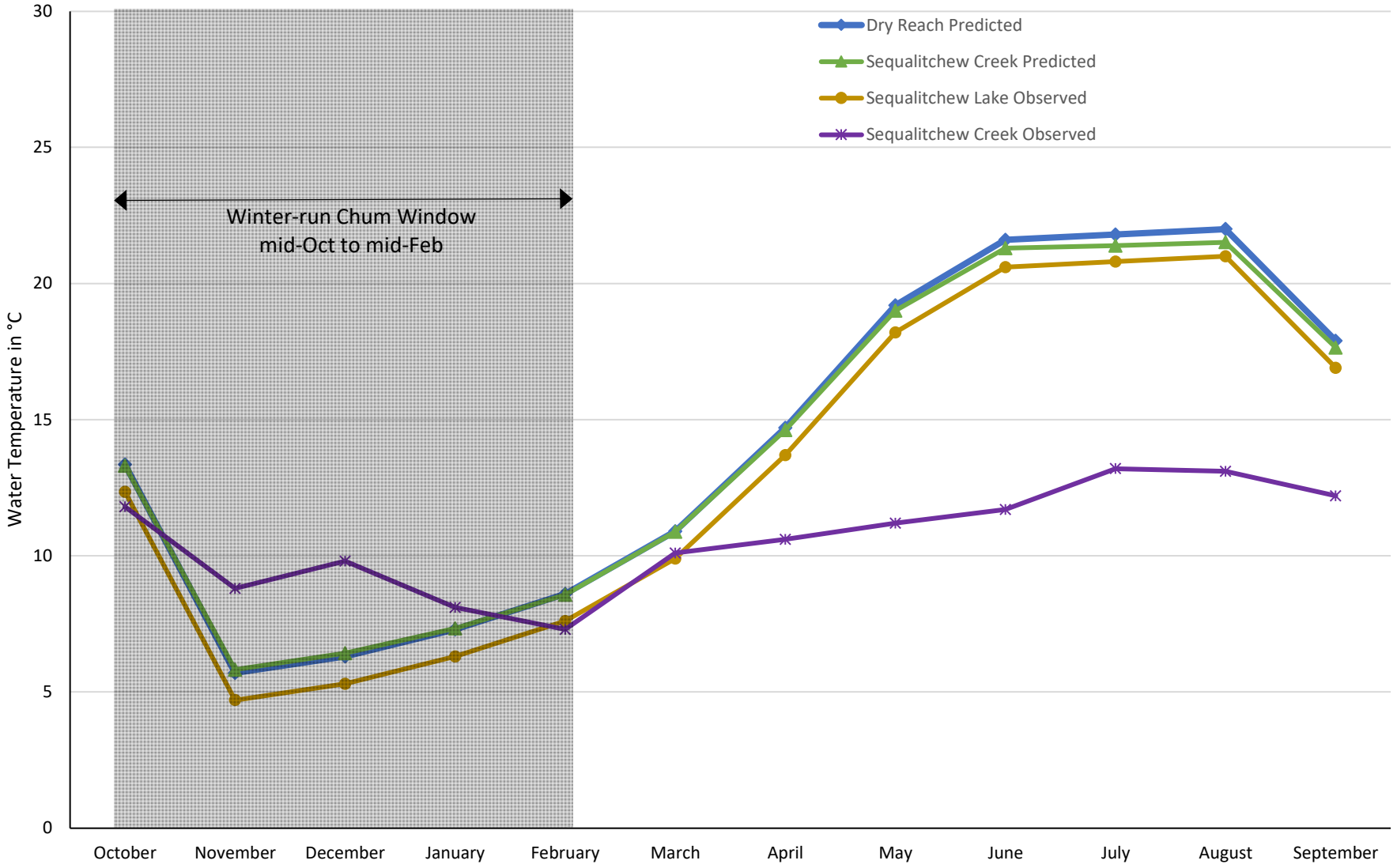


Figure 40

Predicted Streamflow Hydrograph for Sequalitchew Creek with Mining and Restoration



Aspect Consulting
10/28/2022
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Figure 41
Predicted Effects on Stream Temperature in Sequalitchew Creek
Pioneer Aggregates South Parcel Project

APPENDIX A

Select Boring Logs

Aspect consulting
IN-DEPTH PERSPECTIVE

Geologic & Monitoring Well Construction Log

Project Number	Well Number	Sheet
040001	BM-MW-1	1 of 1

Project Name: North Sequalitchew Creek
Location: DuPont, Washington
Drilling Method: Hollow Stem Auger - 4" ID ; Holt Drilling
Sampling Method: 3" Diameter D&M

Top of Casing Elev. (ft mllw): 232.32
Ground Surfave Elev. (ft): 229.37
Depth to Water (ft bgs): 12.5
Start Date: August 3, 2004
Finish Date: August 3, 2004

Depth feet	Well Construction	Tests\Remarks	Blows/ 6"	Sample ID	Mtl. Graphic	Description
1	5" diameter steel monument, cement seal 0'-1.5'					Brown, dry, GRAVEL, trace silt; gravel fine to coarse, predominantly coarse; abundant cobbles, subrounded to rounded (GW)
2						
3						(Road fill)
4	Natural Fill 1.5'-5'					
5		18"/4"	11	5-6.5		Brown to tan, moist sandy GRAVEL, trace silt; gravel fine to coarse, subrounded to rounded; sand predominantly medium to coarse.
6			12			
7			10			
8		18"/12"	4	7.5-9		Brown to reddish brown, moist, slightly gravelly SAND, trace silt; sand fine to coarse, predominantly medium; gravel fine, subangular to rounded (SP)
9	Bentonite Chips 5'-12'		10			
10			16			
11		18"/5"	9	10-11.5		Occasional coarse gravel and grades medium to coarse sand.
12		8/3/04	15			
13		18"/6"	19			
			8	12.5-14		Brown to red-brown, wet, gravelly SAND, trace silt; sand predominantly coarse; gravel fine to coarse, predominantly fine.
	10/20 silica sand filter pack 12'-26.5'		14			
15		18"/10"	15			
16			9	15-16.5		
17			10			
18		18"/8"	16			Yellowish-green to brown, highly oxidized, wet, slightly to trace silt; sandy GRAVEL; gravel fine to coarse; sand predominantly coarse (GW-GM)
19			5	17.5-19		Yellow brown, highly oxidized, wet, slightly gravelly SAND, trace silt; sand medium to coarse, predominantly coarse; gravel predominantly fine (SP)
20	20-slot screen 15'-25'; slip cap with SS screw 25'-25.3'	18"/12"	8			Grades to slightly silty and gravelly in shoe (SP-SM)
21			8			
22			9	20-21.5		Gray olive, wet, SAND; trace gravel; trace to no silt; sand predominantly medium to coarse (SP)
23		18"/14"	11			Gray green, wet, slightly silty to trace silt, sandy GRAVEL; gravel fine to coarse, subrounded to rounded; sand medium to coarse. (GP-GM)
24			13	22.5-24		Gray green, wet, SAND; sand medium (SP)
25		18"/3"	25			
26			24			Gray olive, wet, sandy GRAVEL, trace silt; gravel fine to coarse, sand predominantly medium to coarse (GP)
27			28	25-26.5		Gray olive, wet, slightly silty sandy GRAVEL; gravel fine to coarse; sand medium to coarse (GP-GM)
28			19			
29			17			Total depth = 25' drilled; 26.5' driven.

Sampler Type (ST):
- 3.25" OD D & M Split-Spoon Ring Sampler
- No Recovery
- 2" OD Split-Spoon Sampler

PID - Photoionization Detector
Water Level (ATD)
Static Water Level

Logged by: ILE
Approved by: LJH
Figure No. A- 1

APPENDIX B

MW_GEOL S CRK_SEQ CRK.GPJ November 23, 2004

CH2MHILL

Well Number: CHMW-1

Sheet: 1 of 1

Client: Glacier NW
Project: N Sequalitchew Creek Aquifer Tests
Location: DuPont, Washington
Project Number: 151973.A2.AT

Driller: Hokkaido Drilling (Bill & Steve)
Drilling Method: Speedstar 15 Truck-Mounted Air Rotary
Sampling Method: Sand pump (water added)
Logged by: driller
Start/Finish Date: 9/23/99 - 9/24/99

Depth (ft)	Sample Info: Sample #	Sample Info: STP (6"-6"-6")	Soil Log	Soil Description	Depth / Elev	Well Drawing	Well Construction Notes
-5					5		
					217		Monument (not shown)-- Lockable 6" steel protective casing in concrete.
0				Ground Surface			
				Topsoil	2		
5				Sand and gravel with silt, dry, brown	210		
10							Casing - 2" sch 40 PVC pipe
15							
20					22		
				Brown silty gravel	190		
25					26		
				Brown gravel, like till	186		
30					33		
				Brown silt	179		
35				Light brown gravel, productive water-bearing zone			
40							
45							
50							
55					57		
				Dark brown gravel and sand. Note no "soupy sand" like in CHTW-1.	155		
60							Casing Seal - Hydrated medium bent
65							
70							
75					76		Filter pack - 10-20 CSSI sand
				Dark brown sand and gravel	136		Screen - 2" sch 40 PVC, 0.020-in slot
80					82		
				Gray-blue silty sand, sand and gravel.	130		
85					85		6" end cap
					127		

CH2MHILL

PROJECT NUMBER : 151973.A1.AT

WELL NUMBER : CHMW-1

WELL CONSTRUCTION/BORING LOG

PROJECT : **LONE STAR, DUPONT** LOCATION : **50' S. OF CHTW-1**

WATER LEVELS : **21'6 3/4" ATD**

DRILLING METHOD/EQUIPMENT : **SPEEDSTAR 15 TRUCK-MOUNTED AIR ROTARY**

START : **9/23/99** END : **9/24/99** LOGGER: **HOKKAIDO(BILL&STEVE)**

DEPTH BELOW SURFACE (FT)	CORE DESCRIPTION/COMMENTS
0	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.
	0-2FT Topsoil
	2-22FT Sand/gravel w/silt (dry,brown)
5	
10	
15	
20	
	22-26FT Brown silty gravel
25	
	26-33FT Brown gravel (like till)
30	

CH2MHILL

PROJECT NUMBER : 151973.A1.AT	WELL NUMBER : CHMW-1 SHEET 2 OF 3

WELL CONSTRUCTION/BORING LOG

PROJECT : **LONE STAR, DUPONT** LOCATION : **50' S. OF CHTW-1**

WATER LEVELS : **21'6 3/4" ATD**

DRILLING METHOD/EQUIPMENT : **SPEEDSTAR 15 TRUCK-MOUNTED AIR ROTARY**

START : **9/23/99** END : **9/24/99** LOGGER: **HOKKAIDO(BILL&STEVE)**

DEPTH BELOW SURFACE (FT)	CORE DESCRIPTION/COMMENTS
	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.
	33-35FT Brown silt
35	35-57FT Lt.brown gravel, productive water-bearing zone
40	
45	
50	
55	
	57-59FT Dk.brown gravel & sand NOTE: No "soupy sand" at 50' like in CHTW
60	

CH2MHILL

PROJECT NUMBER : 151973.A1.AT	WELL NUMBER : CHMW-1 SHEET 3 OF 3

WELL CONSTRUCTION/BORING LOG

PROJECT : **LONE STAR, DUPONT** LOCATION : **50' S. OF CHTW-1**

WATER LEVELS : **21'6 3/4" ATD**

DRILLING METHOD/EQUIPMENT : **SPEEDSTAR 15 TRUCK-MOUNTED AIR ROTARY**

START : **9/23/99** END : **9/24/99** LOGGER: **HOKKAIDO(BILL&STEVE)**

DEPTH BELOW SURFACE (FT)	CORE DESCRIPTION/COMMENTS
	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.
65	
70	
75	
	76-82FT Dk.brown sand & gravel
80	
	82-83FT Gray silty sand & gravel
	83-85FT Blue sand & gravel
85	
	WELL: STICKUP=2' (2"sch 40 pvc) SCREEN=75'-84.5' (2"sch 40 pvc, 20-slot) 6" endcap 84.5 -85 fbgs ANNULUS=15 bags 10-20 cost sand (50lb. ea) 52 bags med. bentonite chips (50lbs ea) MONUMENT=6" steel protective casing in concrete
0	

CH2MHILL

Well Number: CHMW-2(D)

Sheet: 1 of 1

Client: Glacier NW
Project: N Sequalitchew Creek Aquifer Tests
Location: DuPont, Washington
Project Number: 151973.A2.AT

Driller: Hokkaido Drilling (Steve & Tom)
Drilling Method: Speedstar 15 & Star 71 Cable Tool
Sampling Method: Sand pump (water added)
Logged by: Driller
Start/Finish Date: 11/12/99 - 11/18/99

Depth (ft)	Sample Info: Sample #	Sample Info: STP (6"-6"-6")	Soil Log	Soil Description	Depth / Elev	Well Drawing	Well Construction Notes
-5					5 212		Monument (not shown): Lockable 6' steel protection casing in concrete
0				Ground Surface			
				Topsoil	4		
5				Brown silty gravel	203 9		
10				Brown gravel	198		Casing--2" sch 40 PVC pipe
15				Brown silty gravel, moist	15 192		
20					24		
25				Hard till, brown	[illegible]		
				Loose sand and gravel, water	181		
30							Casing Seal--Hydrated medium bentc
35				Brown till	35 172		
40							
45					48		
50				Loose sand and gravel, water	159		
55					58		
60				Brown silt bound sand and gravel, tight	149		
65					66		Screen - 2" sch 40 PVC, 0.020-in slot with centralizer
				no record	141		
70					73		6" end cap
75				End of Log	134		

CH2MHILL

PROJECT NUMBER : 151973.A1.AT	WELL NUMBER : CHMW-2(D) SHEET 1 OF 3

WELL CONSTRUCTION/BORING LOG

TOC elev = 209 Stickup = 1.8 grd = 207.2

PROJECT : **LONE STAR, DUPONT** LOCATION : **50' N. OF TW-2**

WATER LEVELS :

DRILLING METHOD/EQUIPMENT: **SPEEDSTAR 15, 8" STEEL CASING(TO58") &STAR 71 CABLE TOOL, 8" CASING**

START : **11/12/99** END : **11/18/99** LOGGER: **HOKKAIDO(STEVE & TOM)**

DEPTH BELOW SURFACE (FT)	CORE DESCRIPTION/COMMENTS
0	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.
	0-4FT Dark brown topsoil
	4-9FT Brown silty gravel
5	
	9-15FT Brown gravel
10	
	15-24FT Brown, silty gravel, moist
15	
20	
25	24-26FT Hard till, brown
	26-35FT Loose sand & gravel H20
30	

CH2MHILL

PROJECT NUMBER : 151973.A1.AT	WELL NUMBER : CHMW-2(D)
	SHEET 2 OF 3

WELL CONSTRUCTION/BORING LOG

PROJECT : **LONE STAR, DUPONT** LOCATION : **50' N. OF TW-2**

WATER LEVELS :

DRILLING METHOD/EQUIPMENT: **SPEEDSTAR 15, 8" STEEL CASING(TO58") &STAR 71 CABLE TOOL, 8" CASING**

START : **11/12/99** END : **11/18/99** LOGGER: **HOKKAIDO(STEVE & TOM)**

DEPTH BELOW SURFACE (FT)	CORE DESCRIPTION/COMMENTS
	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.
35	35-48FT Brown till
40	
45	
50	48-58FT Loose sand & gravel H20
55	
60	58-66FT Brown light Silt Bound sand & gravel

CH2MHILL

PROJECT NUMBER : 151973.A1.AT	WELL NUMBER : CHMW-2(D) SHEET 3 OF 3

WELL CONSTRUCTION/BORING LOG

PROJECT : **LONE STAR, DUPONT** LOCATION : **50' N. OF TW-2**

WATER LEVELS :

DRILLING METHOD/EQUIPMENT: **SPEEDSTAR 15, 8" STEEL CASING(TO58") &STAR 71 CABLE TOOL, 8" CASING**

START : **11/12/99** END : **11/18/99** LOGGER: **HOKKAIDO(STEVE & TOM)**

DEPTH BELOW SURFACE (FT)	CORE DESCRIPTION/COMMENTS
	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.
65	66-73FT NO RECORD
	Total Casing=72'-41/4"
	Well:
70	Stickup=2' (2"sch 40 pvc) w/j plug Screen= 63'-721/2' bgs (2" sch 40 pvc, 20-slot) w/centralizer 6"end cap 721/2-73 fbgs Annulus=13 50-lb bags 10-20 cssi sand 34 50-lb bags medium bentonite chips Monument= 6" steel protectivecasing in concrete
75	
80	
85	
90	

CH2MHILL

Well Number: CHMW-2(S)

Sheet: 1 of 1

Client: Glacier NW
Project: N Sequalitchew Creek Aquifer Tests
Location: DuPont, Washington
Project Number: 151973.A2.AT

Driller: Hokkaido Drilling (Daryl & Tom)
Drilling Method: Star 71 cable tool, 8" steel casing
Sampling Method: Sand pump (water added)
Logged by: driller
Start/Finish Date: 11/17/99 - 11/19/99

Depth (ft)	Sample Info: Sample #	Sample Info: STP (6"-6"-6")	Soil Log	Soil Description	Depth / Elev	Well Drawing	Well Construction Notes
-5					5 212		Monument (not shown)-- Lockable 6" steel protection casing in concrete.
0				Ground Surface Topsoil and gravel	3		
5				Brown silty sand and gravel	204		
10							Casing - 2" sch. 40 PVC pipe
15							Casing seal - Hydrated medium bentc
20					21		
25				Larger gravel and sand, slightly silty, very hard	186 26		
30				Brown silty sand, gravel Sandier with gravel	181		Sandy filterpack - 10-20 CSSI sand
35					36		
40				Clean sand and gravel, water	171		Screen - 2 centralizers, 2" sch 40 PV(0.020-inch slot width
45					43		6" end cap
50				End of Log	164		

CH2MHILL

PROJECT NUMBER : 151973.A1.AT	WELL NUMBER : CHMW-2(S)
	SHEET 1 OF 2

WELL CONSTRUCTION/BORING LOG

TOC elev = 209.39 Stickup = 1.45
grd = 207.94

PROJECT : **LONE STAR, DUPONT** LOCATION : **50' N. OF TW-2(~15FT E.OF MW-2(D)**

WATER LEVELS :

DRILLING METHOD/EQUIPMENT: **STAR 71 CABLE TOOL, 8" STEEL CASING**

START : **11/17/99** END : **11/19/99** LOGGER: **HOKKAIDO(DARYL & TOM)**

DEPTH BELOW SURFACE (FT)	CORE DESCRIPTION/COMMENTS
0	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.
	0-3FT Topsoil & gravels
	3-21FT Brown silty sand and gravels
5	
10	
15	
20	
	21-26FT Larger gravels & sand slightly silty, very hard
25	
	26-27FT Brown silty sand & gravel
	27-28FT Sandier w/gravel (gravel smaller)
30	

CH2MHILL

PROJECT NUMBER : 151973.A1.AT	WELL NUMBER : CHMW-2(S) SHEET 2 OF 2

WELL CONSTRUCTION/BORING LOG

PROJECT : **LONE STAR, DUPONT** LOCATION : **50' N. OF TW-2(~15FT E.OF MW-2(D)**

WATER LEVELS :

DRILLING METHOD/EQUIPMENT: **STAR 71 CABLE TOOL, 8" STEEL CASING**

START : **11/17/99** END : **11/19/99** LOGGER: **HOKKAIDO(DARYL & TOM)**

DEPTH BELOW SURFACE (FT)	CORE DESCRIPTION/COMMENTS
	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.
35	36-43FT Clean sand & gravel w/H20 Total casing=46'-81/2" Well: Stickup=2' (2" sch 40 pvc) w/j-plug Screen=33'-421/2' bgs w/2 centralizers & 6' end (2"sch 40 pvc, 20-slot) Annulus=13 50-lb bags 10-20 cgsi sand 18 50-lb bags medium bentonite chips Monument= 6"steel protecting casing in concrete (7 bags)
40	
45	
50	
55	
60	

CH2MHILL

Well Number: CHMW-3(D)

Sheet: 1 of 1

Client: Glacier NW
Project: N Sequalitchew Creek Aquifer Tests
Location: DuPont, Washington
Project Number: 151973.A2.AT

Driller: Hokkaido Drilling (Steve)
Drilling Method: Speedstar 15 Air Rotary Drill Rig
Sampling Method: Sand pump (water added)
Logged by: driller
Start/Finish Date: 11/4/99 - 11/5/99

Depth (ft)	Sample Info: Sample #	Sample Info: STP (6"-6"-6")	Soil Log	Soil Description	Depth / Elev	Well Drawing	Well Construction Notes
-5					5		Monument (not shown): Lockable 6" steel protective casing in concrete
					221		
0				Ground Surface			
				Brown topsoil	2		
5				Loose brown gravel	214		
10							Casing - 2" sch 40 PVC pipe
15					16		
				Brown silty sand and gravel	200		
20							
25					26		
				Brown silty sand and gravel (moist)	190		Casing seal - hydrated medium bento
30					31		
				Brown sand and gravel, dirty, water	185		
35							
40					41		
				Brown till	175		
45							
					48		
50				Sand and gravel, water	168		
					54		
55				Brown till	162		
				Silt, sand and gravel, brown, wet			
60							
					64		
65				Clean sand and gravel	152		
70							
							Filter pack - 10-20 CSSI sand
75							Screen - 2" sch 40 PVC, 0.020-in slot
80							
					85		6" end cap
85				End of Log	131		
90							

CH2MHILL

Well Number: CHMW-3(S)

Sheet: 1 of 1

Client: Glacier NW
Project: N Sequalitchew Creek Aquifer Tests
Location: DuPont, Washington
Project Number: 151973.A2.AT

Driller: Hokkaido Drilling (Steve)
Drilling Method: Speedstar 15 Air Rotary Drill Rig
Sampling Method: Sand pump (water added)
Logged by: driller
Start/Finish Date: 11/5/99

Depth (ft)	Sample Info: Sample #	Sample Info: STP (6"-6"-6")	Soil Log	Soil Description	Depth / Elev	Well Drawing	Well Construction Notes
-5					5 / 221		Monument (not shown): Lockable 6" steel protection casing in concrete
0				Ground Surface			
				Brown topsoil	2		
				Loose gravel	214		
5							Casing - 2" sch 40 PVC pipe
10							
15					16		Casing seal - Hydrated medium bentc
				Silty brown sand and gravel	200		
20							
25					26		
				Moist silty brown sand and gravel	190		Filter pack - 10-30 CSSI sand
30					31		Screen - 2" sch 40 PVC, 0.020-in slot
				Clean sand and gravel, water	185		
35							
40					40		6" end cap
				End of Log	176		
45							

CH2MHILL

Well Number: CHMW-4(D)

Sheet: 1 of 1

Client: Glacier NW
Project: N Sequalitchew Creek Aquifer Tests
Location: DuPont, Washington
Project Number: 151973.A2.AT

Driller: Hokkaido Drilling (Steve)
Drilling Method: air rotary
Sampling Method: Sand pump (water added)
Logged by: diller
Start/Finish Date: 11/11/99

Depth (ft)	Sample info: Sample #	Sample info: STP (6"-6"-6")	Soil Log	Soil Description	Depth / Elev	Well Drawing	Well Construction Notes
-5					5 / 219		
0				Ground Surface			
				Topsoil	2		
5				Brown gravel	212		Monument: Lockable 6" steel protective casing in concrete
10							
15					15		
				Brown till	199		
20							
25							Casing - 2" sch 40 PVC pipe
30							
					34		
35				Sand, gravel, making water	180		Casing seal - hydrated medium bento
40							
45							
					48		
50				Brown till	166		
					53		
55				Sand, gravel, making water	161		
60							
65					66		
				Brownish orange silty gravel	148		
70				Sand, gravel, water			
75							Filter pack - 10-20 CSSI sand
							Screen - 2" sch 40 PVC, 0.020-in slot
80							
					85		6" end cap
85					129		

CH2MHILL

Well Number: CHMW-4(S)

Sheet: 1 of 1

Client: Glacier NW
Project: N Sequalitchew Creek Aquifer Tests
Location: DuPont, Washington
Project Number: 151973.A2.AT

Driller: Hokkaido Drilling (Steve)
Drilling Method: air rotary
Sampling Method: Sand pump (water added)
Logged by: driller
Start/Finish Date: 11/23/99

Depth (ft)	Sample Info: Sample #	Sample Info: STP (6"-6"-6")	Soil Log	Soil Description	Depth / Elev	Well Drawing	Well Construction Notes
-5					5 219		Monument (not shown): Lockable 6" steel protective casing
0				Ground Surface Topsoil with large gravel	3		
5				Brown silty sand and gravel	211		
10					11		Casing - 2" sch 40 pvc pipe w/ j-plug
				Brown silty sand and large boulders	203		
15					15		Casing seal - hydrated medium bento
				Sand and gravel with water	199 17		
				Brown silt with gravel	197		
20							
25							Filterpack - 10-20 CSSI sand
							Screen - 2" sch 40 pvc, 0.020-in slot v
30							
35							
					37		6" end cap
				End of Log	177		
40							

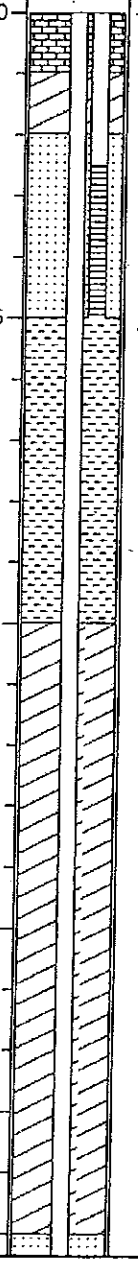
CH2MHILL

PROJECT NUMBER: 151973.A4.WL BORING NUMBER: EM-1
Sheet: 1 of 2

SOIL BORING LOG

GS elev = 207.3

PROJECT: N. Sequalitchew Creek Wetland **LOCATION:** ~100' S. of Edmond Marsh Trail
ELEVATION: **DRILLING CONTRACTOR:** Cascade Drilling
DRILLING METHOD AND EQUIPMENT: CME 75 nodwell track rig, HSA, Dames & Moore, 140lb hammer
WATER LEVELS: See log **START:** 12/11/02 1544 **FINISH:** 12/11/02 1620 **LOGGER:** S. McGinnis

DEPTH BELOW GROUND SURFACE	WELL INSTALLATION	SAMPLE TYPE	SAMPLE RECOVERY (IN)	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION
0					Ground Surface	Drilled down to 24 feet bgs before first sample. Two piezometers installed in one monument. EM-1(S) is the shallow piezometer, and EM-1(D) is the deep piezometer 4': Driller states in gravel and a little water 12': Sounded gravelley to 14' while drilling, rig stopped in gravel 14': Loaded hole with water 14-16': Gravelly, smoother drilling below 16' 17': Driller states cobbles about 4" in diameter, then smaller sized gravels below 17' 17-24': Smooth drilling, loaded hole with water
5						
10						
15						
20						

CH2MHILL

PROJECT NUMBER: 151973.A4.WL BORING NUMBER: EM-1
Sheet: 2 of 2

SOIL BORING LOG

PROJECT: N. Sequalitchew Creek Wetland **LOCATION:** ~100' S. of Edmond Marsh Trail
ELEVATION: **DRILLING CONTRACTOR:** Cascade Drilling
DRILLING METHOD AND EQUIPMENT: CME 75 nodwell track rig, HSA, Dames & Moore, 140lb hammer
WATER LEVELS: See log **START:** 12/11/02 1544 **FINISH:** 12/11/02 1620 **LOGGER:** S. McGinnis

DEPTH BELOW GROUND SURFACE	WELL INSTALLATION	SAMPLE TYPE	SAMPLE RECOVERY (IN)	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION
25		DM	12	16-20-25 (45)	POORLY GRADED SAND WITH GRAVEL (SP) Gray, wet, medium dense, fine to medium grained sand, fine to coarse round to subround gravel, est. 15-20% gravel	
		DM	0	39-50/4" (50/4")	POORLY GRADED SAND WITH GRAVEL (SP) -similar to above but fine to medium gravel	Bottom of boring at 33.5' at 1620 on 12/11/02.
30		DM	12	34-35-35 (70)	No recovery -Slough	Measured groundwater at 6.10' (EM-1(S)) and 7.47' (EM-1 (D)) below top of steel on 12/11/02
		DM	6	50/6" (50/6")	POORLY GRADED SAND WITH SILT AND GRAVEL (SP-SM) Gray, wet, very dense, fine to medium grained sand, fine to coarse gravel, gets siltier toward bottom of sample, grades to SILTY SAND WITH GRAVEL (SM) at 32' Gray, wet, very dense, fine to medium grained sand, fine to medium round to subround gravel, est. 10-20% silt, 20-25% gravel	Piezometer Construction (EM-1(S) and EM-1(D)) +3.65-0' Steel riser, locking monument 3.xx-2.5' Blank PVC (EM-1(S)) 3.xx-22' Blank PVC (EM-1(D)) 0-1' Concrete 1-2' Bentonite chips 2-5' Lapis Lustre 2/12 silica sand 2.5-5' 0.020 machine slot screen and cap (EM-1(S)) 5-10' Cuttings 10-20' Bentonite chips 20-33.5' Lapis Lustre 2/12 silica sand 22-32' 0.020 machine slot screen and cap (EM-1(D)) Note: Both piezometers are in one steel, riser monument
35					BOTTOM OF BORING	
40						

CH2MHILL

PROJECT NUMBER: 151973.A4.WL BORING NUMBER: EM-1A
Sheet: 1 of 5

SOIL BORING LOG

PROJECT: N. Sequalitchew Creek Wetland **LOCATION:** ~100' S. of Edmond Marsh Trail
ELEVATION: **DRILLING CONTRACTOR:** Cascade Drilling
DRILLING METHOD AND EQUIPMENT: CME 75 nodwell track rig, HSA, Dames & Moore, 140lb hammer
WATER LEVELS: See log **START:** 12/11/02 **FINISH:** 12/11/02 **LOGGER:** S. McGinnis

DEPTH BELOW GROUND SURFACE	WELL INSTALLATION	SAMPLE TYPE	SAMPLE RECOVERY (IN)	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION
0					Ground Surface	
		DM	18	1/12"-1/6" (2)	ORGANICS Dark brown, moist, very soft	
		DM	18	5-7-12 (19)	PEAT (PT) Dark brown, moist, very soft, fiberous	
		DM	8	43-40-40 (80)	SANDY SILTY GRAVEL (SM) Light brown, wet, loose, fine to coarse grained sand, coarse round to subround gravel	3': Driller states in gravel and a little water
5		DM	8	35-37-39 (76)	PEAT (PT) Dark brown, moist, very soft, fiberous, trace gravel mixed in	4.5': Sampler very wet, large gravel/small cobble jammed in shoe
					SANDY SILTY GRAVEL (GM) -Similar to above, light brown, wet, dense, fine to coarse grained sand, coarse round to subround gravel	6': Drilled in gravel from 4.5-6'.
					SILTY SAND WITH GRAVEL (SM) Gray, wet, dense, fine to coarse grained sand, fine to coarse round to subround gravel, trace round cobbles (TILL-LIKE)	
10		DM	10	28-35-39 (74)	SILTY GRAVEL WITH SAND (SM) Gray, wet, dense, fine to coarse gravel, fine to coarse grained sand, est. 30% silt, 20% sand (TILL-LIKE) In shoe: SANDY SILT (ML) Gray, moist, hard, fine to medium grained sand, est. 20-30% sand	
15		DM	12	42-35-38 (73) ?	SANDY WELL GRADED GRAVEL WITH SILT (GW-GM) Gray, wet, medium dense, fine to coarse round to subround gravel, fine to coarse sand, est. 30% sand, 10-15% fines	14': Sampler wet 17': Driller states not as much rock, large gravel 19': Water poured out of sampler 19.5': Measured groundwater through augers at 1406 on 12/11/02. Augers may be acting as a barrier.
20		DM	4	21-25-27 (52)		

PT
Qvl
Qvr
dense
med. dense

CH2MHILL

PROJECT NUMBER: 151973.A4.WL BORING NUMBER: EM-1A
Sheet: 2 of 5

SOIL BORING LOG

PROJECT: N. Sequalitchew Creek Wetland **LOCATION:** ~100' S. of Edmond Marsh Trail
ELEVATION: **DRILLING CONTRACTOR:** Cascade Drilling
DRILLING METHOD AND EQUIPMENT: CME 75 nodwell track rig, HSA, Dames & Moore, 140lb hammer
WATER LEVELS: See log **START:** 12/11/02 **FINISH:** 12/11/02 **LOGGER:** S. McGinnis

DEPTH BELOW GROUND SURFACE	WELL INSTALLATION	SAMPLE TYPE	SAMPLE RECOVERY (IN)	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION
					GRAVELLY SAND (SW) Gray, wet, medium dense, fine to coarse grained sand, fine to coarse round to subround gravel, est. 30-40% gravel	
25		DM	10	42-33-30 (63)	POORLY GRADED SAND WITH GRAVEL (SP Gray, wet, medium dense, fine to medium grained sand, fine to coarse round to subround gravel, trace fine cobbles, est. 15-20% gravel	
30		DM	12	24-35-38 (73)	WELL GRADED SAND WITH GRAVEL (SW) Gray, wet, medium dense, fine to coarse grained sand, fine to medium round to subround gravel, trace fines, increased fines toward bottom of sampler, est. 20-30% gravel	
35		DM	6	50/6" (50/6")	POORLY GRADED SAND WITH SILT AND GRAVEL TO SILTY SAND WITH GRAVEL (SP-SM/SM) Gray, wet, very dense, fine to medium grained sand, fine to medium round to subround gravel, est. 10-20% fines, 20-25% gravel (TILL??)	34': Driller states back into a few cobbles
40		DM	4	50/4" (50/4")		

Bottom of Boring

CH2MHILL

PROJECT NUMBER: 151973.A4.WL BORING NUMBER: EM-1A
Sheet: 3 of 5

SOIL BORING LOG

PROJECT: N. Sequalitchew Creek Wetland **LOCATION:** ~100' S. of Edmond Marsh Trail
ELEVATION: **DRILLING CONTRACTOR:** Cascade Drilling
DRILLING METHOD AND EQUIPMENT: CME 75 nodwell track rig, HSA, Dames & Moore, 140lb hammer
WATER LEVELS: See log **START:** 12/11/02 **FINISH:** 12/11/02 **LOGGER:** S. McGinnis

DEPTH BELOW GROUND SURFACE	WELL INSTALLATION	SAMPLE TYPE	SAMPLE RECOVERY (IN)	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION
					POORLY GRADED SAND WITH SILT AND GRAVEL (SP-SM) Gray, wet, very dense, fine to medium grained sand, fine to coarse round to subround gravel, est. 10% fines, 10-15% gravel	
45		DM	4	50/5" (50/5")	POORLY GRADED SAND (SP) Gray, wet, very dense, fine to medium grained sand, trace fines	
50		DM	4	50/4" (50/4")	GRAVELLY WELL GRADED SAND WITH SILT (SW-SM) Gray, wet, very dense, fine to coarse round to subround gravel, est. 5-10% fines, 30-40% gravel	
55		DM	6	50/6" (50/6")	POORLY GRADED SAND (SP) Gray, wet, very dense, fine to medium grained sand	
60		DM	6	50/6" (50/6")		59': Driller states a little more gravel

CH2MHILL

PROJECT NUMBER: 151973.A4.WL BORING NUMBER: EM-1A
Sheet: 4 of 5

SOIL BORING LOG

PROJECT: N. Sequalitchew Creek Wetland **LOCATION:** ~100' S. of Edmond Marsh Trail
ELEVATION: **DRILLING CONTRACTOR:** Cascade Drilling
DRILLING METHOD AND EQUIPMENT: CME 75 nodwell track rig, HSA, Dames & Moore, 140lb hammer
WATER LEVELS: See log **START:** 12/11/02 **FINISH:** 12/11/02 **LOGGER:** S. McGinnis

DEPTH BELOW GROUND SURFACE	WELL INSTALLATION	SAMPLE TYPE	SAMPLE RECOVERY (IN)	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION
					POORLY GRADED SAND WITH SILT AND GRAVEL (SP-SM) Gray, wet, very dense, fine to medium grained sand, fine to medium round to subround gravel, est. 10-15% fines, 5-10% gravel	
65		DM	5	50/5" (50/5")	WELL GRADED SAND WITH GRAVEL TO WELL GRADED SAND WITH SILT AND GRAVEL (SW/SW-SM) Gray, wet, very dense, fine to coarse grained sand, fine to medium round to subround gravel, est. 5-10% fines, 20-30% gravel	
70		DM	5	50/5" (50/5")	POORLY GRADED SAND (SP) Gray, wet, very dense, medium to coarse grained round to subround sand, fine to medium round to subround gravel, est. <5% fines, 5-10% gravel	
75		DM	6	50/6" (50/6")	WELL GRADED SAND WITH GRAVEL TO WELL GRADED SAND WITH SILT AND GRAVEL (SW/SW-SM) Gray, wet, very dense, fine to coarse grained sand, fine round to subround gravel, est. 5-10% fines, 10-15% gravel	
80		DM	5	50/5" (50/5")		

CH2MHILL

PROJECT NUMBER: 151973.A4.WL BORING NUMBER: EM-1A
Sheet: 5 of 5

SOIL BORING LOG

PROJECT: N. Sequalitchew Creek Wetland **LOCATION:** ~100' S. of Edmond Marsh Trail
ELEVATION: **DRILLING CONTRACTOR:** Cascade Drilling
DRILLING METHOD AND EQUIPMENT: CME 75 nodwell track rig, HSA, Dames & Moore, 140lb hammer
WATER LEVELS: See log **START:** 12/11/02 **FINISH:** 12/11/02 **LOGGER:** S. McGinnis

DEPTH BELOW GROUND SURFACE	WELL INSTALLATION	SAMPLE TYPE	SAMPLE RECOVERY (IN)	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION
					POORLY GRADED SAND WITH SILT AND GRAVEL (SP-SM) Gray, wet, very dense, fine grained sand, fine to medium round to subround gravel, est. 10-15% fines, 20-30% gravel	
						83': Driller states into silts
85		DM	4	50/4" (50/4")	SILT (ML) Gray, moist to wet, hard	
90		DM	4	50/4" (50/4")	SILT (ML) -Similar to above, gray, moist to wet, hard, fine to medium sand seams	Bottom of boring at 89.3' at 1300 on 12/11/02.
					BOTTOM OF BORING	Driller states not much heave while drilling
						Backfilled boring with grout. Could not install piezometer in this boring. Had to move 3' north and redrill to the bottom of the piezometer installation.
95						
100						

CH2MHILL

PROJECT NUMBER: 151973.A4.WL BORING NUMBER: EM-2
Sheet: 1 of 3

SOIL BORING LOG

GS elev = 212.1'

PROJECT: N. Sequalitchew Creek Wetland **LOCATION:** ~10' S. of Edmond Marsh Trail
ELEVATION: **DRILLING CONTRACTOR:** Cascade Drilling
DRILLING METHOD AND EQUIPMENT: CME 75 nodwell track rig, HSA, Dames & Moore, 140lb hammer
WATER LEVELS: See log **START:** 12/12/02 0934 **FINISH:** 12/12/02 1228 **LOGGER:** S. McGinnis

DEPTH BELOW GROUND SURFACE	WELL INSTALLATION	SAMPLE TYPE	SAMPLE RECOVERY (IN)	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION
0					Ground Surface	
		DM	12	2-5-5 (10)	SILTY SAND WITH ORGANICS (SM) Dark brown, moist, loose, fine grained sand, trace fine to medium round to subround gravel, est. 30-40% fines, 20% organics (TOPSOIL)	Two piezometers installed in separate monuments. EM-2(S) is the shallow piezometer, and EM-2(D) is the deep piezometer
		DM	6	5-6-6 (12)	SANDY SILTY GRAVEL (GM) Dark brown, moist to wet, medium dense, well graded round to subround gravel, est. 20% fines, 30-40% sand, trace organics (FILL)	3': Driller states in gravel and a little water
		DM	18	3-1-1 (2)	SILTY SAND WITH GRAVEL (SM) Light brown, moist, medium dense, fine to medium grained sand, fine to medium round to subround gravel, est. 15-20% gravel, 20% fines, trace organics (FILL)	
5		DM	18	6-16-18 (34)		5': Driller states drilling in gravel
					PEAT (PT) Dark brown, wet, very soft, fiberous	
					SANDY SILTY GRAVEL (GM) Gray, moist, medium dense, well graded round to subround gravel, fine to medium grained sand, est. 20% fines, 30% sand	
		DM	12	18-21-15 (36)		8': Sampled, then loaded hole with water
10					SILTY SAND WITH GRAVEL (SM) Gray, wet, medium dense, fine to medium grained sand, fine to coarse round to subround gravel, est. 20-30% fines, 20-30% gravel, not compacted, soupy	
		DM	12	18-22-18 (40)	GRAVELLY WELL GRADED SAND (SW) Gray, wet, medium dense, round to subround sand and gravel, fine to medium gravel, trace coarse gravel, est. <5% fines, 30-40% gravel	13': Driller states from 8-13' pretty sandy, not much gravel 14': Sampler wet
15						
		DM	10	44-50/6" (50/6")	GRAVELLY WELL GRADED SAND (SW) Gray, moist to wet, very dense, fine to coarse grained sand, fine round to subround gravel, est. 30-35% gravel	18': Top of sample was heave
20						

PT
Qvl
GM/SM
Qvr

CH2MHILL

PROJECT NUMBER: 151973.A4.WL BORING NUMBER: EM-2
Sheet: 2 of 3

SOIL BORING LOG

PROJECT: N. Sequalitchew Creek Wetland **LOCATION:** ~10' S. of Edmond Marsh Trail
ELEVATION: **DRILLING CONTRACTOR:** Cascade Drilling
DRILLING METHOD AND EQUIPMENT: CME 75 nodwell track rig, HSA, Dames & Moore, 140lb hammer
WATER LEVELS: See log **START:** 12/12/02 0934 **FINISH:** 12/12/02 1228 **LOGGER:** S. McGinnis

DEPTH BELOW GROUND SURFACE	WELL INSTALLATION	SAMPLE TYPE	SAMPLE RECOVERY (IN)	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION
		DM	12	24-26-30 (56)	GRAVELLY WELL GRADED SAND (GW) Gray, moist to wet, medium dense, fine to coarse grained sand, fine to coarse round to subround gravel, est. 30-40% gravel	20.5': Heave in sampler
		DM	12	34-50/6" (50/6")	SANDY WELL GRADED GRAVEL (GW) Gray, moist to wet, very dense, well graded sand, round to subround gravel, est. 30-35% sand	
25		DM	12	23-36-50/6" (86/12")	SANDY WELL GRADED GRAVEL (GW) -Similar to above, gray, moist to wet, dense to very dense, well graded sand, est. 30-40% sand, becomes siltier toward bottom of sample, est. up to 10% silt toward bottom of sample	25.5': Driller drained water out of samples before opening split spoon. Driller loads hole with water, difficult to determine if samples are wet from drilling water or groundwater. All heave in sample from 25.5'. Resampled.
30		DM	12	32-40-50/6" (90/12")	GRAVELLY WELL GRADED SAND (SW) Gray, moist to wet, very dense, fine to coarse grained sand, fine round to subround gravel, "clean"-little to no fines	
		DM	12	36-44-50/6" (94/12")	GRAVELLY WELL GRADED SAND (SW) -Similar to above	
35		DM	2	44-50/3" (50/3")	WELL GRADED SAND (SW) Gray, moist to wet, very dense, fine to coarse round to subround sand	
		DM	6	36-50/6" (50/6")	SANDY WELL GRADED GRAVEL (GW) Gray, moist to wet, very dense, well graded sand, round to subround gravel, est. 30-40% sand, est. 5% silt	
40		DM	3	33-40-50/6" (90/12")	POORLY GRADED SAND WITH GRAVEL (SP) Gray, moist to wet, very dense, fine to medium grained sand, coarse round to subround gravel, est. 15-20% gravel	38': 3" of heave in sampler

CH2MHILL

PROJECT NUMBER: 151973.A4.WL BORING NUMBER: EM-2
Sheet: 3 of 3

SOIL BORING LOG

PROJECT: N. Sequalitchew Creek Wetland **LOCATION:** ~10' S. of Edmond Marsh Trail
ELEVATION: **DRILLING CONTRACTOR:** Cascade Drilling
DRILLING METHOD AND EQUIPMENT: CME 75 nodwell track rig, HSA, Dames & Moore, 140lb hammer
WATER LEVELS: See log **START:** 12/12/02 0934 **FINISH:** 12/12/02 1228 **LOGGER:** S. McGinnis

DEPTH BELOW GROUND SURFACE	WELL INSTALLATION	SAMPLE TYPE	SAMPLE RECOVERY (IN)	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION
		DM	10	16-38-50/6" (88/12")	**WELL GRAED SAND WITH GRAVEL (SW)** Gray, moist to wet, very dense, fine round to subround gravel, "clean", grades to **WELL GRADED SAND WITH SILT AND GRAVEL (SW-SM)** 42' Gray, moist to wet, very dense, fine round to subround gravel, est. 15% gravel, 10-15% silt	
		DM	12	18-28-30 (58)	**POORLY GRADED SAND (SP)** Gray, moist to wet, fine to medium grained sand, trace fine to coarse round to subround gravel, est. 5% or less gravel	
45		DM	12	29-36-42 (78)	**POORLY GRADED SAND (SP)** -Similar to above, some gravels have brown staining surrounding the gravel and within the fine grained sand, fine gravel	
Qvr		DM	12	36-50/6" (50/6")	**POORLY GRADED SAND WITH GRAVEL (SP)** Gray, moist, very dense, fine to medium grained sand, fine to coarse round to subround gravel, gravel was packed in "tight", trace dark organics?, pockets/lenses of fine sand at 48'	48': Driller states it felt more compacted
50		DM	6	(100/6")		Bottom of boring at 51.7' at 1228 on 12-12-02
Qvt		SS	6	(100/8")	**SILTY WELL GRADED SAND WITH GRAVEL (SM)** Gray, moist to wet, very dense, some is compact where the sand is finer grained, est. 20-25% gravel	**Deep Piezometer Construction (EM-2(D))** +2.55-0' Steel riser, locking monument 0-2' Concrete 2-36' Quick grout 36-38' Bentonite chips 38-51.7' Lapis Lustre 2/12 silica sand 0-40' Blank pvc 40-50' 0.020 machine slot screen and cap
					SILTY SAND WITH GRAVEL (SM) Gray, moist, very dense, fine grained sand, fine round to subround gravel, est. 20-25% gravel, compacted looking	
55					BOTTOM OF BORING	**Shallow Piezometer Construction (EM-2(S))** Drilled and installed in a separate monument about 3 feet east of deep well 0-1' Concrete and riser 1-2' Bentonite chips 2-5' Lapis Lustre 2/12 silica sand 0-2.5' Blank pvc 2.5-5' 0.020 machine slot screen and cap
60						

Aspect consulting
IN-DEPTH PERSPECTIVE

Geologic & Monitoring Well Construction Log

Project Number	Well Number	Sheet
040001	EM-3	1 of 1

Project Name: North Sequalichew Creek
Location: Fort Lewis, WA
Drilling Method: Hollow stem auger, 4" ID ; Holt Drilling
Sampling Method: 3" diameter D&M
Ground Elevation 214.63

Top of PVC Casing Elev. (ft mllw) 217.38
Depth to Water (ft BTC) 4.96
Start Date March 11, 2004
Finish Date March 11, 2004

Depth feet	Well Construction	Tests\Remarks	Blows/ 6"	Sample ID	Mtl. Graphic	Description
	5" diameter steel monument, 3' stickup; Concrete seal 0'-2'					Sod and dark brown organic soil
						FILL
		3/26/04 ▼				Gravel, some cobbles at 0.5'
			3 7 10	S-1		Medium dense, moist, dark brown, sandy GRAVEL with SILT and ORGANICS, trace wood
			3 6 8	S-2		Medium dense, wet, gray SAND and GRAVEL
5			6 2 1	S-3		MARSH DEPOSITS
		K Test K = 1x10^{-5} cm/s	1 1 9	S-4		Soft, wet, brown, slightly fibrous PEAT, trace gravel
			8 12 14	S-5		Medium dense, wet, brown, sandy GRAVEL to GRAVEL, trace silt
10	Bentonite chips 2'-13'		2 6 6	S-6		RECESSIONAL OUTWASH
			7 8 13	S-7		Medium dense, wet, gray SAND, trace gravel; sand fine to medium; 1/4" silt seam
			1 12 25	S-8		No recovery, coarse gravel in shoe of sampler
15			16 17 16	S-9		Dense, wet, brown, gravelly SAND to sandy GRAVEL
	10/20 silica sand filter pack 13'-20'		11 16 32	S-10		Dense, wet, sandy GRAVEL
	20-slot screen 15'-20'; slip cap with SS screw 20'-20.3'		15 25 35	S-11		
20						Bottom of boring at 20 feet.

Sampler Type (ST):
- 3.25" OD D & M Split-Spoon Ring Sampler
- No Recovery
- 2" OD Split-Spoon Sampler

PID - Photoionization Detector
▼ Water Level (ATD)
▽ Static Water Level

Logged by: RRH
Approved by: LJH
Figure No. B - 1

SEQUALICHEW CREEK.GPJ July 21, 2004

Aspect consulting
IN-DEPTH PERSPECTIVE

Geologic & Monitoring Well Construction Log

Project Number	Well Number	Sheet
040001	HM-MW-1	1 of 1

Project Name: North Sequalitchew Creek
Location: DuPont, Washington
Drilling Method: Hollow Stem Auger - 4" ID ; Holt Drilling
Sampling Method: 3" Diameter D&M

Top of Casing Elev. (ft mllw): 221.06
Ground Surfave Elev. (ft): 217.75
Depth to Water (ft bgs): 5
Start Date: August 2, 2004
Finish Date: August 2, 2004

Depth feet	Well Construction	Tests\Remarks	Blows/ 6"	Sample ID	Mtl. Graphic	Description
1						Brown, slightly silty GRAVEL; gravel, predominantly coarse and cobbles (observed from drill action and cuttings) (GP)
2	5" diameter steel monument, cement seal 0'-4'					
3		18"/5"	3 27 30	2.5-4		Brown, moist, slightly silty to trace silt, sandy GRAVEL; sand medium to coarse; gravel fine to coarse, abundant cobbles, subangular to rounded (GW)
4						
5		8/2/04 ▼ 18"/8"	11 23 23	5-6.5		Brown to olive gray, wet, very sandy GRAVEL, trace silt; sand medium to coarse, predominantly medium; gravel fine to coarse with cobbles, subangular to subround; no apparent organization.
6	Bentonite Chips 4'-7.5'					
7						
8		18"/11"	19 22 24	7.5-9		Color change to olive gray; grades to medium to coarse sand and predominantly fine gravel; increase in silt (still trace silt), less cobbles.
9						
10		18"/6"	22 28 32	10-11.5		Olive gray to gray-green, wet, SAND; trace gravel; sand medium to coarse, occasional zones of fine to medium; gravel fine (SP-SW)
11	10/20 silica sand filter pack 7.5'-20.3'					
12						
13		18"/12"	21 30 35	12.5-14		Olive gray, wet, slightly silty, very sandy GRAVEL; gravel fine to coarse; with cobbles; sand predominantly medium to coarse (GW-GM)
14						
15	20-slot screen 10'-20'; slip cap with SS screw 20'-20.3'	18"/10"	21 31 44	15-16.5		Gray-green to olive gray, wet, SAND, trace gravel; sand predominantly medium to coarse; gravel fine (SW)
16						Olive gray, wet, very sandy GRAVEL, trace silt, sand medium to coarse, occasional fine, predominantly coarse; gravel fine to coarse (GW)
17						
18		18"/10"	26 50/6"	17.5-19		Gray-green, wet SAND; trace gravel; sand predominantly medium to coarse (SW)
19						Olive-gray, wet, very sandy GRAVEL, trace silt; gravel fine to coarse; sand predominantly medium to coarse (GW)
20		18"/11"	26 50/6"	20-21.5		Gray to olive gray, wet SAND; sand medium; homogenous (SP)
21						
22						Olive gray to gray, wet, sandy GRAVEL, trace silt; gravel fine to coarse; subrounded to rounded; sand medium to coarse, predominantly medium (GW)
23						Total depth = 20' drilled, 22.5' driven.
24						
25						
26						
27						
28						
29						

Sampler Type (ST):
- 3.25" OD D & M Split-Spoon Ring Sampler
- No Recovery
- 2" OD Split-Spoon Sampler

PID - Photoionization Detector
▼ Water Level (ATD)
▽ Static Water Level

Logged by: ILE
Approved by: LJH
Figure No. A-2

MW_GEOL S CRK.GPJ November 23, 2004

14P1

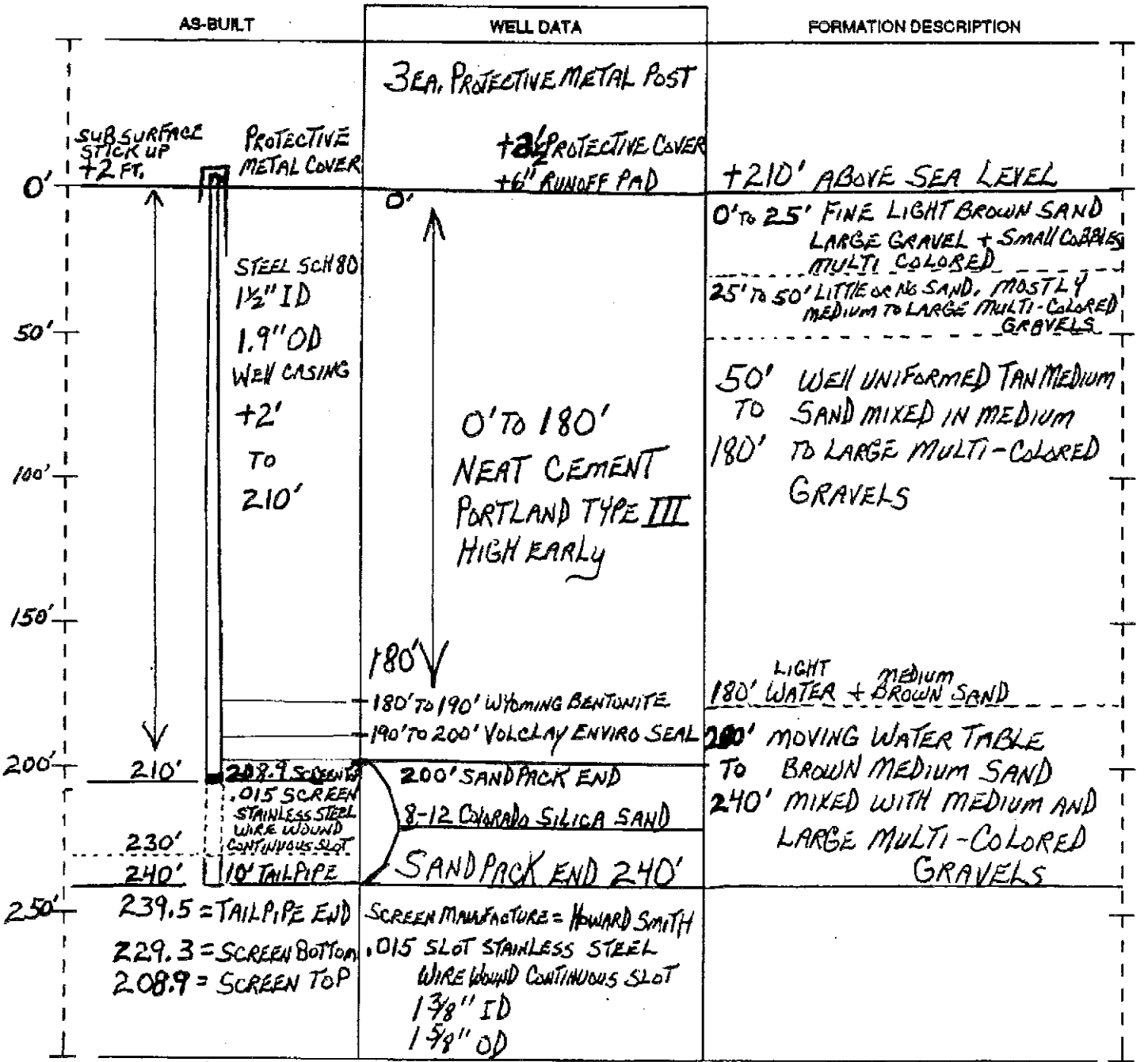
21 FEB 91

RESOURCE PROTECTION WELL REPORT

START CARD NO. 063977

PROJECT NAME: LONESTAR NW OBSERVATION WELL
WELL IDENTIFICATION NO. LONE STAR OB-1
DRILLING METHOD: REVERSE CIRCULATION ROTARY
DRILLER: DOUGLAS GRABOWSKI
FIRM: BECKER DRILLS INC.
SIGNATURE: William J. Flickey
CONSULTING FIRM: HART CROWSER
REPRESENTATIVE: TOM NOYES

COUNTY: PIERCE
LOCATION: SE¼ SW¼ Sec 14 Twn 19N R 1E
STREET ADDRESS OF WELL: NORTHWEST LANDING ANNEX DUPONT STEILACOOM ROAD DUPONT WASHINGTON
WATER LEVEL ELEVATION: 200FT. STATIC
GROUND SURFACE ELEVATION: +210
INSTALLED: FEBRUARY 15, 1991
DEVELOPED:



SCALE: 1" = 50 FEET

PAGE 1 OF 1

ECY 050-12 (Rev. 11/89)

The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report

Aspect consulting
IN-DEPTH PERSPECTIVE

Geologic & Monitoring Well Construction Log

Project Number	Well Number	Sheet
040001	SL-1	1 of 1

Project Name: North Sequalichew Creek
Location: Fort Lewis, WA
Drilling Method: Hollow stem auger, 4" ID ; Holt Drilling
Sampling Method: 3" diameter D&M
Ground Elevation 214.94

Top of PVC Casing Elev. (ft mllw) 217.74
Depth to Water (ft BTC) 6.25
Start Date March 11, 2004
Finish Date March 11, 2004

Depth feet	Well Construction	Tests\Remarks	Blows/ 6"	Sample ID	Mtl. Graphic	Description
	5" diameter steel monument, 3' stickup; Concrete seal 0'-2'					Grass, duff
						FILL
						Gravel up to 1-1/2" diameter, to a depth of 8" below ground surface
			4 3 3	S-1		Medium stiff, moist to very moist, dark brown, gravelly SILT with SAND
		3/26/04 ▼				
5			3 3 4	S-2		•Very gravelly drilling, no recovery
			9 8 11	S-3		Medium dense, wet, gray, sandy GRAVEL; sand medium to coarse, gravel fine to coarse
			4 6 6	S-4		•Low recovery, trace gravel in sampler
			7 7 7	S-5		RECESSIONAL OUTWASH Medium dense, wet, gray, very gravelly SAND; sand predominantly coarse
10	Bentonite chips 2'-13'		7 7 9	S-6		Medium dense, wet, gray-brown, sandy GRAVEL; sand predominantly coarse
			6 7 12	S-7		
			11 10 9	S-8		•Trace silt
15	10/20 silica sand filter pack 13'-20'		10 7 7	S-9		•Trace silt
	20-slot screen 15'-20'; slip cap with SS screw 20'-20.3'		4 6 7	S-10		
20						Bottom of boring at 20 feet.

Sampler Type (ST):
- 3.25" OD D & M Split-Spoon Ring Sampler
- No Recovery
- 2" OD Split-Spoon Sampler

PID - Photoionization Detector
▼ Water Level (ATD)
▽ Static Water Level

Logged by: RRH
Approved by: LJH
Figure No. B - 2

SEQUALICHEW CREEK.GPJ July 20, 2004
MW_GEOLG

CH2MHILL

Well Number: CHTW-1

Client: Glacier NW
Project: N Sequalichew Creek Aquifer Tests
Location: DuPont, Washington
Project Number: 151973.A2.AT

Driller: Hokkaido Drilling (Bob, Ron)
Drilling Method: Star 72 cable tool (12" bit/12" casing)
Sampling Method: Sand pump (water added)
Logged by: TNV
Start/Finish Date: 12/13/99 - 12/15/99

Depth (ft)	Sample Info: Sample #	Sample Info: STP (6"-6"-6")	Soil Log	Soil Description	Depth / Elev	Well Drawing	Well Construction Notes
-5					5 215		Welded Cap with 2" capped access
0				Ground Surface **Silty Sand (SM):** Dark brown sildy sand, dry.	2		NOTE: Sounding tube for pump test water levels (since removed) was roughly 3 feet above ground surface.
5				**Well-graded Sand (SW)** light brown well-graded sand with about 30% fine to coarse gravel, moist. At 9 feet - less gravel, easier drilling.	208		
10				At 18 feet - becomes grayish brown At 21 feet - becomes darker brown, moisture increase			Surface Seal (18) 50-lb bags bentonite chips (medi
15				At 22.5 feet - gravel increases			
20							Native formation sand and gravel
25					25		
				Well-Graded Sand with Silt (SW-SM): Gray brown well-graded sand with 30 to 40% fine gravel, occasional coarse gravel; wet.	185		
30							
35					35		
				Well-Graded Sand (SW): Gray brown fine to coarse sand with about 35% fine to coarse gravel, trace silt; wet. Large amount of water at 36 feet.	175		
40				At 43 feet - increased gravel, silt At 48 feet - increased silt, less dense			
45				At 58 feet - driller reports sand with silt. Casing is falling, difficult to obtain samples			
50				At 66 feet - decreases sand At 67 feet - increased gravel			
55							

CH2MHILL

Well Number: CHTW-1

Client: Glacier NW
Project: N Sequalichew Creek Aquifer Tests
Location: DuPont, Washington
Project Number: 151973.A2.AT

Driller: Hokkaido Drilling (Bob, Ron)
Drilling Method: Star 72 cable tool (12" bit/12" casing)
Sampling Method: Sand pump (water added)
Logged by: TNV
Start/Finish Date: 12/13/99 - 12/15/99

Depth (ft)	Sample Info: Sample #	Sample Info: STP (6"-6"-6")	Soil Log	Soil Description	Depth / Elev	Well Drawing	Well Construction Notes
60				**Well-Graded Sand (SW):** Gray brown fine to coarse sand with about 35% fine to coarse gravel, trace silt; wet. Large amount of water at 36 feet. At 43 feet - increased gravel, silt. At 48 feet - increased silt, less dense. At 58 feet - driller reports sand with silt. Casing is falling, difficult to obtain samples. At 66 feet - decreases sand. At 67 feet - increased gravel			8" Mild steel casing
65							
70							K-Packer; Riser (6" mild steel pipe)
75					75		
				Well-Graded Sand (SW): Dark red-brown fine to coarse sand with minor gravel and trace silt, peat or wood pieces.	135		Screen - 0.100-in slot width vee-wrap 6" pipe size stainless steel
80				**Poorly-Graded Gravel (GP):** Fine gravel with medium and coarse sand, trace silt; water is clean.			
85					87		Sump (6" mild steel pipe)
				Interbedded Sand/Silt/Clay (SP/ML): Interbedded fine to medium sand with silt and clay. Silt and clay layers contain small to medium wood pieces (Olympia Beds)	123		10-20 CSSI sand (5 50-lb bags)
90							
95					99		Hydrated medium bentonite chips (12 50-lb bags)
100				**Organic Silt and Clay (ML/OL):** Dark brown organic silt and clay with wood pieces and occasional fine sand; hard.	111		
105					108		
110				End of Log	102		
115							

CH2MHILL

Well Number: CHTW-2

Client: Glacier NW
Project: N Sequalitchew Creek Aquifer Tests
Location: DuPont, Washington
Project Number: 151973.A2.AT

Driller: Hokkaido Drilling (Bob, Ron)
Drilling Method: Star 72 cable tool (12" bit/12"casing)
Sampling Method: Sand pump (water added)
Logged by: TNV
Start/Finish Date: 12/13/99 - 12/15/99

Depth (ft)	Sample Info: Sample #	Sample Info: STP (6"-6"-6")	Soil Log	Soil Description	Depth / Elev	Well Drawing	Well Construction Notes
-5					5 210		Welded cap w/ 2" NPTaccess
0				Ground Surface **Silty Sand (SM):** silty sand with gravel - topsoil; dry.	2 203		NOTE: Sounding tube for pump test water levels (temporary) was 2.15' above ground surface.
5				**Gravel with Silt (GW-GM/GP-GM):** Light grayish brown fine gravel with sand, silt ranging from trace to 5%, loose to 14.5 feet, then dense, dry. At 19 feet - becomes wet.			
10							Surface Seal (11) 50-lb bags bentonite chips (medi
15							
20					22		
25				**Well-Graded Sand (SW):** Grayish brown fine to coarse sand with fine gravel, trace to 3% silt; wet. At 23.5 feet - increased silt, harder drilling At 25 feet - increased water.	183 30		
30				**Well-Graded Gravel (GW):** Gray with blue, black, red yellow fine to coarse gravel with fine to coarse sand, trace silt. At 33 and 37 feet - increased water, clear At 39 feet - drilling "tighter"	175		8" mild steel casing w/ drive shoe
35							Native formation sand and gravel
40					43		
45				**Well-Graded Sand with Silt (SW-SM):** Brownish fine to coarse sand with silt and up to 20% fine to coarse gravel. At 45 feet - increased water, easier drilling.	162		
50							
55					55		K packer
60				**Well-Graded Gravel (GW):** Brownish fine to coarse gravel with fine to coarse sand, occasional cobbles, trace silt. Increased water.	150 60 145		Riser (6" pipe size, mild steel) Screen (6" pipe size, mild steel, vee-wrap wire, 0.150-inch slot
65				**Well-Graded Sand (SW):** Medium brown fine to coarse sand with fine gravel, less water.	66 139		

CH2MHILL

Well Number: CHTW-2

Client: Glacier NW
Project: N Sequalitchew Creek Aquifer Tests
Location: DuPont, Washington
Project Number: 151973.A2.AT

Driller: Hokkaido Drilling (Bob, Ron)
Drilling Method: Star 72 cable tool (12" bit/12"casing)
Sampling Method: Sand pump (water added)
Logged by: TNV
Start/Finish Date: 12/13/99 - 12/15/99

Depth (ft)	Sample Info: Sample #	Sample Info: STP (6"-6"-6")	Soil Log	Soil Description	Depth / Elev	Well Drawing	Well Construction Notes
70				**Well-Graded Gravel (GW):** Greenish gray fine to coarse gravel with sand.	72		Sump (6" pipe size, mild steel)
				Silty Sand (SM): Gray fine to coarse sand with fine gravel.	133 76		
75				**Poorly-Graded Sand with Silt (SP-SM):** Gray fine sand with about 10% silt. At 78 feet - gray silt chunks. At 79 feet - water decreased	129 80		10-20 CSSI sand
80					125		Betonite chips - medium, hydrated
				Silt (ML): Gray-brown mottled silt in chunks, hard. Feels greasy (clay?).	87		
85				**Silty Sand (SM):** Dark gray silty fine sand.	118 90		
				Poorly-Graded Sand with Silt (SP-SM): Dark gray fine sand with silt, small wood pieces.	115 96		
90				**Well-Graded Sand with Silt (SW-SM):** Dark gray sand with silt, wood pieces.	109		
95				**Silt/Clay (ML/CL):** Dark reddish brown silt/clay, hard, with wood fragments. At 102 feet - becomes dry (moist)	104		
				Poorly-Graded Sand w/ Silt (SP-SM): Dark gray fine sand with occasional small gray silt chunks; wet. Interlayered with:	101 109		
100				**Silty Sand (SM):** Dark gray silty fine sand with silt chunks, wood debris.	96		
					117		
105				End of Log	88		
110							
115							
120							
125							
130							
135							

CH2MHILL

Well Number: CHTW-3

Client: Glacier NW
Project: N Sequalitchew Creek Aquifer Tests
Location: DuPont, Washington
Project Number: 151973.A2.AT

Driller: Hokkaido Drilling (Bob, Ron)
Drilling Method: Star 72 cable tool (12" bit/12"casing)
Sampling Method: Sand pump (water added)
Logged by: TNV
Start/Finish Date: 12/13/99 - 12/15/99

Depth (ft)	Sample Info: Sample #	Sample Info: STP (6"-6"-6")	Soil Log	Soil Description	Depth / Elev	Well Drawing	Well Construction Notes
-5					5 222		Welded cap w/ 2" NPT access NOTE: Sounding tube for pump test water levels (since removed) was about 1.3 feet above ground surface
0				Ground Surface **Topsoil**	2		
5				**Well-Graded Sand with Silt (SW-SM):** Light gray brown fine to coarse sand with silt and fine gravel. At 16 feet - becomes moist	215		Surface seal 50-lb bags bentonite chips (medium)
10							
15							
20					23		
25				**Silty Sand (SM):** Gray brown fine to coarse sand with gravel; wet	194		
30							
35					35		
40				**Poorly-Graded Gravel (GP):** Fine gravel with fine to coarse sand, trace silt.	182		8" mild steel casing
45					45		
50				**Silty Sand (SM):** Gray brown fine to coarse sand with silt, fine to coarse gravel.	172 52		
55				**Well-Graded Sand with Silt (SW-SM):** Gray brown fine to coarse sand with fine to coarse gravel, silt up to 15%.	165		
60							

CH2MHILL

Well Number: CHTW-3

Sheet: 2 of 2

Client: Glacier NW
Project: N Sequalitchew Creek Aquifer Tests
Location: DuPont, Washington
Project Number: 151973.A2.AT

Driller: Hokkaido Drilling (Bob, Ron)
Drilling Method: Star 72 cable tool (12" bit/12"casing)
Sampling Method: Sand pump (water added)
Logged by: TNV
Start/Finish Date: 12/13/99 - 12/15/99

Depth (ft)	Sample Info: Sample #	Sample Info: STP (6"-6"-6")	Soil Log	Soil Description	Depth / Elev	Well Drawing	Well Construction Notes
					62		
				Well-Graded Sand with Silt (SW-SM): Gray brown fine to coarse sand with silt and fine gravel.	155		
65					68		
				Poorly-Graded Gravel with Sand (GP-GM	~~149~~ 70		
70				Blue-gray fine gravel with sand.	147		K Packer
				Well-Graded Sand (SW): Dark gray fine to coarse sand with 25% gravel, trace silt.	75		Riser (6" mild steel pipe with weldring
75				**Poorly-Graded Gravel (GP):** Dark gray fine gravel, about 20% sand, no silt.	142 80		Screen 150-slot vee-wrap 6" pipe size, stainle
80				**Well-Graded Sand with Silt (SW-SM):** Light brown fine to coarse sand with about 25% fine gravel, silt.	137 84		
85				**Silty Gravel (GM):** Medium brown-red silty fine to coarse gravel with fine to coarse sand.	133 87 130 90		Sump (6" mild steel pipe with bailbottc
90				**Silty Sand (SM):** Medium brown silty fine to medium sand with occasional gravel.	127 94		10-20 CSSI sand (6- 50 lb bags)
95				**Poorly-Graded Sand (SP):** Gray fine to medium sand with gravel.	123		
				Silty Sand (SM): Gray silty fine to medium sand, silt clumps, wood pieces.	100		Hydrated bentonite chips, medium (1'
100				**Poorly-Graded Sand with Silt (SP-SM):** Dark gray fine sand w/ silt, wood pieces.	117 107		
105				**Well-Graded Sand (SW):** Gray brown fine to coarse sand with fine gravel and wood debris, interbedded with silty fine sand.	110 110 107		Total depth = 111' BGS
110				End of Log			
115							
120							
125							

LONE STAR NORTHWEST
DUPONT PROJECT

Boring: L.S. WY 007

Ground Elevation: 210

Date Drill: Oct 12, 1988
Drilling starting 8:20

Boring Location: N 658500 E 463000

Elevation Water Table: Not reached
Backfilled previously - 2-22-89

Sampled by:

Depth	Strata	Sample Interval	Description/Drilling Notes
			Organic top soil - Organic, sandy gravel.
5			1' Sandy gravel, gravel Co to fn, slightly silt coating, subround to round, 70 to 80%; sand-md to fn, loose dry, light brown
		8	
10			8' to 10' Sand 50 to 60%, md to fn
			Below 10' Sand fn 30 to 40%
15			
		18	
20			
		24	24' Sandy gravel, gravel mostly fn (<1"), silt coated, subround to round, 60 to 70%, sand co to fn
25			
		28	loose, moist, md, gray brown
30			
35			
			Few oversize, sand increasing, grading to
		38	38' Gravelly sand, sand co to fn, 50 to 60% gravel mostly fn,
40			loose, moist, gray brown.
45			
		48	
50			
55			
		58	58 Grades back to sandy gravel, same as 24' to 38'
60			occasional sm cobble.
65			

LONE STAR NORTHWEST
DUPONT PROJECT

Boring: L.S.W.Y 007

Ground Elevation: 210

Date Drill: [illegible]

Boring Location: N 658500 E 463000

Elevation Water Table:

Sampled by:

Depth	Strata	Sample Interval	Description/Drilling Notes
		68	Sandy gravel as above
70			
75			Below 78' slightly more sand; gravel slightly coarser, [illegible]
		78	
80			
85			
		88	Below 90' gravel finer (<1"), 50 to 60% sand content increasing
90			
95			
		98	98' to 100' [illegible] gravel, [illegible]
100			Gravel [illegible] 50 to 60%, sand [illegible] to fn
105			
		108	Sand finer, gravel 60 to 70%, few oversize
110			
115			
		118	
120			
125			
		128	
130			

LONE STAR NORTHWEST
DUPONT PROJECT

Boring: L.S.W.Y 007 Boring Location: N 658500 E 463000

Ground Elevation: 210 Elevation Water Table: _____

Date Drill: Oct. 12, 1988 Sampled by: _____

Depth	Strata	Sample Interval	Description/Drilling Notes
			Same as above
135			
		138	
140			Gravel mostly fn, silt coated, 50 to 60%; sand intervals - sand content increasing with depth
145			
		148	
150			Grading to Gravelly sand, sand mg, gravel mostly fn, loose moist, gray brown
155			
		158	
160			
			Below 160' gravel coarsing, 50 to 60%
165			
		168	
170			
175			
			subangular to rounded,
180	Kitsap Salmon Sp. 3021.	180	180' Sandy gravel, gravel co to fg, slightly silty, 75 to 80%, sand md to fg, some wood fragments; occ silty balls, mod dense moist, yellow to gray brown - Kitsap?
185		185	184' - very dense, sandy peat
		188	185' ~~Gravelly~~ Peat with silt bands
190		190	188 - Silt, compact, moist, yellow brown, below 189 gravelly sand and sandy gravel.
195			Bottom Hole 190'

210 - 180 / 30

Purple ?

LONE STAR NORTHWEST
DUPONT PROJECT

Boring: L.S.WY 013

Boring Location: N 659000 E 462500

Ground Elevation: 163

Elevation Water Table: -5

Date Drill: Oct. 18, 1995

Sampled by:

Engr. #132 light rain

Depth	Strata	Sample Interval	Description/Drilling Notes
			0.2' Organic topsoil, [illegible] slightly [illegible]
5			0.2' Sandy gravel, gravel mostly fn, few co, subround to round, 70 to 80%; sand md to fn; loose, slightly moist, light brown
		8	Recovery poor to fair -
10			Same as above - gravel thinly coated with silt
15			
		18	
20			22' Sandy gravel, gravel mostly fn, subround to round, 70 to 80%; sand co to fn, loose, moist, gray brown
25			
		21	
30			Gravel content increasing slightly, mostly fine (<1")
35			
		38	
40			Gravel coarser, few small cobbles, some oversize (+2½"), all silt coated - Recovery fair
45			
		48	
50			48' Small pieces of organic matter; gravel mostly fn, some oversize and cobbles (broken) 70 to 80%, gravel silt coated
55			
		58	
60			Gravel very fine 60 to 70%, sand co to fn
65			

LONE STAR NORTHWEST
DUPONT PROJECT

Boring: L.S.W.Y 013 Boring Location: N 659000 E 462500

Ground Elevation: 163 Elevation Water Table: -5

Date Drill: Oct. 18, 1988 Sampled by: _____

Depth	Strata	Sample Interval	Description/Drilling Notes
70		68	Gravel co to fn, thin silt coating, 60 to 70%; few small cobbles (broken)
75			
80		78	Same as above - No cobbles noted
85			
90		88	92' to 100' Gravel fine, 60 to 70%; Sand co to fn
95			
100		98	100' to 110' Gravel co to fn, 65 to 75%, silt coated thining; some drilling difficulties, recovery poor.
105			
110		108	Gravel fn, some crushing, 60 to 70% Recovery fair to poor
115			
120		118	Gravel co to fn, thin silt coating, 70 to 80%
125			
130		128	

LONE STAR NORTHWEST
DUPONT PROJECT

Boring: L.S.W.Y 013 Boring Location: N 659000 E 462500

Ground Elevation: 163 Elevation Water Table: -5

Date Drill: Oct. 17, 1988 Sampled by:

Depth	Strata	Sample Interval	Description/Drilling Notes
135			Gravel co to fn silt coated, [illegible], few small cobbles; some crushing
140		138	Gravel co to fn 60 to 70%, sand co to fn
145			
150		148	
155			Same as above, occasional cobble
160		158	
165			Gravel slightly finer, 65 to 75%
170		168	168' Groundwater Gravel finer than above with occasional oversize, 65 to 75%
175			
180		178	Gravel co to fn, slightly coarser than above 65 to 75%
185		188	
190			Gravel co to fn, some slight staining, 65 to 75% sand mostly med to fn with minor laminae of predominantly sand
195			

LONE STAR NORTHWEST
DUPONT PROJECT

Boring: L.S.WY 013

Boring Location: N 559000 E 462500

Ground Elevation: 163

Elevation Water Table: -5

Date Drill: [illegible]

Drilling [illegible]

Sampled by:

Depth	Strata	Sample Interval	Description/Drilling Notes
			Occasional [illegible] small cobble
		198	
200			
			Same as above, gravel 60 to 70%
205			
		208	
210			Same as above
215			
		218	Water orange color 218' to 219'
220			Gravel [illegible] to fn, appears slightly stained, [illegible]
			[illegible]
225			
		228	228' Water [illegible] brown
230			229' Lost [illegible] very hard, 230' water
			returned [illegible] to dk brown
235			Gravel [illegible] organics or
			manganese.
		238	
240			Bottom [illegible] 238'

LONE STAR NORTHWEST
DUPONT PROJECT

Boring: L. S WY 032

Boring Location: N 655000 E 467000

Ground Elevation: 214

Elevation Water Table: 214-17-197
Caved in at 8.5' 2-23-89

Date Drill: Dec 2, 1988
Began 2 P.M

Sampled by:

Depth	Strata	Sample Interval	Description/Drilling Notes
			Topsoil - organic silty sandy gravel loose, [illegible]
5		1	1' [illegible] gravel, gravel co to mostly fn, subround to round, thin silt coating, 50 to 60%; sand md; loose moist, [illegible] brown; below 8' occasional small cobble
10		12	12' Sandy gravel, gravel mostly fn, round, siltcoated, increasing from 60 to 70% to 70 to 80%. below 16'; sand md; loose, moist to very moist, md brown.
15		2	
			Below 17' gravel [illegible] drill one foot -
20		22	Effluent at 22'
			22 Sandy gravel, gravel co to fn, round, heavy silt coat -
25		3	70 to 80%; sand md, loose, saturated, brown
			Few oversize (broken)
		28	
30			Below 30' sticky sands - gravel co to fn, 65 to 75%; sand [illegible] brown,
35		4	intervals silt; sand, sand 70 to 80, silt 10% [illegible] gravel.
		38	Below 38' very soup, 10 to 20% superfines being
40			washed out of sample. Sample - sandy gravel gravel [illegible] sand fn, silt [illegible]
45		5	
		48	Gravel co to [illegible] fine, 65 to 75%
50			
55		6	Below 55' [illegible] gray
		58	Below 55' effluent [illegible] light chocolate brown (butterscotch),
60			gravel co to fn (heavy pea gravel), 70 to 80%; occasional
214 62 142 / 1	~~Sat. Spn.~~ Vo 142	62 7	oversize [illegible] being washed out. clasts stained
65			and oxidized - with depth (below 62')

LONE STAR NORTHWEST
DUPONT PROJECT

Boring: L.S. WY 033

Boring Location: N 656500 E 467500

Ground Elevation: 218

Elevation Water Table:

Date Drill: Dec 3, 1988

Sampled by:

Depth	Strata	Sample Interval	Description/Drilling Notes
		66	66' Gravelly sand, sand mid to fn, 60 to 70%; gravel fine gravel content increasing below 69'
70		70	70' Sandy gravel, gravel co to fn, mostly 60 to 70%, sand may occasional oversize, sand interbeds – some clasts oxidized, stained
75			
		78	
80			80' Sand, co to fn, 10% fn gravel; gravelly interbeds with gravel mostly <1", yellow brown
85			
	30	88	87' Sandy gravel, gravel mostly fn (<5/8"), 65 to 75%; sand co to fn,
90			
			Below 94' effluent becoming reddish chocolate brown
95			
100		100	100' Gravelly sand, sand co to fn, gravel fn 20 to 30%; loose, saturated, yellowish to reddish brown
105			
110		110	110' Sand, mid to fn, gray brown
115			
		118	118' Sandy gravel, gravel mostly fn (<5/8"), 50 to 60%; sand co to fn; loose, saturated, gray brown.
120	K-loop?		Below 120' effluent yellowish brown
125			125' Gravelly sand, sand co to fn, 50 to 60%; gravel fn fine gravel interbeds
		128	
130			

LONE STAR NORTHWEST
DUPONT PROJECT

Boring: L.S.W.Y [illegible]

Boring Location: N 656500 E 467500

Ground Elevation: _____

Elevation Water Table: _____

Date Drill: _____

Sampled by: _____

[illegible]

Depth	Strata	Sample Interval	Description/Drilling Notes
			Continuation of above
135			
		138	Strong water flow from cyclone
[illegible]			Bottom Hole 138'
			Bottom called as practical mining depth

LONE STAR NORTHWEST
DUPONT PROJECT

Boring: L.S.WY 034

Boring Location: N 656000 E 467500

Ground Elevation: 218

Elevation Water Table: 218-28 = 190

Date Drill: Began drilling 12:50

Sampled by: C.W. - 22' - Caved in at 42' 2-23-89 (196'ct)

Depth	Strata	Sample Interval	Description/Drilling Notes
			Organic top soil - gravel fn +50%, sand, organic
5			1' Sandy gravel, gravel co to mostly fn, subround to round, thin silt coating, 60 to 70%; sand md to fn, loose, moist, md brown
		8	
10			Below 8' gravel finer, 65 to 75%, lighter brown
			Below 12' gravel 60 to 70%
15			
		18	
20			Below 18' gravel v. moist to wet, 60 to 70%, co to fn with occasional cobble
25			
		28	
30			Slightly more oversize, gravel 65 to 75%
35			Below 35' moisture increasing
		38	Effluent at 38', zones few soupy
40			Gravel co to fn; 70 to 80%; some oversize
45			
		48	
50			Same as above, appears grayish
55			
		58	
60			Gravel co to [illegible] interbeds of most pea gravel 65 to 75%, [illegible] co to fn.
65			

LONE STAR NORTHWEST
DUPONT PROJECT

Boring: L.S.WY 034

Boring Location: N [illegible] E [illegible]

Ground Elevation: 218

Elevation Water Table:

Date Drill:

Sampled by:

Depth	Strata	Sample Interval	Description/Drilling Notes
		68	Gravel co to fn 60 to 70%; 3 to 5% oversize
75	[illegible]	78	77' Gravelly sand, sand md to fn, 50 to 60%; gravel co to fn, interbeds very gravelly to sandy gravel, loose, saturated, brown with yellowish cast.
85			Gravel content increasing below 87'
		88	88' Sandy gravel, gravel mostly fn, 60 to 70%.
90			91' - Some light gray silt interbeds
		93	93' [illegible] effluent; gravel mostly fn, 60 to 70%; yellowish-brown to gray brown
		98	
			Few 2½" gravel, 98' to 100'
105		107	
			107' Sand, md to fn, 10% fn gravel, few [illegible]
		118	
			Bottom hole 118'

LONE STAR NORTHWEST
DUPONT PROJECT

Boring: L.S.WY 035

Boring Location: N 656000 E 467000

Ground Elevation: 215

Elevation Water Table: Caved in at 14' - 2.23.89

Date Drill: Dec 4, 1988
Drilling completed 10:45AM

Sampled by:

Depth	Strata	Sample Interval	Description/Drilling Notes
		68	Few sand interbeds, sand md to fn, ±1' thick
70			68 - gravel co to fn with much <1/2", 60 to 70%, sand md.
			72' few cobbles
75			74 Sand interbed, sand md 80 to 90%; gravel fn.
	Vs.		77' Sand.
		78	78' Gravel co to fn, 70 to 80%, gray brown.
80	8.16.89		
	~~Sol Gr~~		Below 84' Reddish-brown - butterscotch effluent. Gravel
85	131 Du Pont		reddish brown cast. Some Gravel stained, oxidized.
		87.5	Sample 87 to 88 contained some silt balls - contact approximated
	127		87.5' Silt, yellowish brown.
90		91.	
			Bottom Hole 91'
95			
100			

LONE STAR NORTHWEST
DUPONT PROJECT

Boring: L.S.WY 036

Boring Location: N 655500 E 466500

Ground Elevation: 214.*

Elevation Water Table: 88'
Caved in at 12' 2-23-89

Date Drill: Dec. 4, 1988
Drilling started 12:00 PM

Sampled by:

* Point in bottom of fill rise - reduced to 214' elev. to place collar elev. at original surface.

Depth	Strata	Sample Interval	Description/Drilling Notes
			Sandy gravel, gravel co to fn, subround to round,
5		6	slightly silt coated, 50 to 60%, sand md to fn, loose,
			moist, dark brown; occasional large cobble
			below 2' md brown,
10		12	6' Sandy gravel, gravel mostly fn, 50 to 60%; sand md fn;
			loose, damp, md light brown; below 10' gravel coarser, 60-70%;
15		16	few broken cobbles; below 12' gravel co to fn, 65 to 75%
			with some broken cobbles
			16' Sand, md fn, 80 to 90%; gravel co to fn; slightly silty
20		22	Below 18' gravel content increasing - grading to -
			22' Sandy gravel, gravel co to fn, silt coated, 60 to 70%;
25			sand md; loose, moist, brown; 5 to 70% +2" gravel
		28	26 to 28' gravel mostly ±1", 65 to 75%; very moist.
			silt coated. Effluent at 28'
30			Below 28' gravel co to fn. 60 to 70%, sand co.,
			few oversize.
35			
		38	
40			38' to 40' Soupy sand, sand md to fn
			Below 40' gravel co to fn, 65 to 75%; sand md to fn,
45			silty. few broken cobbles, material semi soupy
		48	
50			Below 48' gravel finer 60 to 70%; sand md to co.
55			Below 54' gravel coarser, 70 to 80%, silt coated; semi soupy
		58	
60			Gravel becoming finer, 60 to 70%; interval
			gray-brown, soupy due to high silty sands
65			

LONE STAR NORTHWEST
DUPONT PROJECT

Boring: L.S.W.Y 036

Boring Location: N 655500 E 466500

Ground Elevation: 214

Elevation Water Table: 188'

Date Drill:

Sampled by:

Dr[illegible]

Depth	Strata	Sample Interval	Description/Drilling Notes
		68	Below 68' sand, silt increasing
70	VD, ~~Sal Gr~~ 147 DuPont	72	72' Silty, sandy gravel, gravel co to fn, round, 60 to 70%; sand [illegible] to fn, silt coating gravel, mixed with sand (to form soft silty sand balls) ±10%, loose, saturated, brown; intervals maybe silty fine sand <1' thick
75		78	Little or no water return to 78'; below 78' heavy return, gravel mostly fn, 65 to 75%, sand co to fn, brown with slightly reddish cast, gravel generally clean [illegible] silt
80			
85		88	87' effluent light chocolate brown
90		92	92' Brown silt, slightly sandy interbeds <1' thick Gravel fine, sand co to fn below 93'; slightly silty
95		98	97.5' Silty sand, sand v. fn (+100 mech), 80 to 90%; silt interspersed, [illegible] thin silt beds <6' thick and silt balls, occasional small gravel, yellowish brown, very soft (soupy)
100			Below 105' [illegible] interbeds, gravel fn 60 to 70% with some [illegible]
		108	
			Bottom Hole 108'

214
64
146

LONE STAR NORTHWEST
DUPONT PROJECT

Boring: L. S. W Y 037

Boring Location: N 655500 E 467000

Ground Elevation: 215

Elevation Water Table: ~~187~~ 197

Date Drill: Dec 5, 1988
Began [illegible]

Sampled by:

Depth	Strata	Sample Interval	Description/Drilling Notes
			Sandy gravel, gravel co to fn, subround to round,
5			55 to 65%; sand md to fn. organic, loose, moist, dk brown
			±2' Sandy gravel, gravel co to fn, 70 to 80%; sand md-fn,
		8	loose, damp, brown,
10			Below 12' few small cobbles (broken), gravel coarser,
			60 to 70%.
15			
		16	16' Sandy gravel, gravel co to fn, silt coated, 70 to 80%;
			sand co to md, loose, very moist, brown;
20			
			Occasional cobble below 18', heavy silt coating
25			
		28	Groundwater 27.5', good effluent at 28'
30			Gravel co to fn, 60 to 70%; sand mostly co.
			28' to 32' soupy; below 32' saturated; very little effluent
35			~~to~~ 38'
40		41	
			41' Gravelly sand, sand md to fn, 70 to 80%;
45			gravel mostly fn., (soupy) soft, saturated, brown
		47	
			47' Sandy gravel, gravel co to fn, 65 to 75%, sand co
50			to mostly fn; loose, saturated, brown,
			Below 50' few broken cobbles
55			Gravel content increasing 70 to 80%; intervals soupy
			from fine sand and silt (5 to 10%), gray brown
		58	
60			1st good water return below 60', gravel co to
			fn (finer than above) with coarse intervals, 60 to 70%;
65			sand co to fn, brown gray

LONE STAR NORTHWEST
DUPONT PROJECT

Boring: S.W.Y 037

Boring Location: N 655500 E 467000
caved in at 4' - 2-23-89

Ground Elevation: 215

Elevation Water Table:

Date Drill:

Sampled by:

Finished drilling 10:25

Depth	Strata	Sample Interval	Description/Drilling Notes
215 / 52 / 148	? Du Pont 148	67	67' Sandy gravel, gravel fn with coarse gravel and cobbles below 72'; 70 to 80%, sand mostly fn, silty with silt coatings; loose to semi soupy, saturated, light brown
70			
75	139	76	76' Sandy gravel, gravel fn (mostly <1/2"), 50 to 60%; Sand co.; loose, wet, md rust brown; below 77 some coarse gravel, darker (soupy) brown (md dk chocolate) Effluent md-dk brown below 77' - slightly silty (±5%), color due to organic?
80		80	80' Sandy gravel, gravel mostly fn 50 to 60%, sand co to fn gray brown, reddish cast.
85		86	85' Thin silt bed (<6" thick)
90		89	86' Gravel mostly <3/4", 70 to 80%, few large gravels/small cobbles (broken) Effluent yellow brown
95			89' Gravelly sand, sand co to md, 50 to 60%, gravel fn coarsing with depth - md dense, saturated gray brown
100		98	96' contact gradational Sandy gravel, gravel co to fn (avg <5/8"), 60 to 70%; sand co to md; md. dense, yellow brown, gravel content increase to ±80% 96' to 98'
		101	
105		104	Below 98' gravel very silty, some silt balls, lost effluent; drilled hard.
110			Bottom Hole 104'
			Bottom 10' section of drill pipe filled with fn silty brown sand followed by 2.5' dense, gray, fn sandy silt
			Lost 1 hour cleaning pipe

LONE STAR NORTHWEST
DUPONT PROJECT

Boring: L.S.W.Y 038

Boring Location: N 655000 E 466500

Ground Elevation: 215

Elevation Water Table: 200
Water 11.5, caved, at 12.5' 2-23-89

Date Drill: Dec. 5, 1988

Sampled by:

Drilling began 12:25 PM

El 215

Depth	Strata	Sample Interval	Description/Drilling Notes
			Sandy gravel, gravel mostly fn, round, 50 to 60%; sand md to fn; slightly silty (3-5%), organic, loose, very moist, dark brown
5			32' Sandy gravel, gravel mostly fn, subround to round, thin silt coating, 50 to 60%; sand co to md; few small cobbles; loose, moist, brown; below 9' few more broken cobbles
		8	
10			Moisture increasing below 13', gravel generally finer.
			Water return at 15', silt content increasing.
15			
		18	
20			Below 18' gravel co to mostly fn, 50 to 60%; sand co to md; slightly silty (≤5%) wet, sticky, becoming gray brown
			20' gray brown, md sand interbed
25			21' gravel coarser
		28	
30			28' Gravel co to fn, 50 to 60%, some gravel broken, angular most round; sand mostly v. fn. (soupy), some silt; few small cobbles.
35			
		38	38' gravelly sand, sand fn, 80 to 90%; gravel mostly fn; loose, soupy, saturated, brown
40			
		43	
45			43' Sandy gravel gravel mostly fn, 60 to 70%; sand co to fn; silty; occasional small cobble; gravel coarsing with depth.
		48	
50			Gravel mostly fn 65 to 75%; sand co to md; few oversize; sand becoming finer (md to fn) below 50'
55			
		58	
60			Gravel mostly fn (<3/4"), 10% 2 1/2", gravel 60 to 70%; sand mostly md to fn with few thin ~~fn~~ interbeds, predominently co sand (50 to 60) with fn gravel
65			

(HTW-4 15) Screened 27 - 32'

LONE STAR NORTHWEST
DUPONT PROJECT

Boring: L.S.W.Y. 038

Boring Location: N 655000 E 466500

Ground Elevation: 215

Elevation Water Table:

Date Drill:

Sampled by:

Depth	Strata	Sample Interval	Description/Drilling Notes
215 70 145 70	145 Vo	70	70' Gravelly sand, sand md to fn, 60 to 70% gravel co to mostly fn; loose, saturated brown. Few interbeds high gravel concentrations; sand coarsing below 75'
75			materials becoming more stained and oxidized -
	~~[illegible]~~ 137	78	77 - hoot water.
80			Pipe plugged off at 78' - drilled to 83' worked for ± 2 hrs
		83'	trying to unplug - recovered co sand, fn gravel
85			At 83' bits of silt. After pulling pipe recovered co gravel packed with silty sand.
			Bottom Hole 83' - Bit penetrated to 88' with no recovery
90			

LONE STAR NORTHWEST
DUPONT PROJECT

Boring: L.S.W.Y 045

Boring Location: N 657500 E 464000

Ground Elevation: 168

Elevation Water Table: ~~± 9 ft~~ 120 Cased in at 6' 2-24-89

Date Drill: Dec. 12, 1988

Sampled by:

Drilling began ±10 AM
Drilling completed 11:30 AM

weather - overcast, foggy, poor light

168
-120
48

Depth	Strata	Sample Interval	Description/Drilling Notes
5		8	Sandy gravel, gravel co (max 2"), f to m, silt coated, subrounded to round, 60 to 70%, sand m d, loose, moist; organic dark brown to 2', below 2, slightly organic, m d grayish brown
10			Below 8' gravel co to fn, coarser than above, 60 to 70% sand co to md.
15			(Note (3-18-89) S&C fresher looking w/ less oxidized/stained clasts than #12)
20		18	Below 21' gravel slightly finer, slightly lighter grayish brown
25			
30		28	Few small cobbles; gravel less silt coatings and sand finer below 35'
35	Gillespie		
40		38	Gravel co to fn, slightly coarser than above, 60 to 70% 42 to 46, gravel mostly 3/4 to 1/2", 80 to 90%, occasional large gravel sand co to md; few oversize 38 to 42
45			
50	VT	48	48 Sandy gravel, gravel co mostly, heavily silt coated (sticky) 65 to 75%, sand co to md, loose, wet gray brown, 49' gravel much finer, yellow brown (stained oxidized) (transition zone.)
55	Kitsap 114	54	54' Silt, brown organic 54 to 54, occasion gravel, slightly sandy
60			56' Silt greenish to purplish gray
65		68	64' Groundwater - low volume - Very little return thru cyclone 68' Bottom Hole. Enviroplug added 3 bags

168
-54
114

LONE STAR NORTHWEST
DUPONT PROJECT

Boring: L.S.W.Y 047

Boring Location: N 657000 E 464500

Ground Elevation: 212

Elevation Water Table: 212-40 = 172
Caved in at 13.9' 2-26-89

Date Drill: Dec 13, 1988
Began drilling 9:10 AM.

Sampled by:

Depth	Strata	Sample Interval	Description/Drilling Notes
			Sandy gravel, gravel co (<2") to fn, subround to round,
5			silt coated, 60 to 70%; sand co to md, loose. v moist
			to moist, top 1' organic dk brown, below 1' md brown.
		8	
10			
			occasional oversize (+2½)
15			
		18	
20			Gravel <2", co to fn, 60 to 70%; below 21' wet.
			(perched water?)
25			
		28	
30			29 - Gravel coarser with some oversize, silt coated, wet
			Below 35 gravel becoming finer.
35			No return at 38' water
	Vs?	38'	Groundwater 40' (return when stopped 2 min. at this depth)
40			Below 38' gravel co (<1½") to fn, silty, 60 to 70%, sand
	VR?		coarse to md., wet; below 40 saturated, gravel 70 to 80%.
45			1 cobble, below 44 gravel co to fn, sticky, 60 to 75%.
			45 to 46 Sand with 1 cobble, sand md to fn.
		48	47' Gravel co to fn, sticky, 65 to 75%, heavy lt brown return.
50			Few stained, oxidized clasts -
			50' Sandy gravel, gravel co to fn, subround to
55			round, may be concentrated in interbed units w/ broken cobbles,
			60 to 70%, sand mostly md, may occurs as sand
		58	interbed at 60 to 80%; md dense, saturated, gray brown
60			
			Below 60' yellowish-gray brown, gravel co to fn mostly
65			50 to 60%, sand co to fn.

LONE STAR NORTHWEST
DUPONT PROJECT

Boring: L.S.W.Y 047

Boring Location: N 657000 E 664500

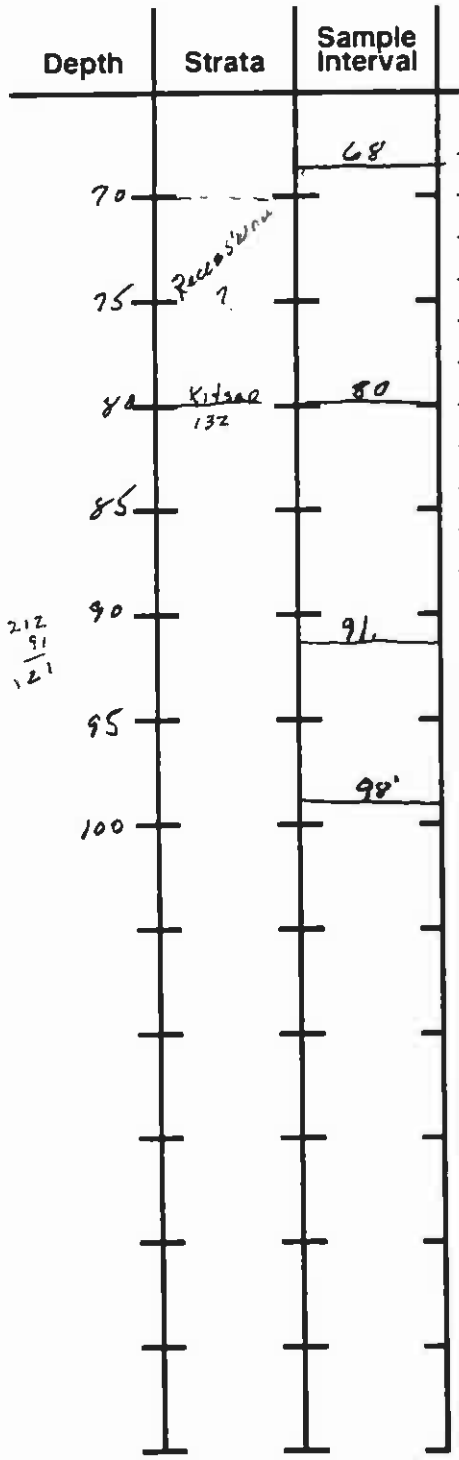
Ground Elevation: 212

Elevation Water Table: _____

Date Drill: _____

Sampled by: _____

Finished drilling 10:35



Gravel fn with coarse zones; 60 to 70%, sand co to fn. yellowish brown effluent, material gray brown. Amount of stained, oxidized clasts increasing with depth.

76 Gravelly sand, sand co to fn, 60 to 70%, gravel fn with sand co:, brown

80 Gravelly sand, sand md, 60 to 70%, gravel mostly fn with intervals co to fn and in heavy concentrations. md. dense, saturated, blue-gray ~ Kitsap.

Silt, blue-green with organic fragments 91 to 92' damp. md dense

Below 96 purplish cast. Ibey ENVIRONMENTAL

Bottom hole

LONE STAR NORTHWEST
DUPONT PROJECT

Boring: L.S.W.Y 050

Boring Location: N 656500 E 465500

Ground Elevation: 214

Elevation Water Table: [illegible] - 18[illegible]' (188)
Caved in at 14.9' deep -2 20-89

Date Drill: Dec. 14, 1988
Began drilling ± 8:30

Sampled by:

Depth	Strata	Sample Interval	Description/Drilling Notes
			Sandy gravel, gravel mostly fn (avg <3/4"), subround to
5			round, 60 to 70%; sand co to md, silt coatings; loose, very moist
			organic, dark brown to 1', below 1' moisture decreasing, md. brown
		8	recovery fair
10			8' Gravelly sand, sand md to fn, 60 to 70%; gravel mostly fn
			(<5/8"), occasional very coarse gravel, loose, moist brown
		13	gravel content increasing
15			13' Sandy gravel; gravel co to mostly fn, silt coated, 60 to 70%
		18	occasional oversize or small broken cobble; sand md;
20			loose, moist, brown
			Below 18 sand finer.
25			Below 25 moisture increasing
		28	Groundwater - 28
30			Gravel co to mostly fn, 65 to 75%, occasional oversize
			or small cobble, top 3', very sandy, soupy
35			
		38	37 to 38 very sandy, soupy
40			Below 38 gravel co to fn, 65 to 75%, few interval
			high sand content, sand co to md, brown.
45	Vs - VR		Below 45 material gray brown, effluent yellow brown
		48	
50			Gravel coarser with more oversize & small cobbles than above
55			Below 42' gravel finer with interbeds of coarse gravel and
			fn gravelly [illegible] sand.
		58	
60			Below 58 gravel co to fn, 60 to 70%, few oversize and small
			cobbles; sand co to fn. gray brown mod. dense
65			

LONE STAR NORTHWEST
DUPONT PROJECT

Boring: L.S.W.Y 050

Boring Location: N 656500 E 465500

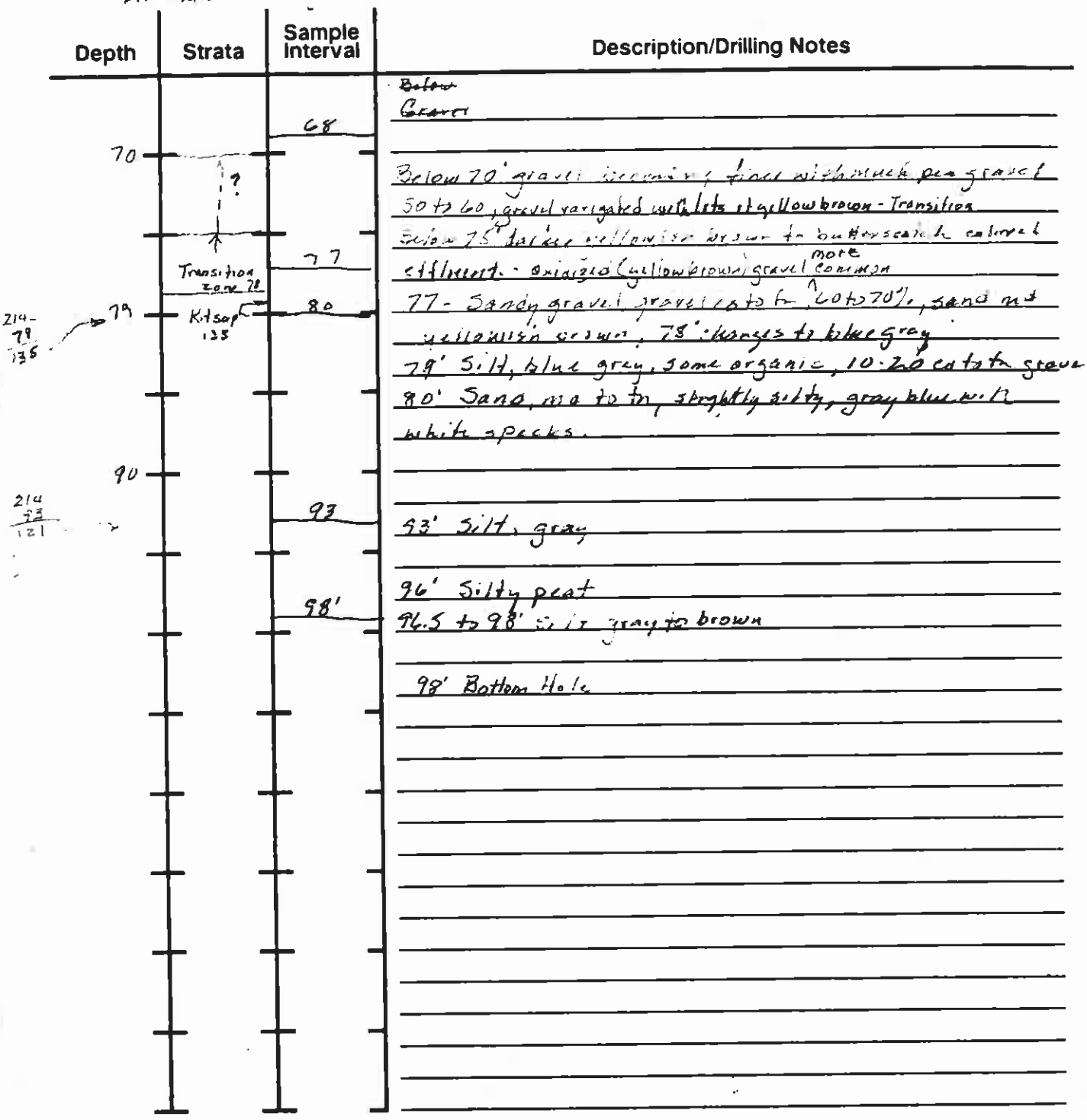
Ground Elevation: 214

Elevation Water Table: 186

Date Drill: Dec. [illegible]

Sampled by:

[illegible] 10.15AM



Depth	Strata	Sample Interval	Description/Drilling Notes
			~~Below~~ Gravel
		68	
70	?		Below 70' gravel becoming finer with much pea gravel 50 to 60, gravel varigated with lots of yellow brown - Transition
			Below 75' darker yellowish brown to butterscotch colored
	Transition zone 78	77	efflorent - oxidized (yellow brown) gravel more common
79	Kitsap 135	80	77 - Sandy gravel, gravel co to fn, 60 to 70%, sand md yellowish brown, 78' changes to blue gray
214-79 135			79' Silt, blue gray, some organic, 10-20 co to fn gravel - Kitsap
			80' Sand, md to fn, slightly silty, gray blue with white specks.
90			
214 93 121		93	93' Silt, gray
			96' Silty peat
		98'	96.5 to 98' Silt gray to brown
			98' Bottom Hole

LONE STAR NORTHWEST
DUPONT PROJECT

Boring: L.S.W.Y. 075

Boring Location: N 658000 E 463500

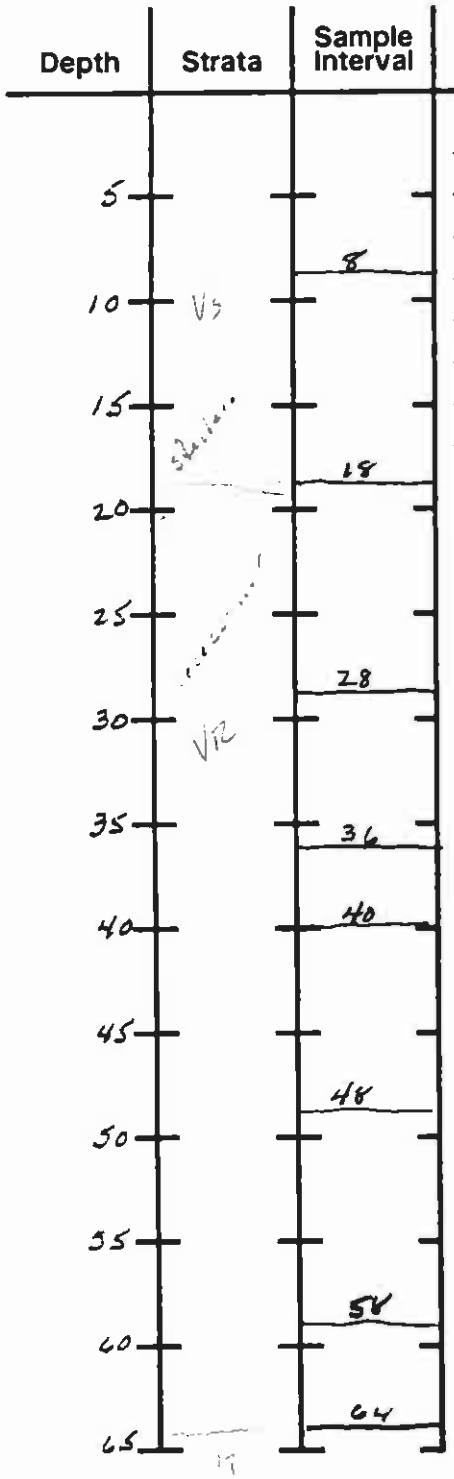
Ground Elevation: 212

Elevation Water Table: N/W
caved 42.3'-N/W-2-22-89

Date Drill: _____

Sampled by: _____

Started drilling 9:20 AM



Description/Drilling Notes

Sandy gravel, gravel mainly fn, silt coated, 70 to 80% sand co to md, loose, very moist, grayish brown

5' Sandy gravel, gravel fn, silt coated, 60 to 70%, sand mostly md, one small cobble

Below 8' sand md 40 to 50%

Below 10' gravel co to fn, silt coated, 60 to 70%, sand md, loose, moist, grayish brown

18 Sand, md to fn, 80 to 90%, gravel co to fn occurring as isolated clasts or in thin interbeds 5 to 10%, silt occurring with sand, increasing with depth content loose, moist, yellow brown - gravel increasing below 25'

28 Sandy gravel, gravel co to fn, silt coated (slightly sticky) 50 to 60%, sand fn to md, loose, moist, yellowish-brown

Below 30' moisture increasing, few small silt coated cobbles

34' to 36' very moist with silt more common

36 Gravelly Sand, sand mostly md, 50 to 60%, gravel co to ~~mostly~~ fn, silt coated, loose, moist, yellowish-brown

intervals very gravelly to predominant, silt interspersed; sand becoming finer, silty below 38'

40' Sandy gravel, gravel co to fn, silt coated, 60 to 70%; sand md to fn, loose, moist, yellowish brown

Same as above

Below 54 gravel becoming finer, 50 to 60%, sand co to fn few small cobbles, slightly silty

62 to 64 Sand md, sharp, 50 to 60%, grey mostly fn, loose damp, gray brown

LONE STAR NORTHWEST
DUPONT PROJECT

Boring: L. S. W. Y. 075

Boring Location: N 658000 E 463500

Ground Elevation: 212

Elevation Water Table:

Date Drill:

Sampled by:

Finished drilling ± 10:15

Depth	Strata	Sample Interval	Description/Drilling Notes
			Sandy gravel, gravel co to fn, silt coated, 60 to 70%
70		71	sand mostly fn, ~~slightly~~ silty, few oversize, md dense,
			damp, yellowish brown
			Below 71 gravel co to fn, more cleaved clasts, 65 to 75%, clasts stained;
75			yellow brown with orangist cast 71' to 72', bright yellowish brown
		78	below 72'; some stained, oxidized clasts
80	↓T?		
			Staining, oxidizing increasing
	Kitsap	84	84'
85	128		Silt, gray, dry; becoming lighter gray to yellowish brown below 86
		88	
90			88' Bottom Hole
95			
100			

212
84
128

LONE STAR NORTHWEST
DUPONT PROJECT

Boring: L S W.Y 099

Boring Location: N 665500 E 465000

Ground Elevation: 217

Elevation Water Table: 217 -16 = 201

Date Drill: Jan 24, 1989
Drilling started 9:20

Sampled by:

Depth	Strata	Sample Interval	Description/Drilling Notes
5			Sandy gravel, gravel co to mostly fn, silt coated, subround to round, 60 to 70%, sand md to mostly fn, loose, moist, top 2' organic, dk brown, below 2' brown
		8	
10			Gravel becoming coarser, sand coarser
15			Few small cobbles below 14'
		18	16' material wet, water return at 18.
20			Gravel co to fn, sticky silt coatings, 65 to 75%, sand mostly co.
25			
		29	
30			29 Sand, md to fn, 80 to 90%, slightly silty (5 to 10%) gravel co to fn, as interbeds, 5 to 10%, loose, saturated gray brown
35	1/2		
		38	38' Sandy gravel, gravel fn and coarsing, 50 to 60%, sand md to co, md dense, saturated, lt brown surface coatings
40	1'		40 Sandy Gravel, gravel co to fn, sticky silt coatings, 70 to 80% sand co, md dense, saturated, lt brown surface coatings
45	1/2		45 to 45 - Sandy sandy with silt
		48	48 Gravelly sand, sand md to fn, 50 to 60%, gravel co to fn, clean
50			51 Sandy gravel, gravel co to fn, clean to silt coated, 20 to 50%, some broken oversize and small cobbles (± 5%), sand co to fine, slightly silty, md dense, saturated, gray brown with lt brown coating
55			Below 44 Sandy
		54	Below 58 gravel 60 to 70%, few oversize
60			
65			(No strong water return)

LONE STAR NORTHWEST
DUPONT PROJECT

Boring: L.S.W.Y. 099

Boring Location: N 655500 E 465000

Ground Elevation:

Elevation Water Table:

Date Drill: Jan. 24, 1989
Drilling complete 10:55

Sampled by:

217
- 82
135

Depth	Strata	Sample Interval	Description/Drilling Notes
		68	Gravel co to fn, clean to slightly silt coated, 65 to 75% sand mostly md to f. dk brown
70			
	Jsd JR		Same as above, few intervals with +2½" clasts.
75			Below 75 sand co to md
			Below 78 gravel co to fn 65 to 75%, sand co to fn,
80	Trans.		silt 10-15% as coatings - increasing with depth
217 82 135	Kitsap 135	82	81 Sand and silt content increasing.
			82' Silt, gray; some wood fragments - poor recovery.
85			
		88	88 Bottom Hole
90			

LONE STAR NORTHWEST
DUPONT PROJECT

Boring: L.S.N.W. 101

Boring Location: N 656500 E 465000

Ground Elevation: 212

Elevation Water Table: 212 - 28 = 184
Measured at 16' - 2-24-89

Date Drill:

Sampled by:

Drilling began ± 3:10

Depth	Strata	Sample Interval	Description/Drilling Notes
5			Sandy gravel, gravel co to fn, some silt coatings, subround to round, 60 to 70%, sand mostly fn, slightly silty, Top 2' loose, organic very moist, dk brown; below 2' loose, moist grayish brown
		8	
10		10	8 Sand md fn 80 to 90%, gravel co to fn, loose, moist yellowbrown
			10 Sandy gravel, gravel mostly fn, silt coated, 60 to 70%,
15			sand md to fn, loose, moist, brown.
		18	Occasional oversize
20			
25			Moisture increasing, grayish brown below 25
		28	28 some water return - gravel co to fn, 50 to 60%, sand
30			co to md
			Below 32' gravel coarser, co to fn (40:60), slight sticky silt
35			coating, 70 to 80%, sand co to fn
		38	Below 38' gravel co to fn 65 to 75%; sand co to fn.
40			silt 10-25% interval semi liquid
45			
		48	
50			Sand md with 20 to 30% gravel interbedded with
			sandy gravel, gravel mostly co, 70 to 80%, relatively
55			clean, md dense, saturated, gray brown
			56 to 60 Sand md to fn
		58	Below 60 gravel mostly fn 55 to 65%, sand md to fn, slightly silty
60			
65			

LONE STAR NORTHWEST
DUPONT PROJECT

Boring: L.S.W.Y. 101

Boring Location: N 656500 E 465000

Ground Elevation: 212

Elevation Water Table:

Date Drill: Jan. 24, 1989

Drilling complete 4:20

Sampled by:

Depth	Strata	Sample Interval	Description/Drilling Notes
	VR?		
		69	69 Yellowish brown to butterscotch return – material
70			coated with thin yellow brown soupy silt
	VR or VD		gravel co to fn, subangular to round, 65 to 75%,
75			sand co to fn, md dense, saturated (low return
	Recessive	78	flow), yellow brown (some clasts stained, oxidized)
			Below 78 gravel mostly fn, some weathered, stained 50 to 60%
80			sand md to fn clean, md dense, saturated, brown – Transitional?
		83	83 - Sandy gravel [illegible] co to fn, increase in Kitsap mineralogy
85			60 to 70%, sand co to fn, few oversize, soupy interval, = Transition or reworked?
212 / 87 / 125	Kitsap 125	87	87 Sand, mostly fn, few gravel, slightly silty, loose
90	122	90	saturated, gray blue.
		92	89. Few silt layers in sand
			90' Silt gray to brown with organics common – several
95			large wood chips.
		98	92 Sand, md to fn, dry. purple with red specks, few wood chips.
101			98 Bottom Hole
			2-17-89
			Note Gravel surface [illegible] mostly fn sandy, sl. silty, brown, gray
			blue, yellow brown suggest VR

LONE STAR NORTHWEST
DUPONT PROJECT

Boring: L.S.W.Y. 106

Boring Location: N 655000 E 465500

Ground Elevation: 218

Elevation Water Table: 218 - 25 = 193
Caved-in at 19 2-20-89

Date Drill: Jan. 26, 1989
Drilling started ± 10:30

Sampled by:

Depth	Strata	Sample Interval	Description/Drilling Notes
			Sandy gravel, gravel co to fn, slightly silt coated, subround to
5			round, 60 to 70%; sand md to fn; slightly silty, ±10%
			oversize, small cobbles, loose, moist, top 1' organic
		8	dk brown; below 1' brown - poor recovery
10			Below 8' gravel co to fn, silt coated, 65 to 75%; sand md to fn;
			few oversize and small (broken) cobbles (5 to 10%); loose,
15			moist, grayish brown.
			Below 16' moisture increasing
		18	Below 18' gravel finer, coated with sticky silt,
20			65 to 75%; sand mostly md; very moist, grayish brown.
		25	Below 25' wet, clasts coated in heavy sticky silt.
25			light brown
		28	
30			Gravel finer with occasional oversize. less sticky silt
			coating, gravel mostly fn, 60 to 70%; sand md to fn, some
35			breakage due to drilling; material md dense, saturated
		38	
40			41' - silty interbed, sticky
			Water return increasing - (very slight return)
45			44' Gravelly sand, sand md to fn, 70 to 80%; gravel
			co to fn; silt 10-20%; loose, (soupy) saturated, light brown.
		49	46' Sandy gravel - same as 38' to 41'
50			
			Below 52 - Soup fn, silty sand with gravel - same as 44' to 46'
55			
			Below 56' gravel content increasing
		58	Below 58 water return increasing - gravel co to fn, some
60			broken, clean, interval slightly concentrated, 60 to 70%; sand co to fn,
			intervals finer, few broken oversize, silt increasing slightly
65			as coating below 65', md dense, saturated, gray brown

LONE STAR NORTHWEST
DUPONT PROJECT

Boring: L.S.W.Y. 106 Boring Location: N 655000 E 465500

Ground Elevation: 218 Elevation Water Table: _____

Date Drill: Jan 26, 1989 Sampled by: _____

2:20 - Pipe plugging
3:30 Pipe unplugged assumed at this time

Depth	Strata	Sample Interval	Description/Drilling Notes
		68	Continuation of above - see last page for description
70	Vs		Below 66' gravel mostly <1 1/4" with coarser intervals.
	144	72	65 to 75%; sand co to md, thin wet sticky silt coating
	Transitional		clasts. Below 72' soupy silty fn sand with gravel and oversize
75	Sat Spec? 141	77	76' gravel content increasing
			77 Gravel coarse, heavily coated with silt, dense, yellow brown
80	Vo	82	gravel co to fn 65 to 75%, sand co to fn, silt 10 to 15%. (DuPont)
			82' Sandy gravel, gravel co to fn, 60 to 70%, sand co to fn;
85			clean, md dense, saturated, yellowish brown, gravel
		88	stained, slightly oxidized
90			90' to 91' gravel coarse
			91' Gravelly sand, sand mostly md to fn, clean, 85 to 90%; gravel
95			mostly fn, md dense saturated, lt md brown with white specks -
		98	- Sand result of segregation from dragged pipe
100			Interval continuation of sandy gravel from 82' - Butterscotch colored return
		102	Gravel co to mostly fn 60 to 70%; clean, sand mostly md to fn,
105			saturated, brown
			102' Sand, mostly fn, 90 to 95%; occasional gravel; dispersed silt
		108	and sandy silt balls, occasional thin gravel interbed
110			loose to md dense, saturated, yellowish brown - some sample drag-ging
		111	Below 108' sandy gravel - see description @ 102'
			Below 111' silt content increasing - few silt balls - water return
115			thicker, dark butterscotch (low volume), material dense -
		117	gravel co to mostly fn, clean, 60 to 70%; sand co to fn
			Below 115' gravel co to fn, few oversize, clasts, fractured, angular
120			to round, 60 to 70%; sand co to fn, dense, saturated, brown
		122	122' Silty gravelly sand, silt content increasing, dark brown & water return
			gravel angular to round, co to fn, 60 to 70%; sand co to fn
125	Projection V92 Kitsap	126	122' Gravelly sand, sand md to fn 60 to 70%, gravel co to fn, saturated, brown
			126' Gravelly sand, sand mostly md to fn 70 to 80%, gravel mostly fn
130			loose, saturated, bluish-green

LONE STAR NORTHWEST
DUPONT PROJECT

Boring: L.S.W.Y. 106

Boring Location: N 655000 E 465500

Ground Elevation: 218

Elevation Water Table: _____

Date Drill: Jan 26-27, 1989

Sampled by: _____

Drilling complete 8:35AM 1-27-89

Depth	Strata	Sample Interval	Description/Drilling Notes
218			
135	83	134	134' S/H. brown with gray interbed some organics and volcanic ashy, hard, very moist to moist
	79	137	137 Sand, md to fn, 5 to 10% fn gravel, some mud laymonds, small silt balls and interspersed silt (5 to 10%), purplish gray with red speckles
140			
145			
		148	
150			148' Bottom Hole

LONE STAR NORTHWEST
DUPONT PROJECT

Boring: L.S.W.Y. 107

Boring Location: N 655500 E 466000

Ground Elevation: 212

Elevation Water Table: 212-12 = 200
Cave in 12.5 - water on top. 2-20-89

Date Drill: Jan 27, 1989
Drilling began ≈ 10:30

Sampled by:

Depth	Strata	Sample Interval	Description/Drilling Notes
			2' Topsoil showing in ditch beside boring
			Sandy gravel, gravel mostly <1 1/4", slightly silt coated, subround
5			to round, 55 to 65%, sand md to fn, slightly silty, loose, top 2'
			organic, moist, dk brown, below 2', moist, grayish brown, to 6, brown below 6
		8	Below 8' gravel co to fn, silt coated, 60 to 70%, sand mostly fn
10			
			Below 12 moisture increasing
15		15	15 water return, gravel co to fn, clean, 65 to 75%, sand fn.
20		20	Gravel co to fn, sticky silt coatings, increasing in concentration
			with depth, 70 to 80%; sand co to fn, few oversize (±5%)
25			loose, saturated, gray brown with brown coating
		28	Below 30 gravel co to fn, clean, 60 to 70%, few oversize (broken)
30			sand md to fn, silt <5%, gray brown with slight reddish cast
		34	Same as above with some sticky silt coating
35			slightly soupy.
		38	
40			
45			Below 45 material with less silt, cleaner, soupy interval 40' to 42'
		47	
50		50	47 - Gravelly sand, sand md to fn, 60 to 70%, gravel co to fn,
			loose, saturated, brown
			50 Sandy gravel, gravel co to fn, some co. interbeds, clean, 60 to 70%;
55	Sfoilacoom		sand mostly md to fn with coarser intervals, few oversize, some
			oxidized & stained clasts, md dense, saturated, gray brown
		58	strong water return
60	Sal Sprs	61	61' Sandy gravel, gravel mostly fn with coarser interbeds
212 / 61 / 151	151		stained, oxidized, 50 to 60%; sand mostly md to fn; slightly silty
	DuPont		yellowish brown paste (return), md dense, saturated, brown, yellow cast
65			61' to 65' heavy silt, yellow to reddish brown

LONE STAR NORTHWEST
DUPONT PROJECT

Boring: L.S.W.Y. 107 Boring Location: N 655500 E 466000

Ground Elevation: 212 Elevation Water Table: _____

Date Drill: Jan 27, 1984 Sampled by: _____

Drilling began ±10:30

Depth	Strata	Sample Interval	Description/Drilling Notes
70		68	Gravel mostly fn, clean 50 to 60%, sand mostly md to fn slightly silty, md dense, saturated yellowish brown
75			few coarse gravel intervals
80		78	Below 78' sand intervals 50 to 60%. few small cobbles - gravel then interval mostly fn 50 to 60%
85			
90		88	(1 x ½") Gravel mostly fn 50 to 60%, sand md to fn.
95		93	93 Gravelly sand, sand mostly fn, 70 to 80%, silty 10 to 15% hard silt intervals, few gravel (5 to 10%), loose, saturated yellowish brown
100		100	100 Sandy gravel, gravel co to fn, max ±2", 55 to 65%; sand md to fn, slightly silty, 5 to 10%, md dense, saturated, yellowish gray brown
105			Water return good, yellowish brown (butterscotch) Below 106 gravel mostly fn, 50 to 60%, sand md to fn.
110		108	
115		114	112 Decomposed granite cobble or boulder 114 Gravelly sand, sand md to fn, 70 to 80%, gravel co to fn, clean, md dense, saturated, brown
120	Advance		117 Sandy gravel, gravel co to mostly fn, 50 to 60%, sand md to fn; clean, md dense, saturated, brown white specked.
125			
130	Riprap	127	127 Sand, md to fn 30 to 70%, gravel co to fn; clean md dense, saturated - gray blue

LONE STAR NORTHWEST
DUPONT PROJECT

Boring: L S W.Y. 107

Boring Location: N 655500 E 466000

Ground Elevation: 212

Elevation Water Table: _____

Date Drill: Jan 27, 1989
Drilling completed 1:55 1/27/89

Sampled by: _____

Depth	Strata	Sample Interval	Description/Drilling Notes
212		134	
134	78		134 - Silt, gray (about 'h' thick)
135			135 - Silty sand, sand fn, 80 to 90%, gray, saturated
			Below 137 v. fn sand and silt mixed
140			
		142	142 Silt, brown, last return
145			
		146	146 Sand fn. green, silty
212		148	
149	69		
150			Bottom Hole 148

LONE STAR NORTHWEST
DUPONT PROJECT

Boring: L.S.W.Y. 119

Boring Location: N 656000 E 466000

Ground Elevation: 218

Elevation Water Table: 218 - 30 = 188
Corrected at 4.6' 2-24-89

Date Drill: Feb. 7
Drilling started 12:20 P.M

Sampled by:

Depth	Strata	Sample Interval	Description/Drilling Notes
5			Sandy gravel, gravel mostly fn, clean. 65 to 75%; sand co to fn, loose, moist; top 3' organics, dk brown, below 3' brown - poor recovery -
		8	
10			Below 8 gravel coarser, some silt coatings, some crushing (10 to 20%), 70 to 80%, some oversize and broken cobbles (±10%); sand most md to fn, loose, moist, brown
15			Below 15 silt coating increasing, oversize broken to round ±10%;
		18	moisture increasing.
20			
25			
30		30	30 Gravelly sand, sand md to fn, 50 to 60%, gravel co to fn loose, wet to saturated, brown, slightly silty.
35			few oversize and small cobbles
			Strong water return below 36'
40		40	40 Sandy gravel, gravel co to fn, subangular (some breakage) to round, slight wet sticky silt coatings 70 to 80%, sand co to md, md dense, saturated gray brown to brown
45			
50		48	Below 40 seeps, slightly more silt, few oversize, sand fines
55			
		58	
60			
65			

LONE STAR NORTHWEST
DUPONT PROJECT

Boring: L.S.W.Y. 119

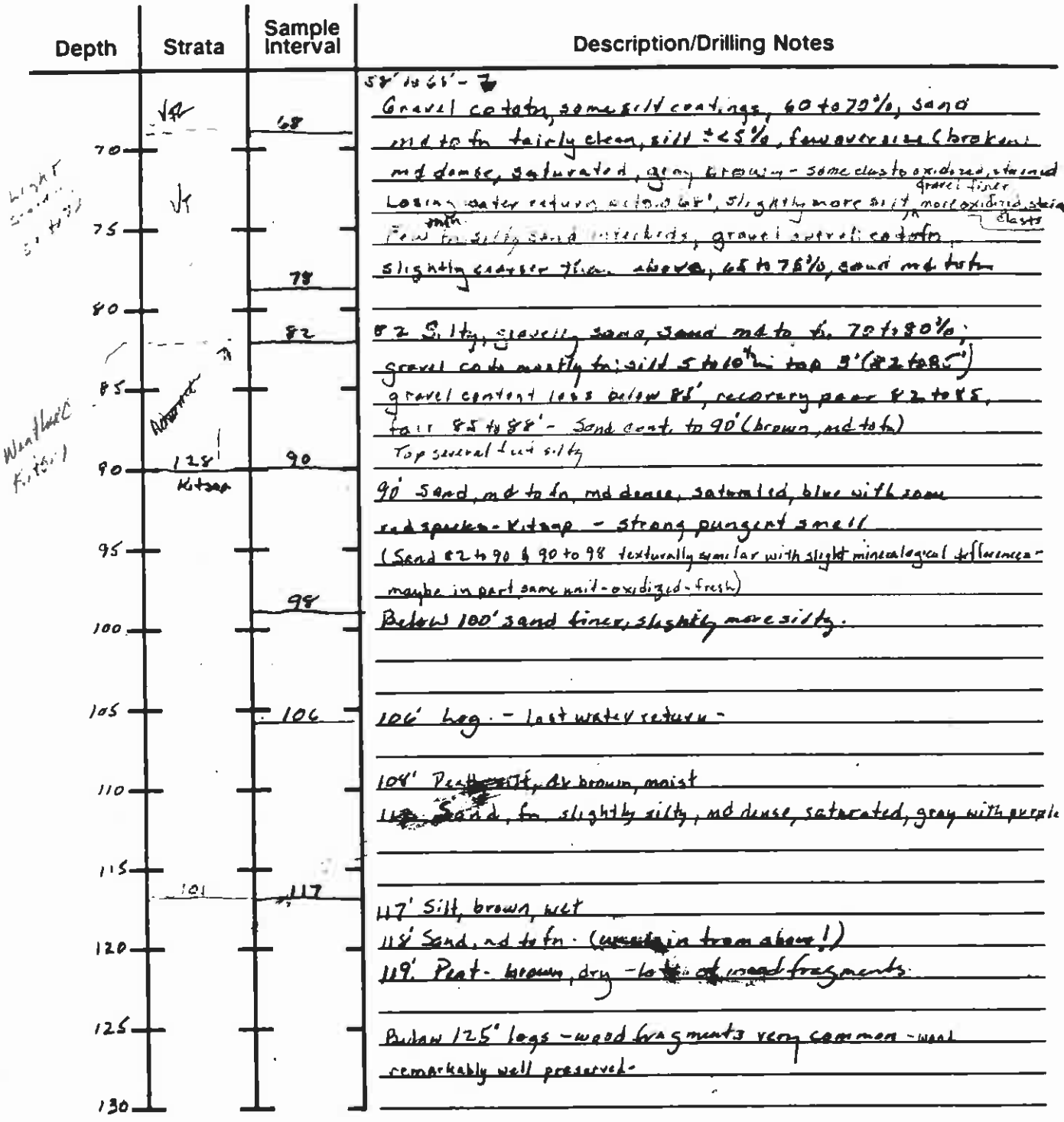
Boring Location: N 656000 E 466000

Ground Elevation: 218

Elevation Water Table: 188
Caved at 4.6' 2-24-89

Date Drill: Feb. 7

Sampled by:



LONE STAR NORTHWEST
DUPONT PROJECT

Boring: L.S.W.Y. 119

Boring Location: N 656000 E 460000

Ground Elevation: 218

Elevation Water Table: _____

Date Drill: Feb 7, 1985

Sampled by: _____

Depth	Strata	Sample Interval	Description/Drilling Notes
		131	131. Organic sandy gravel, gravel mostly fine, 50 to 60%, sand coarse to fine, dense, wet, dk brown - water returning
135		136	132 material gray, silt 10 to 20%, gravel angular to round
			Bit plugged 2' off bottom 129 to 131' deep. - cobbles & boulders.
140			Intervals very silty, gray with wood fragment, dense
			("Till-like - mudflow?)
			136 Bottom hole - 2 hrs spent trying to penetrate
			131' to 136'-

LONE STAR NORTHWEST
DUPONT PROJECT

Boring: L.S.W.Y 120

Boring Location: N 655000 E 466000

Ground Elevation: 214

Elevation Water Table: 214-16=198 ✓2-20-89
water 12.5' 2-20-89 - Caved in at - 13.5

Date Drill: Feb. 8, 1989

Sampled by:

Depth	Strata	Sample Interval	Description/Drilling Notes
			Location approx 3' below original ground level. Area cut out for complete building/railway N.W. of boring site
5			Sandy gravel, gravel co to fn, slightly silt coated, subrounded round, 65 to 75%; sand mostly fn, slightly silty (±5%), loose, moist, brown - Top 1 slightly organic - Occasional cobble
		8	
10			Below 9' small cobbles 8 to 10%, gravel slightly coarser
15		16	Below 16 slightly heavier silt coating, less oversize, gravel co to fn (finer than above) very moist to wet
20			sand co to fn
25		26	Below 26 few small cobbles
			Below 28 gravel becoming finer.
30		32	Below 32' soupy with silty fn sand common; gravel co to fn, 50 to 60%, sand md to mostly fn 30 to 40%, silt 10 to 20%
35			
40		40	Below 40 gravel co to fn 65 to 75%, sand co to fn, some sticky silt coatings, few oversize, md dense, saturated, brown
45			
		48	
50			Gravel co to fn with some fn gravel intervals. Sand md to fn with few soupy fn sand intervals, few isolated cobbles, md dense, saturated, brown to gray brown.
55			
		58	
60			Below 58 gravel co to fn, clean to silt coated, 65 to 75%; sand co to fn, md dense, saturated, gray brown
65			

LONE STAR NORTHWEST
DUPONT PROJECT

Boring: L.S.W.Y. 120

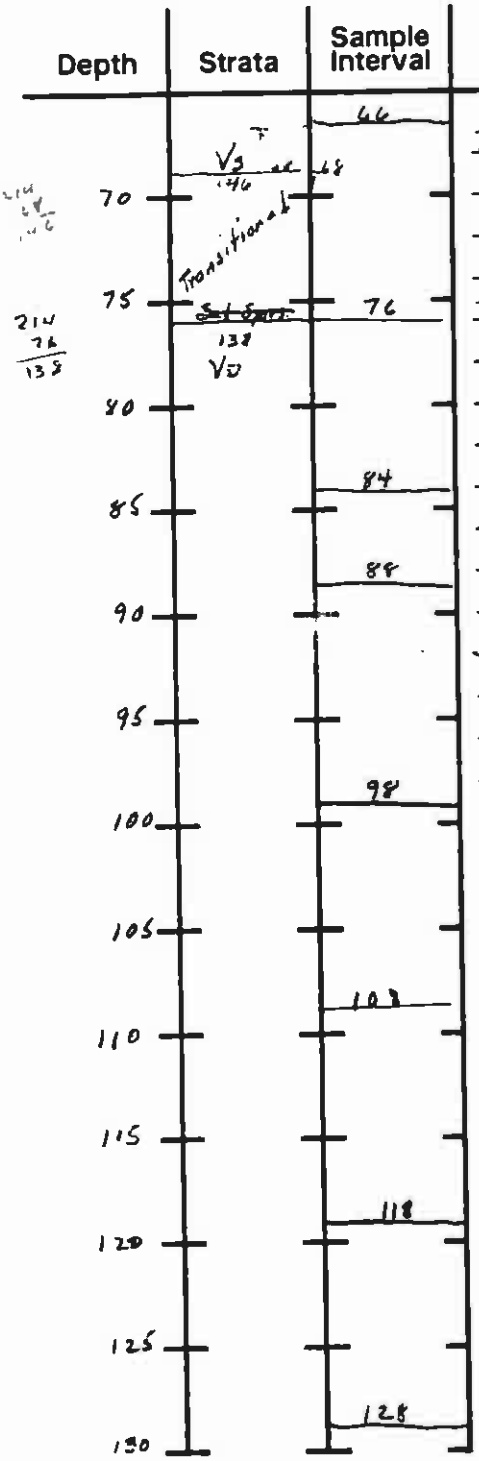
Boring Location: N 655000 E 466000

Ground Elevation: 214

Elevation Water Table: _____

Date Drill: _____

Sampled by: _____



Below 66' silt increasing

Below 68' gravel co to fn, 60 to 70%, sand co to fn, silt heavily coating clasts, 10 to 15%, md dense, saturated, brown

Transitional (Field exam. 3-16-89 - phreatic contact at 76')

76 Sandy gravel, gravel co to mostly fn, most < 2", few + 2", some staining, oxidized, many yellowbrown, 60 to 70%; sand co to fn; md dense, saturated (darker yellow brown effluent), brown with yellowish cast - Few cobbles below 82'

84' Gravelly sand, sand md to fn, 60 to 70%, gravel co to fn, occasional oversize, loose, saturated, brown - materials slightly oxidized

88 Sandy gravel, gravel co to mostly fn, few 2", 60 to 70%; sand mostly md to fn, loose to md dense, saturated, brown

82 to 85 predominantly sand md, 70 to 80%, gravel mostly fn.

Below 85' gravel mostly fn, stained, 50 to 60%, occasional oversize, sand mostly md to fn, yellow to red hue

sand content increasing - grading to

102 gravelly sand, sand md to fn, bids coarser, 60 to 70%; gravel mostly fn, concentrations as interbeds; loose to md dense, saturated, yellowish brown

1

Same as above - sand md to fn, 50 to 60%, gravel mostly fn, with some reddish brown below 112'

Below 114' greyish brown.

Same as above, few fn gravel interbeds

LONE STAR NORTHWEST
DUPONT PROJECT

Boring: L.S.W.Y. 120

Boring Location: N 655000 E 466000

Ground Elevation: 214

Elevation Water Table:

Date Drill: Feb. 8, 1989

Drilling completed ± 2

Sampled by:

Depth	Strata	Sample Interval	Description/Drilling Notes
			Below 130' becoming gray, silty, losing water return.
135			Some co to fn gravel - grading to
			132 Sand, fn, silty, saturated, gray,
	75	139	139 Silt, brown
214 139 75 140	~~Rubble~~ Kitsap		
			Recovery poor - drilled tight
145		145	
			145' Bottom Hole
150			214 − 139 = 75

LONE STAR NORTHWEST
DUPONT PROJECT

Boring: L.S.W.Y 122

Boring Location: N 656500 E 466500

Ground Elevation: 212

Elevation Water Table: 212 - 18 = 194'
Caved in at 18.1' 2-23-89

Date Drill: Feb 9
Drilling began 11:30 AM

Sampled by: _____

Depth	Strata	Sample Interval	Description/Drilling Notes
			Top Soil 1'-2'
			2' Sandy gravel, gravel co to mostly fn, slight silt coating, subround to round, 60 to 70%; sand md to fn, few oversize; loose, moist, brown
5		8	Below 8 gravel coarser
10			
15			16 to 18 coarse gravel common.
		18	
20			Below 18 wet, gravel finer, few broken cobbles, sand coarser. 18' water return - gravel co to mostly fn 60 to 70%, sand md, few sandy intervals, material clean loose, saturated, gray brown
25			
		28	
30			Below 28 clasts coated in silt, gravel co to fn, 65 to 75%, sand co to fn, oversize 5 to 10%; loose, sticky, gray brown
35			Below 35 material finer
		38	
40			Below 38 gravel finer, gravel co to fn, 60 to 70%, sand mostly md, (co to fn), 5 to 8% oversize, generally clean, gray brown
45			
		48	
50			Same as above
			Below 52 less oversize
55			
		58	
60			Gravel co to fn, 55 to 65%, sand mostly md to fn; clean
65			

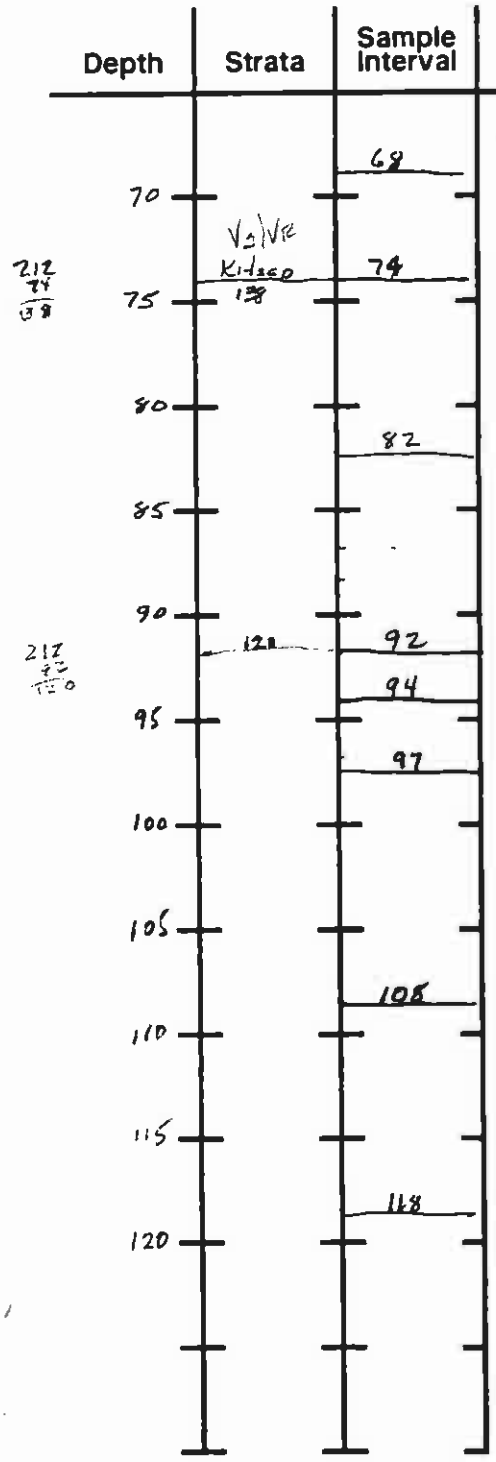
LONE STAR NORTHWEST
DUPONT PROJECT

Boring: L.S.W.Y 122 — Boring Location: N 656500 E 466500

Ground Elevation: 212 — Elevation Water Table: _____

Date Drill: Feb. 9, 1989 — Sampled by: _____

Drilling completed 1:40



212 74 138

217 92 TD

Below 65 few oversize. -

Gravel content increase, more volcanic materials, some stained oxidized

74 Effluent slightly darker brown - changing to olive below 76'

74' Sandy gravel, gravel co to fn, subround to round, few oxidized, 60 to 70%, sand co to fn, moist, clasts volcanic origin, md dense saturated bluish green

Below 78 bluish green with purple hue, gravel co to mostly fn 55 to 65%; sand co to fn, sharp to round, oversize 5 to 10%; md dense, saturated. -

82' Sand, md to fn, few gravel, cobbles (10 - 20% total) md dense, saturated greenish-blue white speckled (quartz)

Few gravel interbeds, wood 88 to 90'

92' (915) Peat. - Lost return at 92'

94' Silt, gray, organic; moist to damp - recovery poor

97' Sand, fn, few silt balls (<1"), purple; damp

Below 100' interval coarser, contains occasional fn pebble (hard) or silt ball (soft), becoming more bluish

Water return (chocolate brown when began at 105

113 Silt layers and interspersed with fine sand, saturated, brown

Below 116 sand coarsing

118' Bottom Hole.

LONE STAR NORTHWEST
DUPONT PROJECT

Boring: L.S.W.Y. 124

Boring Location: N 658250 E 463250

Ground Elevation: 207

Elevation Water Table: Wet zone 124' to 127' depth
Cored in at 40' 2-22-89

Date Drill: Feb. 10
Drilling began ± 10:45

Sampled by:

Located between two kettles

Depth	Strata	Sample Interval	Description/Drilling Notes
5		6	Sandy gravel, gravel co to tn, 60 to 70%, sand md, loose, moist, yellowish brown - sand content increasing with depth
			6' Gravelly sand, sand md to mostly fn, 85 to 95%, gravel fn, loose, damp, brown
10		10	10' Sandy gravel, gravel co to fn, slightly silt coated, subrounded to rounded, 65 to 75%; sand mostly fn, loose, damp, brown
15			Below 15 some oversize
		18	
20			Below 22' occasional cobbles, damp.
25			
		28	28' Gravelly sand; sand md to fn, 50 to 60%, gravel co to fn, occasional cobble, clean, loose, moist, brown
30			
35			Few very gravelly interbeds
		38	38' Sandy gravel, gravel co to mostly fn, slightly silt coated, 50 to 60%; sand mostly fn, loose, damp, brown
40			
45			Below 45' gravel fn, 60 to 70%
		48	Below 48' gravel co to fn, 60 to 70%, occasional oversize or small cobble - becoming grayish brown
50			
55			
		58	58' to 60' co gravel, small cobbles
60			Below 60' gravel co to fn, relatively clean, 65 to 75%, sand md to fn, sharp, loose, dry, light brown; occasional oversize
65			

LONE STAR NORTHWEST
DUPONT PROJECT

Boring: L.S.W.Y 124

Boring Location: N 658250 E 463250

Ground Elevation: 207

Elevation Water Table: _____

Date Drill: Feb. 10, 1989
Finished drilling 12:40

Sampled by: _____

207 - 118 / 89

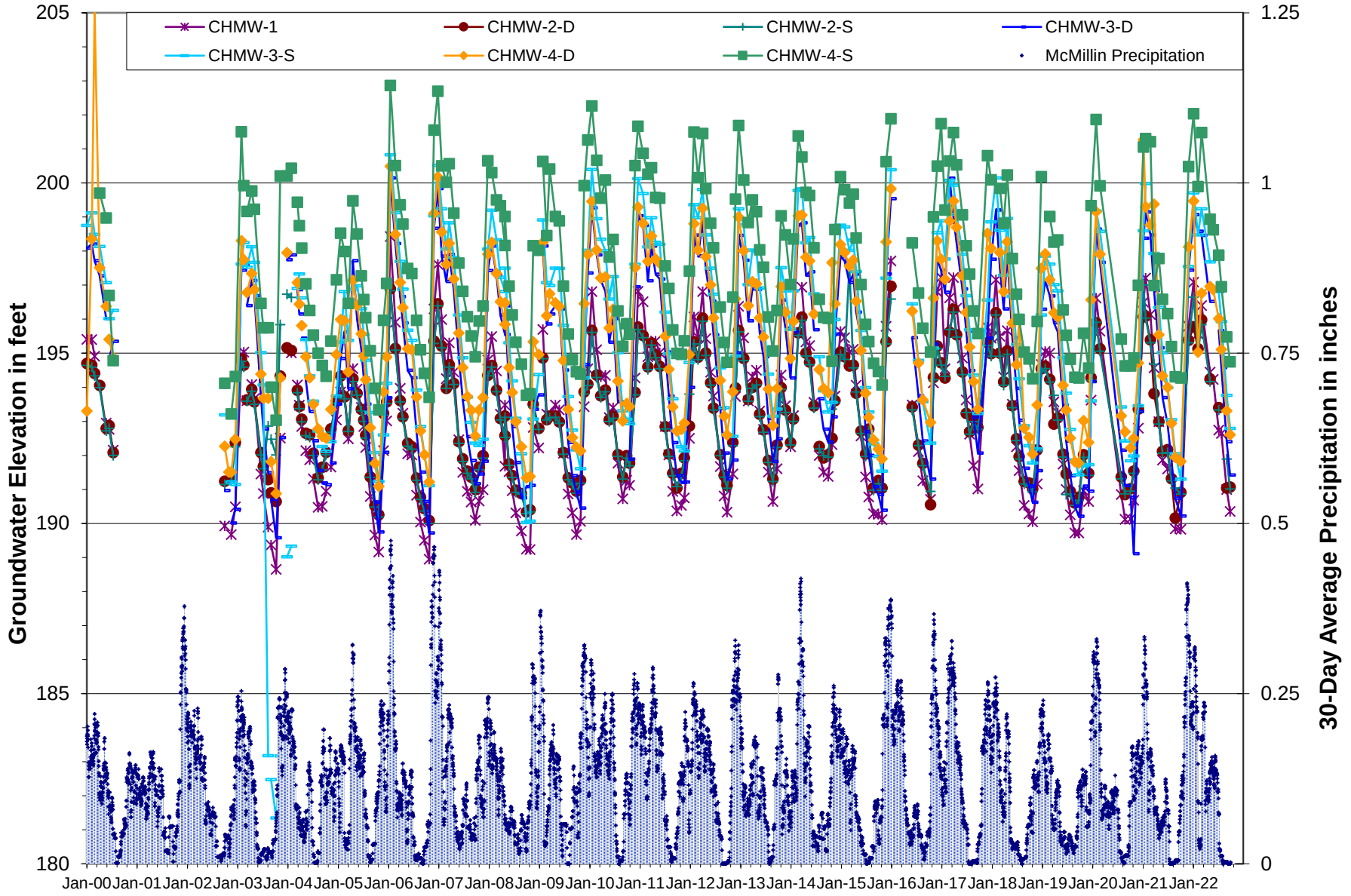
Depth	Strata	Sample Interval	Description/Drilling Notes
70		68	Below 70 gravel mostly fn, 60 to 65%, sand fn, occasional oversize damp, grey brown
75			
80		78	Below 78 gravel covering with more oversize
85			
90		88	88 Gravelly sand, sand mostly fn, 85 to 95%, gravel co to fn, mostly isolated; loose, damp brown
95			
100		97	97 Sandy gravel, gravel mostly fn, silt coated, 55 to 65%, sand fn becoming med to fn, loose, dry to damp, brown
105		104	104 Sand same as 88 to 97, slightly more moist slightly silty with few small silt balls
110		110	Below 110 gravel co to fn 30 to 40%, silty (10 to 20%)
115			
120	Kitsap 89	118	118 Sand, md to fn, occasional small gravel or wood fragment loose, moist, purple with red specks - Kitsap.
125	88 / 31		124 Water return 126 ~~Silt~~ Peat mixed with sand wet
130		127	127 Silt gray, very moist to wet becoming moist to damp below 132
		138	138' Bottom Hole

207 / 118 / 89

207 / 124 / 89

APPENDIX B

Hydrographs of Groundwater and Surface Water Monitoring Data



Aspect Consulting, LLC
10/28/2022
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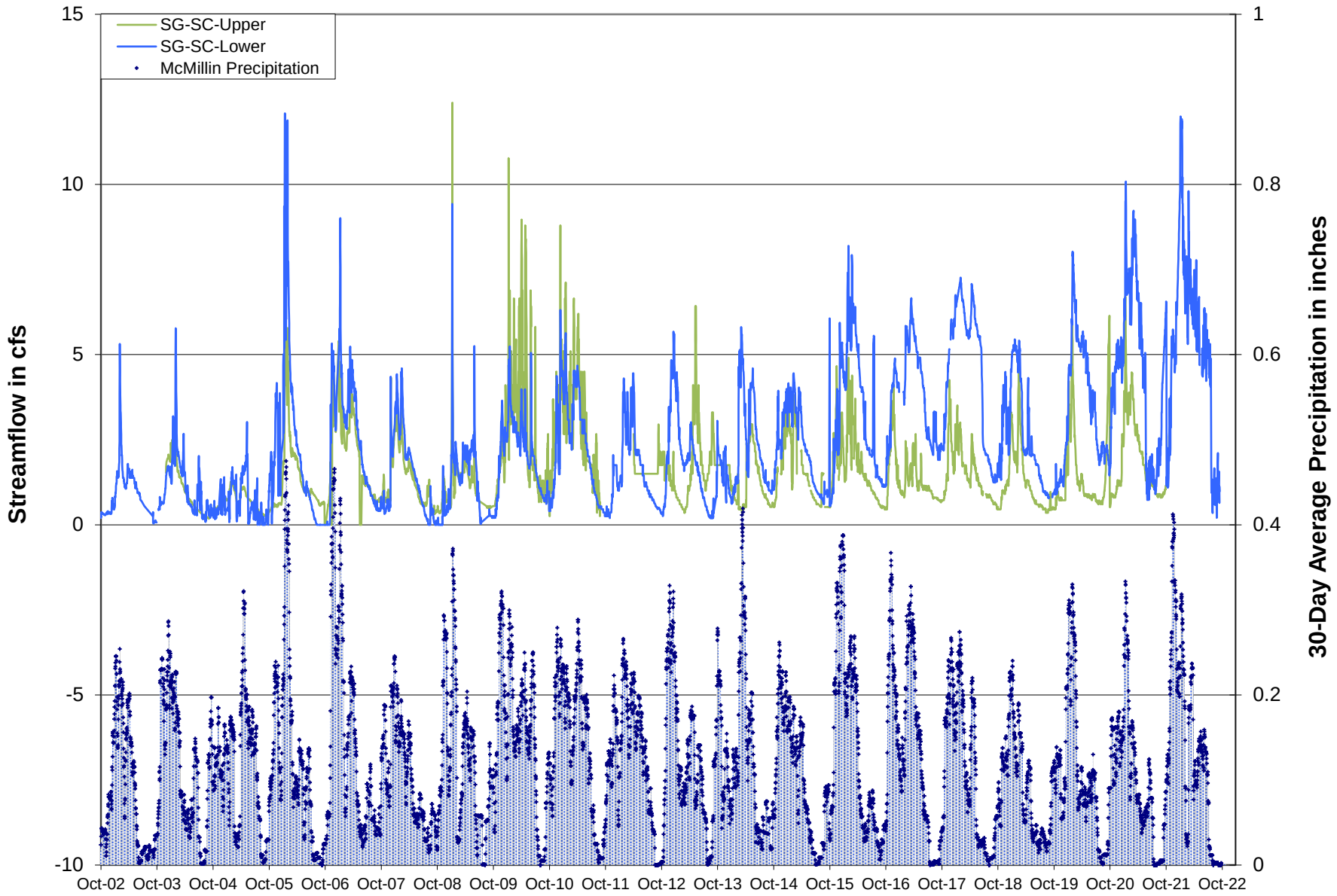
B-1 Vashon Aquifer Water Levels

Pioneer Aggregates South Parcel Project
DuPont, WA



Aspect Consulting, LLC
10/28/2022
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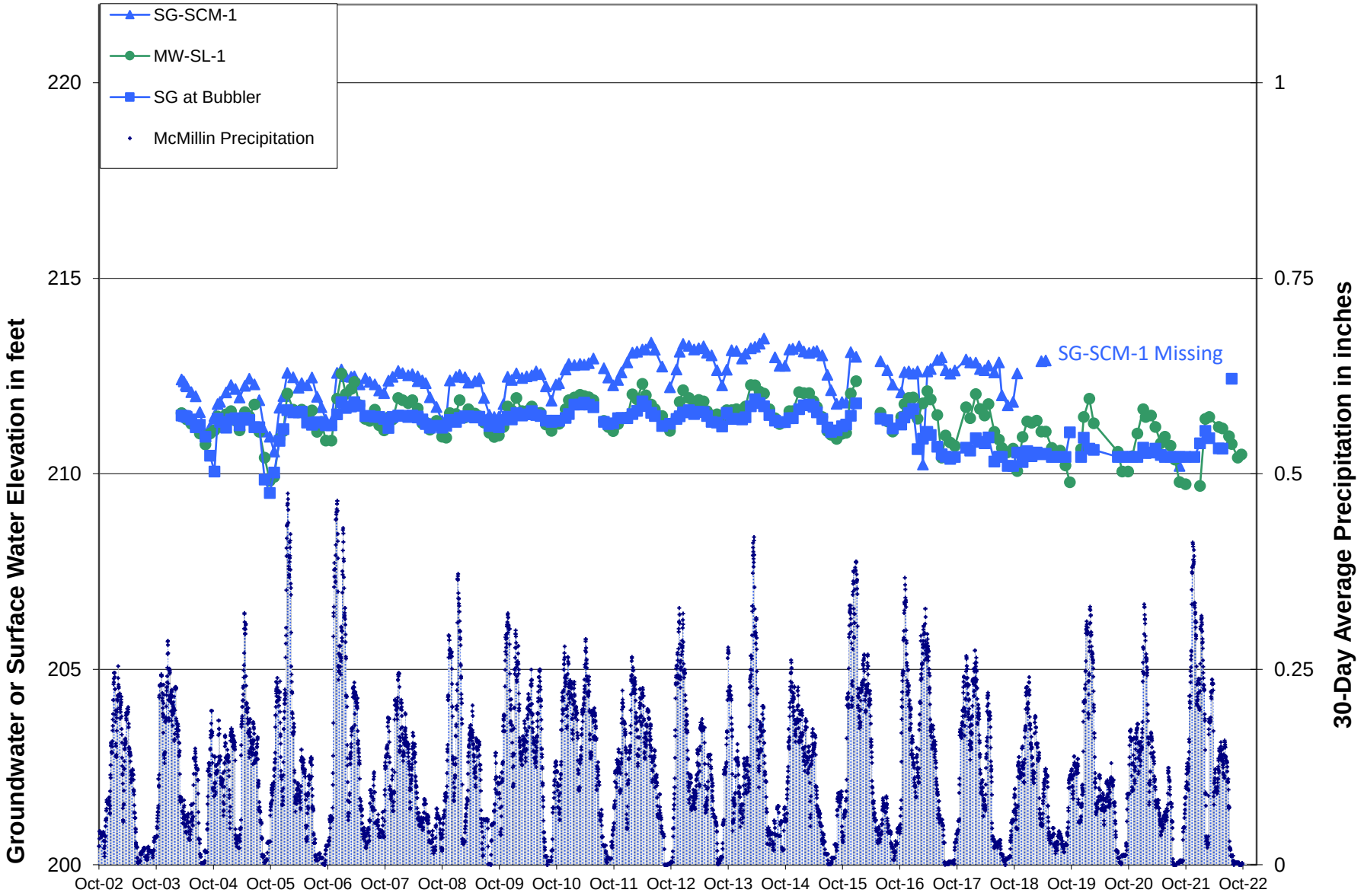
B-2 Sequalitchew Creek Hydrographs

Pioneer Aggregates South Parcel Project
DuPont, WA



Aspect Consulting, LLC
10/28/2022
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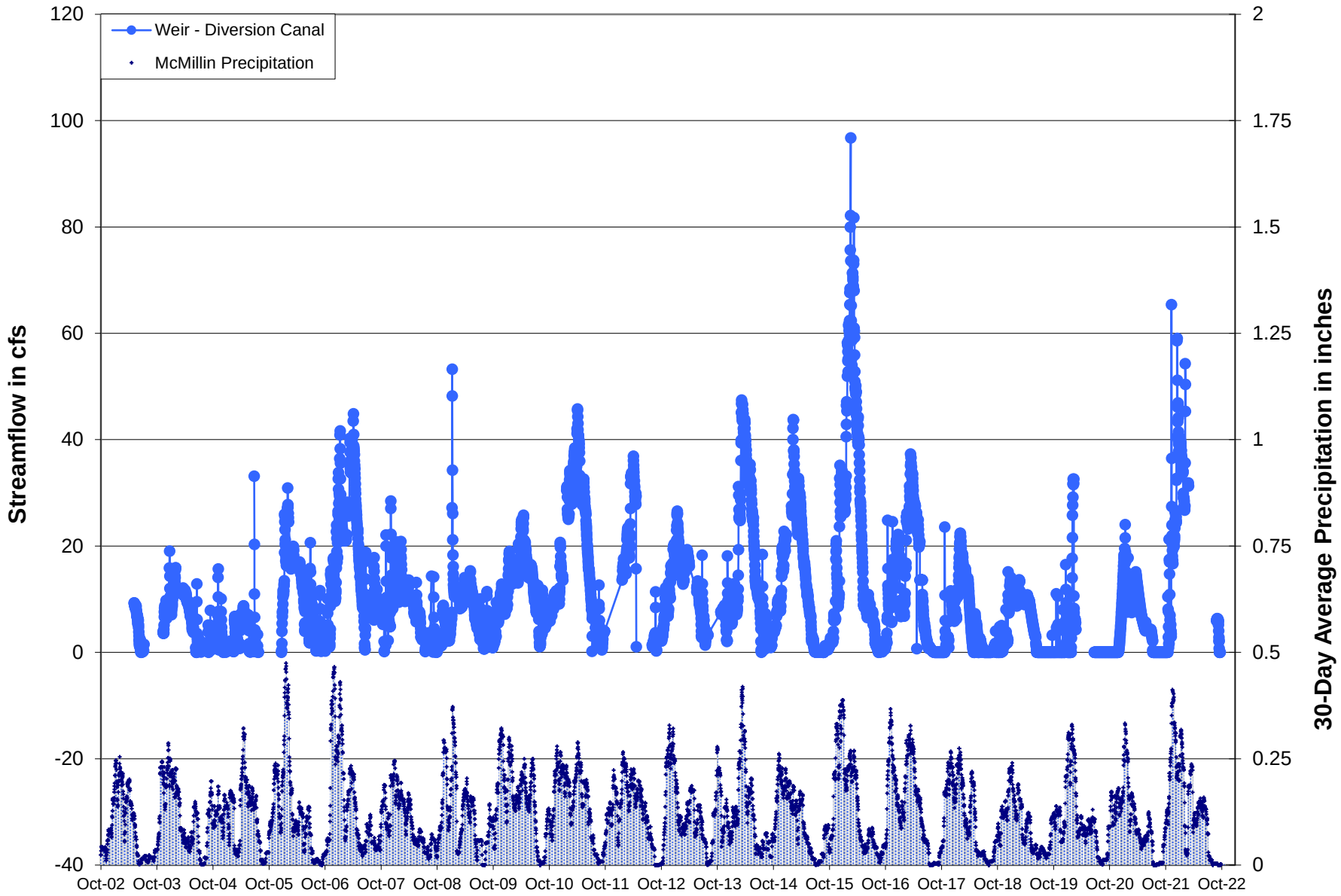
B-3 Sequalitchew Lake Area Water Levels

Pioneer Aggregates South Parcel Project
DuPont, WA



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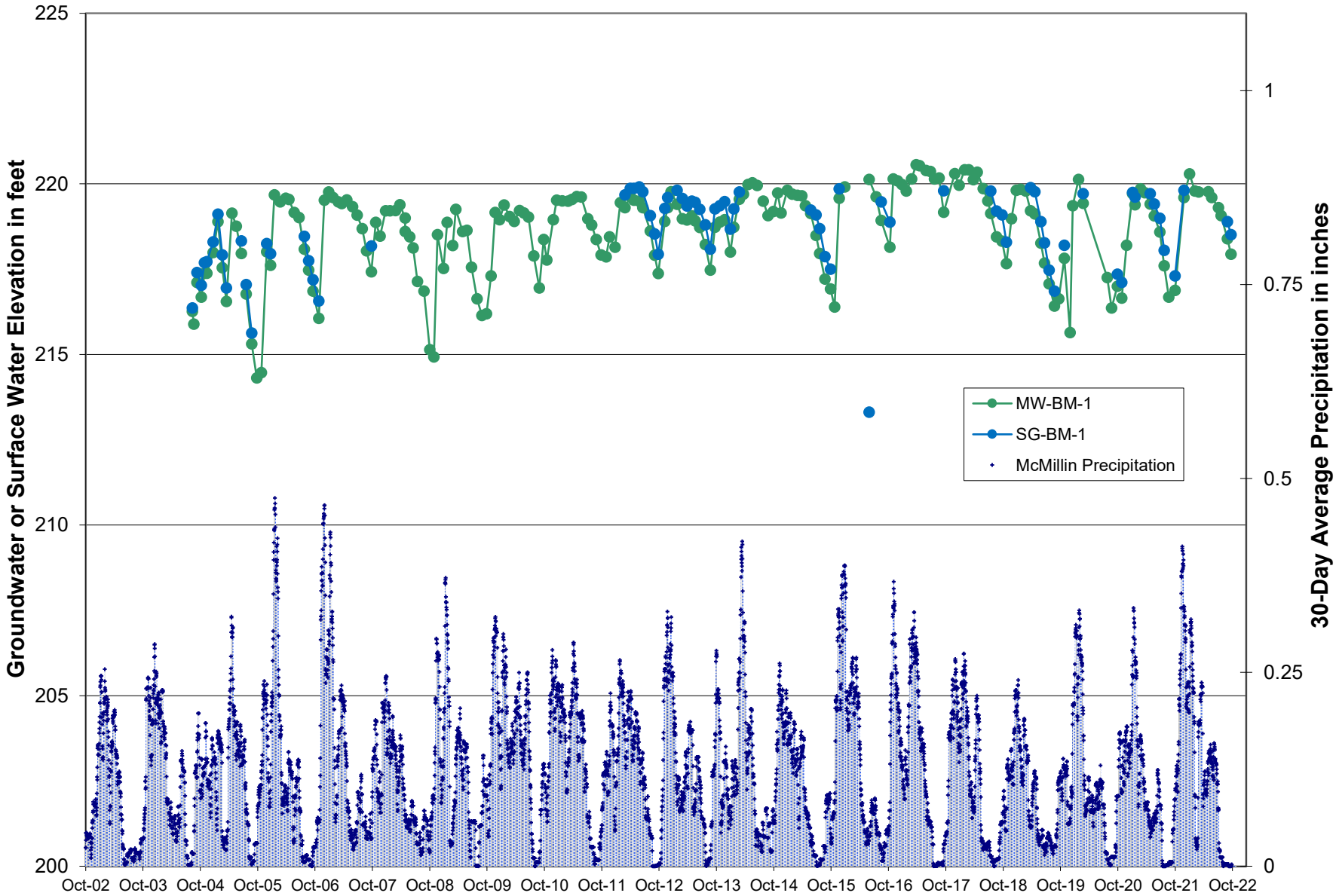
B-4 Diversion Weir Hydrograph

Pioneer Aggregates South Parcel Project
DuPont, WA



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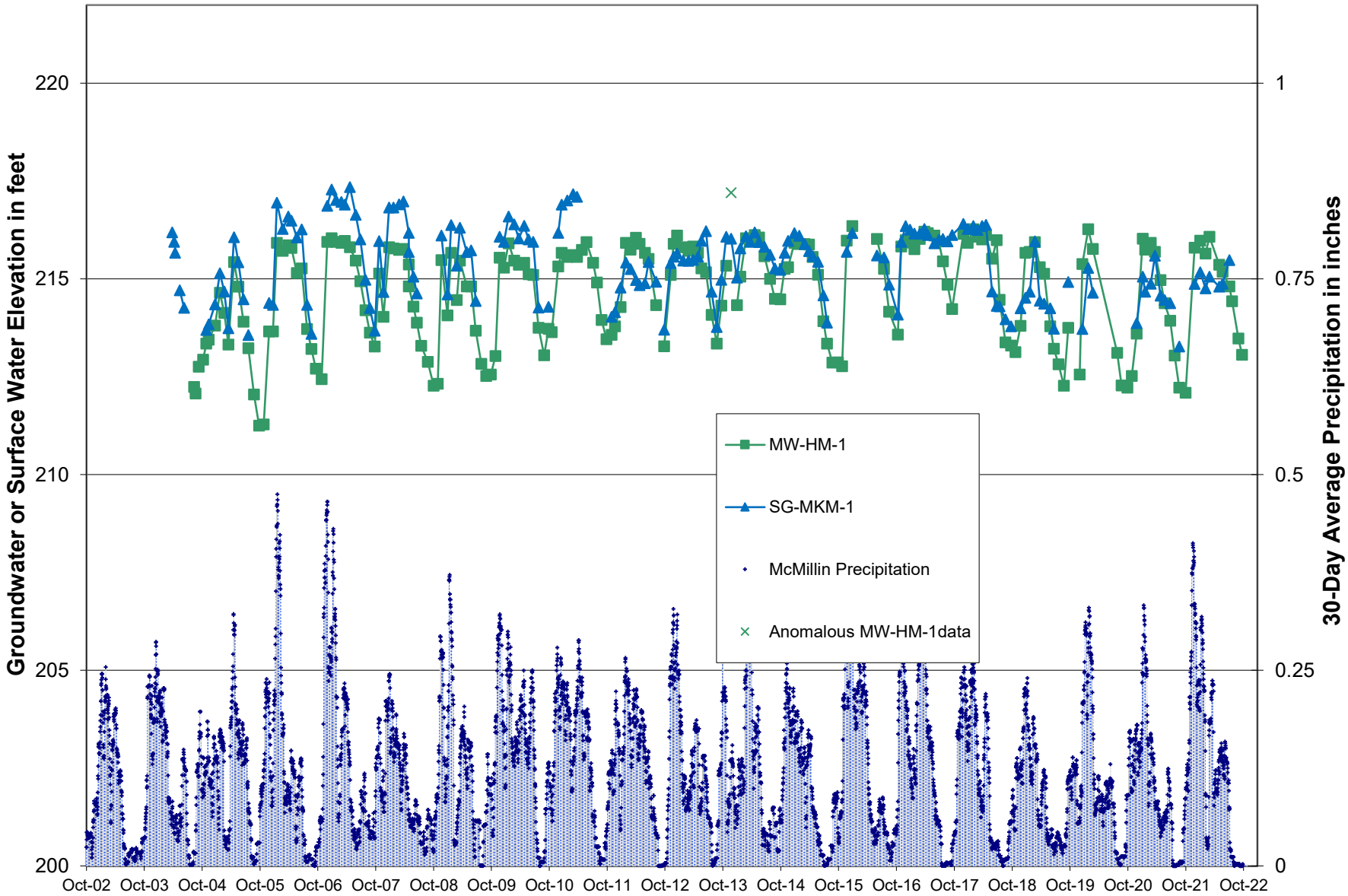
B-5a Bell Marsh Water Levels

Pioneer Aggregates South Parcel Project
DuPont, WA



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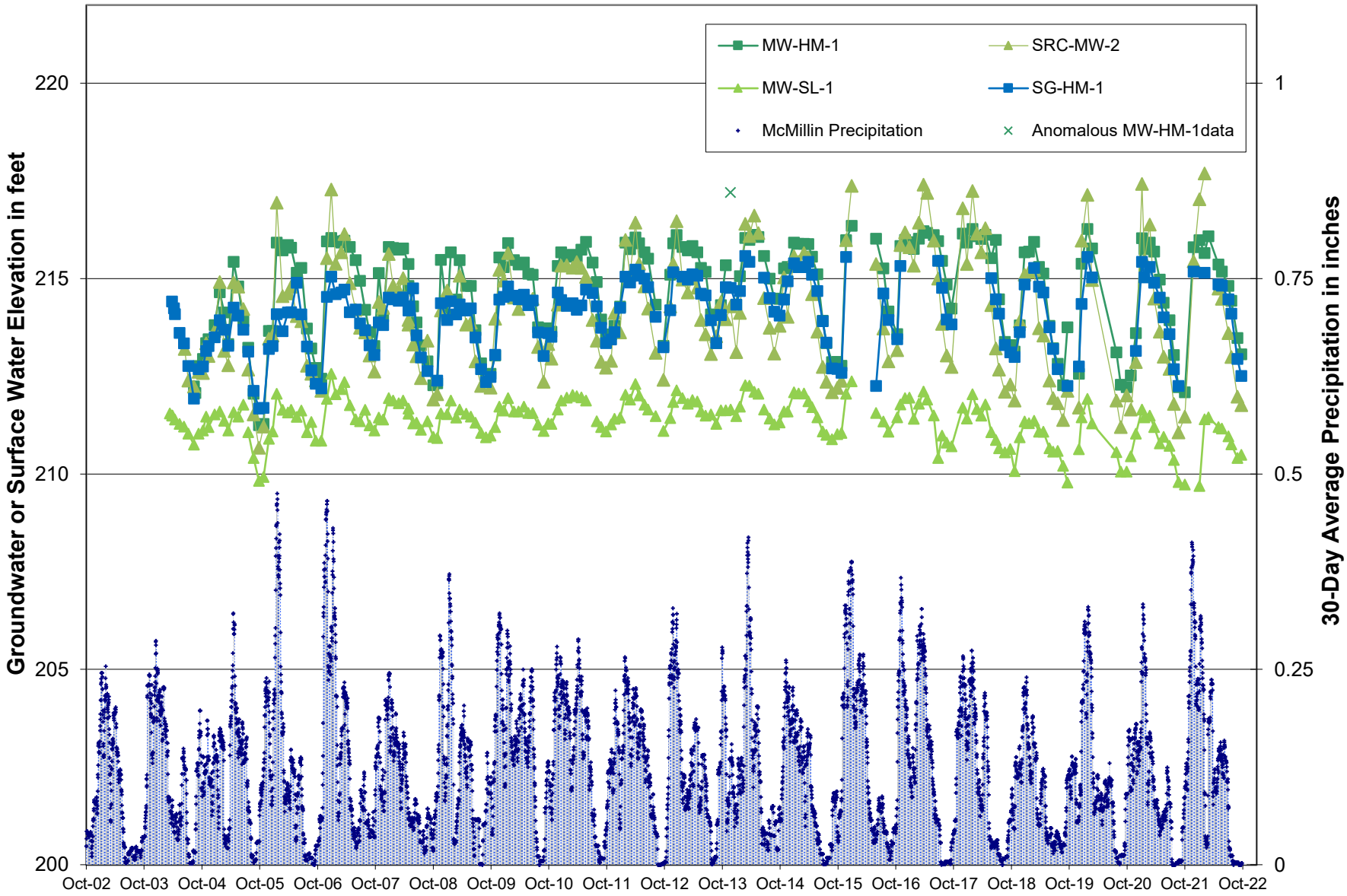
B-5b McKay Marsh Water Levels

Pioneer Aggregates South Parcel Project
DuPont, WA



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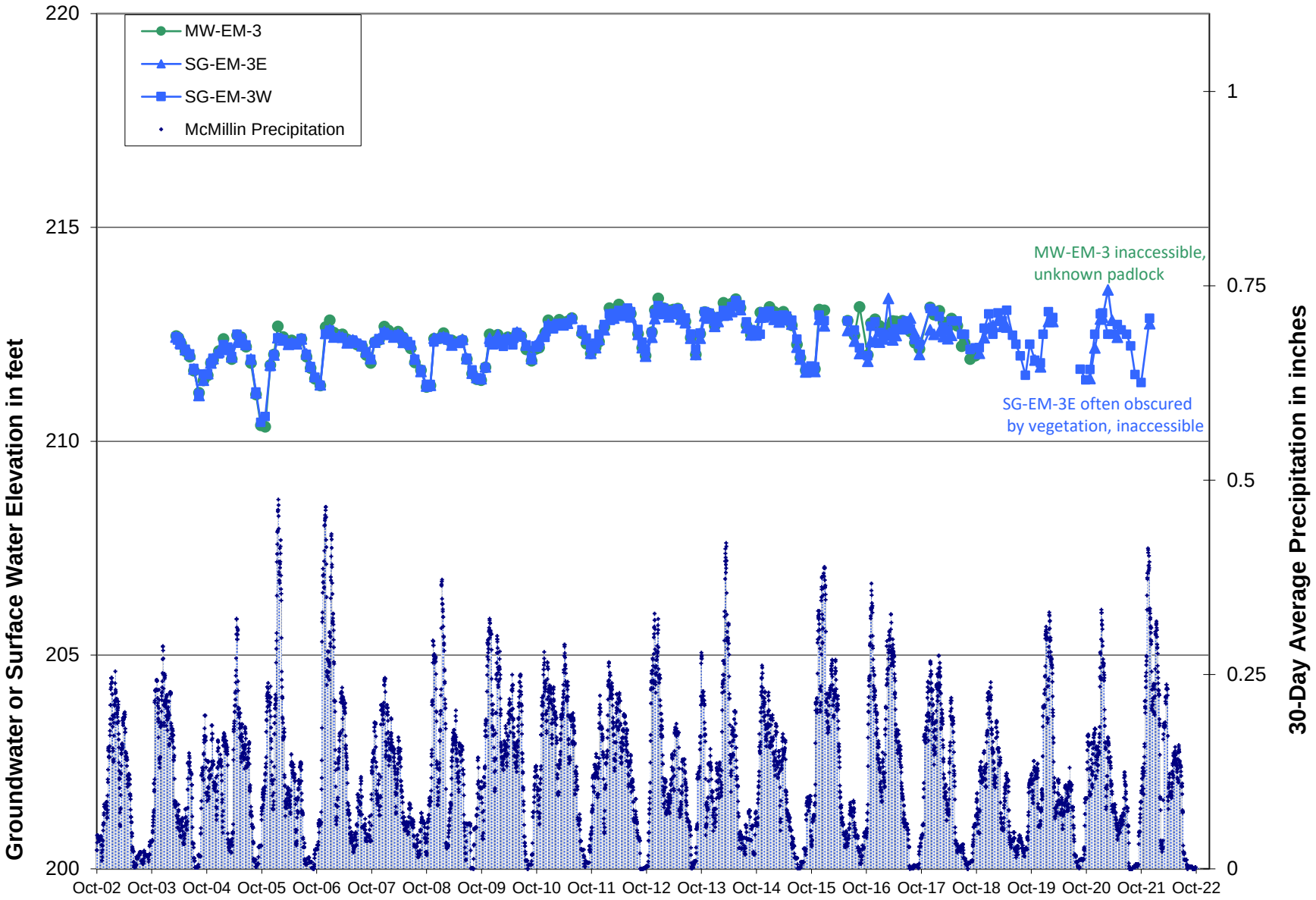
B-5c Hamer Marsh Water Levels

Pioneer Aggregates South Parcel Project
DuPont, WA



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10/28/2022
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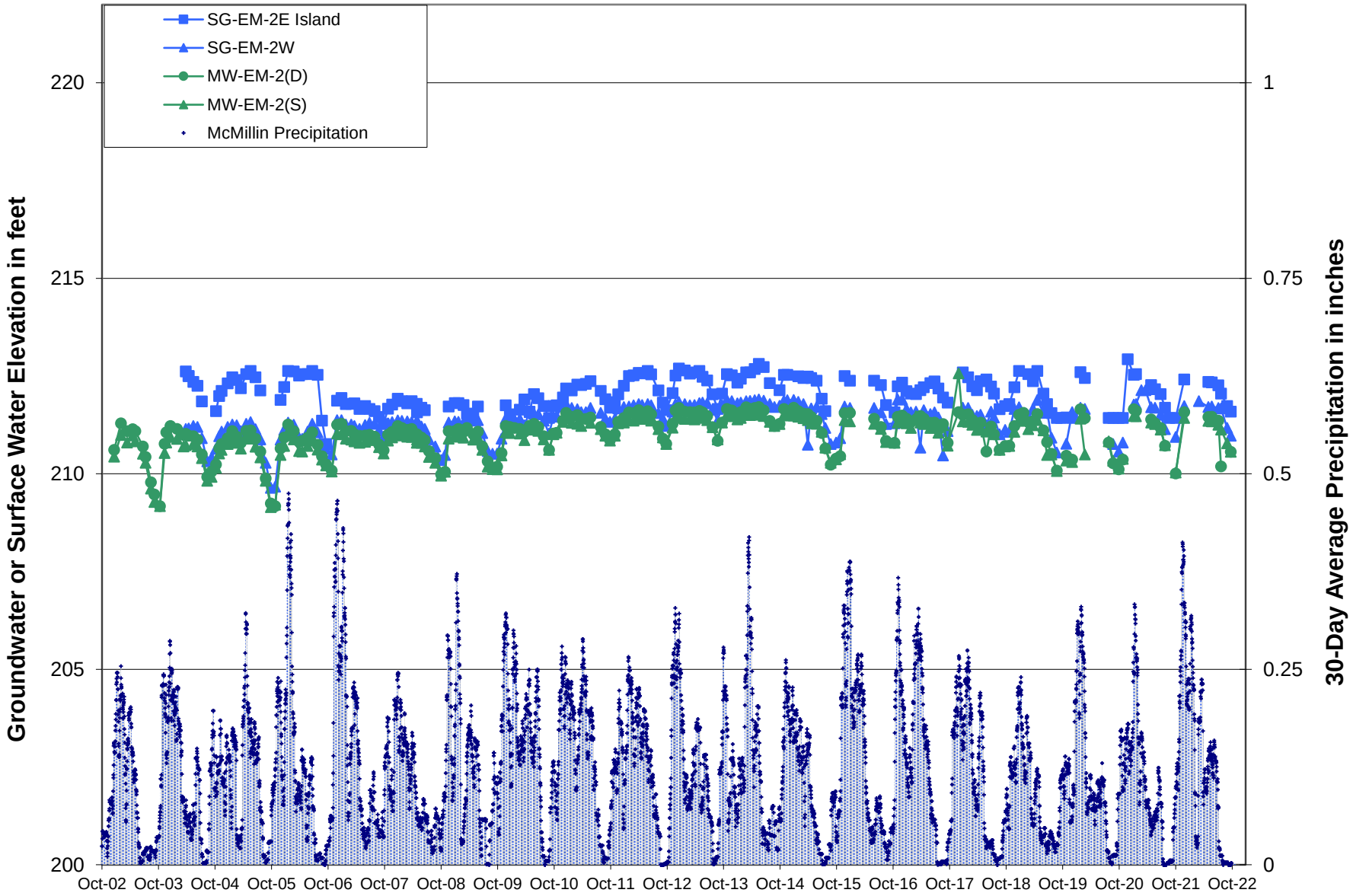
B-6 East Edmond Marsh Water Levels

Pioneer Aggregates South Parcel Project
DuPont, WA



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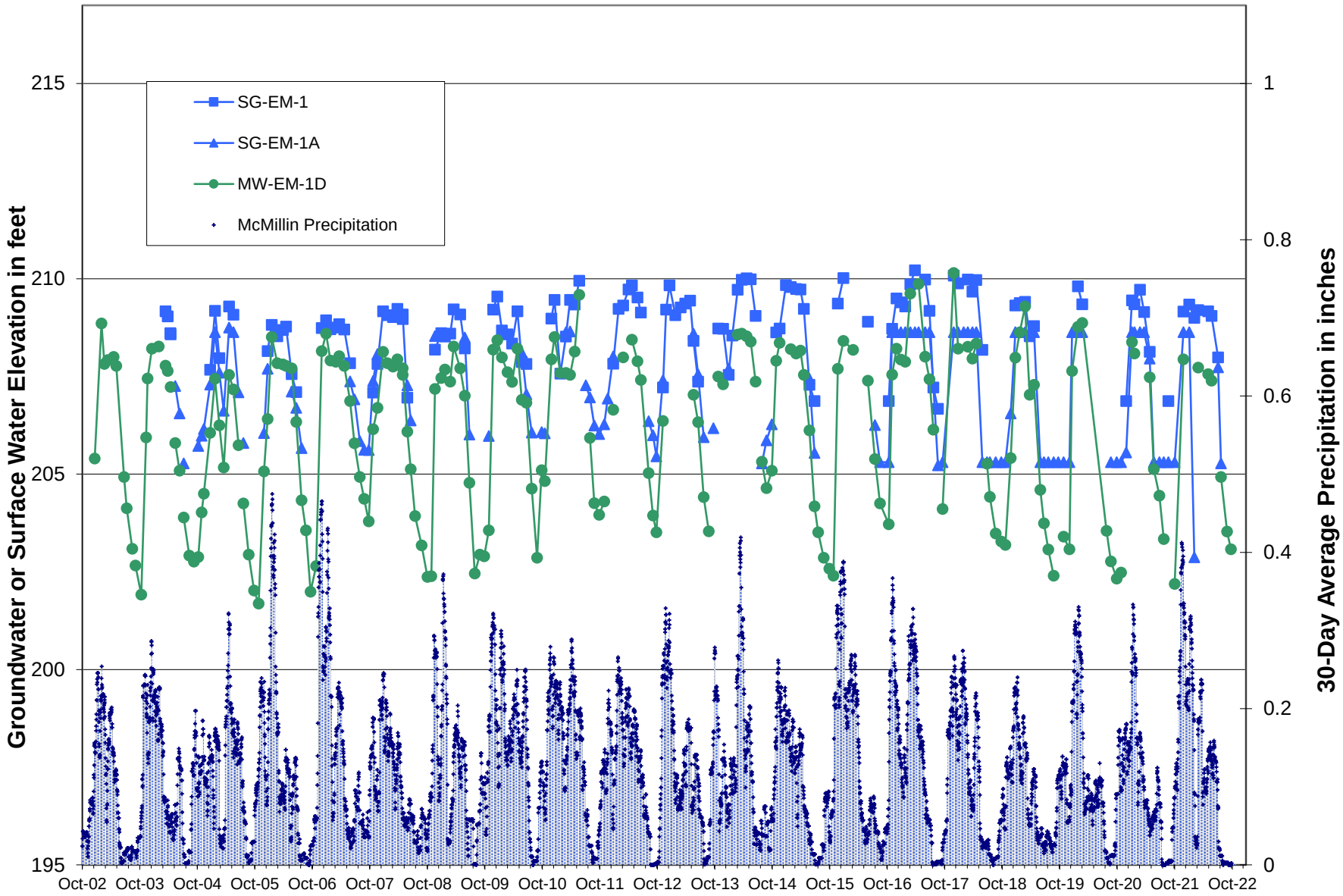
B-7 East Edmond Marsh Water Levels

Pioneer Aggregates South Parcel Project
DuPont, WA



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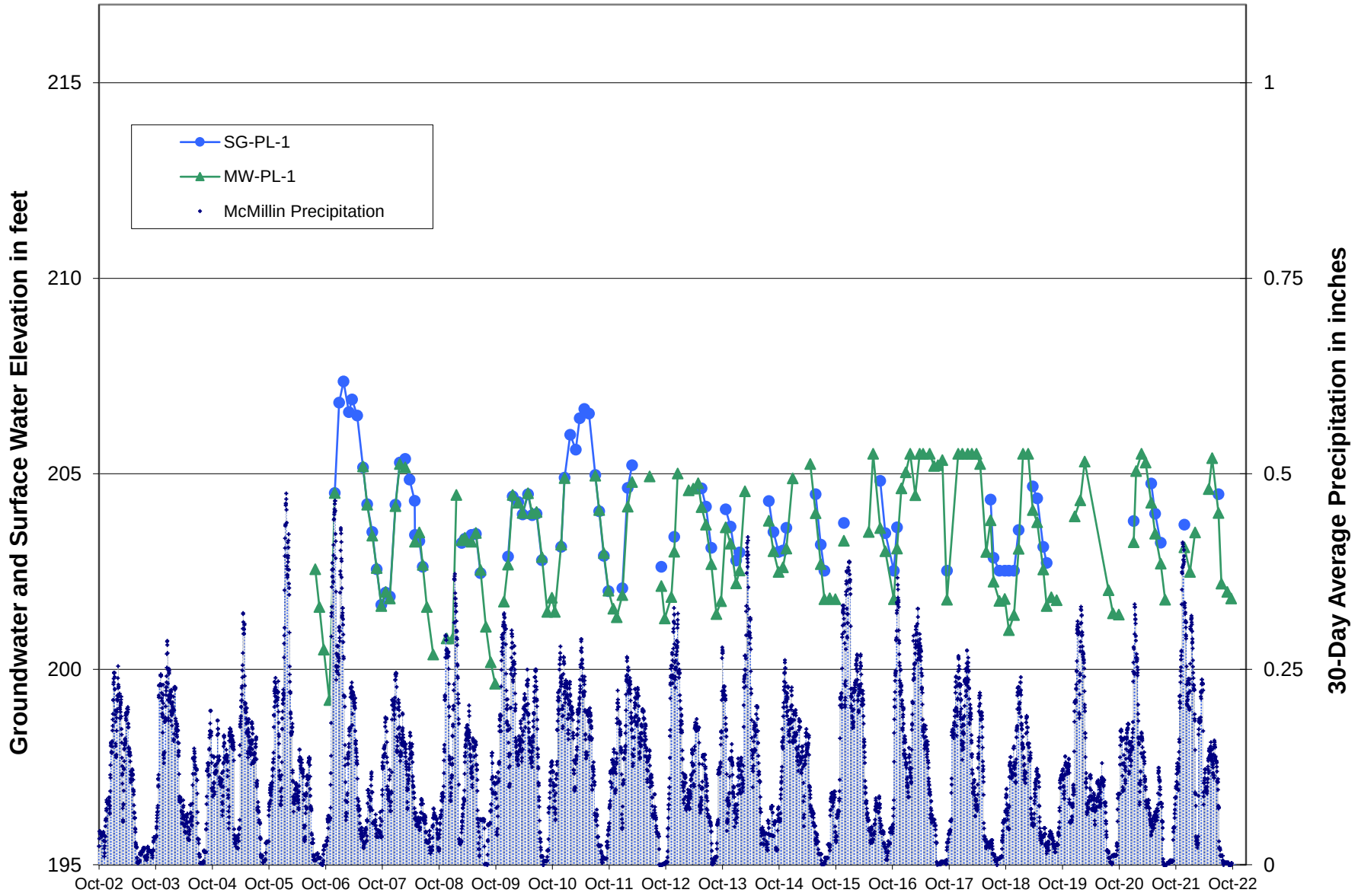
B-8 West Edmond Marsh Water Levels

Pioneer Aggregates South Parcel Project
DuPont, WA



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10/28/2022
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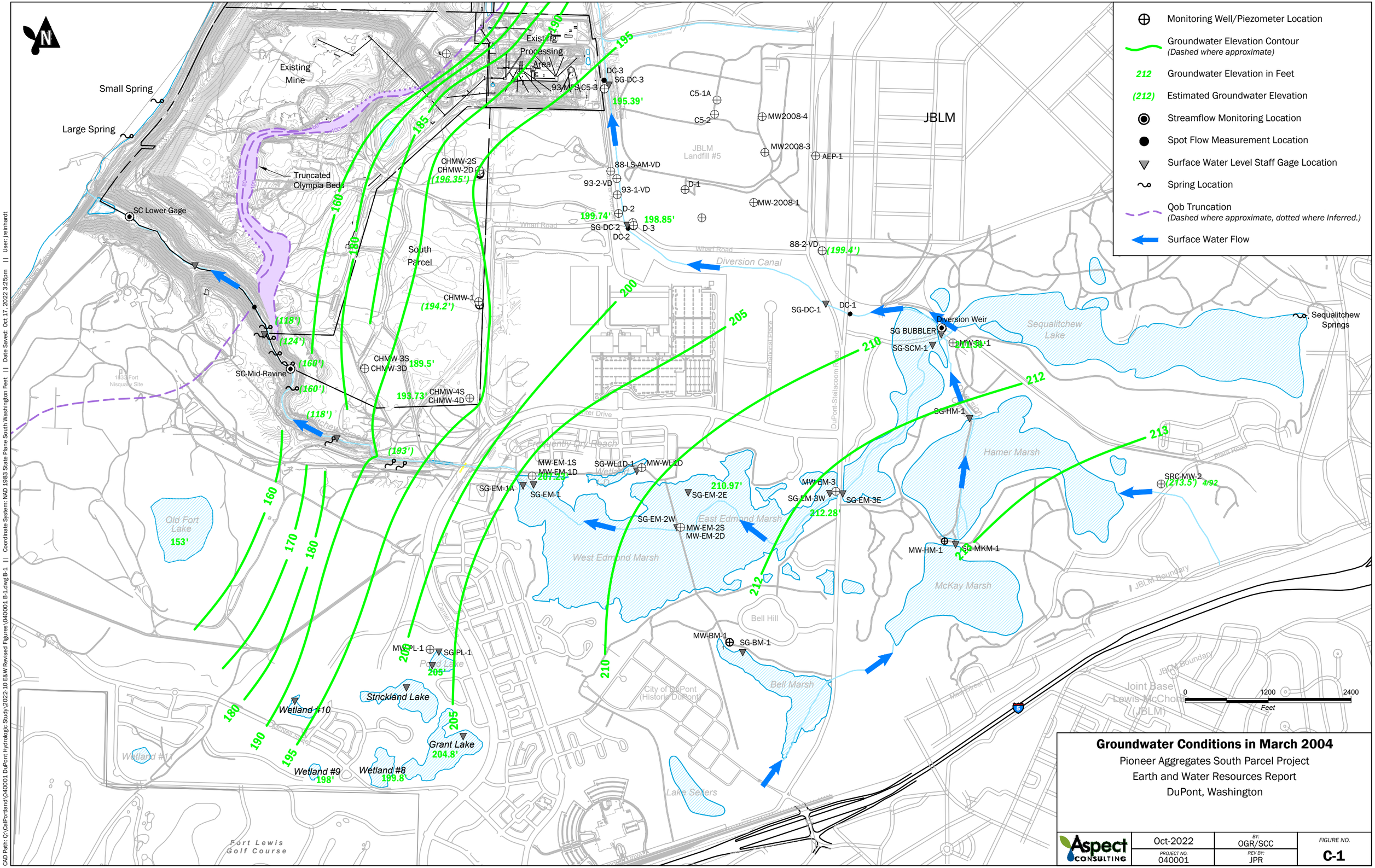
B-9 Pond Lake Water Levels

Pioneer Aggregates South Parcel Project
DuPont, WA

APPENDIX C

Groundwater Elevation Contour Maps



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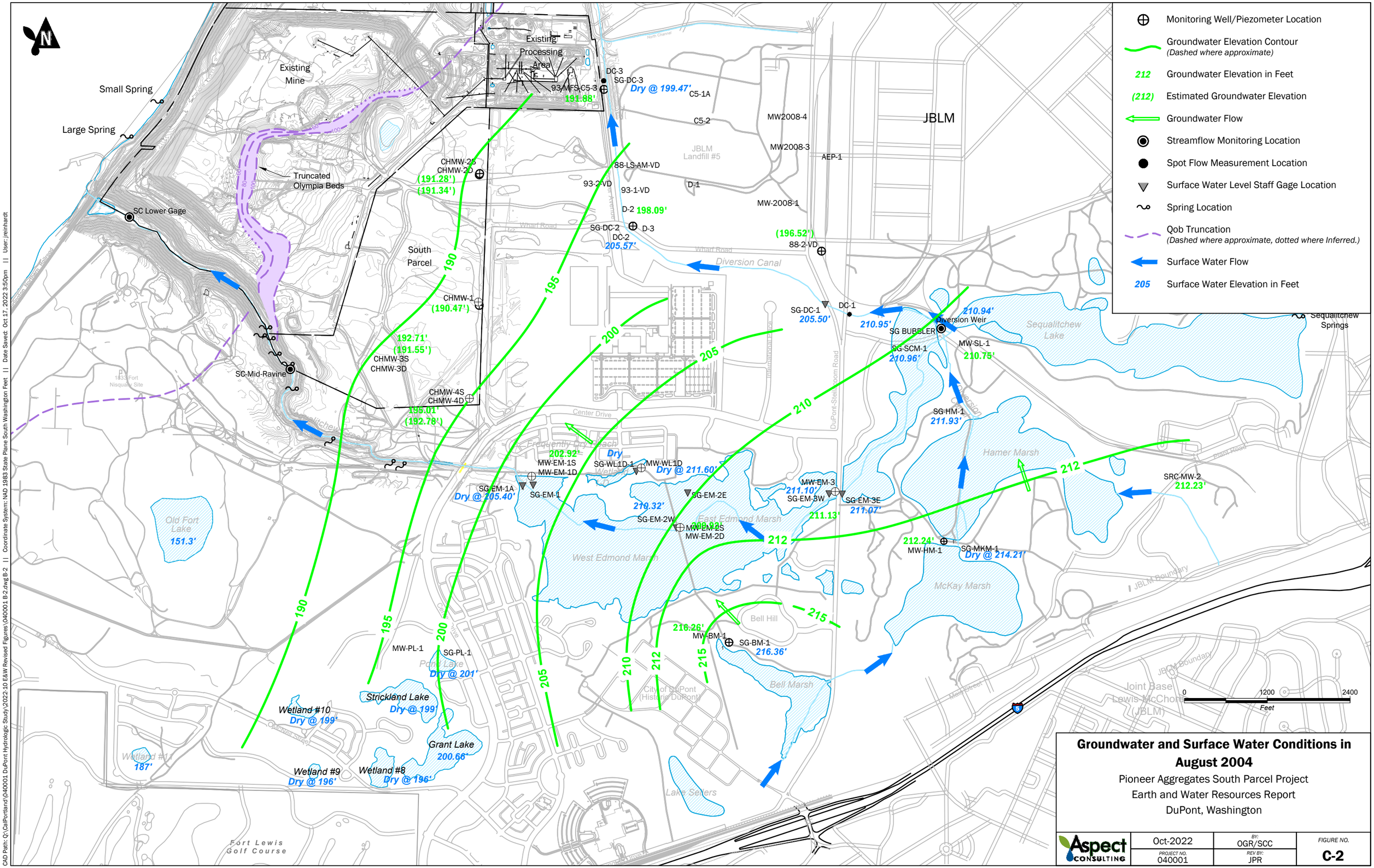

Groundwater and Surface Water Conditions in August 2004

Pioneer Aggregates South Parcel Project
Earth and Water Resources Report
DuPont, Washington

Aspect Consulting	Oct-2022	BY: OGR/SCC	FIGURE NO. C-2
	PROJECT NO. 040001	REV BY: JPR	

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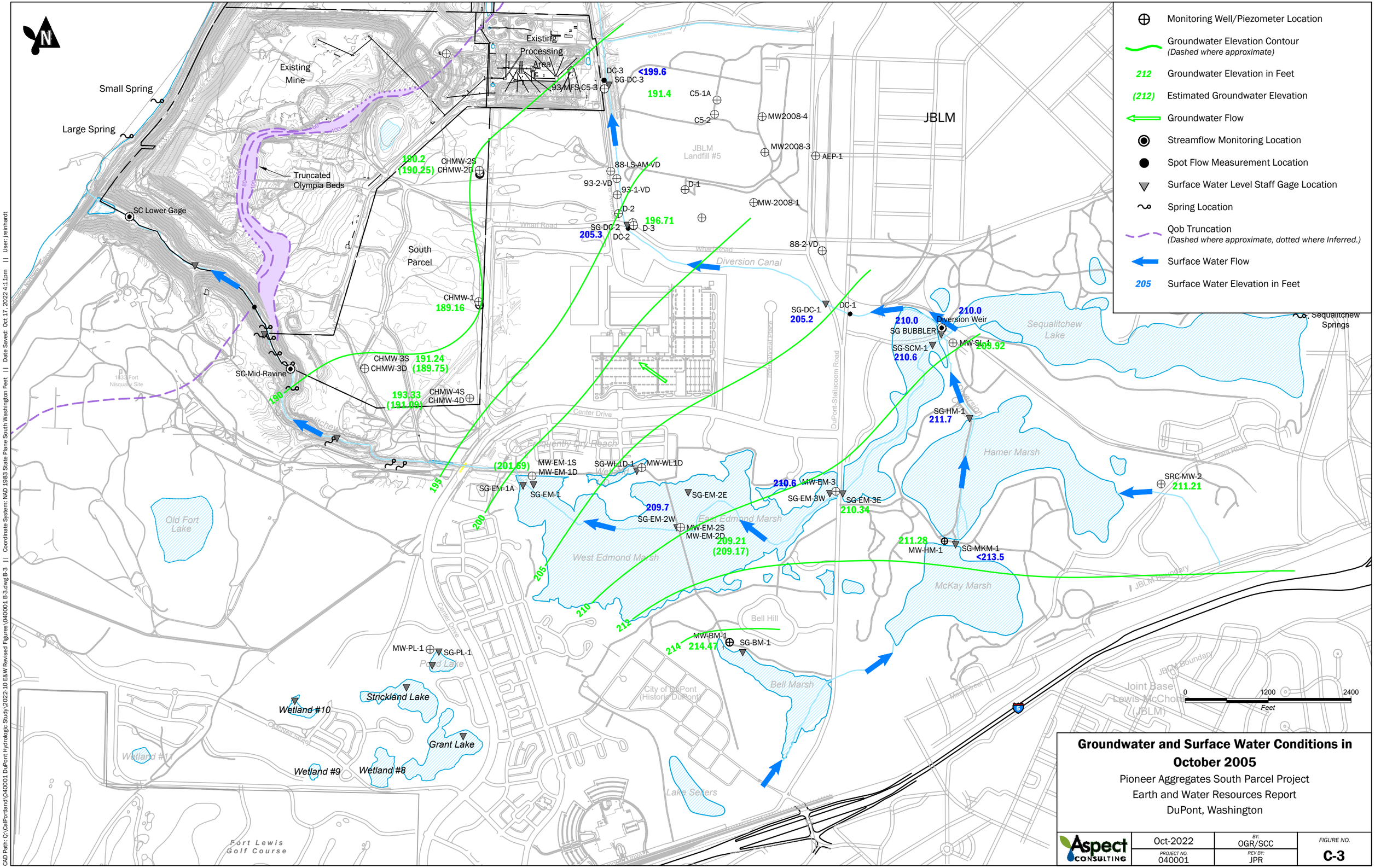

Groundwater and Surface Water Conditions in October 2005

Pioneer Aggregates South Parcel Project
Earth and Water Resources Report
DuPont, Washington

Aspect Consulting	Oct-2022	BY: OGR/SCC	FIGURE NO. C-3
	PROJECT NO. 040001	REV BY: JPR	

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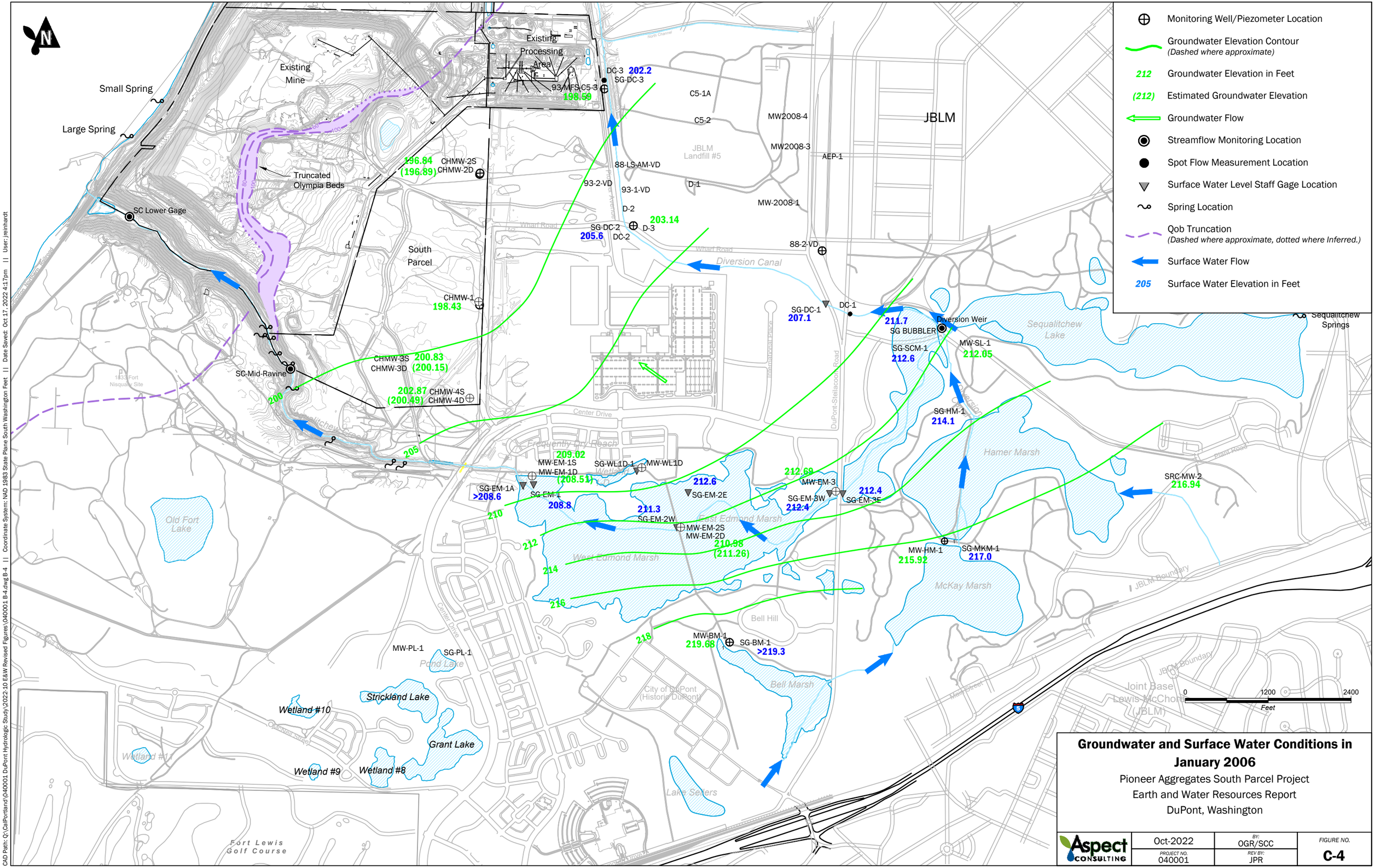

Groundwater and Surface Water Conditions in January 2006

Pioneer Aggregates South Parcel Project
Earth and Water Resources Report
DuPont, Washington

Aspect Consulting	Oct-2022	BY: OGR/SCC	FIGURE NO. C-4
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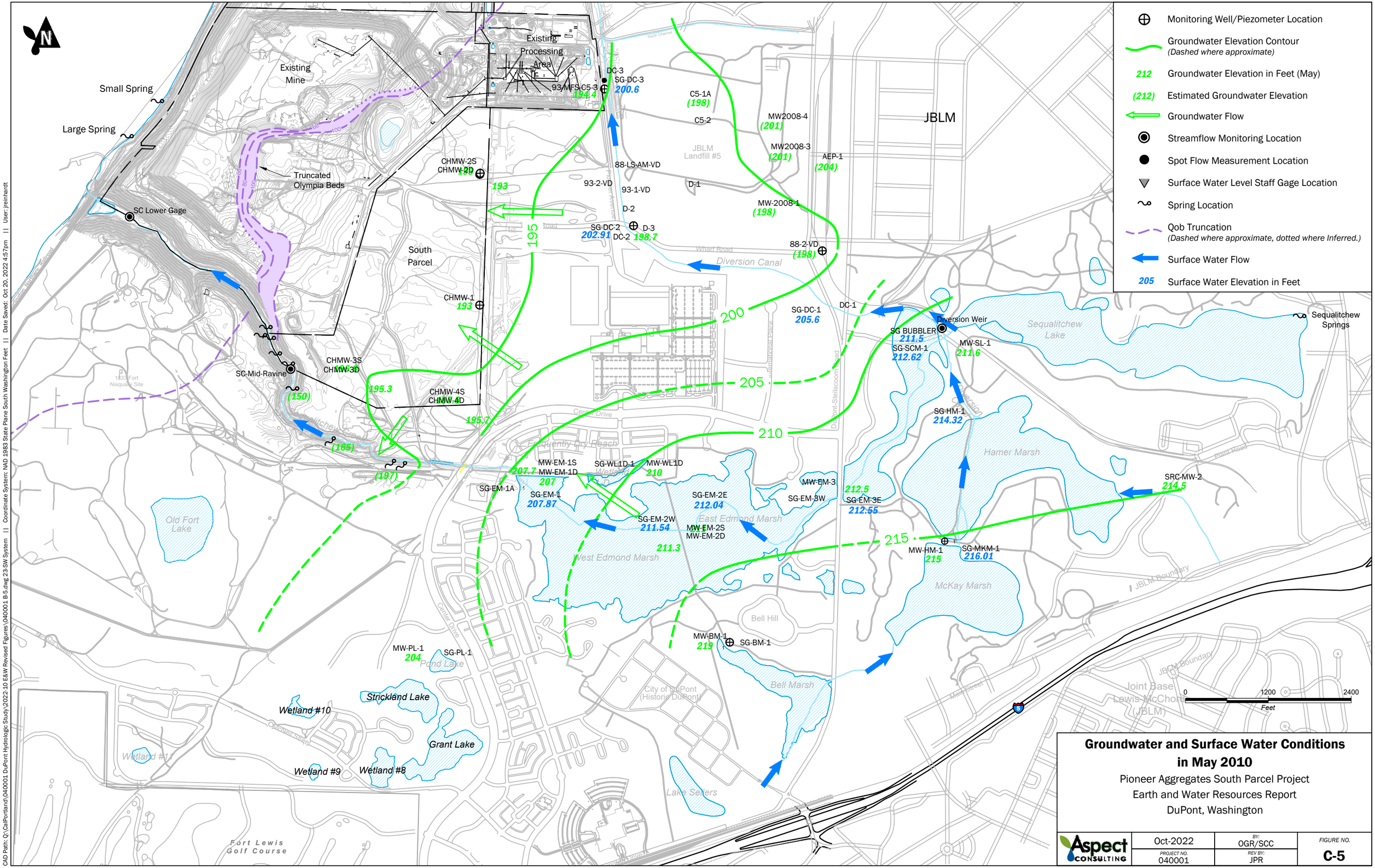

Groundwater and Surface Water Conditions in May 2010

Pioneer Aggregates South Parcel Project
Earth and Water Resources Report
DuPont, Washington

Aspect Consulting	Oct-2022	BY: OGR/SCC	FIGURE NO. C-5
	PROJECT NO. 040001	REV BY: JPR	

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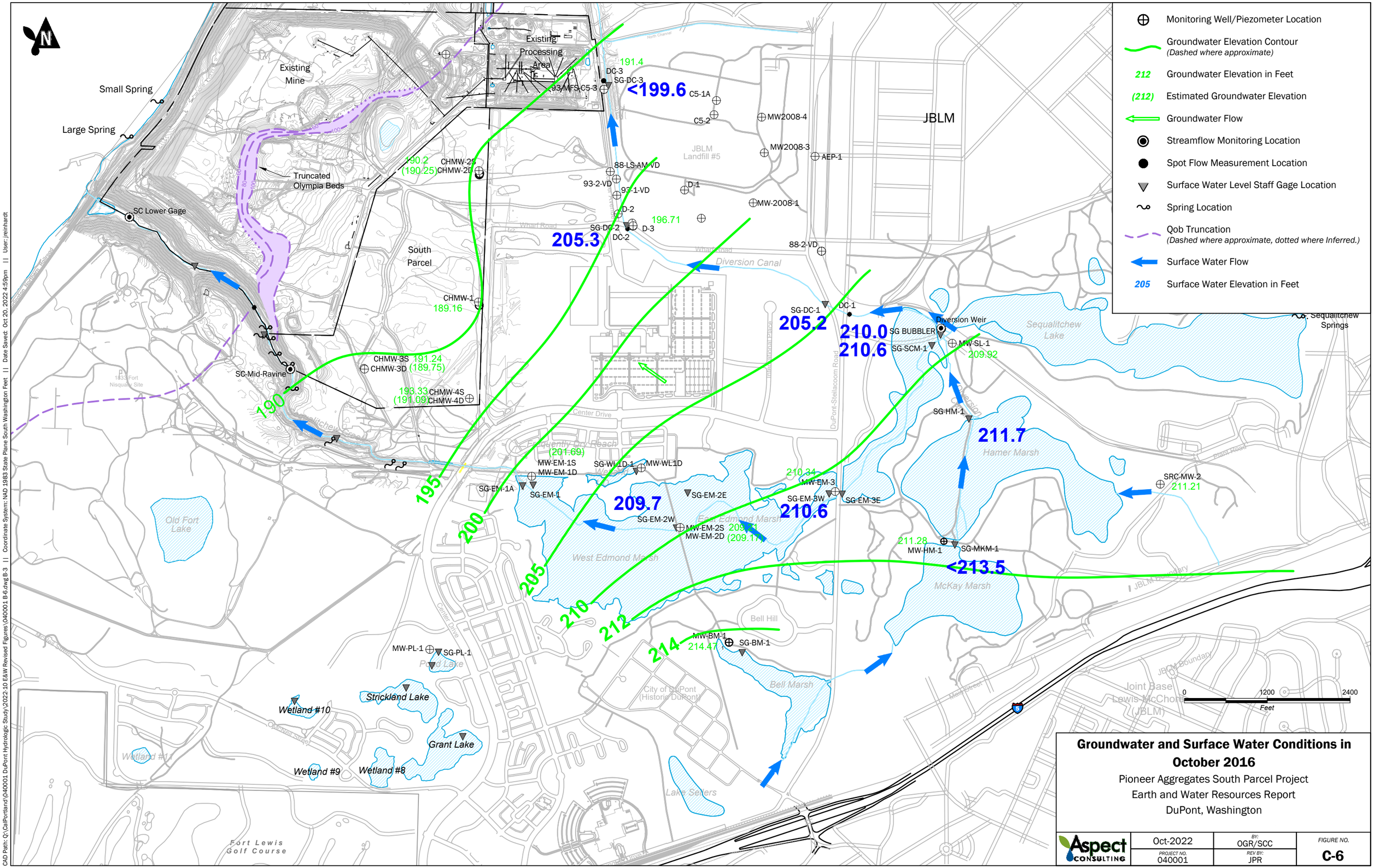

Groundwater and Surface Water Conditions in October 2016

Pioneer Aggregates South Parcel Project
Earth and Water Resources Report
DuPont, Washington

Aspect Consulting	Oct-2022	BY: OGR/SCC	FIGURE NO. C-6
	PROJECT NO. 040001	REV BY: JPR	

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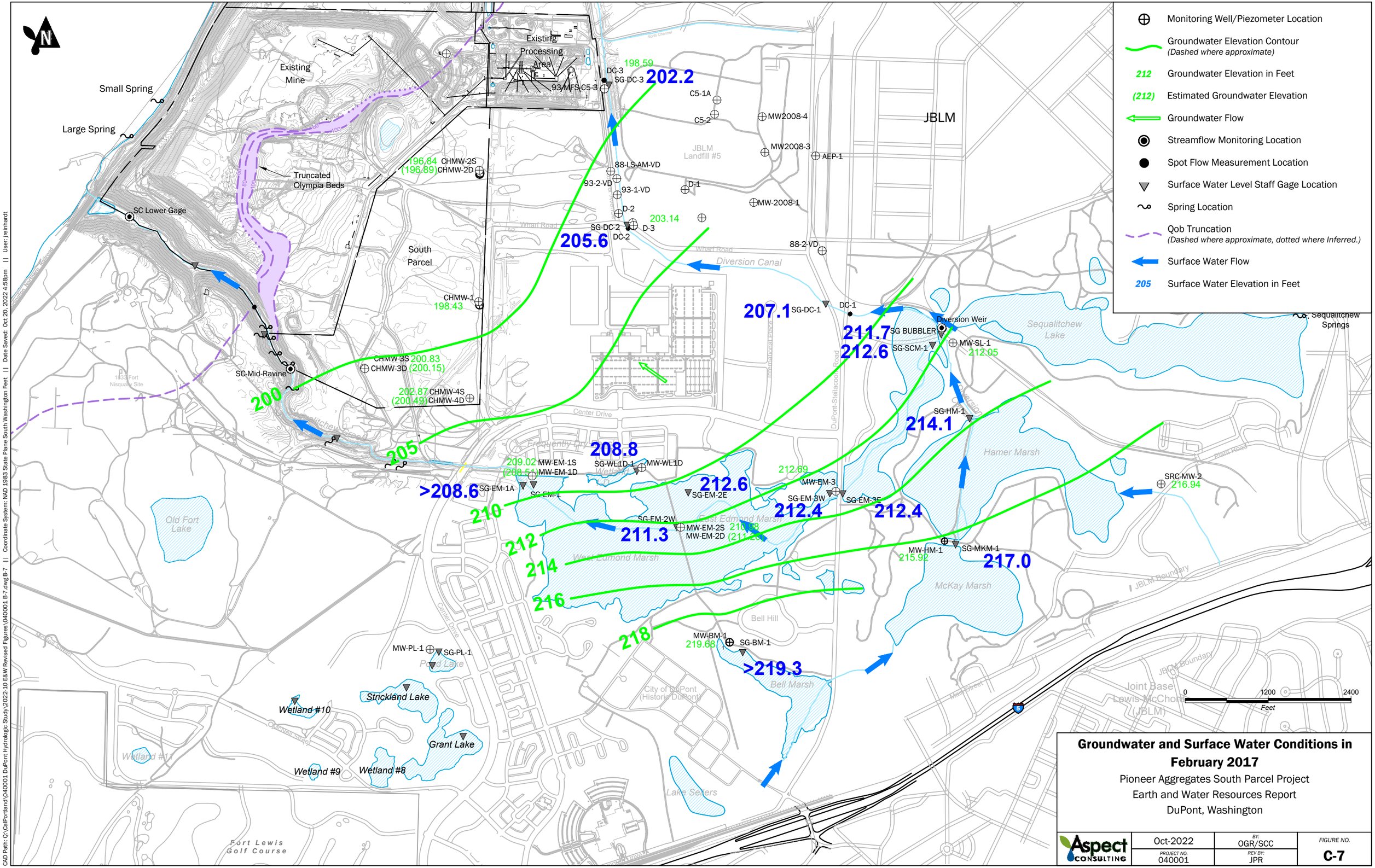

Groundwater and Surface Water Conditions in February 2017

Pioneer Aggregates South Parcel Project
Earth and Water Resources Report
DuPont, Washington

Aspect Consulting	Oct-2022	BY: OGR/SCC	FIGURE NO. C-7
	PROJECT NO. 040001	REV BY: JPR	

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Monitoring Well/Piezometer Location
Groundwater Elevation Contour
(Dashed where approximate)
212 Groundwater Elevation in Feet (February 2019)
Groundwater Flow
Streamflow Monitoring Location
Spot Flow Measurement Location
Surface Water Level Staff Gage Location
Spring Location
Qob Truncation
(Dashed where approximate, dotted where Inferred.)
Surface Water Flow
205 Surface Water Elevation in Feet

Small Spring
Large Spring
Existing Mine
Existing Processing Area
Truncated Olympia Beds
SC Lower Gage
SC-Mid-Ravine
South Parcel
JBLM
JBLM Landfill #5
Wharf Road
Diversion Canal
Center Drive
Frequently Dry Reach
International Place
DuPont-Stellacoom Road
Diversion Weir
Sequalitchew Lake
Sequalitchew Springs
Hamer Marsh
Plant Road
Old Fort Lake
West Edmond Marsh
McKay Marsh
Bell Hill
Bell Marsh
Lake Sellers
Pond Lake
Strickland Lake
Grant Lake
Wetland #10
Wetland #11
Wetland #9
Wetland #8
McNeil Street
Main Street
JBLM Boundary
City of DuPont (Historic DuPont)
Joint Base Lewis-McChord (JBLM)
Fort Lewis Golf Course
1833 Fort Nisqually Site

DC-3 SG-DC-3 209.41
93/MFS-C5-3 195.79
C5-1A
C5-2
MW2008-4
MW2008-3
AEP-1
MW-2008-1
88-LS-AM-VD
93-2-VD
93-1-VD
D-1
D-2
D-3
SG-DC-2 200.62
DC-2 200.31
88-2 VD
SG-DC-1 202.81
DC-1
SG-BUBBLER 210.54
SG-SCM-1
MW-SL-1 211.36
SG-HM-1 215.27
MW-HM-1 215.94
SG-MKM-1 215.96
SRC-MW-2 215.22
194.15 CHMW-2S
CHMW-2D 194.23
CHMW-1 195.00
197.62 CHMW-3S
CHMW-3D 196.68
199.02 CHMW-4S
CHMW-4D 197.16
204.49 MW-EM-1S
MW-EM-1D 209.29
SG-WL1D-1 210.61
MW-WL1D 210.53
SG-EM-1A 209.41
SG-EM-1 208.64
SG-EM-2E 212.55
SG-EM-2W 211.48
211.14 MW-EM-2S
MW-EM-2D 211.32
MW-EM-3
SG-EM-3W 213.00
SG-EM-3E 212.83
MW-BM-1 219.79
SG-BM-1 206.04
MW-PL-1 205.51
SG-PL-1
195
200
205
210
215

0 1200 2400 Feet

Groundwater and Surface Water Conditions in February 2019

Pioneer Aggregates South Parcel Project
Earth and Water Resources Report
DuPont, Washington

Aspect Consulting	Oct-2022	BY: OGR/SCC	FIGURE NO. C-8
	PROJECT NO. 040001	REV BY: MML/SCC	

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APPENDIX D

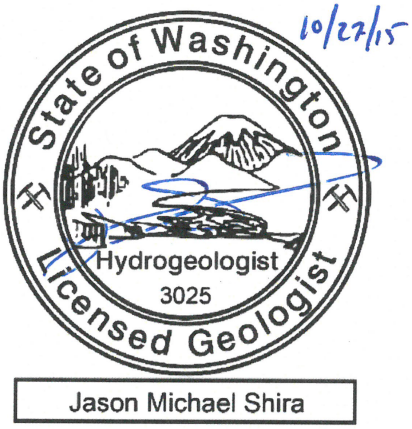
Intertidal Springs Evaluation

MEMORANDUM

Project No.: 040001-014-02

October 27, 2015

To: Pete Stoltz, CalPortland Company



From: Jason Shira, LHG and Owen Reese, P.E.

Re: **Water Sources of the Intertidal Beach Springs—FINAL**

This memorandum presents an evaluation of the water sources to the intertidal beach springs along the Puget Sound shoreline north of Sequalitchew Creek in DuPont, Washington.

An initial analysis was performed in 2004 as a component of the surface water and groundwater evaluations for the proposed mine expansion of CalPortland's DuPont Mine (Aspect, 2004). This update incorporates information about groundwater levels collected since 2004 and the results of a significant update to the three-dimensional groundwater model. This memorandum presents background information about the springs, aquifers, and groundwater conditions, and an analysis of the three contributors of flow in the springs: tidal intrusion, the Vashon Aquifer, and the Sea Level Aquifer.

The relative contribution of these three sources is estimated using standard hydrogeological analytical solutions (as opposed to a numerical model) and site-specific information collected from a variety of studies over the past several decades. This approach provides a rough estimate of the discharge from each of the sources to the intertidal springs collectively. There is insufficient information to evaluate the specific sources at any individual spring; however, much of the information on flow and water quality that informs our approach was collected from the Large Springs.

The 2004 analysis concluded that the Vashon Aquifer contributes 0.5 to 16 percent of flow to the intertidal springs. This updated analysis estimates the Vashon Aquifer contributes 0.2 to 14 percent of the flow to the springs.

Background

Intertidal Beach Springs

Springs are located at multiple points along the shoreline of the Nisqually Reach. Two springs are located along the beach just north of the Sequalitchew Creek estuary and directly west of the area of the proposed South Parcel mine development, Figure 1. The largest of these springs, the Large Spring, was reported to flow between 11 and 18 cubic feet per second (cfs) based on monthly data collected by the U.S. Geological Survey (USGS) in 1942. Spot measurements by CH2M HILL in 1999 and 2000 indicated flows of 9.1 and 14.9 cfs, respectively (CH2M HILL, 2001).

Hydrogeologic Conditions

The Steilacoom Delta was created by a glacial outburst flood that resulted in deposition of glacial outwash sand and gravel, Steilacoom Gravels (Borden and Troost, 2001). The outburst of flood waters eroded away older deposits (Vashon Till and Vashon Outwash) in some areas resulting in a channel of Steilacoom Gravels (Savoca, et al., 2010). In the area of the South Parcel, the Steilacoom Gravels (Qvs) overlie Vashon Till (Qvt) and Vashon Advance Outwash (Qva), which are identified in drilling logs. Beneath these Vashon Drift deposits lies a nonglacial deposit known as the Olympia Beds (Qob).

The Olympia Beds are a low permeable layer that generally consists of lahars, ashes, and fine-grained fluvial sediments. In the vicinity of the South Parcel, the Olympia Beds are best described as mudflows that separate the Vashon Aquifer and Sea Level Aquifer that are of interest in this evaluation. The Olympia Beds are not present in the vicinity of the beach springs. After the Olympia Beds were deposited, advancement of the Puget lobe of the Cordilleran ice sheet, and flow of water beneath the glacier, carved a valley through the Olympia Beds. As the glaciers receded, outburst floods from glacial lakes located northeast of DuPont deposited Steilacoom Gravels over the truncated Vashon Drift deposits and Olympia Beds effectively filling the valley carved by the glacier.

Below the Olympia Beds are glacial drift deposits locally referred to as the Salmon Springs Drift ($Qpog_2$) (Savoca, et al, 2010). These deposits are characterized by intervening nonglacial sediments, the presence of intervening glaciolacustrine sediments, and the presence of a thick, intensely oxidized zone at the top of the recessional outwash (Borden and Troost, 2001). Like the Olympia Beds, the Salmon Springs Drift deposits were truncated by the meltwater and advancement of the Puget lobe of the Cordilleran ice sheet, which was subsequently filled by the outwash of Steilacoom Gravels, Figure 2.

The Steilacoom Gravels host the upper unconfined aquifer. This upper aquifer is separated from a semiconfined aquifer by a 10-foot-thick low permeability unit comprised of Vashon Till. The till layer is not uniformly present. Beneath the till layer is a semiconfined aquifer hosted by the Vashon Advance Outwash. In this memorandum, the unconfined aquifer, upper confining unit, and semiconfined outwash aquifer are referred to collectively as the Vashon Aquifer.

The Salmon Springs Drift hosts the Sea Level Aquifer. The Sea Level Aquifer is regionally considered to be a confined aquifer; however, extending from approximately 6,000 feet upgradient of the truncation of the Olympia Beds, the Sea Level Aquifer is unconfined (Hart Crowser, 1994).

The area between the Olympia Bed truncation and the Puget Sound is comprised of Steilacoom Gravels (Qvs) overlying the Salmon Springs Drift ($Qpog_2$). Locally referred to as the Sequalitchew Delta Aquifer. Due to the thickness and high hydraulic conductivity of the Steilacoom Gravels, the hydraulic gradient of the Sequalitchew Delta Aquifer is fairly shallow. This is one reason springs are not observed higher on the bluffs overlooking Puget Sound.

Downgradient of the truncation of the Olympia Beds, the Vashon Aquifer and the Sea Level Aquifer flow into the Sequalitchew Delta Aquifer, which then discharges to the springs and sea floor of the Puget Sound. Intrusion of salt water into the Sequalitchew Delta Aquifer also occurs near the shoreline and as tidal elevations fluctuate. We evaluated the water sources to the intertidal springs based on the relative contributions to the Sequalitchew Delta Aquifer of saltwater, freshwater from the Vashon Aquifer, and freshwater from the Sea Level Aquifer.

Physical Properties (Hydraulic Conductivity and Gradient)

Hydraulic conductivities (K) within glacial deposits can vary by orders of magnitude because of the heterogenous deposition of gravels, sands, silts, and clay. The unconfined aquifer in the Steilacoom Gravels exhibits a high hydraulic conductivity (1,100 feet per day [ft/d] on average) due to the size of the grains deposited, sand and gravel, and lack of fine-grained material (silts or clay). The two other hydrogeologic units that make up the Vashon Aquifer exhibit hydraulic conductivities that are orders of magnitude lower (0.33 and 77 ft/d on average, respectively). The hydraulic conductivity of the Sea Level Aquifer in the Salmon Springs Drift is also fairly high (690 ft/d on average). The average hydraulic conductivities presented here are derived from parameter estimation techniques used during calibration of the South Parcel Mine Expansion groundwater model (Aspect, 2015), and are generally consistent with prior studies and pumping test results (Woodward Clyde, 1991; CH2M HILL, 2000; Aspect, 2004).

The hydraulic gradient, or slope, of the water table for the Vashon Aquifer is moderate on a regional scale; however, the hydraulic gradient steepens as the Vashon Aquifer approaches and travels over the Olympia Beds truncation. The Sea Level Aquifer also exhibits a change in hydraulic gradient; however, relative to the Vashon Aquifer, it has a comparatively shallow gradient near the Olympia Beds truncation (Figure 2 and Table 1).

Table 1—Hydraulic Gradients

Unit and Location Description	Hydraulic Gradient	Reference
Vashon near landfill	0.0006	Woodward Clyde, 1991,p.3-34
Vashon South Parcel (Dec 2014, high)	0.0009	Unpublished, based on recent monitoring data.
Vashon South Parcel (Oct 2014, low)	0.001	Unpublished, based on recent monitoring data.
Vashon west of landfill	0.005	Woodward Clyde, 1991, p.3-34
Vashon south of Sequalitchew Ck.	0.02	Hart Crowser, 1994, p.3.1-13
Vashon north of Sequalitchew Ck.	0.05	Hart Crowser, 1994, p.3.1-13
Vashon near Qob cutoff	0.33	Woodward Clyde, 1991,p.3-34
Sea Level Aq. near landfill	0.0001	Woodward Clyde, 1991, p.3-35
Sea Level Aq. (Bell Hill No. 1 to MW-18)	0.007	Hart Crowser, 1994, p.3.1-14
Sea Level Aq. west of landfill	0.01	WCC, 1992, p.3-35
Sea Level Aq. (MW-18 to PS)	0.03	Hart Crowser, 1994, p.3.1-14
Sea Level Aq. near Qob cutoff	0.05	Woodward Clyde,1991, p.3-35
Sequalitchew Delta Aquifer	0.002	Woodward Clyde,1991, p.3-35
SLA/Sequalitchew Delta Aquifer (MW-3 to PS)	0.005	Hart Crowser, 1994, p.3.1-14
SLA/ Sequalitchew Delta Aquifer (MW-6 to PS)	0.02	Hart Crowser, 1994, p.3.1-14

Seawater Intrusion

In coastal aquifer systems, the interaction of saltwater with freshwater aquifers is an important component for understanding the physical and chemical behavior of the groundwater system. The Ghyben-Herzberg Relation (Freeze and Cherry, 1979) states that the depth of the freshwater below sea level (Z) is 40 times the height of the water table above sea level (h). It is important to note that the Ghyben-Herzberg Relation is a simplified solution. In reality, the exact position of the saltwater/freshwater interface is governed by hydrostatic pressure, which varies with tide stage, mixing of freshwater and saltwater, combined with geologic heterogeneities, to create a diffuse zone instead of a sharp boundary.

The elevation of the Sequalitchew Delta Aquifer water table is less than 5-feet above mean sea level at the Puget Sound bluffs (Hart Crowser, 1994). This allows for seawater to potentially intrude the Sequalitchew Delta Aquifer. With seawater intrusion, the fresh water floats on top of the denser seawater. The lower the water table elevation (pressure), the more readily seawater displaces the freshwater. Tidal action and diffusion results in a mixing zone between the seawater and freshwater.

Freshwater within the Sequalitchew Delta Aquifer may be up to 100 feet thick in the area below the existing mine, and a few feet thick at the location where the springs discharge to the Puget Sound, Figure 2.

Analysis

Our approach for estimating the relative contribution of the three sources to the intertidal springs was to first estimate the portion of saltwater in the spring discharge using water quality measurements (electrical conductivity) to distinguish saltwater from freshwater. We then used analytical techniques to calculate the flow per unit width in each of the freshwater aquifers based on

their hydrogeologic characteristics. These results were compared with the output from a three-dimensional numerical groundwater model.

Evaluation of Saltwater Discharge from Large Springs

The portion of the discharge in the large springs coming from saltwater that intrudes into the aquifer at high tide, then drains through the springs at lower tidal elevations, was evaluated based on water quality measurements taken from the springs.

Electrical conductivity (EC) is an indicator of the quantity of dissolved solids in a water, and provides a useful measure for identifying salt waters (which have a high EC values) and freshwaters, which have much lower EC values. Monitoring data from the Large Spring (Aspect, 2004) indicate that EC of the spring discharge ranges from 15,400 to 43,200 micromhos per centimeter (μm/cm), and change diurnally with the tidal cycle. Spring discharge measuring EC at this range is indicative of seawater intrusion of the Sequalitchew Delta Aquifer. Groundwater is typically 150 to 200 μm/cm in the Vashon and Sea Level Aquifers (Woodward Clyde, 1991), and marine water in the Nisqually Reach area is 43,236 μm/cm (Thut, et al., 1978). These data indicate that marine water constitutes between 36 and 99 percent of the spring discharge, depending on diurnal tide stage.

Estimate of Vashon and Sea Level Aquifer Contributions

Based on the observed water quality at the Large Spring, the two freshwater aquifers are estimated to contribute from 1 to 64 percent of the flow to the spring. The contributions of each of the aquifers were evaluated using two approaches for calculating groundwater flux: an analytical approach, and the results of a calibrated three-dimensional groundwater model.

An analytical solution, the Dupuit Equation, was used to evaluate the unconfined aquifer conditions, and Darcy's Law for the confined aquifer conditions (Fetter, 2001).

Dupuit Equation

$$q' = K\frac{(h_1^2 - h_2^2)}{2L}$$

Darcy's Law

$$q' = Kb\frac{(h_1 - h_2)}{L}$$

Where,

q' = flow per unit width (square feet per day [ft^2/d]);
K = hydraulic conductivity (feet per day [ft/d]);
h_1 = water level elevation at origin (feet [ft]);
h_2 = water level elevation at L (ft);
L = the distance from origin at point h_2 (ft); and
b = aquifer thickness (ft).

The unconfined portions of the Vashon and Sea Level Aquifers have been characterized in a variety of studies conducted over the past several decades. South of Sequalitchew Creek, the aquifers were characterized as part of remedial efforts for the Former DuPont Works Site. Monitoring wells completed in the Vashon and Sea Level Aquifers indicate the hydraulic gradients vary seasonally and spatially (Hart Crowser, 1994). Similar work was performed for the Army Corp of Engineers on the north side of Sequalitchew Creek. Here, great variations occurred in the Vashon Aquifer and Sequalitchew Delta Aquifer (likely due to tidal influence) with little measurable change in the Sea Level Aquifer (Woodward Clyde, 1991). Recent monitoring data and model simulations of the groundwater response to dewatering confirmed seasonal variations in the Vashon Aquifer system (Aspect, 2015). The range of hydraulic gradients for each hydrogeologic unit are listed in Table 1. In this analysis, the median hydraulic gradient from previous investigations in the area was used for each aquifer and are shown in Table 2. The hydraulic conductivities listed in Table 2 were determined during calibration of the South Parcel Mine Expansion groundwater model (Aspect, 2015).

Table 2—Aquifer Parameters and Flow

Aquifer	Hydrogeologic Unit	Hydraulic Conductivity (K), ft/d	Hydraulic Gradient (dh/dl), ft/ft	Unit Thickness (b), ft	Flow per Unit Width (q'), ft^2/d
Vashon Aquifer	Vashon Steilacoom Gravels (Qvs)	1100	0.005	70	151
	Vashon Advance Outwash (Qva)	77	0.005	40	2
Sea Level Aquifer	Salmon Springs (Qpog2)	690	0.010	150	518
Percentage of Total Flow from Vashon Aquifer					23%

Using the DuPuit equation and the aquifer characteristics shown in Table 2, the total flow per unit width is estimated at 153 ft^2/d for the Vashon Aquifer and 518 ft^2/d for the Sea Level Aquifer. Flow in the Sequalitchew Delta Aquifer is the sum of the flows in these two aquifers, or 671 ft^2/d. As a result, the Vashon Aquifer contributes 23 percent of the freshwater flow to the Sequalitchew Delta Aquifer.

This analysis makes idealized assumptions about the occurrence and movement of groundwater through a complex geological and geographical setting. The analytical solutions presented represent one-dimensional steady-state conditions in an area that is better characterized by transient (tidally and seasonally changing hydraulic gradients and groundwater flow directions) and spatially variable conditions. The location of the intertidal springs and the amount of water discharged is controlled not only by the regional geology, but also by the fine-scale spatial variability of physical conditions that lead to preferential flow paths.

Comparison with Groundwater Model Results

A groundwater model has been previously developed (Aspect, 2004 and 2009) and recently updated (Aspect, 2015) to simulate effects on groundwater behavior in response to CalPortland's proposed dewatering, mining, and cessation of dewatering in the South Parcel. The model is centered between the South Parcel and East Edmonds Marsh, and extends beyond the Olympia Beds truncation to the west and Sequalitchew Lake to the east. The Sea Level Aquifer was treated as underflow in the vicinity of the South Parcel to the Puget Sound. The Vashon Aquifer was simulated as groundwater outflow to the Puget Sound. Although the primary purpose of the model is not predicting the relative discharge amounts from the two aquifers, it is capable of doing so. However, the model does not simulate saltwater intrusion from Puget Sound.

Model results indicate that, on average over the six-year period simulated by the model, the Vashon Aquifer contributes 15 percent of the total freshwater groundwater discharge to Puget Sound. This result is generally consistent with, but slightly lower than, the 23 percent predicted by the simpler analytical approach described above.

Summary of Sources of Water to the Intertidal Springs

By combining the estimates of the marine portion of the springs discharge with the relative flow in the two freshwater aquifers, we arrive at the breakdown of sources shown in Table 3. The makeup of the water (saltwater versus freshwater) discharging from the springs is influenced by tidal stage and season, and the contribution of the Vashon Aquifer from less than 1 percent up to 14 percent. This result is remarkably consistent with the 2004 estimate of 0.5 to 16 percent.

The ratio of sources at a specific intertidal spring may vary depending on its elevation (and thus potential for saltwater intrusion) and preferential flow paths for freshwater from one aquifer or the other.

Table 3—Percentage Contribution to Large Spring

Source	Estimated Percentage of Intertidal Spring Flow
Vashon Aquifer	0.2 - 14
Sea Level Aquifer	0.8 - 49
Puget Sound	36 - 99

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Limitations

Work for this project was performed for the CalPortland Company (Client), and this memorandum was prepared in accordance with generally accepted professional practices for the nature and conditions of work completed in the same or similar localities, at the time the work was performed. This memorandum does not represent a legal opinion. No other warranty, expressed or implied, is made.

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Attachments

Figure 1—Sequalitchew Creek Basin Map
Figure 2—Aquifer Systems Near DuPont

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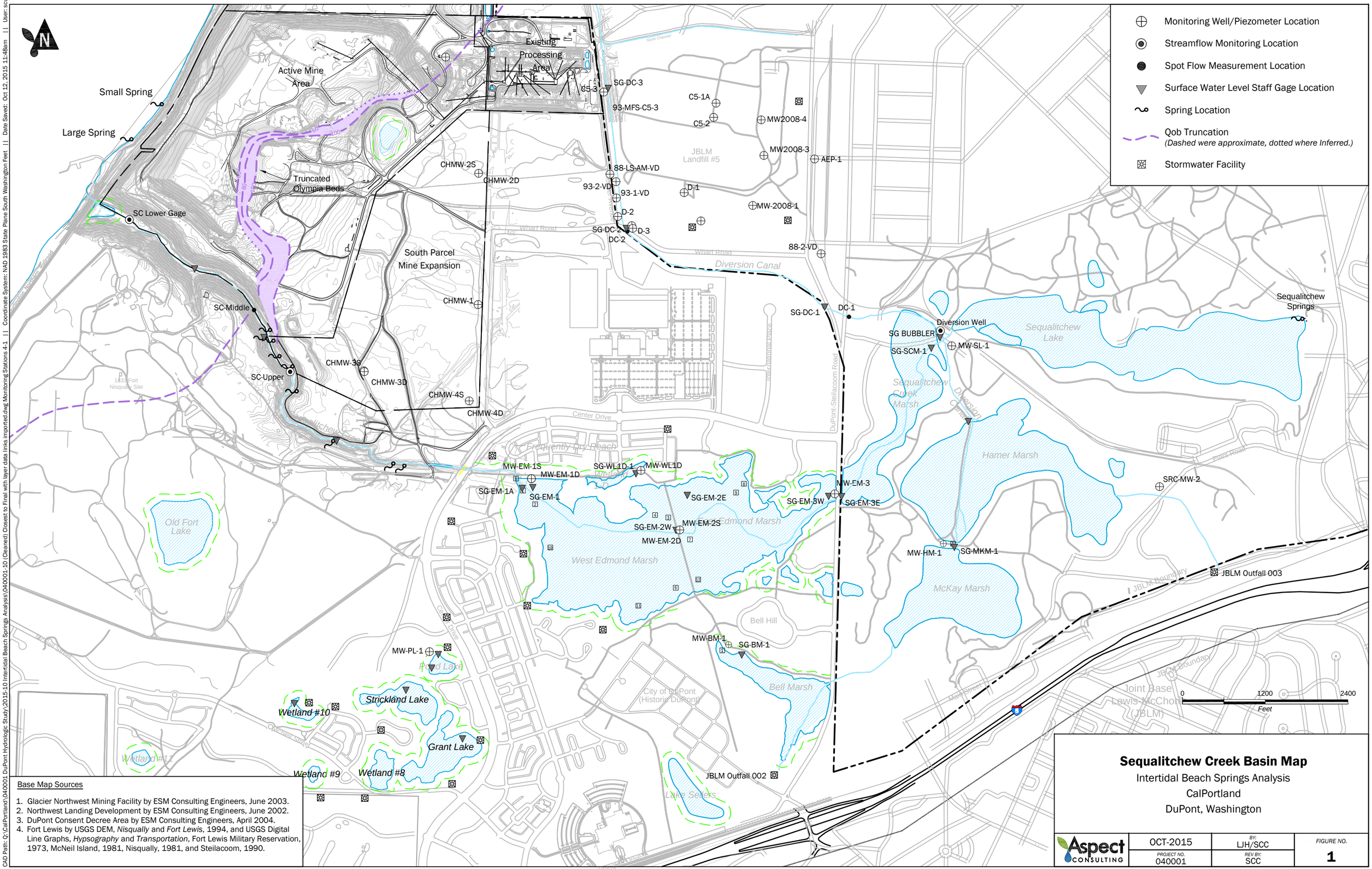
FIGURES



Base Map Sources

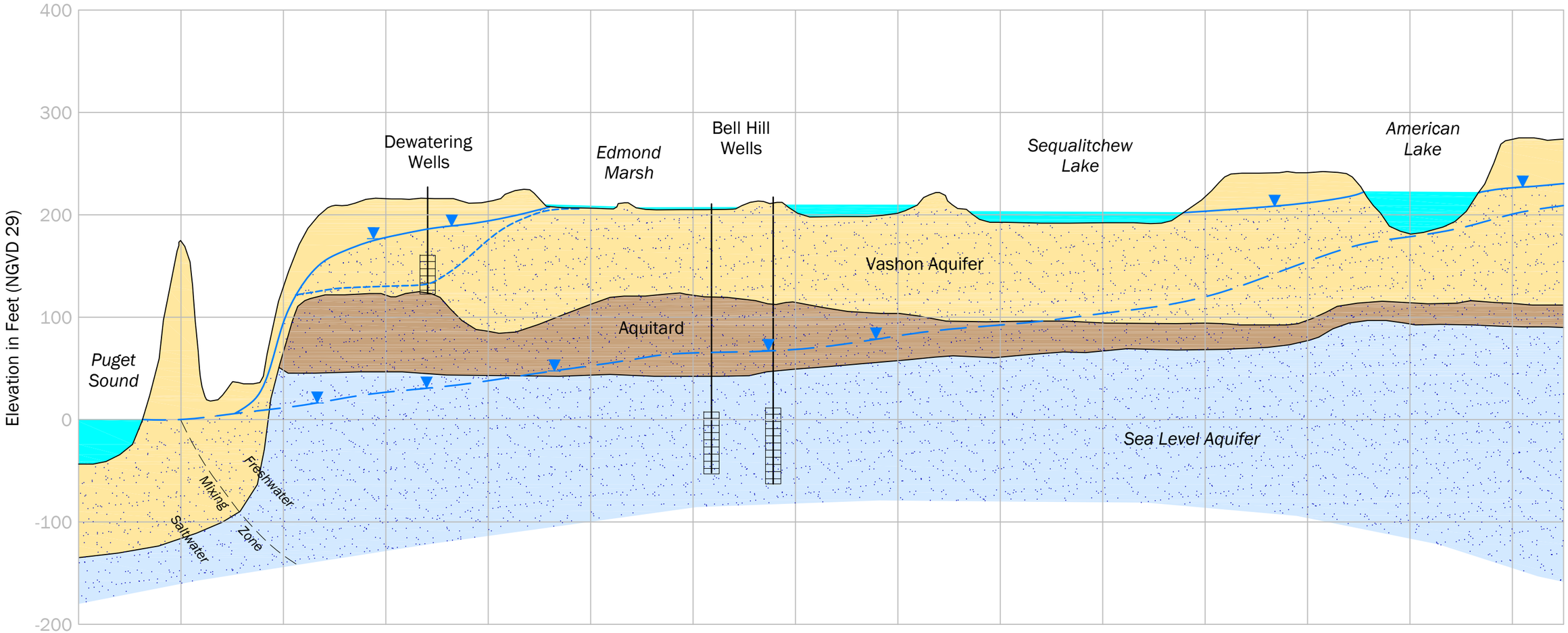
1. Glacier Northwest Mining Facility by ESM Consulting Engineers, June 2003.
2. Northwest Landing Development by ESM Consulting Engineers, June 2002.
3. DuPont Consent Decree Area by ESM Consulting Engineers, April 2004.
4. Fort Lewis by USGS DEM, *Nisqually* and *Fort Lewis*, 1994, and USGS Digital Line Graphs, *Hypsography* and *Transportation*, Fort Lewis Military Reservation, 1973, McNeil Island, 1981, Nisqually, 1981, and Steilacoom, 1990.

Sequalitchew Creek Basin Map

Intertidal Beach Springs Analysis
CalPortland
DuPont, Washington

Aspect Consulting	OCT-2015	BY: LJH/SCC	FIGURE NO. 1
	PROJECT NO. 040001	REV BY: SCC	

C:\GIS Path: Q:\CalPortland\040001 DuPont Hydrologic Study\2015-10 Intertidal Beach Springs Analysis\040001-10 (Cleaned) Closest to Final with layer data links imported.dwg Monitoring Stations 4-1. || Coordinate System: NAD 1983 State Plane South Washington Feet || Date Saved: Oct 12, 2015 11:48am || User: scud



— — — Ghyben-Herzberg Interface

Current Water Level in Vashon Aquifer

Predicted Water Level with Mining

Water Level in the Sea Level Aquifer (City of DuPont Water Supply Aquifer)

Aquifer Systems Near DuPont

Intertidal Beach Springs Analysis

CalPortland

DuPont, Washington

Aspect CONSULTING	OCT-2015	BY: JS/SCC	FIGURE NO. 2
	PROJECT NO. 040001	REV BY: SC	

CAD Path: Q:\CalPortland\040001 DuPont Hydrologic Study\2015-10 Intertidal Beach Springs Analysis\040001-AA-20x.dwg 11x17 Landscape || Coordinate System: NAD 1983 State Plane Washington North FIPS 4601 Feet || Date Saved: Oct 12, 2015 11:48am || User: scudd

APPENDIX E

Site Water Balance Results

Table E-1. Site Water Balance for Existing Conditions

Project No. 040001, DuPont, Washington

	Inflows			Outflows			
Year	Total Precipitation in inches	Total Surface Water Run-On in cfs	Groundwater Inflows in cfs	Evapo-transpiration in inches	Stormwater in cfs	Direct Groundwater Recharge in cfs	Total Groundwater Outflow in cfs
1901	40.83	0	6.9	21.75	0.14	0.92	7.96
1902	38.26	0	6.9	19.55	0.11	0.93	7.94
1903	35.03	0	6.9	16.33	0.11	0.93	7.94
1904	38.42	0	6.9	17.55	0.13	1.03	8.06
1905	25.71	0	6.9	14.10	0.06	0.58	7.54
1906	37.95	0	6.9	21.91	0.12	0.78	7.79
1907	38.20	0	6.9	16.92	0.13	1.05	8.08
1908	38.11	0	6.9	17.89	0.12	1.00	8.02
1909	53.09	0	6.9	25.48	0.18	1.35	8.43
1910	33.20	0	6.9	12.51	0.11	1.04	8.05
1911	48.37	0	6.9	20.55	0.19	1.36	8.44
1912	45.91	0	6.9	16.27	0.18	1.47	8.55
1913	32.51	0	6.9	15.47	0.10	0.85	7.85
1914	36.06	0	6.9	18.48	0.11	0.86	7.88
1915	46.92	0	6.9	21.81	0.16	1.24	8.29
1916	31.16	0	6.9	15.39	0.09	0.79	7.78
1917	50.58	0	6.9	19.90	0.19	1.51	8.60
1918	37.07	0	6.9	16.79	0.12	1.01	8.03
1919	38.67	0	6.9	17.95	0.13	1.02	8.05
1920	45.83	0	6.9	20.26	0.16	1.26	8.32
1921	41.45	0	6.9	18.25	0.14	1.15	8.19
1922	48.12	0	6.9	18.46	0.18	1.47	8.55
1923	34.20	0	6.9	16.99	0.10	0.86	7.86
1924	36.53	0	6.9	18.54	0.11	0.89	7.90
1925	45.82	0	6.9	21.91	0.15	1.18	8.23
1926	37.20	0	6.9	16.90	0.12	1.01	8.03
1927	41.37	0	6.9	19.19	0.14	1.10	8.13
1928	45.78	0	6.9	17.27	0.17	1.41	8.48
1929	51.97	0	6.9	25.28	0.18	1.31	8.38
1930	48.05	0	6.9	18.29	0.17	1.48	8.55
1931	37.66	0	6.9	15.49	0.13	1.10	8.13
1932	48.90	0	6.9	21.31	0.17	1.36	8.43
1933	62.18	0	6.9	22.37	0.26	1.95	9.11
1934	35.86	0	6.9	14.11	0.12	1.09	8.11
1935	52.09	0	6.9	20.01	0.20	1.59	8.68
1936	42.98	0	6.9	19.49	0.15	1.16	8.20
1937	49.63	0	6.9	21.90	0.17	1.37	8.44
1938	26.62	0	6.9	16.09	0.06	0.52	7.48
1939	46.62	0	6.9	23.06	0.15	1.16	8.21
1940	30.97	0	6.9	13.76	0.10	0.86	7.86
1941	43.78	0	6.9	19.73	0.15	1.18	8.24
1942	37.47	0	6.9	17.78	0.12	0.97	7.99
1943	49.82	0	6.9	20.25	0.18	1.46	8.54
1944	50.74	0	6.9	23.68	0.17	1.33	8.40
1945	40.83	0	6.9	16.73	0.14	1.20	8.24
1946	34.17	0	6.9	17.32	0.10	0.84	7.84

Table E-1. Site Water Balance for Existing Conditions

Project No. 040001, DuPont, Washington

	Inflows			Outflows			
Year	Total Precipitation in inches	Total Surface Water Run-On in cfs	Groundwater Inflows in cfs	Evapo-transpiration in inches	Stormwater in cfs	Direct Groundwater Recharge in cfs	Total Groundwater Outflow in cfs
1947	38.87	0	6.9	18.11	0.13	1.02	8.05
1948	43.71	0	6.9	18.59	0.16	1.23	8.29
1949	31.37	0	6.9	16.29	0.09	0.75	7.74
1950	42.12	0	6.9	20.24	0.13	1.08	8.12
1951	46.83	0	6.9	19.36	0.18	1.34	8.43
1952	53.37	0	6.9	20.03	0.22	1.63	8.75
1953	35.77	0	6.9	14.74	0.12	1.05	8.07
1954	39.97	0	6.9	20.58	0.12	0.96	7.98
1955	30.18	0	6.9	15.69	0.08	0.72	7.70
1956	44.18	0	6.9	20.40	0.15	1.17	8.22
1957	58.24	0	6.9	21.68	0.24	1.79	8.93
1958	52.59	0	6.9	19.25	0.21	1.64	8.75
1959	33.13	0	6.9	12.83	0.11	1.01	8.03
1960	55.41	0	6.9	22.14	0.22	1.63	8.75
1961	36.29	0	6.9	15.89	0.13	1.01	8.03
1962	36.22	0	6.9	19.15	0.10	0.85	7.85
1963	33.33	0	6.9	15.82	0.10	0.87	7.87
1964	57.69	0	6.9	23.56	0.24	1.66	8.80
1965	28.52	0	6.9	11.27	0.09	0.87	7.86
1966	38.98	0	6.9	20.63	0.12	0.90	7.92
1967	43.40	0	6.9	18.08	0.15	1.25	8.31
1968	37.92	0	6.9	18.86	0.11	0.94	7.96
1969	45.01	0	6.9	19.71	0.16	1.25	8.30
1970	44.55	0	6.9	17.55	0.17	1.33	8.40
1971	45.61	0	6.9	19.02	0.16	1.31	8.38
1972	51.44	0	6.9	17.60	0.21	1.67	8.78
1973	43.43	0	6.9	17.78	0.15	1.27	8.32
1974	45.51	0	6.9	19.86	0.16	1.26	8.32
1975	46.93	0	6.9	18.39	0.17	1.41	8.49
1976	36.53	0	6.9	16.71	0.11	0.99	8.00
1977	57.46	0	6.9	20.49	0.23	1.82	8.95
1978	35.73	0	6.9	15.88	0.11	0.99	8.00
1979	44.96	0	6.9	19.26	0.16	1.27	8.33
1980	42.56	0	6.9	17.97	0.15	1.22	8.27
1981	38.36	0	6.9	18.84	0.11	0.97	7.98
1982	48.39	0	6.9	19.70	0.18	1.42	8.49
1983	34.00	0	6.9	15.77	0.10	0.91	7.91
1984	38.65	0	6.9	17.77	0.13	1.03	8.06
1985	36.02	0	6.9	16.93	0.11	0.95	7.96
1986	39.21	0	6.9	17.69	0.13	1.06	8.10
1987	35.69	0	6.9	15.79	0.12	0.99	8.01
1988	36.33	0	6.9	17.25	0.12	0.94	7.96
1989	44.58	0	6.9	22.35	0.14	1.09	8.13
1990	47.15	0	6.9	16.93	0.18	1.50	8.58
1991	46.79	0	6.9	17.39	0.18	1.46	8.53
1992	52.29	0	6.9	22.48	0.19	1.47	8.56

Table E-1. Site Water Balance for Existing Conditions

Project No. 040001, DuPont, Washington

	Inflows			Outflows			
Year	Total Precipitation in inches	Total Surface Water Run-On in cfs	Groundwater Inflows in cfs	Evapo-transpiration in inches	Stormwater in cfs	Direct Groundwater Recharge in cfs	Total Groundwater Outflow in cfs
1993	44.54	0	6.9	15.32	0.17	1.46	8.52
1994	33.69	0	6.9	16.27	0.10	0.87	7.87
1995	61.78	0	6.9	20.71	0.26	2.02	9.18
1996	40.75	0	6.9	18.04	0.13	1.13	8.16
1997	43.33	0	6.9	19.88	0.14	1.16	8.20
1998	23.49	0	6.9	13.46	0.05	0.50	7.46
1999	44.25	0	6.9	23.38	0.14	1.02	8.06
2000	31.82	0	6.9	15.14	0.09	0.83	7.83
2001	41.20	0	6.9	18.33	0.14	1.13	8.17
2002	37.41	0	6.9	17.64	0.12	0.98	8.00
2003	46.97	0	6.9	19.04	0.17	1.38	8.45
2004	57.63	0	6.9	24.78	0.21	1.61	8.72
2005	43.60	0	6.9	15.75	0.15	1.39	8.45
2006	35.32	0	6.9	14.01	0.12	1.06	8.08
2007	37.55	0	6.9	17.85	0.12	0.97	7.99
2008	40.60	0	6.9	19.35	0.13	1.05	8.08
2009	35.07	0	6.9	16.35	0.11	0.93	7.94
2010	33.78	0	6.9	16.34	0.10	0.87	7.87
2011	34.09	0	6.9	17.15	0.11	0.83	7.84
2012	38.96	0	6.9	18.93	0.13	0.99	8.01
2013	30.12	0	6.9	14.01	0.09	0.80	7.79
2014	43.52	0	6.9	21.82	0.15	1.06	8.11
2015	25.74	0	6.9	11.70	0.07	0.71	7.68
2016	50.36	0	6.9	23.17	0.18	1.33	8.41
2017	56.54	0	6.9	19.80	0.23	1.81	8.94
2018	58.35	0	6.9	21.81	0.23	1.80	8.93
2019	43.38	0	6.9	17.78	0.15	1.27	8.32
2020	52.71	0	6.9	19.25	0.20	1.65	8.76
2021	37.15	0	6.9	18.10	0.11	0.95	7.96
2022	49.81	0	6.9	19.76	0.19	1.48	8.57
2023	37.80	0	6.9	18.08	0.12	0.97	8.00
2024	39.84	0	6.9	18.68	0.13	1.04	8.08
2025	45.58	0	6.9	20.38	0.15	1.24	8.30
2026	35.92	0	6.9	16.57	0.11	0.96	7.97
2027	31.55	0	6.9	17.24	0.08	0.72	7.69
2028	43.54	0	6.9	18.08	0.16	1.26	8.31
2029	47.68	0	6.9	20.22	0.17	1.35	8.42
2030	34.39	0	6.9	14.94	0.11	0.97	7.98
2031	35.52	0	6.9	18.28	0.10	0.86	7.86
2032	35.66	0	6.9	18.56	0.11	0.84	7.85
2033	43.89	0	6.9	21.58	0.14	1.10	8.14
2034	35.91	0	6.9	15.30	0.12	1.02	8.04
2035	45.85	0	6.9	20.68	0.16	1.24	8.30
2036	27.87	0	6.9	13.20	0.08	0.73	7.71
2037	48.88	0	6.9	20.58	0.19	1.39	8.47
2038	28.10	0	6.9	16.17	0.06	0.60	7.56

Table E-1. Site Water Balance for Existing Conditions

Project No. 040001, DuPont, Washington

	Inflows			Outflows			
Year	Total Precipitation in inches	Total Surface Water Run-On in cfs	Groundwater Inflows in cfs	Evapo-transpiration in inches	Stormwater in cfs	Direct Groundwater Recharge in cfs	Total Groundwater Outflow in cfs
2039	36.26	0	6.9	20.13	0.10	0.79	7.80
2040	33.69	0	6.9	16.62	0.10	0.85	7.85
2041	46.65	0	6.9	23.03	0.16	1.15	8.21
2042	53.77	0	6.9	22.52	0.19	1.54	8.64
2043	51.49	0	6.9	17.48	0.20	1.69	8.79
2044	51.64	0	6.9	21.40	0.19	1.49	8.58
2045	52.33	0	6.9	19.56	0.20	1.62	8.72
2046	36.35	0	6.9	15.18	0.12	1.06	8.08
2047	42.13	0	6.9	20.70	0.13	1.06	8.09
2048	41.81	0	6.9	18.00	0.15	1.18	8.22
2049	36.96	0	6.9	18.50	0.12	0.91	7.93
2050	46.15	0	6.9	19.94	0.16	1.30	8.36
2051	45.24	0	6.9	18.70	0.16	1.31	8.37
2052	48.60	0	6.9	20.18	0.17	1.41	8.48
2053	45.60	0	6.9	18.98	0.17	1.31	8.38
2054	37.71	0	6.9	18.78	0.11	0.94	7.95
2055	33.13	0	6.9	16.22	0.09	0.84	7.84
2056	46.21	0	6.9	21.31	0.16	1.22	8.28
2057	41.86	0	6.9	16.27	0.15	1.27	8.32
2058	67.38	0	6.9	24.61	0.29	2.08	9.27
Average	41.99	0	6.90	18.51	0.14	1.16	8.20
Average in inches	41.99	0	124.26	18.51	2.59	20.89	147.74

Notes:

1) Stormwater is the sum of surface runoff and interflow.

2) Under existing conditions, all stormwater infiltrates within the mine area or on the South Parcel.

3) Total Groundwater outflow is the sum of stormwater + direct groundwater recharge + groundwater inflows.

4) Average flows in cfs are converted to inches by calculating the total volume in cubic feet for the year, then dividing by the project area of 482.4 acres

Table E-2. Site Water Balance for Proposed Action

Project No. 040001, DuPont, Washington

	Inflows			Outflows			
Year	Total Precipitation in inches	Total Surface Water Run-On in cfs	Groundwater Inflows in cfs	Evapo-transpiration in inches	Stormwater in cfs	Direct Groundwater Recharge in cfs	Total Groundwater Outflow in cfs
1901	40.83	0	6.9	19.65	0.62	0.56	8.08
1902	38.26	0	6.9	19.29	0.43	0.62	7.95
1903	35.03	0	6.9	15.81	0.44	0.63	7.97
1904	38.42	0	6.9	16.50	0.56	0.66	8.12
1905	25.71	0	6.9	14.40	0.20	0.42	7.53
1906	37.95	0	6.9	20.60	0.45	0.52	7.86
1907	38.20	0	6.9	16.03	0.53	0.70	8.13
1908	38.11	0	6.9	17.11	0.51	0.65	8.07
1909	53.09	0	6.9	24.23	0.76	0.84	8.50
1910	33.20	0	6.9	11.88	0.49	0.69	8.08
1911	48.37	0	6.9	19.10	0.80	0.83	8.53
1912	45.91	0	6.9	15.18	0.81	0.90	8.61
1913	32.51	0	6.9	15.03	0.39	0.59	7.87
1914	36.06	0	6.9	17.78	0.45	0.57	7.91
1915	46.92	0	6.9	20.70	0.66	0.80	8.36
1916	31.16	0	6.9	15.12	0.32	0.57	7.79
1917	50.58	0	6.9	17.88	0.87	0.94	8.72
1918	37.07	0	6.9	16.10	0.48	0.69	8.06
1919	38.67	0	6.9	16.89	0.53	0.68	8.11
1920	45.83	0	6.9	19.35	0.66	0.81	8.37
1921	41.45	0	6.9	17.43	0.59	0.75	8.23
1922	48.12	0	6.9	17.15	0.81	0.91	8.62
1923	34.20	0	6.9	16.90	0.37	0.59	7.86
1924	36.53	0	6.9	17.69	0.43	0.62	7.95
1925	45.82	0	6.9	20.58	0.63	0.77	8.30
1926	37.20	0	6.9	16.23	0.48	0.68	8.06
1927	41.37	0	6.9	18.21	0.56	0.73	8.19
1928	45.78	0	6.9	15.90	0.78	0.88	8.56
1929	51.97	0	6.9	23.88	0.73	0.83	8.46
1930	48.05	0	6.9	17.46	0.76	0.94	8.60
1931	37.66	0	6.9	15.13	0.54	0.71	8.15
1932	48.90	0	6.9	20.00	0.74	0.87	8.50
1933	62.18	0	6.9	20.65	1.14	1.16	9.21
1934	35.86	0	6.9	13.56	0.52	0.72	8.14
1935	52.09	0	6.9	18.64	0.87	0.98	8.76
1936	42.98	0	6.9	18.66	0.61	0.74	8.25
1937	49.63	0	6.9	21.08	0.71	0.88	8.49
1938	26.62	0	6.9	15.91	0.19	0.41	7.49
1939	46.62	0	6.9	21.51	0.64	0.76	8.29
1940	30.97	0	6.9	13.15	0.40	0.59	7.89
1941	43.78	0	6.9	18.51	0.66	0.74	8.30
1942	37.47	0	6.9	17.09	0.49	0.65	8.03
1943	49.82	0	6.9	18.92	0.82	0.89	8.62
1944	50.74	0	6.9	22.60	0.71	0.85	8.46
1945	40.83	0	6.9	15.79	0.59	0.80	8.29
1946	34.17	0	6.9	17.10	0.36	0.59	7.85

Table E-2. Site Water Balance for Proposed Action

Project No. 040001, DuPont, Washington

	Inflows			Outflows			
Year	Total Precipitation in inches	Total Surface Water Run-On in cfs	Groundwater Inflows in cfs	Evapo-transpiration in inches	Stormwater in cfs	Direct Groundwater Recharge in cfs	Total Groundwater Outflow in cfs
1947	38.87	0	6.9	16.98	0.55	0.67	8.12
1948	43.71	0	6.9	17.19	0.72	0.75	8.37
1949	31.37	0	6.9	16.39	0.32	0.51	7.73
1950	42.12	0	6.9	19.23	0.54	0.73	8.17
1951	46.83	0	6.9	17.77	0.78	0.83	8.51
1952	53.37	0	6.9	18.69	0.96	0.97	8.83
1953	35.77	0	6.9	14.38	0.50	0.69	8.09
1954	39.97	0	6.9	19.95	0.47	0.64	8.01
1955	30.18	0	6.9	15.71	0.28	0.52	7.70
1956	44.18	0	6.9	19.04	0.65	0.75	8.30
1957	58.24	0	6.9	19.94	1.07	1.05	9.03
1958	52.59	0	6.9	17.77	0.97	0.96	8.83
1959	33.13	0	6.9	12.42	0.49	0.66	8.05
1960	55.41	0	6.9	20.71	0.97	0.96	8.83
1961	36.29	0	6.9	15.14	0.53	0.64	8.07
1962	36.22	0	6.9	19.22	0.36	0.58	7.84
1963	33.33	0	6.9	14.98	0.42	0.60	7.92
1964	57.69	0	6.9	21.39	1.06	0.95	8.92
1965	28.52	0	6.9	11.41	0.36	0.59	7.85
1966	38.98	0	6.9	19.52	0.49	0.59	7.98
1967	43.40	0	6.9	17.00	0.65	0.82	8.37
1968	37.92	0	6.9	18.21	0.45	0.65	7.99
1969	45.01	0	6.9	18.12	0.70	0.79	8.39
1970	44.55	0	6.9	16.44	0.74	0.82	8.46
1971	45.61	0	6.9	17.78	0.72	0.83	8.44
1972	51.44	0	6.9	16.26	0.94	1.01	8.85
1973	43.43	0	6.9	17.16	0.65	0.81	8.36
1974	45.51	0	6.9	18.84	0.69	0.79	8.38
1975	46.93	0	6.9	17.37	0.75	0.89	8.54
1976	36.53	0	6.9	16.37	0.43	0.69	8.02
1977	57.46	0	6.9	19.08	1.03	1.10	9.03
1978	35.73	0	6.9	15.40	0.46	0.67	8.03
1979	44.96	0	6.9	18.25	0.66	0.82	8.38
1980	42.56	0	6.9	17.22	0.63	0.78	8.31
1981	38.36	0	6.9	18.37	0.45	0.66	8.01
1982	48.39	0	6.9	18.34	0.79	0.88	8.57
1983	34.00	0	6.9	15.82	0.37	0.64	7.91
1984	38.65	0	6.9	16.62	0.54	0.68	8.12
1985	36.02	0	6.9	16.34	0.45	0.64	7.99
1986	39.21	0	6.9	16.73	0.56	0.69	8.15
1987	35.69	0	6.9	14.90	0.50	0.65	8.05
1988	36.33	0	6.9	16.58	0.46	0.64	8.00
1989	44.58	0	6.9	21.30	0.59	0.71	8.19
1990	47.15	0	6.9	15.40	0.79	0.97	8.66
1991	46.79	0	6.9	16.41	0.78	0.91	8.59
1992	52.29	0	6.9	21.48	0.78	0.93	8.61

Table E-2. Site Water Balance for Proposed Action

Project No. 040001, DuPont, Washington

	Inflows			Outflows			
Year	Total Precipitation in inches	Total Surface Water Run-On in cfs	Groundwater Inflows in cfs	Evapo-transpiration in inches	Stormwater in cfs	Direct Groundwater Recharge in cfs	Total Groundwater Outflow in cfs
1993	44.54	0	6.9	14.26	0.73	0.95	8.58
1994	33.69	0	6.9	16.06	0.38	0.60	7.88
1995	61.78	0	6.9	18.54	1.22	1.18	9.30
1996	40.75	0	6.9	17.66	0.54	0.74	8.18
1997	43.33	0	6.9	18.98	0.59	0.76	8.25
1998	23.49	0	6.9	13.95	0.15	0.38	7.43
1999	44.25	0	6.9	21.64	0.56	0.69	8.16
2000	31.82	0	6.9	14.33	0.37	0.60	7.87
2001	41.20	0	6.9	16.95	0.61	0.74	8.25
2002	37.41	0	6.9	17.01	0.50	0.63	8.03
2003	46.97	0	6.9	17.93	0.76	0.86	8.51
2004	57.63	0	6.9	23.43	0.90	1.00	8.80
2005	43.60	0	6.9	15.06	0.67	0.92	8.48
2006	35.32	0	6.9	13.53	0.50	0.71	8.11
2007	37.55	0	6.9	17.10	0.49	0.64	8.04
2008	40.60	0	6.9	18.40	0.55	0.69	8.13
2009	35.07	0	6.9	16.21	0.44	0.61	7.95
2010	33.78	0	6.9	15.96	0.39	0.60	7.89
2011	34.09	0	6.9	16.25	0.43	0.56	7.89
2012	38.96	0	6.9	17.90	0.52	0.65	8.07
2013	30.12	0	6.9	13.89	0.36	0.54	7.80
2014	43.52	0	6.9	20.23	0.62	0.68	8.19
2015	25.74	0	6.9	12.26	0.24	0.50	7.65
2016	50.36	0	6.9	21.46	0.79	0.81	8.50
2017	56.54	0	6.9	18.34	1.04	1.08	9.02
2018	58.35	0	6.9	20.40	1.05	1.05	9.01
2019	43.38	0	6.9	17.03	0.65	0.82	8.36
2020	52.71	0	6.9	18.40	0.92	0.99	8.81
2021	37.15	0	6.9	17.64	0.44	0.64	7.98
2022	49.81	0	6.9	18.08	0.85	0.91	8.66
2023	37.80	0	6.9	17.69	0.46	0.66	8.02
2024	39.84	0	6.9	17.46	0.55	0.69	8.14
2025	45.58	0	6.9	19.13	0.66	0.81	8.37
2026	35.92	0	6.9	15.90	0.44	0.67	8.01
2027	31.55	0	6.9	17.05	0.27	0.53	7.71
2028	43.54	0	6.9	16.21	0.69	0.83	8.42
2029	47.68	0	6.9	18.88	0.76	0.84	8.50
2030	34.39	0	6.9	14.73	0.41	0.68	7.99
2031	35.52	0	6.9	17.71	0.39	0.60	7.89
2032	35.66	0	6.9	17.56	0.43	0.58	7.91
2033	43.89	0	6.9	19.82	0.61	0.73	8.24
2034	35.91	0	6.9	14.71	0.51	0.67	8.08
2035	45.85	0	6.9	19.52	0.67	0.79	8.36
2036	27.87	0	6.9	13.06	0.32	0.50	7.72
2037	48.88	0	6.9	18.53	0.84	0.85	8.59
2038	28.10	0	6.9	16.42	0.19	0.46	7.55

Table E-2. Site Water Balance for Proposed Action

Project No. 040001, DuPont, Washington

	Inflows			Outflows			
Year	Total Precipitation in inches	Total Surface Water Run-On in cfs	Groundwater Inflows in cfs	Evapo-transpiration in inches	Stormwater in cfs	Direct Groundwater Recharge in cfs	Total Groundwater Outflow in cfs
2039	36.26	0	6.9	19.01	0.40	0.56	7.86
2040	33.69	0	6.9	15.82	0.40	0.59	7.89
2041	46.65	0	6.9	21.34	0.68	0.73	8.31
2042	53.77	0	6.9	21.07	0.87	0.95	8.72
2043	51.49	0	6.9	16.58	0.90	1.04	8.84
2044	51.64	0	6.9	19.94	0.83	0.93	8.66
2045	52.33	0	6.9	18.02	0.91	1.00	8.81
2046	36.35	0	6.9	14.98	0.50	0.69	8.09
2047	42.13	0	6.9	19.91	0.54	0.70	8.13
2048	41.81	0	6.9	17.02	0.62	0.76	8.28
2049	36.96	0	6.9	17.67	0.47	0.60	7.97
2050	46.15	0	6.9	18.99	0.68	0.83	8.41
2051	45.24	0	6.9	16.76	0.74	0.84	8.48
2052	48.60	0	6.9	19.39	0.73	0.89	8.52
2053	45.60	0	6.9	16.45	0.77	0.85	8.52
2054	37.71	0	6.9	18.67	0.41	0.65	7.96
2055	33.13	0	6.9	16.08	0.35	0.60	7.85
2056	46.21	0	6.9	19.74	0.68	0.79	8.37
2057	41.86	0	6.9	15.44	0.65	0.82	8.37
2058	67.38	0	6.9	22.01	1.35	1.17	9.42
Average	41.99	0	6.90	17.57	0.61	0.75	8.26
Average in inches	41.99	0	124.26	17.57	10.95	13.47	148.68

Notes:

1) Stormwater is the sum of surface runoff and interflow.

2) Under existing conditions, all stormwater infiltrates within the mine area or on the South Parcel.

3) Total Groundwater outflow is the sum of stormwater + direct groundwater recharge + groundwater inflows.

4) Average flows in cfs are converted to inches by calculating the total volume in cubic feet for the year, then dividing by the project area of 482.4 acres

Table E-3. Site Water Balance for No Action

Project No. 040001, DuPont, Washington

	Inflows			Outflows			
Year	Total Precipitation in inches	Total Surface Water Run-On in cfs	Groundwater Inflows in cfs	Evapo-transpiration in inches	Stormwater in cfs	Direct Groundwater Recharge in cfs	Total Groundwater Outflow in cfs
1901	40.83	0	6.9	17.80	0.61	0.67	8.18
1902	38.26	0	6.9	15.76	0.53	0.72	8.15
1903	35.03	0	6.9	13.02	0.48	0.74	8.12
1904	38.42	0	6.9	13.94	0.57	0.79	8.26
1905	25.71	0	6.9	11.59	0.32	0.47	7.68
1906	37.95	0	6.9	17.52	0.54	0.60	8.03
1907	38.20	0	6.9	13.57	0.55	0.82	8.27
1908	38.11	0	6.9	14.43	0.54	0.78	8.22
1909	53.09	0	6.9	20.53	0.77	1.04	8.71
1910	33.20	0	6.9	9.95	0.48	0.81	8.19
1911	48.37	0	6.9	16.48	0.74	1.03	8.67
1912	45.91	0	6.9	13.02	0.71	1.12	8.73
1913	32.51	0	6.9	12.67	0.45	0.65	8.00
1914	36.06	0	6.9	15.01	0.50	0.66	8.07
1915	46.92	0	6.9	17.27	0.69	0.95	8.55
1916	31.16	0	6.9	12.31	0.41	0.64	7.95
1917	50.58	0	6.9	15.58	0.79	1.16	8.84
1918	37.07	0	6.9	13.68	0.51	0.79	8.20
1919	38.67	0	6.9	14.68	0.54	0.79	8.23
1920	45.83	0	6.9	16.34	0.67	0.97	8.54
1921	41.45	0	6.9	14.75	0.59	0.89	8.38
1922	48.12	0	6.9	14.65	0.74	1.12	8.76
1923	34.20	0	6.9	13.86	0.46	0.67	8.03
1924	36.53	0	6.9	14.96	0.49	0.71	8.10
1925	45.82	0	6.9	17.56	0.66	0.91	8.47
1926	37.20	0	6.9	13.30	0.53	0.80	8.23
1927	41.37	0	6.9	15.24	0.60	0.85	8.35
1928	45.78	0	6.9	13.70	0.70	1.08	8.68
1929	51.97	0	6.9	20.14	0.77	1.00	8.67
1930	48.05	0	6.9	14.46	0.72	1.14	8.77
1931	37.66	0	6.9	12.52	0.54	0.85	8.30
1932	48.90	0	6.9	17.12	0.72	1.04	8.66
1933	62.18	0	6.9	17.58	0.98	1.49	9.38
1934	35.86	0	6.9	11.17	0.51	0.86	8.27
1935	52.09	0	6.9	16.05	0.80	1.21	8.90
1936	42.98	0	6.9	15.67	0.63	0.88	8.42
1937	49.63	0	6.9	17.60	0.72	1.06	8.68
1938	26.62	0	6.9	12.74	0.33	0.44	7.67
1939	46.62	0	6.9	18.46	0.66	0.91	8.46
1940	30.97	0	6.9	10.99	0.43	0.68	8.01
1941	43.78	0	6.9	15.70	0.65	0.91	8.46
1942	37.47	0	6.9	14.23	0.53	0.76	8.19
1943	49.82	0	6.9	16.31	0.75	1.11	8.76
1944	50.74	0	6.9	18.81	0.74	1.03	8.67
1945	40.83	0	6.9	13.28	0.59	0.94	8.43
1946	34.17	0	6.9	13.91	0.46	0.67	8.02

Table E-3. Site Water Balance for No Action

Project No. 040001, DuPont, Washington

	Inflows			Outflows			
Year	Total Precipitation in inches	Total Surface Water Run-On in cfs	Groundwater Inflows in cfs	Evapo-transpiration in inches	Stormwater in cfs	Direct Groundwater Recharge in cfs	Total Groundwater Outflow in cfs
1947	38.87	0	6.9	14.59	0.55	0.80	8.25
1948	43.71	0	6.9	14.87	0.66	0.94	8.50
1949	31.37	0	6.9	13.16	0.42	0.59	7.91
1950	42.12	0	6.9	16.19	0.60	0.84	8.34
1951	46.83	0	6.9	15.39	0.72	1.03	8.65
1952	53.37	0	6.9	15.86	0.85	1.23	8.98
1953	35.77	0	6.9	11.59	0.53	0.81	8.24
1954	39.97	0	6.9	16.73	0.54	0.75	8.19
1955	30.18	0	6.9	12.57	0.40	0.58	7.88
1956	44.18	0	6.9	16.18	0.66	0.90	8.45
1957	58.24	0	6.9	17.02	0.92	1.37	9.19
1958	52.59	0	6.9	15.27	0.81	1.26	8.97
1959	33.13	0	6.9	10.33	0.48	0.79	8.17
1960	55.41	0	6.9	17.86	0.86	1.23	8.99
1961	36.29	0	6.9	12.51	0.54	0.78	8.22
1962	36.22	0	6.9	15.53	0.49	0.66	8.05
1963	33.33	0	6.9	12.61	0.46	0.69	8.05
1964	57.69	0	6.9	18.56	0.92	1.25	9.07
1965	28.52	0	6.9	9.03	0.40	0.68	7.98
1966	38.98	0	6.9	16.62	0.55	0.69	8.14
1967	43.40	0	6.9	14.50	0.64	0.96	8.51
1968	37.92	0	6.9	15.10	0.53	0.74	8.17
1969	45.01	0	6.9	15.97	0.66	0.95	8.51
1970	44.55	0	6.9	14.03	0.68	1.02	8.59
1971	45.61	0	6.9	15.45	0.68	1.00	8.57
1972	51.44	0	6.9	14.04	0.82	1.26	8.98
1973	43.43	0	6.9	14.57	0.64	0.97	8.50
1974	45.51	0	6.9	15.92	0.69	0.95	8.54
1975	46.93	0	6.9	14.59	0.71	1.09	8.70
1976	36.53	0	6.9	13.24	0.52	0.77	8.19
1977	57.46	0	6.9	16.26	0.91	1.38	9.19
1978	35.73	0	6.9	12.85	0.51	0.76	8.17
1979	44.96	0	6.9	15.51	0.67	0.97	8.54
1980	42.56	0	6.9	14.51	0.63	0.93	8.46
1981	38.36	0	6.9	15.42	0.52	0.75	8.17
1982	48.39	0	6.9	16.01	0.72	1.07	8.70
1983	34.00	0	6.9	12.86	0.46	0.71	8.07
1984	38.65	0	6.9	14.19	0.57	0.79	8.26
1985	36.02	0	6.9	14.00	0.49	0.73	8.12
1986	39.21	0	6.9	14.05	0.58	0.81	8.30
1987	35.69	0	6.9	12.69	0.52	0.75	8.18
1988	36.33	0	6.9	13.88	0.52	0.72	8.15
1989	44.58	0	6.9	18.11	0.64	0.83	8.37
1990	47.15	0	6.9	13.12	0.72	1.17	8.79
1991	46.79	0	6.9	13.71	0.73	1.11	8.74
1992	52.29	0	6.9	17.95	0.79	1.11	8.81

Table E-3. Site Water Balance for No Action

Project No. 040001, DuPont, Washington

	Inflows			Outflows			
Year	Total Precipitation in inches	Total Surface Water Run-On in cfs	Groundwater Inflows in cfs	Evapo-transpiration in inches	Stormwater in cfs	Direct Groundwater Recharge in cfs	Total Groundwater Outflow in cfs
1993	44.54	0	6.9	12.23	0.68	1.12	8.69
1994	33.69	0	6.9	13.11	0.47	0.68	8.04
1995	61.78	0	6.9	16.24	1.01	1.52	9.43
1996	40.75	0	6.9	14.58	0.59	0.86	8.35
1997	43.33	0	6.9	16.08	0.62	0.89	8.41
1998	23.49	0	6.9	10.68	0.29	0.42	7.61
1999	44.25	0	6.9	18.54	0.63	0.80	8.33
2000	31.82	0	6.9	11.87	0.43	0.67	8.01
2001	41.20	0	6.9	14.60	0.60	0.87	8.38
2002	37.41	0	6.9	14.08	0.54	0.76	8.20
2003	46.97	0	6.9	15.14	0.72	1.05	8.67
2004	57.63	0	6.9	19.74	0.88	1.23	9.00
2005	43.60	0	6.9	12.37	0.65	1.08	8.63
2006	35.32	0	6.9	11.04	0.52	0.82	8.25
2007	37.55	0	6.9	14.31	0.54	0.75	8.19
2008	40.60	0	6.9	15.46	0.59	0.81	8.30
2009	35.07	0	6.9	13.14	0.50	0.71	8.12
2010	33.78	0	6.9	13.18	0.48	0.67	8.04
2011	34.09	0	6.9	13.76	0.48	0.65	8.03
2012	38.96	0	6.9	15.06	0.56	0.76	8.23
2013	30.12	0	6.9	11.39	0.42	0.62	7.94
2014	43.52	0	6.9	17.71	0.63	0.81	8.33
2015	25.74	0	6.9	9.40	0.35	0.56	7.81
2016	50.36	0	6.9	18.58	0.76	1.01	8.66
2017	56.54	0	6.9	15.78	0.89	1.38	9.16
2018	58.35	0	6.9	17.23	0.92	1.37	9.18
2019	43.38	0	6.9	14.12	0.64	0.99	8.52
2020	52.71	0	6.9	15.67	0.81	1.24	8.96
2021	37.15	0	6.9	14.75	0.51	0.73	8.14
2022	49.81	0	6.9	15.58	0.77	1.13	8.80
2023	37.80	0	6.9	14.65	0.52	0.76	8.19
2024	39.84	0	6.9	14.75	0.58	0.82	8.29
2025	45.58	0	6.9	16.51	0.65	0.97	8.51
2026	35.92	0	6.9	12.97	0.51	0.76	8.17
2027	31.55	0	6.9	14.07	0.40	0.57	7.87
2028	43.54	0	6.9	14.17	0.65	0.98	8.53
2029	47.68	0	6.9	16.24	0.72	1.03	8.65
2030	34.39	0	6.9	11.78	0.49	0.77	8.16
2031	35.52	0	6.9	14.83	0.48	0.67	8.05
2032	35.66	0	6.9	14.83	0.50	0.66	8.06
2033	43.89	0	6.9	17.36	0.62	0.85	8.37
2034	35.91	0	6.9	11.96	0.53	0.80	8.23
2035	45.85	0	6.9	16.49	0.68	0.95	8.53
2036	27.87	0	6.9	10.47	0.40	0.57	7.87
2037	48.88	0	6.9	16.44	0.75	1.05	8.70
2038	28.10	0	6.9	12.94	0.35	0.49	7.74

Table E-3. Site Water Balance for No Action

Project No. 040001, DuPont, Washington

	Inflows			Outflows			
Year	Total Precipitation in inches	Total Surface Water Run-On in cfs	Groundwater Inflows in cfs	Evapo-transpiration in inches	Stormwater in cfs	Direct Groundwater Recharge in cfs	Total Groundwater Outflow in cfs
2039	36.26	0	6.9	16.09	0.49	0.63	8.02
2040	33.69	0	6.9	13.50	0.45	0.68	8.02
2041	46.65	0	6.9	18.18	0.68	0.90	8.48
2042	53.77	0	6.9	17.80	0.80	1.20	8.90
2043	51.49	0	6.9	13.78	0.80	1.30	8.99
2044	51.64	0	6.9	17.17	0.77	1.14	8.81
2045	52.33	0	6.9	15.36	0.81	1.25	8.95
2046	36.35	0	6.9	12.28	0.52	0.82	8.24
2047	42.13	0	6.9	16.60	0.60	0.82	8.32
2048	41.81	0	6.9	14.25	0.62	0.91	8.43
2049	36.96	0	6.9	14.79	0.52	0.71	8.13
2050	46.15	0	6.9	15.87	0.68	1.00	8.58
2051	45.24	0	6.9	14.87	0.67	1.01	8.59
2052	48.60	0	6.9	16.45	0.71	1.08	8.69
2053	45.60	0	6.9	14.17	0.72	1.03	8.65
2054	37.71	0	6.9	15.06	0.51	0.75	8.16
2055	33.13	0	6.9	12.90	0.45	0.67	8.02
2056	46.21	0	6.9	16.88	0.68	0.95	8.53
2057	41.86	0	6.9	12.85	0.63	0.98	8.51
2058	67.38	0	6.9	19.34	1.10	1.57	9.57
Average	41.99	0	6.90	14.80	0.61	0.90	8.41
Average in inches	41.99	0	124.26	14.80	11.07	16.12	151.44

Notes:

1) Stormwater is the sum of surface runoff and interflow.

2) Under existing conditions, all stormwater infiltrates within the mine area or on the South Parcel.

3) Total Groundwater outflow is the sum of stormwater + direct groundwater recharge + groundwater inflows.

4) Average flows in cfs are converted to inches by calculating the total volume in cubic feet for the year, then dividing by the project area of 482.4 acres

APPENDIX F

Wetland Water Balance Calculations

MARSH WATER BALANCE FIGURES

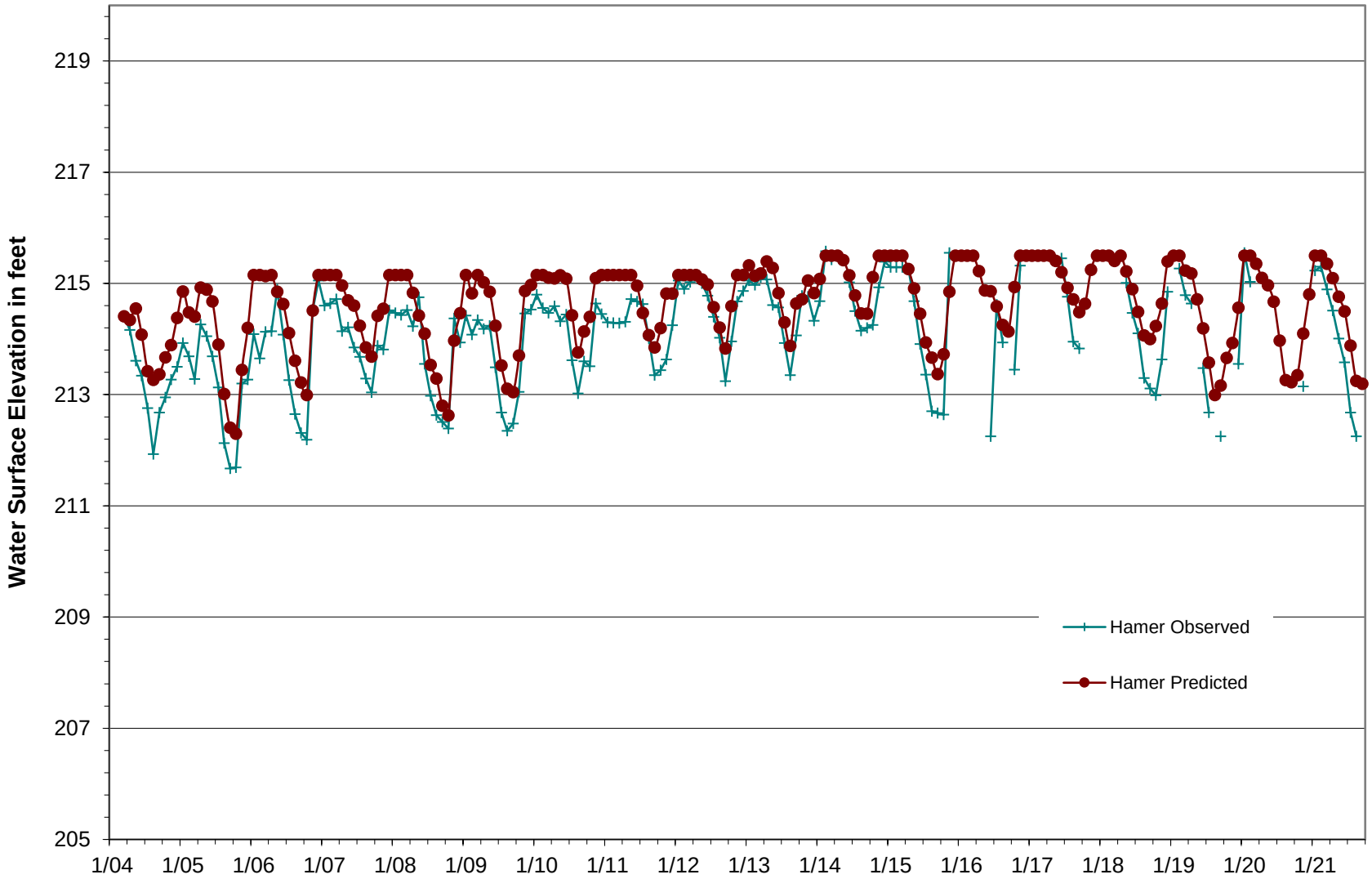


Figure F-1

Predicted Water Levels for Hamer Marsh under Existing Conditions

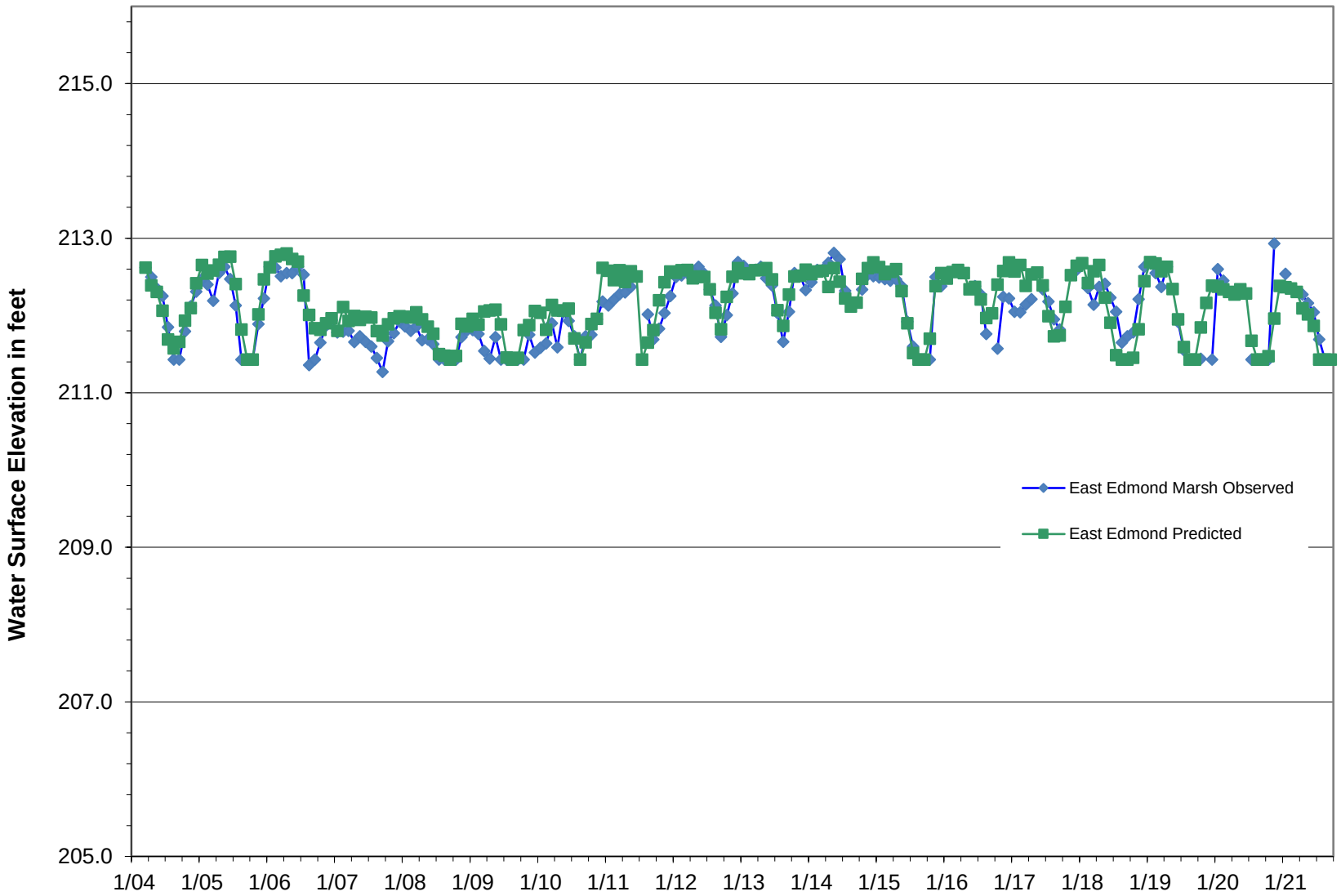


Figure F-2

Predicted Water Levels for East Edmond Marsh under Existing Conditions

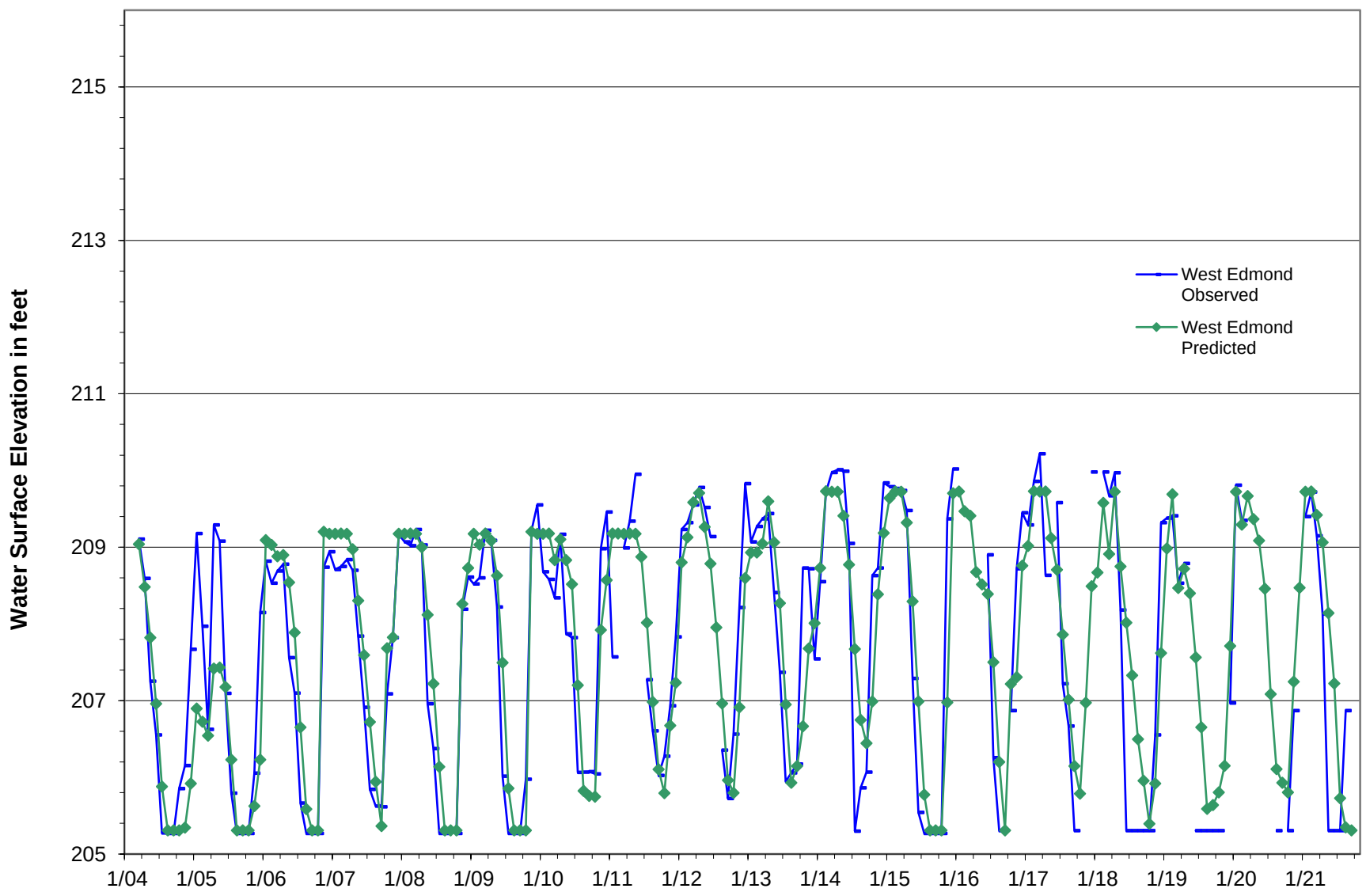


Figure F-3

Predicted Water Levels for West Edmond Marsh under Existing Conditions

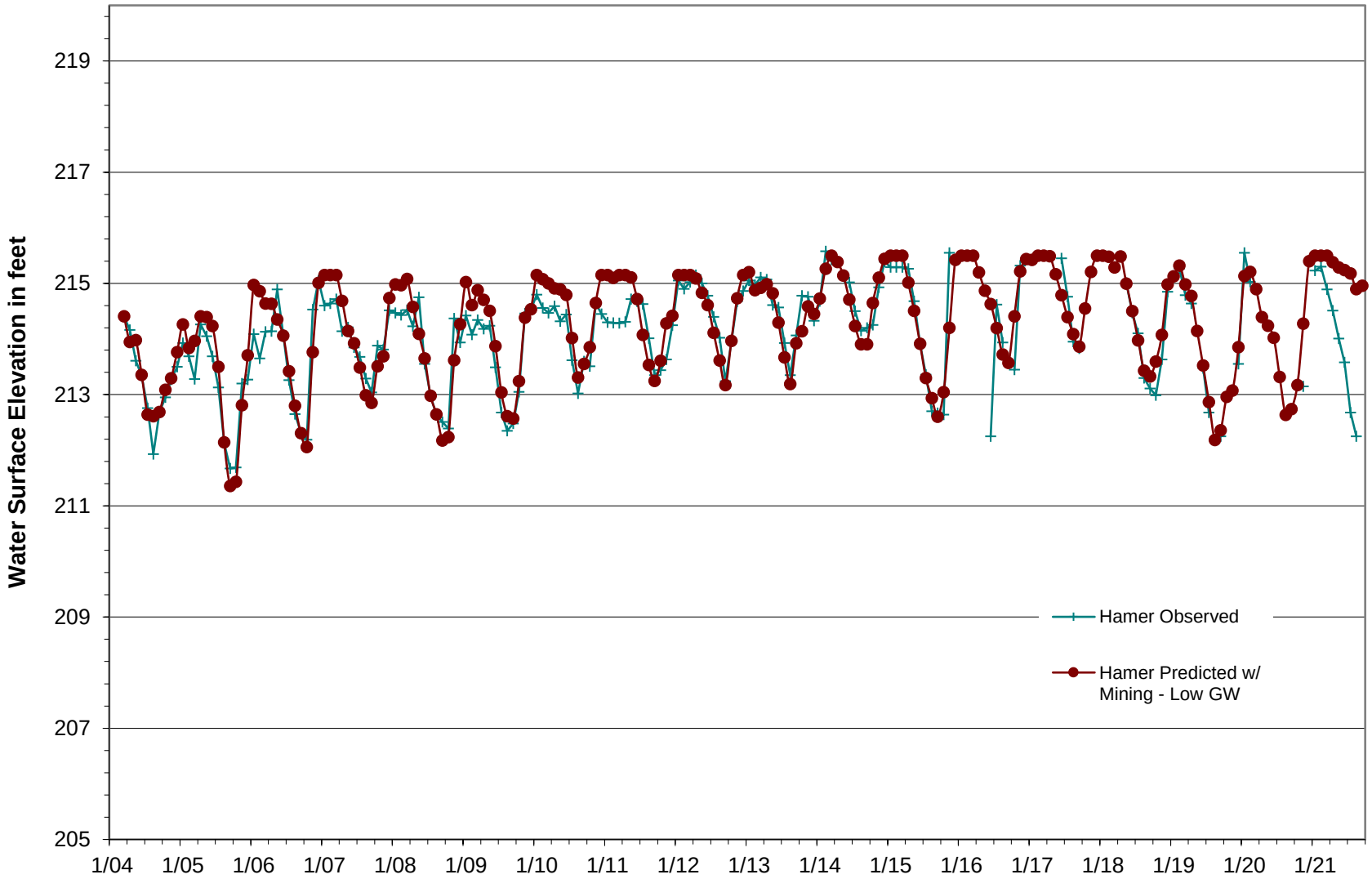


Figure F-4

Predicted Water Levels for Hamer Marsh with Mining - Low Groundwater

Earth and Water Resources Report

DuPont, WA

Aspect Consulting

10/28/2022

S:\CalPortland\DuPont\South Parcel\Water Balance Analyses\Water Balance -2022 - Mining.xlsm

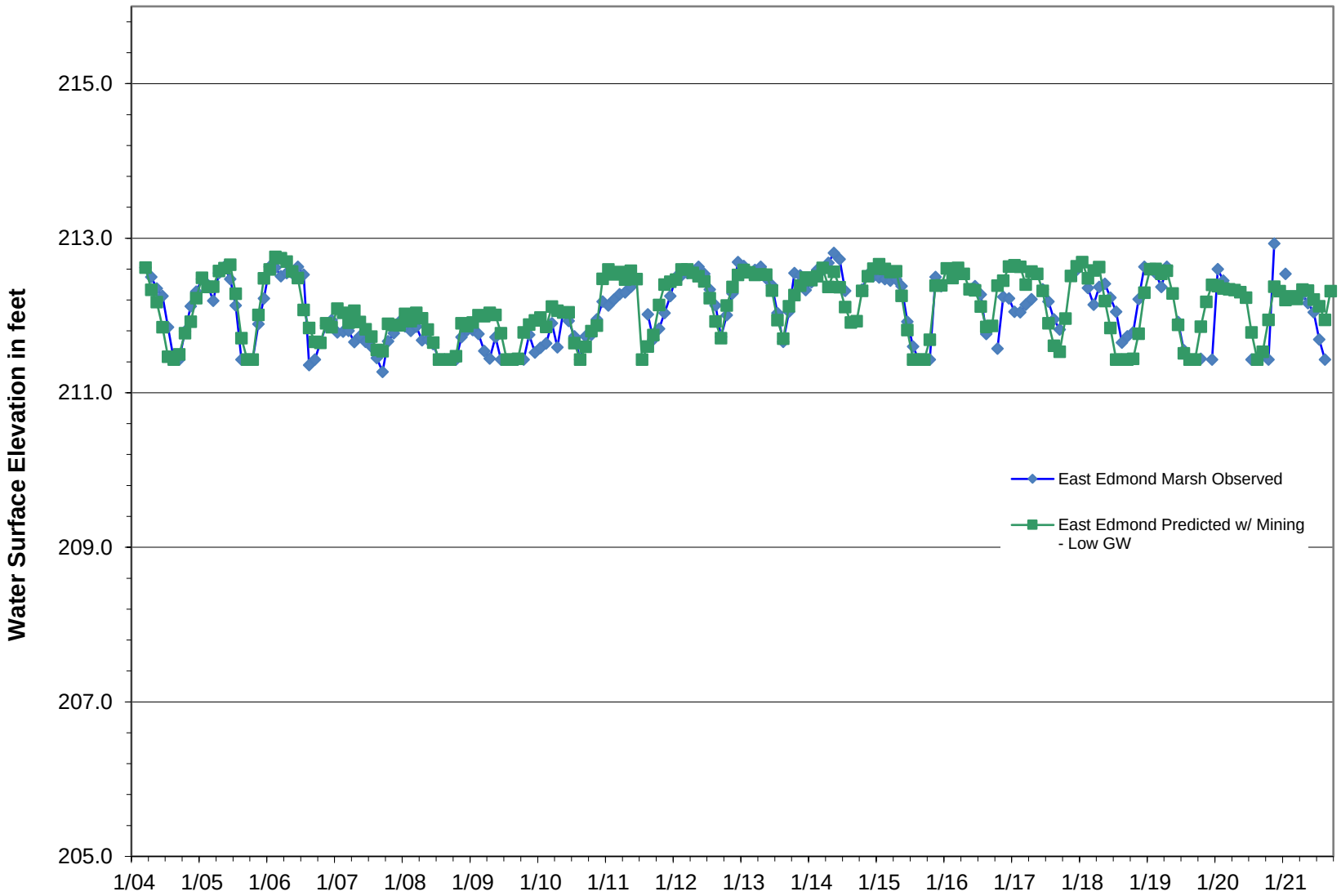


Figure F-5

Predicted Water Levels for East Edmond Marsh with Mining - Low Groundwater

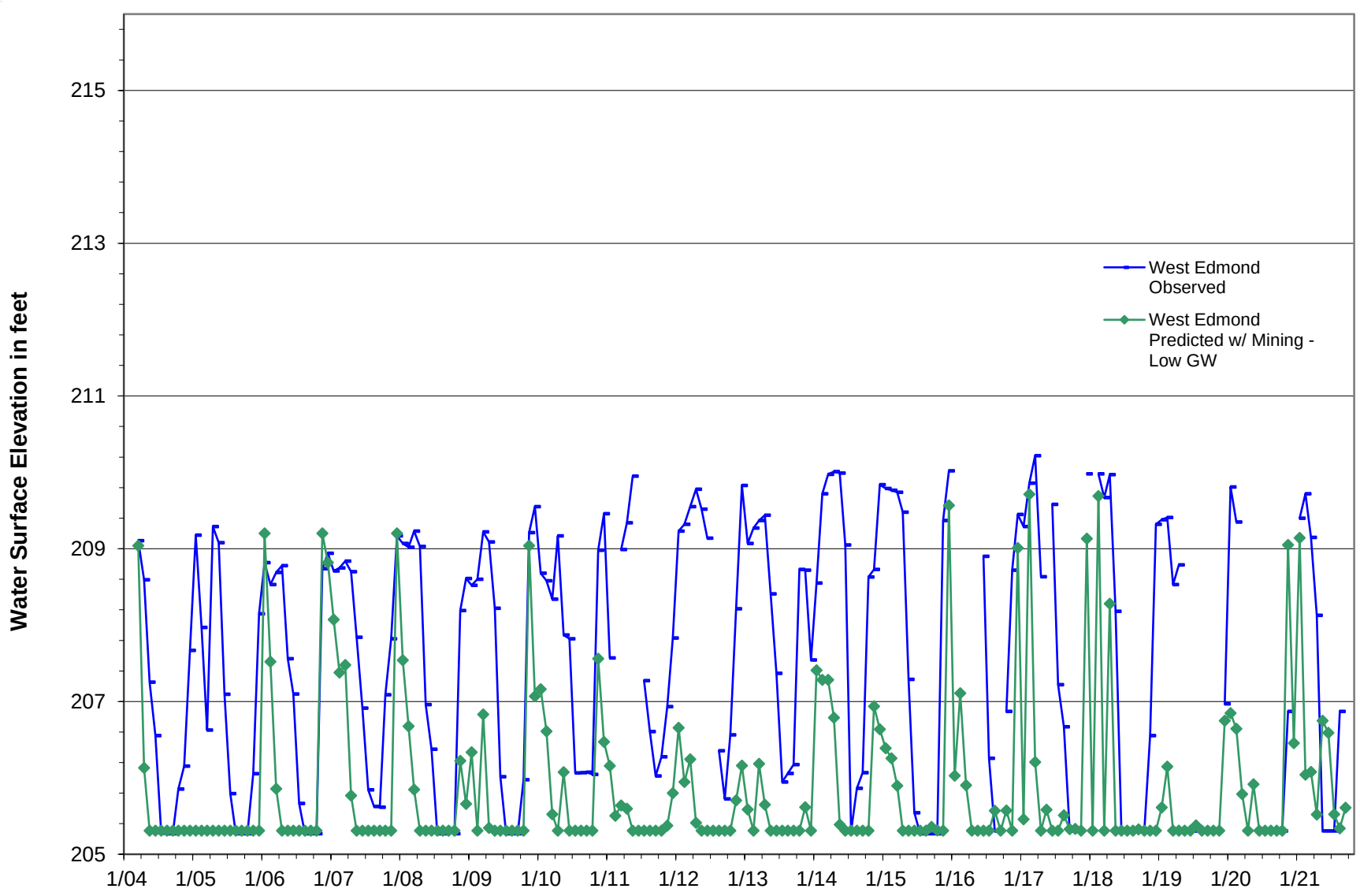


Figure F-6

Predicted Water Levels for West Edmond Marsh with Mining - Low GW

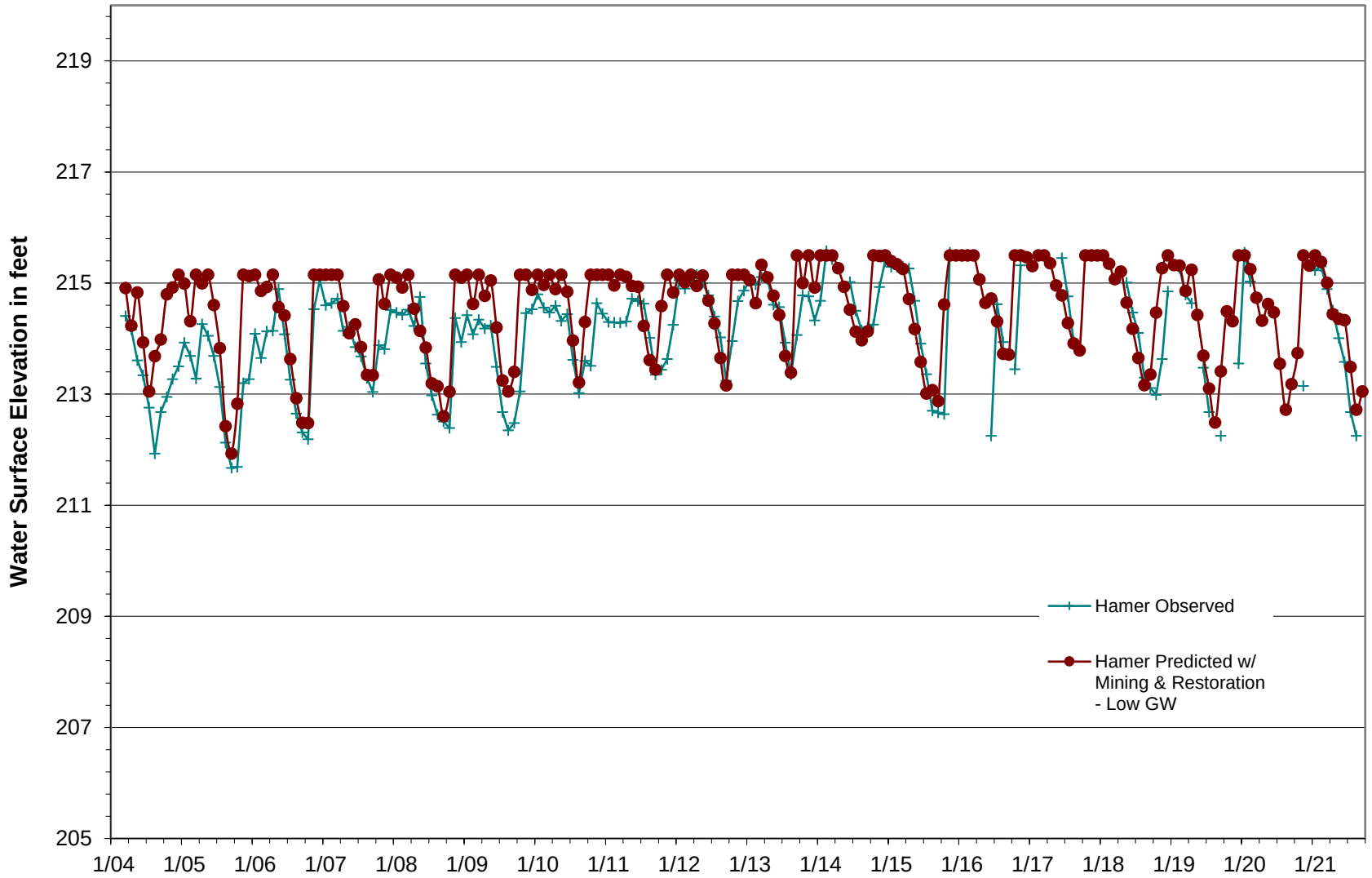


Figure F-7

Predicted Water Levels for Hamer Marsh with Mining + Restoration - Low Groundwater

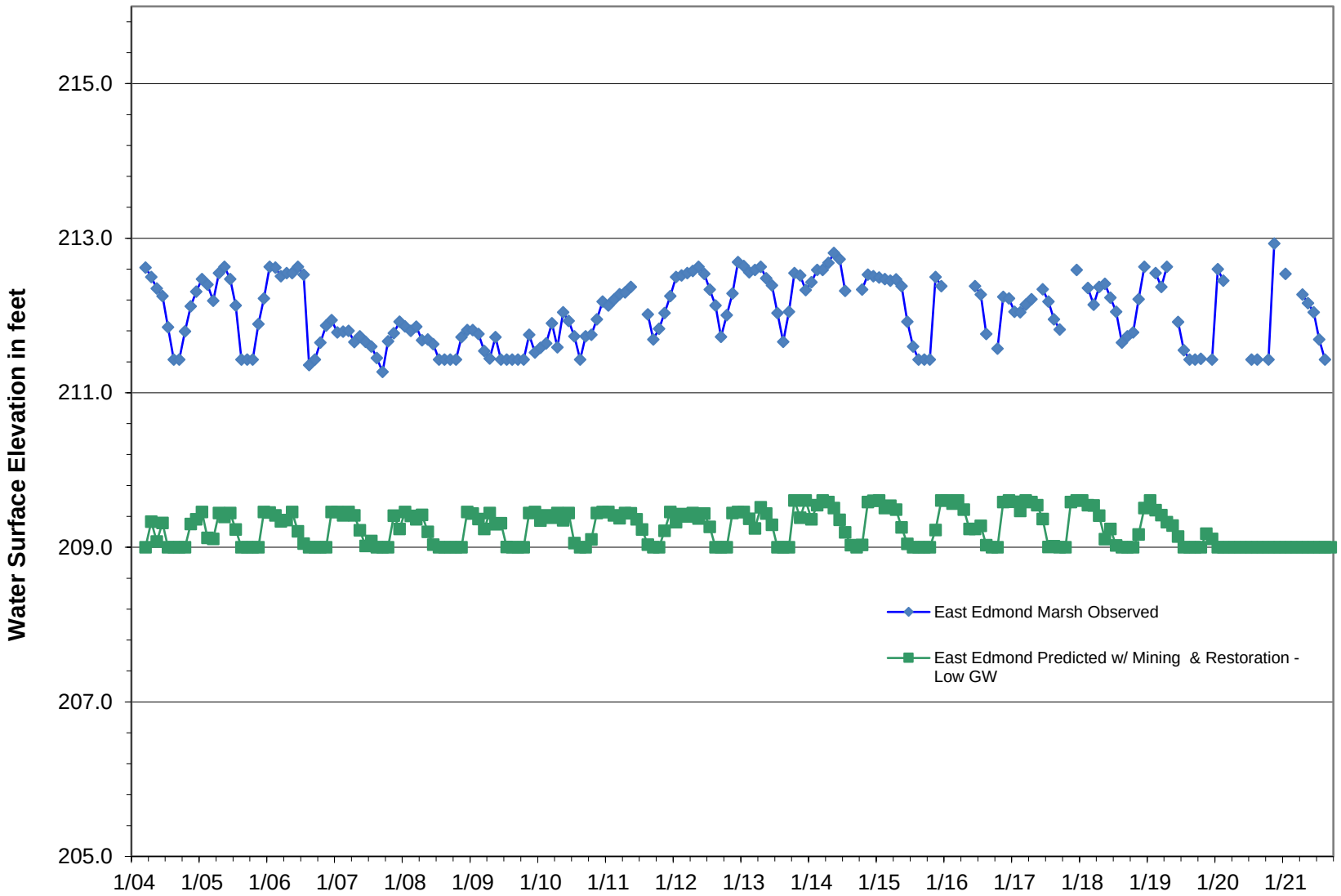


Figure F-8
Predicted Water Levels for East Edmond Marsh with Mining + Restoration - Low Groundwater

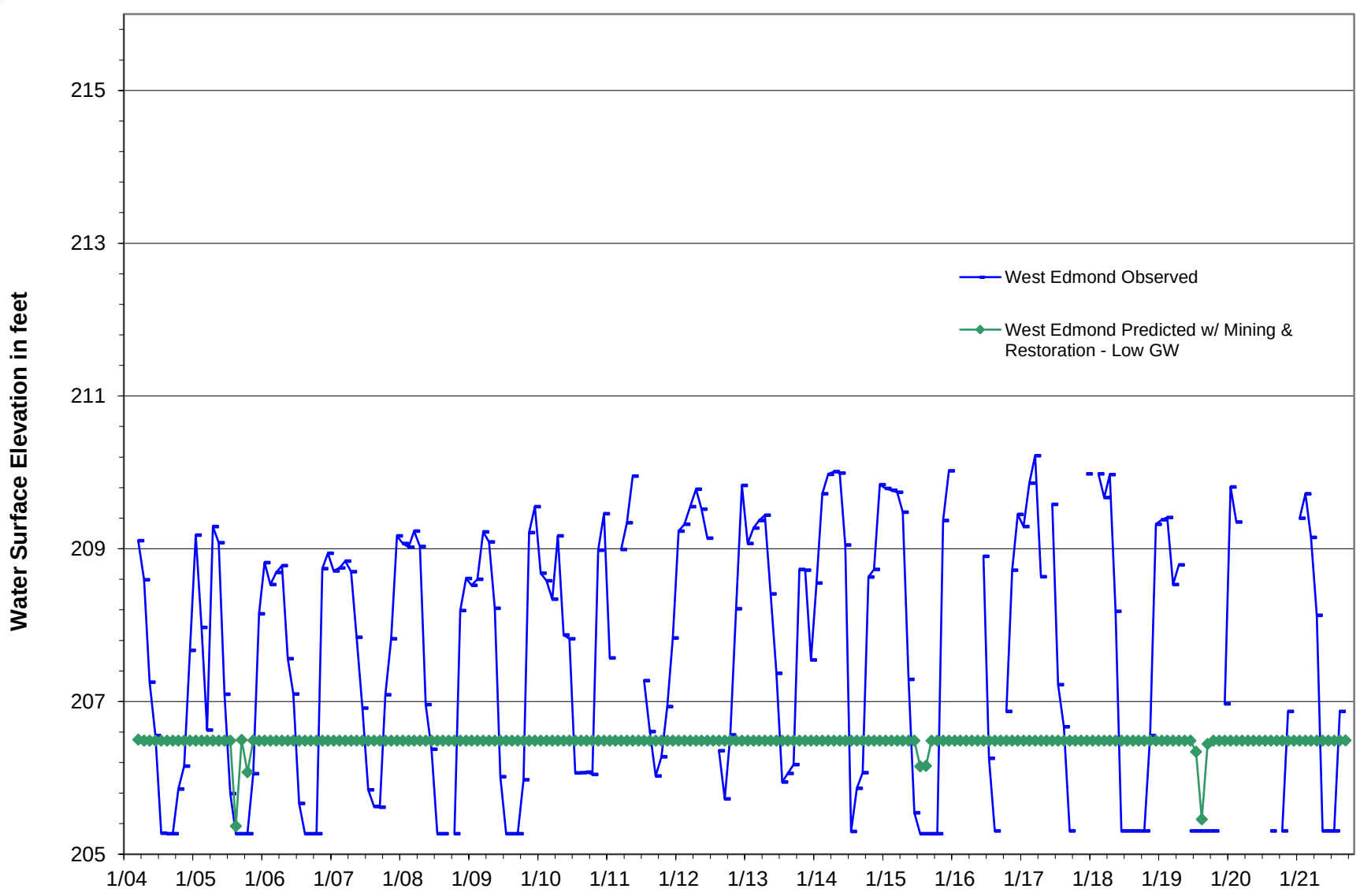


Figure F-9

Predicted Water Levels for West Edmond Marsh with Mining + Restoration - Low GW

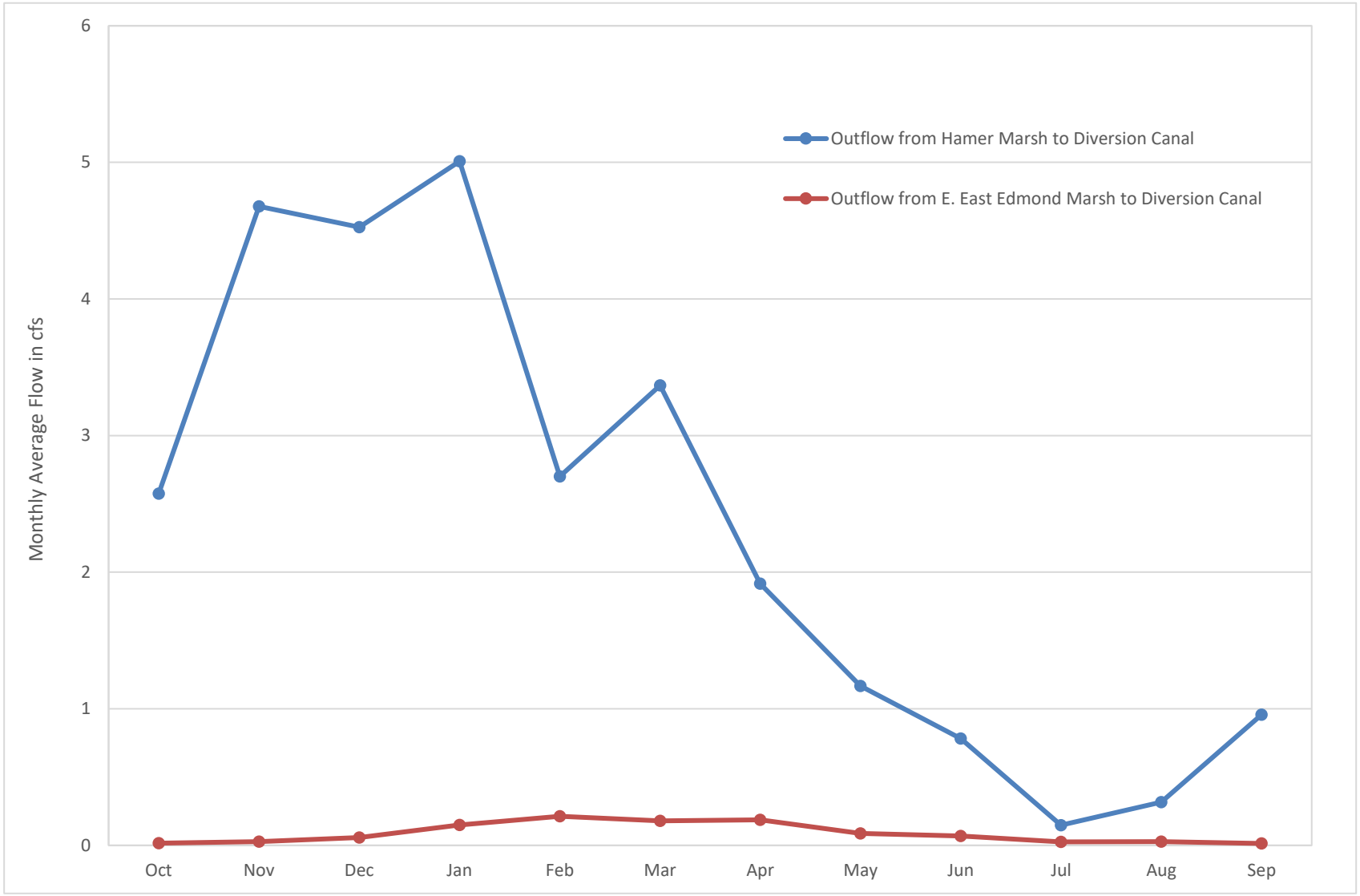


Figure F-10
Marsh Outflow to Diversion Canal under Existing Conditions
Earth and Water Resources Report

MARSH WATER BALANCE MONTHLY AVERAGE TABLES

Table F-1. Annual Average Water Balance for Bell, McKay, and Hamer Marshes - Existing Conditions

CalPortland DuPont - 040001

Flow

	Monthly Average in cfs												
Hydrologic Process	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Average in cfs
Precipitation	0.6	0.9	0.9	1.0	0.7	0.8	0.6	0.4	0.3	0.1	0.1	0.3	0.6
Surface Water Inflows	3.2	5.4	4.8	5.2	2.8	3.5	2.2	1.5	1.0	0.2	0.4	1.2	2.6
Runoff from Ft. Lewis - Outfall 002	1.9	3.3	3.0	3.2	1.7	2.2	1.3	0.9	0.6	0.1	0.2	0.7	1.6
Runoff from Ft. Lewis - Outfall 003	1.2	2.1	1.9	2.0	1.1	1.4	0.9	0.6	0.4	0.1	0.2	0.5	1.0
Evapotranspiration	-0.1	-0.1	0.0	0.0	-0.1	-0.2	-0.3	-0.5	-0.6	-0.7	-0.6	-0.3	-0.3
Recharge (-) Discharge (+)	-0.3	0.1	0.0	0.1	0.1	0.0	0.2	0.1	0.1	0.0	-0.1	-0.1	0.0
Surface Water Outflows	-2.6	-4.8	-4.8	-5.4	-3.2	-3.9	-2.4	-1.6	-1.1	-0.3	-0.4	-1.0	-2.6
To Diversion Canal	-2.6	-4.7	-4.5	-5.0	-2.7	-3.4	-1.9	-1.2	-0.8	-0.1	-0.3	-1.0	-2.3
To E. East Edmond. Marsh (surface)	-0.04	-0.13	-0.30	-0.44	-0.55	-0.53	-0.49	-0.41	-0.35	-0.11	-0.04	-0.03	-0.28
Subsurface Outflows	-0.2	-0.3	-0.3	-0.3	-0.3	-0.3	-0.3	-0.3	-0.3	-0.3	-0.2	-0.2	-0.3
Change in Storage	0.5	1.2	0.6	0.5	-0.1	-0.1	-0.1	-0.3	-0.5	-1.0	-0.8	-0.2	0.0

Water Volume

	Average Monthly Volume in AF												
Hydrologic Process	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Avg. Annual Volume in AF
Precipitation	38	53	55	59	40	46	34	25	20	6	8	18	401
Surface Water Inflows	196	319	297	319	157	218	131	92	62	11	24	71	1898
Runoff from Ft. Lewis - Outfall 002	120	194	181	195	96	133	80	56	37	6	14	43	1156
Runoff from Ft. Lewis - Outfall 003	76	125	116	125	61	85	51	36	24	5	9	28	741
Evapotranspiration	-9	-4	0	0	-6	-12	-19	-31	-35	-42	-35	-20	-214
Recharge (-) Discharge (+)	-16	6	1	8	4	0	10	8	7	0	-6	-6	15
Surface Water Outflows	-161	-286	-297	-335	-181	-239	-143	-97	-67	-16	-22	-59	-1903
To Diversion Canal	-158	-278	-278	-308	-150	-207	-114	-72	-47	-9	-19	-57	-1698
To E. East Edmond. Marsh (surface)	-3	-8	-19	-27	-31	-32	-29	-25	-21	-7	-2	-2	-205
Subsurface Outflows	-15	-18	-18	-20	-18	-19	-19	-19	-18	-17	-15	-14	-210
Change in Storage	33	69	37	31	-3	-6	-7	-21	-32	-59	-47	-10	-13

Table F-2. Annual Average Water Balance for East Edmond Marsh - Existing Conditions

CalPortland DuPont - 040001

Flow

	Monthly Average in cfs												
Hydrologic Process	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Average in cfs
Precipitation	0.6	0.9	0.9	1.0	0.7	0.7	0.6	0.4	0.3	0.1	0.1	0.3	0.5
Surface Water Inflows	0.1	0.2	0.3	0.5	0.6	0.5	0.5	0.4	0.4	0.1	0.0	0.0	0.3
From Sequalitchew Lake	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
From Center Drive	0.03	0.04	0.04	0.04	0.02	0.03	0.02	0.01	0.01	0.00	0.00	0.01	0.02
From Hamer (surface)	0.04	0.13	0.30	0.44	0.55	0.53	0.49	0.41	0.35	0.11	0.04	0.03	0.28
Subsurface Inflows	0.2	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.2	0.2	0.3
Evapotranspiration	-0.1	-0.1	0.0	0.0	-0.1	-0.2	-0.3	-0.5	-0.6	-0.7	-0.6	-0.3	-0.3
Recharge (-) Discharge (+)	-0.3	-0.3	-0.4	-0.5	-0.6	-0.6	-0.6	-0.6	-0.5	-0.6	-0.3	-0.3	-0.5
Surface Water Outflows	-0.1	-0.6	-0.7	-1.2	-1.0	-0.9	-0.7	-0.2	-0.2	-0.1	-0.1	0.0	-0.5
To Diversion Canal	-0.1	-0.3	-0.4	-0.8	-0.7	-0.6	-0.5	-0.2	-0.1	0.0	0.0	0.0	-0.3
To West Edmond Marsh	-0.03	-0.24	-0.28	-0.48	-0.36	-0.31	-0.22	-0.06	-0.05	-0.01	-0.01	-0.01	-0.17
Change in Storage	0.4	0.5	0.4	0.0	-0.1	-0.1	-0.2	-0.2	-0.3	-0.8	-0.5	-0.1	-0.1

Water Volume

	Average Monthly Volume in AF												
Hydrologic Process	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Avg. Annual Volume
Precipitation	37	53	54	59	39	46	33	25	20	6	8	18	398
Surface Water Inflows	4	10	21	29	32	34	30	26	21	7	3	2	220
From Sequalitchew Lake	0	0	0	0	0	0	0	0	0	0	0	0	0
From Center Drive	2	2	2	2	1	2	1	1	1	0	0	1	16
From Hamer (surface)	3	8	19	27	31	32	29	25	21	7	2	2	205
Subsurface Inflows	15	18	18	20	18	19	19	19	18	17	15	14	210
Evapotranspiration	-8	-4	0	0	-6	-12	-19	-31	-35	-41	-34	-19	-210
Recharge (-) Discharge (+)	-20	-17	-27	-33	-33	-39	-34	-37	-31	-37	-16	-17	-341
Surface Water Outflows	-6	-33	-42	-76	-58	-53	-42	-13	-10	-3	-4	-2	-342
To Diversion Canal	-4	-19	-25	-46	-38	-34	-28	-10	-8	-3	-3	-1	-218
To West Edmond Marsh	-2	-14	-17	-29	-20	-19	-13	-3	-3	-1	-1	0	-124
Change in Storage	21.9	28.1	24.4	-0.9	-8.1	-6.0	-11.7	-10.5	-18.3	-51.5	-28.0	-3.1	-64.0

Table F-3. Annual Average Water Balance for West Edmond Marsh - Existing Conditions

CalPortland DuPont - 040001

Flow

	Monthly Average in cfs												
Hydrologic Process	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Average in cfs
Precipitation	0.07	0.10	0.19	0.27	0.23	0.25	0.18	0.14	0.10	0.03	0.02	0.04	0.14
Surface Water Inflows	0.03	0.24	0.28	0.48	0.36	0.31	0.22	0.06	0.05	0.01	0.01	0.01	0.17
From East Edmond	0.03	0.24	0.28	0.48	0.36	0.31	0.22	0.06	0.05	0.01	0.01	0.01	0.17
Evapotranspiration	-0.02	-0.01	0.00	0.00	-0.03	-0.07	-0.11	-0.16	-0.19	-0.18	-0.12	-0.05	-0.08
Recharge (-) Discharge (+)	-0.08	-0.04	-0.11	-0.23	-0.28	-0.30	-0.26	-0.36	-0.42	-0.43	-0.27	-0.12	-0.24
Surface Water Outflows	0.00	-0.06	-0.13	-0.17	-0.12	-0.19	-0.07	-0.03	-0.01	-0.01	-0.01	0.00	-0.07
To Center Drive	0.00	-0.06	-0.13	-0.17	-0.12	-0.19	-0.07	-0.03	-0.01	-0.01	-0.01	0.00	-0.07
Change in Storage	0.00	0.23	0.23	0.35	0.16	0.00	-0.03	-0.36	-0.48	-0.58	-0.36	-0.12	-0.1

Water Volume

	Average Monthly Volume in AF												
Hydrologic Process	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Avg. Annual Volume
Precipitation	4	6	12	17	13	15	11	8	6	2	1	2	98
Surface Water Inflows	2	14	17	29	20	19	13	3	3	1	1	0	124
From East Edmond	2	14	17	29	20	19	13	3	3	1	1	0	124
Evapotranspiration	-1	-1	0	0	-2	-4	-6	-10	-11	-11	-7	-3	-56
Recharge (-) Discharge (+)	-5	-2	-7	-14	-16	-18	-15	-22	-25	-27	-17	-7	-175
Surface Water Outflows	0	-3	-8	-11	-7	-12	-4	-2	-1	-1	0	0	-49
To Center Drive	0	-3	-8	-11	-7	-12	-4	-2	-1	-1	0	0	-49
Change in Storage	0.1	13.8	14.4	21.8	9.2	0.0	-1.9	-22.0	-28.3	-35.9	-22.3	-7.3	-58.6

Table F-4. Annual Average Water Balance for Bell, McKay, and Hamer Marshes with Mining - Low Groundwater

Flow

	Monthly Average in cfs												
Hydrologic Process	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Average in cfs
Precipitation	0.6	0.8	0.9	1.0	0.7	0.8	0.6	0.4	0.3	0.1	0.1	0.3	0.5
Surface Water Inflows	3.2	5.4	4.8	5.2	2.8	3.5	2.2	1.5	1.0	0.2	0.4	1.2	2.6
Runoff from Ft. Lewis - Outfall 002	1.9	3.3	3.0	3.2	1.7	2.2	1.3	0.9	0.6	0.1	0.2	0.7	1.6
Runoff from Ft. Lewis - Outfall 003	1.2	2.1	1.9	2.0	1.1	1.4	0.9	0.6	0.4	0.1	0.2	0.5	1.0
Evapotranspiration	-0.1	-0.1	0.0	0.0	-0.1	-0.2	-0.3	-0.5	-0.6	-0.7	-0.6	-0.3	-0.3
Recharge (-) Discharge (+)	-0.2	0.0	0.0	-0.1	-0.3	-0.2	-0.3	-0.2	-0.2	-0.2	-0.3	-0.2	-0.2
Surface Water Outflows	-2.6	-4.7	-4.4	-5.2	-3.0	-3.7	-2.2	-1.5	-1.0	-0.2	-0.3	-1.0	-2.5
To Diversion Canal	-2.6	-4.6	-4.2	-4.8	-2.5	-3.2	-1.7	-1.2	-0.8	-0.2	-0.3	-1.0	-2.3
To Seq. Ck. Marsh (surface)	0.0	0.0	-0.2	-0.4	-0.5	-0.5	-0.4	-0.3	-0.2	-0.1	0.0	0.0	-0.2
Subsurface Outflows	-0.2	-0.2	-0.3	-0.3	-0.3	-0.3	-0.3	-0.2	-0.2	-0.2	-0.2	-0.2	-0.2
Change in Storage	0.7	1.3	1.0	0.6	-0.1	-0.1	-0.3	-0.5	-0.7	-1.0	-0.9	-0.2	0.0

Water Volume

	Average Monthly Volume in AF												
Hydrologic Process	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Avg. Annual Volume
Precipitation	35	51	53	59	41	47	34	25	20	6	8	17	395
Surface Water Inflows	196	319	297	319	157	218	131	92	62	11	24	71	1897
Runoff from Ft. Lewis - Outfall 002	120	194	181	195	96	133	80	56	37	6	14	43	1156
Runoff from Ft. Lewis - Outfall 003	76	125	116	125	61	85	51	36	24	5	9	28	741
Evapotranspiration	-8	-4	0	0	-6	-13	-20	-31	-36	-41	-34	-19	-210
Recharge (-) Discharge (+)	-12	3	-2	-4	-15	-11	-19	-12	-12	-12	-19	-11	-126
Surface Water Outflows	-158	-279	-268	-317	-165	-228	-130	-91	-62	-14	-20	-58	-1791
To Diversion Canal	-158	-276	-258	-295	-137	-199	-104	-71	-48	-10	-20	-57	-1633
To Seq. Ck. Marsh (surface)	0	-2	-10	-22	-28	-29	-26	-20	-14	-4	-1	-1	-158
Subsurface Outflows	-11	-15	-17	-18	-15	-17	-15	-15	-13	-13	-11	-10	-170
Change in Storage	41	75	64	40	-4	-4	-19	-31	-42	-63	-53	-10	-6

Table F-5. Annual Average Water Balance for East Edmond Marsh with Mining - Low Groundwater

Flow

	Monthly Average in cfs												
Hydrologic Process	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Average in cfs
Precipitation	0.6	0.9	0.9	0.9	0.7	0.7	0.6	0.4	0.3	0.1	0.1	0.3	0.5
Surface Water Inflows	0.0	0.1	0.2	0.4	0.5	0.5	0.5	0.3	0.3	0.1	0.0	0.0	0.2
From Sequalitchew Lake	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
From Center Drive	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
From Hamer (surface)	0.0	0.0	0.2	0.4	0.5	0.5	0.4	0.3	0.2	0.1	0.0	0.0	0.2
Subsurface Inflows	0.2	0.2	0.3	0.3	0.3	0.3	0.3	0.2	0.2	0.2	0.2	0.2	0.2
Evapotranspiration	-0.1	-0.1	0.0	0.0	-0.1	-0.2	-0.3	-0.5	-0.6	-0.7	-0.6	-0.3	-0.3
Recharge (-) Discharge (+)	-0.2	-0.1	-0.3	-0.4	-0.5	-0.6	-0.5	-0.5	-0.4	-0.4	-0.2	-0.2	-0.4
Surface Water Outflows	0.0	-0.2	-0.4	-0.5	-0.6	-0.5	-0.3	-0.1	-0.1	0.0	0.0	0.0	-0.2
To Diversion Canal	0.0	0.0	-0.1	-0.1	-0.2	-0.2	-0.2	-0.1	-0.1	0.0	0.0	0.0	-0.1
To West Edmond Marsh	-0.01	-0.22	-0.32	-0.41	-0.37	-0.28	-0.18	-0.07	-0.06	-0.01	-0.01	-0.01	-0.16
Change in Storage	0.4	0.8	0.7	0.7	0.3	0.3	0.1	-0.1	-0.3	-0.8	-0.4	0.0	0.1

Water Volume

	Average Monthly Volume in AF												
Hydrologic Process	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Avg. Annual Volume
Precipitation	36	53	53	58	39	46	33	25	20	6	8	18	395
Surface Water Inflows	2	5	13	24	29	30	27	21	15	4	1	2	173
From Sequalitchew Lake	0	0	0	0	0	0	0	0	0	0	0	0	0
From Center Drive	2	2	2	2	1	2	1	1	1	0	0	1	16
From Hamer (surface)	0.0	2.5	10.2	22.1	27.9	29.0	26.1	20.2	14.4	3.7	0.5	1.3	158
Subsurface Inflows	11	15	17	18	15	17	15	15	13	13	11	10	170
Evapotranspiration	-8	-4	0	0	-6	-12	-19	-31	-35	-41	-34	-19	-209
Recharge (-) Discharge (+)	-13	-8	-16	-27	-29	-35	-30	-31	-23	-27	-9	-10	-259
Surface Water Outflows	-1	-15	-23	-33	-32	-29	-20	-9	-8	-3	-2	-1	-175
To Diversion Canal	-1	-1	-3	-8	-11	-11	-10	-5	-4	-2	-1	-1	-59
To West Edmond Marsh	-1	-13	-20	-25	-20	-17	-11	-4	-3	-1	-1	0	-116
Change in Storage	26.4	45.2	43.8	40.3	17.7	17.2	5.6	-9.1	-18.2	-48.4	-26.0	0.2	94.9

Table F-6. Annual Average Water Balance for West Edmond Marsh with Mining - Low Groundwater

Flow

	Monthly Average in cfs												
Hydrologic Process	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Average in cfs
Precipitation	0.03	0.05	0.12	0.18	0.13	0.13	0.08	0.04	0.03	0.00	0.01	0.02	0.07
Surface Water Inflows	0.01	0.22	0.32	0.41	0.37	0.28	0.18	0.07	0.06	0.01	0.01	0.01	0.16
From East Edmond	0.01	0.22	0.32	0.41	0.37	0.28	0.18	0.07	0.06	0.01	0.01	0.01	0.16
Evapotranspiration	-0.01	0.00	0.00	0.00	-0.02	-0.04	-0.05	-0.05	-0.04	-0.04	-0.03	-0.02	-0.02
Recharge (-) Discharge (+)	-0.03	-0.20	-0.51	-0.65	-0.64	-0.64	-0.51	-0.13	-0.06	0.02	0.01	0.00	-0.28
Surface Water Outflows	0.00	-0.02	-0.05	-0.02	-0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-0.01
To Center Drive	0.00	-0.02	-0.05	-0.02	-0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-0.01
Change in Storage	0.00	0.05	-0.11	-0.08	-0.19	-0.26	-0.31	-0.07	-0.01	0.00	0.00	0.00	-0.1

Water Volume

	Average Monthly Volume in AF												
Hydrologic Process	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Avg. Annual Volume
Precipitation	2	3	7	11	7	8	4	2	2	0	0	1	49
Surface Water Inflows	1	13	20	25	20	17	11	4	3	1	1	0	116
From East Edmond	1	13	20	25	20	17	11	4	3	1	1	0	116
Evapotranspiration	0	0	0	0	-1	-2	-3	-3	-2	-2	-2	-1	-17
Recharge (-) Discharge (+)	-2	-12	-31	-40	-36	-39	-30	-8	-3	1	1	0	-201
Surface Water Outflows	0	-1	-3	-1	-2	0	0	0	0	0	0	0	-8
To Center Drive	0	-1	-3	-1	-2	0	0	0	0	0	0	0	-8
Change in Storage	-0.1	2.9	-6.7	-5.0	-10.5	-16.3	-18.6	-4.6	-0.8	-0.1	-0.1	-0.1	-60.0

Table F-7. Annual Average Water Balance for Bell, McKay, and Hamer Marshes with Mining + Restoration - Low Groundwater

Flow

	Monthly Average in cfs												
Hydrologic Process	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Average in cfs
Precipitation	0.6	0.9	0.9	1.0	0.7	0.7	0.6	0.4	0.3	0.1	0.1	0.3	0.6
Surface Water Inflows	3.2	5.4	4.8	5.2	2.8	3.5	2.2	1.5	1.0	0.2	0.4	1.2	2.6
Runoff from Ft. Lewis - Outfall 002	1.9	3.3	3.0	3.2	1.7	2.2	1.3	0.9	0.6	0.1	0.2	0.7	1.6
Runoff from Ft. Lewis - Outfall 003	1.2	2.1	1.9	2.0	1.1	1.4	0.9	0.6	0.4	0.1	0.2	0.5	1.0
Evapotranspiration	-0.1	-0.1	0.0	0.0	-0.1	-0.2	-0.3	-0.5	-0.6	-0.7	-0.5	-0.3	-0.3
Recharge (-) Discharge (+)	-0.5	-0.3	-0.1	0.0	-0.1	0.0	-0.1	-0.1	-0.1	-0.1	-0.2	-0.2	-0.2
Surface Water Outflows	-0.7	-4.0	-4.7	-5.3	-2.9	-3.1	-2.0	-0.9	-0.6	-0.1	0.0	-0.1	-2.0
To Diversion Canal	-0.6	-3.7	-4.2	-4.7	-2.3	-2.7	-1.5	-0.6	-0.3	0.0	0.0	-0.1	-1.7
To E. East Edmond. Marsh (surface)	-0.05	-0.33	-0.53	-0.55	-0.54	-0.47	-0.49	-0.34	-0.29	-0.09	-0.01	0.00	-0.3
Subsurface Outflows	-0.8	-0.9	-0.9	-0.9	-0.9	-0.9	-0.8	-0.8	-0.7	-0.6	-0.5	-0.5	-0.8
Change in Storage	1.7	1.0	0.1	0.1	-0.4	0.0	-0.5	-0.4	-0.6	-1.2	-0.8	0.3	0.0

Water Volume

	Average Monthly Volume in AF												
Hydrologic Process	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Avg. Annual Volume
Precipitation	36	56	57	60	40	45	33	25	19	6	8	17	401
Surface Water Inflows	196	319	297	319	157	218	131	92	62	11	24	71	1898
Runoff from Ft. Lewis - Outfall 002	120	194	181	195	96	133	80	56	37	6	14	43	1156
Runoff from Ft. Lewis - Outfall 003	76	125	116	125	61	85	51	36	24	5	9	28	741
Evapotranspiration	-8	-4	0	0	-6	-12	-19	-30	-34	-40	-33	-18	-206
Recharge (-) Discharge (+)	-33	-16	-6	3	-4	-2	-8	-3	-6	-5	-13	-15	-109
Surface Water Outflows	-41	-241	-291	-323	-160	-193	-121	-58	-37	-5	0	-4	-1473
To Diversion Canal	-38	-221	-259	-289	-130	-164	-91	-37	-19	0	0	-4	-1252
To E. East Edmond. Marsh (surface)	-3	-20	-32	-34	-30	-29	-29	-21	-17	-5	0	0	-221
Subsurface Outflows	-46	-52	-54	-56	-48	-55	-47	-48	-42	-37	-31	-32	-548
Change in Storage	104	62	4	4	-20	2	-30	-22	-38	-71	-47	18	-36

Table F-8. Annual Average Water Balance for East Edmond Marsh with Mining + Restoration - Low Groundwater

Flow

	Monthly Average in cfs												
Hydrologic Process	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Average in cfs
Precipitation	0.4	0.6	0.5	0.6	0.4	0.4	0.3	0.2	0.2	0.1	0.1	0.2	0.3
Surface Water Inflows	3.8	7.5	11.6	16.4	20.4	22.1	20.9	13.7	8.0	3.5	2.5	2.2	10.98
From Sequalitchew Lake	3.7	7.1	11.0	15.8	19.8	21.6	20.4	13.4	7.7	3.4	2.5	2.2	10.66
From Center Drive	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.02
From Hamer (surface)	0.0	0.3	0.5	0.5	0.5	0.5	0.5	0.3	0.3	0.1	0.0	0.0	0.31
Subsurface Inflows	0.8	0.9	0.9	0.9	0.9	0.9	0.8	0.8	0.7	0.6	0.5	0.5	0.8
Evapotranspiration	-0.1	0.0	0.0	0.0	-0.1	-0.1	-0.2	-0.3	-0.4	-0.4	-0.4	-0.2	-0.2
Recharge (-) Discharge (+)	1.1	1.3	1.3	1.4	1.3	1.4	1.3	1.3	1.2	1.0	1.1	1.0	1.2
Surface Water Outflows	-5.6	-9.5	-13.7	-18.9	-22.6	-24.2	-22.7	-15.4	-9.4	-4.6	-3.5	-3.4	-12.7
To Diversion Canal	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
To West Edmond Marsh	-5.6	-9.5	-13.7	-18.9	-22.6	-24.2	-22.7	-15.4	-9.4	-4.6	-3.5	-3.4	-12.7
Change in Storage	0.4	0.7	0.6	0.4	0.4	0.5	0.5	0.3	0.4	0.2	0.2	0.3	0.4

Water Volume

	Average Monthly Volume in AF												
Hydrologic Process	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Avg. Annual Volume
Precipitation	25	35	34	35	23	27	19	15	12	4	5	12	246
Surface Water Inflows	232	444	710	1008	1142	1356	1243	845	477	216	152	129	7956
From Sequalitchew Lake	227	422	676	972	1111	1326	1212	823	459	211	151	129	7719
From Center Drive	2	2	2	2	1	2	1	1	1	0	0	1	16
From Hamer (surface)	3.0	19.9	32.3	33.5	30.5	28.9	29.1	20.7	17.4	5.5	0.4	0.0	221
Subsurface Inflows	46	52	54	56	48	55	47	48	42	37	31	32	548
Evapotranspiration	-6	-3	0	0	-3	-7	-11	-18	-21	-26	-23	-13	-131
Recharge (-) Discharge (+)	70	76	80	84	75	85	78	78	73	62	66	62	889
Surface Water Outflows	-342	-565	-843	-1161	-1265	-1487	-1348	-950	-561	-283	-217	-202	-9224
To Diversion Canal	0	0	0	0	0	0	0	0	0	0	0	0	0
To West Edmond Marsh	-342	-565	-843	-1161	-1265	-1487	-1348	-950	-561	-283	-217	-202	-9224
Change in Storage	26.0	40.2	34.3	22.4	20.7	28.1	27.6	17.8	21.5	9.7	15.1	20.5	283.8

Table F-9. Annual Average Water Balance for West Edmond Marsh with Mining + Restoration - Low Groundwater

Flow

	Monthly Average in cfs												
Hydrologic Process	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Average in cfs
Precipitation	0.1	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.1	0.1
Surface Water Inflows	5.6	9.5	13.7	18.9	22.6	24.2	22.7	15.4	9.4	4.6	3.5	3.4	12.7
From East Edmond	5.6	9.5	13.7	18.9	22.6	24.2	22.7	15.4	9.4	4.6	3.5	3.4	12.7
Evapotranspiration	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1
Recharge (-) Discharge (+)	-1.0	-0.8	-0.7	-0.6	-0.7	-0.7	-0.8	-0.8	-0.9	-1.0	-1.1	-1.0	-0.8
Surface Water Outflows	-4.7	-8.8	-13.2	-18.5	-22.0	-23.6	-21.9	-14.6	-8.5	-3.5	-2.4	-2.4	-11.9
To Center Drive	-4.7	-8.8	-13.2	-18.5	-22.0	-23.6	-21.9	-14.6	-8.5	-3.5	-2.4	-2.4	-11.9
Change in Storage	-0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-0.01	-0.03	0.01	0.0

Water Volume

	Average Monthly Volume in AF												
Hydrologic Process	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Avg. Annual Volume
Precipitation	8	11	10	11	7	8	6	5	4	1	2	3	75
Surface Water Inflows	342	565	843	1161	1265	1487	1348	950	561	283	217	202	9224
From East Edmond	342	565	843	1161	1265	1487	1348	950	561	283	217	202	9224
Evapotranspiration	-2	-1	0	0	-1	-2	-3	-6	-6	-8	-7	-4	-40
Recharge (-) Discharge (+)	-63	-49	-44	-36	-37	-44	-46	-51	-54	-64	-67	-60	-614
Surface Water Outflows	-286	-525	-809	-1136	-1234	-1450	-1305	-898	-504	-213	-147	-142	-8648
To Center Drive	-286	-525	-809	-1136	-1234	-1450	-1305	-898	-504	-213	-147	-142	-8648
Change in Storage	-0.5	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.6	-2.1	0.7	-2.0

MARSH WATER BALANCE MONTHLY RESULTS

Table F-10. Water Balance for Bell, McKay, and Hamer Marshes - Existing Conditions

Monthly Average in Inches of Water	WY2004							WY2005					
Hydrologic Process	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar
Precipitation	2.0	1.0	3.8	0.9	0.1	3.6	2.9	4.0	3.2	4.3	4.3	0.6	4.5
Surface Water Inflows	6.3	1.5	16.1	1.4	0.0	16.4	11.7	18.7	13.0	21.1	19.1	0.3	20.3
Runoff from Ft. Lewis - Outfall 002	3.8	0.8	9.9	0.7	0.0	10.0	7.2	11.5	8.0	12.9	11.7	0.0	12.5
Runoff from Ft. Lewis - Outfall 003	2.5	0.7	6.2	0.7	0.0	6.3	4.5	7.2	5.0	8.1	7.3	0.3	7.8
Evapotranspiration	-1.3	-2.0	-3.2	-3.7	-4.5	-4.0	-2.3	-1.0	-0.5	0.0	0.0	-0.6	-1.3
Recharge (-) Discharge (+)	-6.0	2.8	0.8	-0.3	-2.1	-4.1	-0.9	-2.1	-1.6	-1.3	0.1	-2.7	-6.0
Surface Water Outflows	-5.9	-2.4	-13.2	-2.4	-0.1	-12.5	-8.8	-14.4	-9.8	-16.4	-15.8	-0.9	-17.1
To Diversion Canal	-4.8	-1.5	-12.3	-1.3	0.0	-12.5	-8.8	-14.4	-9.8	-16.4	-14.8	-0.3	-15.9
To Seq. Ck. Marsh (surface)	-1.1	-0.9	-0.9	-1.1	0.0	0.0	0.0	0.0	0.0	0.0	-1.0	-0.6	-1.3
Subsurface Outflows	-1.3	-1.6	-1.9	-1.6	-1.4	-1.3	-1.5	-1.5	-1.5	-1.8	-2.0	-1.3	-1.3
Change in Storage	-6.2	-0.8	2.5	-5.6	-7.9	-1.8	1.1	3.7	2.7	5.8	5.7	-4.5	-0.9
Predicted WSE in feet													
Bell	218.34	218.27	218.48	218.01	217.35	217.20	217.29	217.60	217.82	218.31	218.79	218.41	218.33
McKay	216.19	216.12	216.33	215.86	215.20	215.05	215.14	215.45	215.67	216.16	216.64	216.26	216.18
Hamer	214.41	214.34	214.55	214.08	213.42	213.27	213.36	213.67	213.89	214.38	214.86	214.48	214.40
Observed WSE ('04) in feet													
Bell						216.36	217.40	217.36	217.72	218.30	219.11	217.92	216.95
McKay	216.19	215.81	214.71	214.26				213.70	213.84	214.35	215.15	214.68	213.74
Hamer	214.41	214.17	213.61	213.34	212.76	211.93	212.68	212.95	213.27	213.50	213.93	213.69	213.28

Table F-10. Water Balance for Bell, McKay, and Hamer Marshes - Existing Conditions

Monthly Average in Inches of Water — WY2006

Hydrologic Process	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr
Precipitation	5.4	3.9	3.8	1.4	0.2	1.6	3.3	6.7	6.5	12.2	3.2	2.6	3.9
Surface Water Inflows	25.8	16.4	15.5	3.2	0.0	5.1	17.0	46.3	38.2	94.8	10.6	8.7	15.6
Runoff from Ft. Lewis - Outfall 002	15.8	10.1	9.5	1.9	0.0	3.0	10.4	28.3	23.4	57.1	6.5	5.3	9.6
Runoff from Ft. Lewis - Outfall 003	10.0	6.3	6.0	1.4	0.0	2.1	6.6	18.0	14.8	37.6	4.1	3.4	6.0
Evapotranspiration	-2.0	-3.2	-3.7	-4.5	-4.0	-2.3	-1.0	-0.5	0.0	0.0	-0.6	-1.3	-2.0
Recharge (-) Discharge (+)	0.8	-0.4	-2.3	-3.6	-5.7	-6.8	-6.7	2.2	-2.0	2.0	1.1	1.6	1.4
Surface Water Outflows	-21.9	-15.2	-14.3	-4.6	-0.2	-4.1	-12.9	-38.8	-31.8	-95.3	-12.5	-9.8	-16.7
To Diversion Canal	-20.8	-12.6	-11.9	-2.8	-0.2	-4.1	-12.9	-38.8	-31.8	-94.9	-9.6	-6.6	-13.6
To Seq. Ck. Marsh (surface)	-1.0	-2.7	-2.5	-1.8	0.0	0.0	0.0	0.0	0.0	-0.5	-2.9	-3.2	-3.1
Subsurface Outflows	-2.0	-1.9	-1.5	-1.2	-1.0	-0.8	-0.9	-2.1	-1.8	-2.2	-1.8	-2.1	-2.0
Change in Storage	6.3	-0.4	-2.6	-9.3	-10.7	-7.3	-1.3	13.8	9.1	11.4	0.0	-0.2	0.2
Predicted WSE in feet													
Bell	218.86	218.82	218.60	217.83	216.94	216.33	216.23	217.37	218.13	219.08	219.08	219.06	219.08
McKay	216.71	216.67	216.45	215.68	214.79	214.18	214.08	215.22	215.98	216.93	216.93	216.91	216.93
Hamer	214.93	214.89	214.67	213.90	213.01	212.40	212.30	213.44	214.20	215.15	215.15	215.13	215.15
Observed WSE ('04) in feet													
Bell			218.33	217.05	215.63			218.25	217.95				
McKay	216.07	215.43	214.48	213.57				214.39	214.34	216.95	216.28	216.60	216.49
Hamer	214.26	214.05	213.69	213.13	212.13	211.67	211.69	213.20	213.27	214.09	213.65	214.13	214.14

Table F-10. Water Balance for Bell, McKay, and Hamer Marshes - Existing Conditions

Monthly Average in Inches of Water	WY2007												
Hydrologic Process	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May
Precipitation	2.1	2.2	0.4	0.0	0.8	1.6	14.4	8.6	6.5	4.5	5.7	1.7	1.1
Surface Water Inflows	6.5	6.8	0.0	0.0	1.0	5.2	152.0	52.5	33.2	17.8	27.6	4.5	2.2
Runoff from Ft. Lewis - Outfall 002	3.9	4.1	0.0	0.0	0.4	3.1	91.2	31.9	20.3	10.9	16.9	2.7	1.2
Runoff from Ft. Lewis - Outfall 003	2.5	2.7	0.0	0.0	0.5	2.1	60.8	20.6	12.9	6.9	10.7	1.8	1.0
Evapotranspiration	-3.2	-3.7	-4.5	-4.0	-2.3	-1.0	-0.5	0.0	0.0	-0.6	-1.3	-2.0	-3.2
Recharge (-) Discharge (+)	1.1	1.4	-0.1	-0.5	-1.2	-3.2	4.0	2.2	1.6	1.1	1.1	1.9	2.2
Surface Water Outflows	-8.2	-7.5	-0.4	0.0	-1.5	-4.2	-149.1	-53.4	-39.0	-21.0	-31.1	-6.2	-3.3
To Diversion Canal	-4.9	-5.2	-0.1	0.0	-1.5	-4.2	-149.1	-52.0	-35.8	-18.0	-27.8	-3.3	-1.4
To Seq. Ck. Marsh (surface)	-3.2	-2.4	-0.3	0.0	0.0	0.0	0.0	-1.4	-3.2	-2.9	-3.2	-2.9	-1.8
Subsurface Outflows	-1.9	-1.8	-1.7	-1.5	-1.3	-1.1	-2.6	-2.2	-2.3	-1.9	-2.1	-2.2	-2.3
Change in Storage	-3.6	-2.7	-6.3	-6.0	-4.7	-2.7	18.2	7.7	0.0	0.0	0.0	-2.3	-3.2
Predicted WSE in feet													
Bell	218.78	218.56	218.03	217.54	217.15	216.92	218.44	219.08	219.08	219.08	219.08	218.89	218.63
McKay	216.63	216.41	215.88	215.39	215.00	214.77	216.29	216.93	216.93	216.93	216.93	216.74	216.48
Hamer	214.85	214.63	214.10	213.61	213.22	212.99	214.51	215.15	215.15	215.15	215.15	214.96	214.70
Observed WSE ('04) in feet													
Bell			218.46	217.75	217.19	216.57							
McKay	216.06	216.27	214.34	213.60			216.87	217.29	217.02	216.97	216.90	217.35	216.64
Hamer	214.89	214.08	213.26	212.65	212.31	212.19	214.53	215.05	214.60	214.64	214.72	214.14	214.21

Table F-10. Water Balance for Bell, McKay, and Hamer Marshes - Existing Conditions

Monthly Average in Inches of Water						WY2008							
Hydrologic Process	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
Precipitation	2.7	1.5	1.0	1.7	5.0	2.8	7.7	4.2	3.6	4.9	1.8	1.3	1.7
Surface Water Inflows	9.1	4.0	1.9	5.2	26.2	9.9	44.6	17.9	13.5	22.1	4.7	2.8	4.4
Runoff from Ft. Lewis - Outfall 002	5.6	2.4	1.0	3.1	16.1	6.1	27.2	11.0	8.3	13.6	2.8	1.6	2.6
Runoff from Ft. Lewis - Outfall 003	3.5	1.7	0.9	2.1	10.1	3.9	17.4	6.9	5.2	8.5	1.9	1.2	1.8
Evapotranspiration	-3.7	-4.5	-4.0	-2.3	-1.0	-0.5	0.0	0.0	-0.6	-1.3	-2.0	-3.2	-3.7
Recharge (-) Discharge (+)	1.6	1.5	0.6	-0.9	1.8	-0.3	0.4	0.4	0.4	1.0	0.0	0.1	0.1
Surface Water Outflows	-8.7	-5.0	-2.6	-4.1	-20.8	-8.5	-43.3	-20.5	-15.0	-24.6	-6.5	-4.0	-4.6
To Diversion Canal	-6.9	-3.3	-2.0	-4.1	-20.8	-7.5	-41.8	-17.3	-11.9	-21.4	-3.5	-2.1	-3.5
To Seq. Ck. Marsh (surface)	-1.9	-1.7	-0.6	0.0	0.0	-1.1	-1.5	-3.2	-3.0	-3.2	-3.0	-1.9	-1.1
Subsurface Outflows	-2.1	-1.9	-1.7	-1.6	-2.3	-1.9	-2.1	-2.1	-2.0	-2.1	-1.9	-1.9	-1.7
Change in Storage	-1.2	-4.3	-4.7	-2.0	8.8	1.6	7.3	0.0	0.0	0.0	-3.8	-4.9	-3.9
Predicted WSE in feet													
Bell	218.53	218.17	217.78	217.61	218.35	218.48	219.08	219.08	219.08	219.08	218.76	218.35	218.03
McKay	216.38	216.02	215.63	215.46	216.20	216.33	216.93	216.93	216.93	216.93	216.61	216.20	215.88
Hamer	214.60	214.24	213.85	213.68	214.42	214.55	215.15	215.15	215.15	215.15	214.83	214.42	214.10
Observed WSE ('04) in feet													
Bell				218.18									
McKay	216.01	214.98	214.26	213.68	215.97	214.67	216.83	216.83	216.91	216.98	215.93	215.06	214.63
Hamer	213.85	213.68	213.29	213.04	213.88	213.81	214.52	214.47	214.43	214.52	214.23	214.75	213.55

Table F-10. Water Balance for Bell, McKay, and Hamer Marshes - Existing Conditions

Monthly Average in Inches of Water WY2009

Hydrologic Process	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul
Precipitation	0.9	2.1	0.5	2.6	8.3	5.2	7.3	1.6	5.3	3.5	3.4	1.3	0.0
Surface Water Inflows	1.4	7.4	0.2	11.8	64.3	27.5	41.4	3.6	25.4	13.0	13.2	3.0	0.0
Runoff from Ft. Lewis - Outfall 002	0.7	4.5	0.0	7.2	39.1	16.9	25.3	2.2	15.6	8.0	8.1	1.7	0.0
Runoff from Ft. Lewis - Outfall 003	0.7	2.9	0.2	4.6	25.2	10.6	16.1	1.5	9.8	5.0	5.1	1.3	0.0
Evapotranspiration	-4.5	-4.0	-2.3	-1.0	-0.5	0.0	0.0	-0.6	-1.3	-2.0	-3.2	-3.7	-4.5
Recharge (-) Discharge (+)	-1.3	-1.4	-2.6	-5.7	2.4	-3.1	-0.7	-1.7	0.5	-1.2	-0.6	-2.1	-2.9
Surface Water Outflows	-1.9	-5.6	-0.7	-8.9	-56.3	-22.0	-37.8	-5.2	-23.6	-13.0	-13.0	-4.3	0.0
To Diversion Canal	-1.8	-5.6	-0.7	-8.9	-56.3	-22.0	-36.6	-2.6	-21.3	-9.9	-10.0	-2.3	0.0
To Seq. Ck. Marsh (surface)	-0.1	0.0	0.0	0.0	0.0	0.0	-1.2	-2.6	-2.3	-3.1	-3.0	-2.0	0.0
Subsurface Outflows	-1.5	-1.4	-0.9	-0.8	-2.1	-1.7	-2.0	-1.7	-2.2	-1.8	-1.9	-1.4	-1.2
Change in Storage	-6.8	-2.9	-5.9	-2.1	16.1	5.9	8.2	-4.0	4.0	-1.5	-2.1	-7.3	-8.6
Predicted WSE in feet													
Bell	217.46	217.22	216.73	216.56	217.90	218.39	219.08	218.75	219.08	218.95	218.78	218.17	217.45
McKay	215.31	215.07	214.58	214.41	215.75	216.24	216.93	216.60	216.93	216.80	216.63	216.02	215.30
Hamer	213.53	213.29	212.80	212.63	213.97	214.46	215.15	214.82	215.15	215.02	214.85	214.24	213.52
Observed WSE ('04) in feet													
Bell													
McKay					216.11	214.61	216.38	215.34	216.31	215.69	215.73	214.44	
Hamer	212.98	212.63	212.51	212.39	214.37	213.94	214.42	214.08	214.34	214.18	214.24	213.49	212.68

Table F-10. Water Balance for Bell, McKay, and Hamer Marshes - Existing Conditions

Monthly Average in Inches of Water			WY2010										
Hydrologic Process	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug
Precipitation	1.9	2.8	5.6	8.9	3.0	8.0	3.3	3.3	3.3	4.6	4.3	0.4	0.2
Surface Water Inflows	6.3	11.4	32.9	60.0	11.0	47.2	11.4	12.5	12.3	20.2	17.6	0.0	0.0
Runoff from Ft. Lewis - Outfall 002	3.8	7.0	20.2	36.5	6.7	28.8	7.0	7.7	7.5	12.4	10.8	0.0	0.0
Runoff from Ft. Lewis - Outfall 003	2.5	4.4	12.7	23.6	4.3	18.5	4.4	4.8	4.8	7.8	6.8	0.0	0.0
Evapotranspiration	-4.0	-2.3	-1.0	-0.5	0.0	0.0	-0.6	-1.3	-2.0	-3.2	-3.7	-4.5	-4.0
Recharge (-) Discharge (+)	-3.2	-2.8	-1.4	1.2	0.1	1.0	-0.2	-0.5	0.5	0.1	-0.1	-1.7	-2.6
Surface Water Outflows	-4.9	-8.6	-26.7	-53.4	-10.8	-52.0	-11.9	-12.7	-12.3	-18.9	-16.8	-0.4	-0.2
To Diversion Canal	-4.9	-8.6	-26.7	-53.4	-8.3	-49.2	-9.0	-9.5	-9.3	-15.8	-13.7	-0.1	0.0
To Seq. Ck. Marsh (surface)	0.0	0.0	0.0	0.0	-2.5	-2.8	-2.9	-3.2	-3.0	-3.1	-3.1	-0.3	-0.1
Subsurface Outflows	-1.1	-1.1	-1.6	-2.3	-2.0	-2.1	-2.1	-2.0	-2.0	-2.1	-2.0	-1.7	-1.4
Change in Storage	-5.0	-0.7	7.9	14.0	1.3	2.1	0.0	-0.6	-0.1	0.7	-0.7	-7.9	-8.0
Predicted WSE in feet													
Bell	217.03	216.98	217.63	218.79	218.90	219.08	219.08	219.03	219.02	219.08	219.02	218.36	217.69
McKay	214.88	214.83	215.48	216.64	216.75	216.93	216.93	216.88	216.87	216.93	216.87	216.21	215.54
Hamer	213.10	213.05	213.70	214.86	214.97	215.15	215.15	215.10	215.09	215.15	215.09	214.43	213.76
Observed WSE ('04) in feet													
Bell													
McKay				216.08	215.95	216.60	216.40	216.04	216.36	216.01	215.95	214.27	214.28
Hamer	212.35	212.48	213.05	214.46	214.53	214.80	214.56	214.47	214.59	214.32	214.44	213.62	213.02

Table F-10. Water Balance for Bell, McKay, and Hamer Marshes - Existing Conditions

Monthly Average in Inches of Water	WY2011												
Hydrologic Process	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Precipitation	4.0	4.2	6.6	7.2	6.1	3.1	7.2	5.7	4.8	2.8	0.8	0.3	1.3
Surface Water Inflows	18.2	18.9	34.4	38.5	30.5	10.3	39.3	26.9	21.2	9.3	0.9	0.0	3.0
Runoff from Ft. Lewis - Outfall 002	11.2	11.6	21.0	23.5	18.7	6.3	24.0	16.5	13.0	5.7	0.4	0.0	1.7
Runoff from Ft. Lewis - Outfall 003	7.0	7.3	13.4	15.0	11.8	4.0	15.3	10.4	8.2	3.6	0.5	0.0	1.3
Evapotranspiration	-2.3	-1.0	-0.5	0.0	0.0	-0.6	-1.3	-2.0	-3.2	-3.7	-4.5	-4.0	-2.3
Recharge (-) Discharge (+)	0.7	-2.2	-0.3	1.3	1.2	1.1	1.3	1.6	1.7	1.2	1.9	1.7	0.2
Surface Water Outflows	-14.0	-14.9	-29.8	-44.5	-36.2	-12.3	-44.8	-30.4	-22.6	-10.1	-1.7	-0.3	-2.7
To Diversion Canal	-14.0	-14.6	-28.8	-41.4	-32.9	-9.4	-41.6	-27.3	-19.4	-7.0	-0.6	-0.1	-2.7
To Seq. Ck. Marsh (surface)	0.0	-0.2	-1.0	-3.1	-3.2	-2.9	-3.2	-3.1	-3.2	-3.1	-1.1	-0.2	0.0
Subsurface Outflows	-2.0	-1.8	-2.1	-1.8	-1.7	-1.7	-1.7	-1.8	-1.9	-1.7	-3.3	-2.6	-2.1
Change in Storage	4.5	3.2	8.3	0.7	0.0	0.0	0.0	0.0	0.0	-2.3	-5.9	-4.8	-2.6
Predicted WSE in feet													
Bell	218.06	218.33	219.02	219.08	219.08	219.08	219.08	219.08	219.08	218.89	218.40	218.00	217.78
McKay	215.91	216.18	216.87	216.93	216.93	216.93	216.93	216.93	216.93	216.74	216.25	215.85	215.63
Hamer	214.13	214.40	215.09	215.15	215.15	215.15	215.15	215.15	215.15	214.96	214.47	214.07	213.85
Observed WSE ('04) in feet													
Bell													
McKay	214.29	215.23	216.18	216.90	217.01	217.07	217.13						
Hamer	213.60	213.51	214.64	214.45	214.30	214.29	214.28	214.31	214.72	214.68	214.63	214.01	213.35

Table F-10. Water Balance for Bell, McKay, and Hamer Marshes - Existing Conditions

Monthly Average in Inches of Water	WY2012												WY2013
Hydrologic Process	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct
Precipitation	4.1	6.1	3.2	7.2	3.9	6.8	4.3	3.1	3.3	1.6	0.0	0.1	6.5
Surface Water Inflows	19.3	32.1	12.6	40.0	14.7	35.5	17.5	11.1	11.9	4.3	0.0	0.0	38.6
Runoff from Ft. Lewis - Outfall 002	11.9	19.7	7.7	24.4	9.0	21.7	10.7	6.8	7.3	2.5	0.0	0.0	23.6
Runoff from Ft. Lewis - Outfall 003	7.4	12.5	4.9	15.6	5.7	13.8	6.7	4.3	4.6	1.7	0.0	0.0	15.0
Evapotranspiration	-1.0	-0.5	0.0	0.0	-0.6	-1.3	-2.0	-3.2	-3.7	-4.5	-4.0	-2.3	-1.0
Recharge (-) Discharge (+)	-1.2	-1.3	-2.2	1.2	0.6	1.1	1.5	1.5	1.1	1.4	1.4	-0.6	-0.7
Surface Water Outflows	-14.9	-26.9	-11.9	-42.4	-17.0	-40.5	-19.5	-11.6	-11.9	-5.9	0.0	-0.1	-32.2
To Diversion Canal	-14.9	-26.5	-9.5	-40.0	-14.0	-37.2	-16.4	-8.4	-9.0	-3.2	0.0	0.0	-32.2
To Seq. Ck. Marsh (surface)	0.0	-0.4	-2.3	-2.3	-3.0	-3.2	-3.1	-3.2	-2.9	-2.6	0.0	-0.1	0.0
Subsurface Outflows	-2.1	-2.1	-1.8	-2.0	-1.7	-1.7	-1.8	-1.9	-1.8	-1.8	-1.8	-1.5	-2.1
Change in Storage	4.2	7.4	0.0	4.0	0.0	0.0	0.0	-1.0	-1.1	-4.9	-4.4	-4.5	9.2
Predicted WSE in feet													
Bell	218.13	218.75	218.75	219.08	219.08	219.08	219.08	219.00	218.91	218.50	218.13	217.76	218.52
McKay	215.98	216.60	216.60	216.93	216.93	216.93	216.93	216.85	216.76	216.35	215.98	215.61	216.37
Hamer	214.20	214.82	214.82	215.15	215.15	215.15	215.15	215.07	214.98	214.57	214.20	213.83	214.59
Observed WSE ('04) in feet													
Bell					219.68	219.77	219.87	219.91	219.77	219.42	219.07	218.23	218.84
McKay	214.03	214.15	214.78	215.42	215.25	215.08	214.91	214.89	215.43	215.18	214.93	213.70	214.59
Hamer	213.44	213.63	214.25	215.05	214.90	215.03	215.15	215.00	214.78	214.40	214.02	213.24	213.96

Table F-10. Water Balance for Bell, McKay, and Hamer Marshes - Existing Conditions

Monthly Average in Inches of Water — WY2014

Hydrologic Process	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov
Precipitation	6.5	7.6	3.5	1.7	3.7	5.5	4.4	1.9	0.0	1.6	6.9	2.6	4.1
Surface Water Inflows	33.5	42.4	13.5	4.0	14.6	25.0	17.7	5.0	0.0	4.3	40.5	8.9	17.3
Runoff from Ft. Lewis - Outfall 002	20.5	25.8	8.3	2.4	9.0	15.3	10.9	3.0	0.0	2.6	24.7	5.5	10.6
Runoff from Ft. Lewis - Outfall 003	13.0	16.5	5.2	1.6	5.6	9.7	6.8	2.0	0.0	1.8	15.8	3.5	6.7
Evapotranspiration	-0.5	0.0	0.0	-0.6	-1.3	-2.0	-3.2	-3.7	-4.5	-4.0	-2.3	-1.0	-0.5
Recharge (-) Discharge (+)	0.0	2.2	0.4	-0.2	-0.5	-0.8	-1.1	-0.2	-0.2	-1.3	0.3	0.8	0.3
Surface Water Outflows	-30.8	-50.4	-13.5	-5.7	-14.4	-23.4	-17.6	-6.9	0.0	-4.2	-34.1	-8.5	-15.3
To Diversion Canal	-29.2	-47.1	-10.2	-2.8	-11.2	-20.1	-13.8	-3.7	0.0	-3.5	-34.1	-6.7	-13.4
To Seq. Ck. Marsh (surface)	-1.6	-3.2	-3.2	-2.9	-3.2	-3.2	-3.8	-3.2	0.0	-0.7	0.0	-1.8	-1.9
Subsurface Outflows	-2.0	-1.8	-1.8	-1.5	-1.7	-1.7	-1.7	-1.5	-1.6	-1.4	-2.0	-1.9	-1.9
Change in Storage	6.7	0.0	2.1	-2.3	0.5	2.6	-1.4	-5.4	-6.3	-5.1	9.2	0.9	4.1
Predicted WSE in feet													
Bell	219.08	219.08	219.25	219.07	219.11	219.32	219.21	218.76	218.23	217.81	218.57	218.64	218.98
McKay	216.93	216.93	217.10	216.92	216.96	217.17	217.06	216.61	216.08	215.66	216.42	216.49	216.83
Hamer	215.15	215.15	215.32	215.14	215.18	215.39	215.28	214.83	214.30	213.88	214.64	214.71	215.05
Observed WSE ('04) in feet													
Bell	219.44	219.62	219.81	219.57	219.35	219.49	219.46	219.25	218.80	218.09	219.27	219.36	219.48
McKay	215.49	215.65	215.47	215.46	215.49	215.57	215.97	216.22	214.67	213.77	214.98	216.08	216.03
Hamer	214.68	214.86	215.05	214.97	215.11	215.07	214.61	214.57	213.93	213.35	214.07	214.78	214.76

Table F-10. Water Balance for Bell, McKay, and Hamer Marshes - Existing Conditions

Monthly Average in Inches of Water — WY2015

Hydrologic Process	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Precipitation	2.4	4.2	6.9	9.8	4.5	3.3	1.3	1.2	1.6	1.8	5.9	6.1	4.8
Surface Water Inflows	7.7	18.1	33.2	59.2	18.2	12.0	2.5	2.4	4.2	5.2	30.0	29.3	20.6
Runoff from Ft. Lewis - Outfall 002	4.7	11.1	20.3	35.9	11.2	7.3	1.4	1.3	2.5	3.1	18.4	17.9	12.7
Runoff from Ft. Lewis - Outfall 003	3.0	7.0	12.9	23.3	7.0	4.6	1.1	1.0	1.7	2.1	11.6	11.4	8.0
Evapotranspiration	0.0	0.0	-0.6	-1.3	-2.0	-3.2	-3.7	-4.5	-4.0	-2.3	-1.0	-0.5	0.0
Recharge (-) Discharge (+)	-2.5	-1.0	0.3	0.8	1.6	2.0	2.5	2.2	2.0	2.6	1.1	-1.0	1.1
Surface Water Outflows	-8.7	-16.4	-33.1	-66.8	-20.3	-13.1	-3.8	-3.6	-5.7	-5.3	-25.8	-27.2	-24.6
To Diversion Canal	-5.8	-14.0	-30.4	-62.7	-16.3	-9.1	-1.4	-1.5	-3.4	-4.1	-24.5	-24.2	-20.6
To Seq. Ck. Marsh (surface)	-2.9	-2.4	-2.7	-4.1	-3.9	-4.1	-2.3	-2.1	-2.2	-1.2	-1.2	-3.0	-4.1
Subsurface Outflows	-1.5	-1.8	-1.7	-1.7	-2.1	-2.0	-2.0	-2.1	-2.0	-2.0	-2.3	-2.0	-1.9
Change in Storage	-2.7	3.1	5.0	0.0	0.0	-1.0	-3.2	-4.4	-3.9	0.0	7.9	4.6	0.0
Predicted WSE in feet													
Bell	218.76	219.01	219.43	219.43	219.43	219.35	219.08	218.71	218.39	218.39	219.04	219.43	219.43
McKay	216.61	216.86	217.28	217.28	217.28	217.20	216.93	216.56	216.24	216.24	216.89	217.28	217.28
Hamer	214.83	215.08	215.50	215.50	215.50	215.42	215.15	214.78	214.46	214.46	215.11	215.50	215.50
Observed WSE ('04) in feet													
Bell	218.67	219.27	219.76										
McKay	215.03	215.78	216.09	215.95	216.19	215.94	215.82	215.62	215.27	215.36	215.45	215.97	216.17
Hamer	214.33	214.68	215.58	215.43			215.02	214.50	214.15	214.20	214.25	214.93	215.39

Table F-10. Water Balance for Bell, McKay, and Hamer Marshes - Existing Conditions

Monthly Average in Inches of Water — WY2016

Hydrologic Process	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan
Precipitation	4.1	4.7	4.4	2.1	0.8	0.4	0.2	2.2	1.3	5.0	7.1	12.0	6.9
Surface Water Inflows	16.3	17.9	17.9	5.9	1.0	0.0	0.0	7.7	3.2	26.3	42.8	88.5	34.5
Runoff from Ft. Lewis - Outfall 002	10.0	11.0	11.0	3.6	0.4	0.0	0.0	4.7	1.8	16.2	26.1	53.4	21.1
Runoff from Ft. Lewis - Outfall 003	6.3	6.9	6.9	2.3	0.5	0.0	0.0	3.0	1.3	10.2	16.7	35.1	13.4
Evapotranspiration	0.0	-0.6	-1.3	-2.0	-3.2	-3.7	-4.5	-4.0	-2.3	-1.0	-0.5	0.0	0.0
Recharge (-) Discharge (+)	0.7	0.6	0.6	0.9	0.7	0.0	0.0	-1.6	-1.4	-3.6	2.7	1.6	-0.5
Surface Water Outflows	-19.4	-21.0	-19.7	-8.0	-1.8	-0.4	-0.2	-5.9	-2.8	-21.0	-36.3	-92.3	-39.1
To Diversion Canal	-15.3	-17.3	-15.6	-4.3	-0.5	-0.1	-0.1	-5.9	-2.8	-21.0	-36.3	-89.8	-35.1
To Seq. Ck. Marsh (surface)	-4.1	-3.7	-4.1	-3.7	-1.3	-0.3	-0.2	0.0	0.0	0.0	0.0	-2.4	-4.1
Subsurface Outflows	-1.8	-1.7	-1.9	-1.8	-1.8	-1.8	-1.7	-1.7	-1.4	-1.4	-2.3	-2.1	-1.8
Change in Storage	0.0	0.0	0.0	-2.9	-4.2	-5.5	-6.2	-3.3	-3.6	4.3	13.5	7.8	0.0
Predicted WSE in feet													
Bell	219.43	219.43	219.43	219.19	218.84	218.38	217.87	217.59	217.30	217.66	218.78	219.43	219.43
McKay	217.28	217.28	217.28	217.04	216.69	216.23	215.72	215.44	215.15	215.51	216.63	217.28	217.28
Hamer	215.50	215.50	215.50	215.26	214.91	214.45	213.94	213.66	213.37	213.73	214.85	215.50	215.50
Observed WSE ('04) in feet													
Bell					219.23	219.09	218.69	217.87	217.69	217.50	219.85		
McKay	216.10	215.99	215.89	215.65	215.44	214.58	213.88				215.69	216.17	
Hamer	215.29	215.29	215.29	215.26	214.68	213.91	213.36	212.70	212.67	212.64	215.55		

Table F-10. Water Balance for Bell, McKay, and Hamer Marshes - Existing Conditions

Monthly Average in Inches of Water — WY2017

Hydrologic Process	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
Precipitation	5.8	5.9	1.8	1.0	2.3	1.3	0.2	1.5	9.3	6.9	3.9	3.4	8.6
Surface Water Inflows	25.0	27.6	4.5	1.6	7.3	2.9	0.0	3.7	62.0	36.3	15.4	12.6	43.5
Runoff from Ft. Lewis - Outfall 002	15.3	16.9	2.7	0.9	4.4	1.7	0.0	2.2	37.6	22.2	9.4	7.8	26.5
Runoff from Ft. Lewis - Outfall 003	9.7	10.7	1.8	0.8	2.9	1.2	0.0	1.5	24.4	14.1	5.9	4.9	17.1
Evapotranspiration	-0.6	-1.3	-2.0	-3.2	-3.7	-4.5	-4.0	-2.3	-1.0	-0.5	0.0	0.0	-0.6
Recharge (-) Discharge (+)	-1.1	-1.8	0.4	0.8	4.2	3.5	2.1	1.2	-2.9	2.1	1.8	1.0	1.9
Surface Water Outflows	-27.5	-28.7	-6.2	-2.6	-7.9	-4.2	-0.2	-3.7	-55.8	-35.5	-19.0	-14.9	-51.6
To Diversion Canal	-23.7	-24.7	-3.0	-0.9	-5.5	-2.2	0.0	-3.1	-55.5	-32.9	-15.0	-10.8	-48.0
To Seq. Ck. Marsh (surface)	-3.8	-4.1	-3.3	-1.7	-2.4	-2.0	-0.2	-0.6	-0.2	-2.6	-4.1	-4.1	-3.7
Subsurface Outflows	-1.6	-1.7	-1.8	-1.8	-2.3	-2.3	-2.1	-1.8	-2.0	-2.4	-2.1	-2.2	-1.8
Change in Storage	0.0	0.0	-3.3	-4.2	-0.2	-3.3	-4.0	-1.5	9.6	6.8	0.0	0.0	0.0
Predicted WSE in feet													
Bell	219.43	219.43	219.15	218.80	218.79	218.51	218.18	218.06	218.87	219.43	219.43	219.43	219.43
McKay	217.28	217.28	217.00	216.65	216.64	216.36	216.03	215.91	216.72	217.28	217.28	217.28	217.28
Hamer	215.50	215.50	215.22	214.87	214.86	214.58	214.25	214.13	214.94	215.50	215.50	215.50	215.50
Observed WSE ('04) in feet													
Bell							219.47		218.88				
McKay					215.60	215.55	214.85		214.09	215.95	216.30	216.16	216.16
Hamer					212.25	214.62	213.94		213.45	215.32			

Table F-10. Water Balance for Bell, McKay, and Hamer Marshes - Existing Conditions

Monthly Average in Inches of Water — WY2018

Hydrologic Process	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar
Precipitation	8.7	4.6	2.8	1.8	0.0	0.1	1.0	5.2	7.2	5.8	7.2	3.3	2.3
Surface Water Inflows	49.3	18.7	9.4	4.6	0.0	0.0	1.8	25.2	38.8	27.0	37.3	10.8	7.1
Runoff from Ft. Lewis - Outfall 002	30.0	11.5	5.8	2.8	0.0	0.0	0.9	15.5	23.7	16.6	22.8	6.6	4.3
Runoff from Ft. Lewis - Outfall 003	19.3	7.2	3.7	1.8	0.0	0.0	0.8	9.7	15.1	10.5	14.6	4.2	2.8
Evapotranspiration	-1.3	-2.0	-3.2	-3.7	-4.5	-4.0	-2.3	-1.0	-0.5	0.0	0.0	-0.6	-1.3
Recharge (-) Discharge (+)	3.4	3.2	3.4	3.6	3.9	4.6	2.1	-4.4	-1.4	2.0	2.5	2.7	2.3
Surface Water Outflows	-57.8	-22.3	-11.2	-6.4	0.0	-0.1	-2.8	-21.5	-34.6	-29.5	-45.1	-14.0	-9.4
To Diversion Canal	-53.7	-18.4	-7.1	-3.2	0.0	0.0	-1.4	-20.2	-32.9	-26.2	-41.0	-10.3	-5.4
To Seq. Ck. Marsh (surface)	-4.1	-3.9	-4.1	-3.2	0.0	-0.1	-1.4	-1.3	-1.7	-3.4	-4.1	-3.7	-4.1
Subsurface Outflows	-2.3	-2.3	-2.4	-2.4	-2.8	-3.1	-2.5	-1.8	-2.1	-2.2	-2.0	-2.2	-2.2
Change in Storage	0.0	0.0	-1.1	-2.5	-3.4	-2.4	-2.8	1.8	7.3	3.1	0.0	0.0	-1.1
Predicted WSE in feet													
Bell	219.43	219.43	219.34	219.13	218.85	218.65	218.41	218.56	219.17	219.43	219.43	219.43	219.34
McKay	217.28	217.28	217.19	216.98	216.70	216.50	216.26	216.41	217.02	217.28	217.28	217.28	217.19
Hamer	215.50	215.50	215.41	215.20	214.92	214.72	214.48	214.63	215.24	215.50	215.50	215.50	215.41
Observed WSE ('04) in feet													
Bell							219.80						
McKay	216.28	216.12		215.96	216.02	215.96	216.12			216.35		216.30	216.35
Hamer				215.45	214.76	213.95	213.83						

Table F-10. Water Balance for Bell, McKay, and Hamer Marshes - Existing Conditions

Monthly Average in Inches of Water — WY2019

Hydrologic Process	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr
Precipitation	6.1	0.7	0.9	0.2	0.3	1.8	4.0	3.8	6.4	3.4	4.8	1.6	3.6
Surface Water Inflows	27.7	0.3	1.3	0.0	0.0	5.2	18.6	15.2	33.7	12.3	18.5	3.8	12.9
Runoff from Ft. Lewis - Outfall 002	17.0	0.0	0.6	0.0	0.0	3.1	11.4	9.3	20.6	7.5	11.4	2.2	7.9
Runoff from Ft. Lewis - Outfall 003	10.8	0.3	0.6	0.0	0.0	2.1	7.2	5.9	13.1	4.7	7.2	1.5	5.0
Evapotranspiration	-2.0	-3.2	-3.7	-4.5	-4.0	-2.3	-1.0	-0.5	0.0	0.0	-0.6	-1.3	-2.0
Recharge (-) Discharge (+)	2.6	2.0	2.1	2.1	1.1	0.9	-2.1	0.9	1.4	1.1	0.9	0.0	-0.1
Surface Water Outflows	-31.2	-1.0	-2.2	-0.2	-0.3	-4.1	-14.3	-12.2	-29.7	-13.2	-21.8	-5.3	-13.1
To Diversion Canal	-27.5	-0.2	-0.7	0.0	-0.1	-4.1	-14.3	-11.6	-27.9	-9.4	-18.1	-2.3	-9.8
To Seq. Ck. Marsh (surface)	-3.7	-0.8	-1.5	-0.2	-0.2	0.0	0.0	-0.5	-1.8	-3.8	-3.7	-3.0	-3.2
Subsurface Outflows	-2.1	-2.2	-2.3	-2.5	-2.2	-2.2	-2.3	-2.3	-2.7	-2.3	-1.9	-2.0	-1.9
Change in Storage	1.1	-3.4	-3.9	-4.9	-5.1	-0.8	2.8	4.8	9.1	1.3	0.0	-3.3	-0.6
Predicted WSE in feet													
Bell	219.43	219.15	218.83	218.42	218.00	217.93	218.16	218.57	219.33	219.43	219.43	219.16	219.11
McKay	217.28	217.00	216.68	216.27	215.85	215.78	216.01	216.42	217.18	217.28	217.28	217.01	216.96
Hamer	215.50	215.22	214.90	214.49	214.07	214.00	214.23	214.64	215.40	215.50	215.50	215.23	215.18
Observed WSE ('04) in feet													
Bell				219.79	219.20	219.09	218.29					219.89	219.77
McKay	216.38	214.68	214.31	214.30	213.97	213.79		214.25	214.52	214.67	215.96	214.44	214.37
Hamer		215.01	214.47	214.10	213.30	213.11	212.99	213.63	214.85		215.27	214.79	214.64

Table F-10. Water Balance for Bell, McKay, and Hamer Marshes - Existing Conditions

Monthly Average in Inches of Water	WY2020												
Hydrologic Process	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May
Precipitation	1.1	0.7	1.0	0.8	3.5	3.9	1.7	6.5	9.6	4.2	3.5	1.5	3.1
Surface Water Inflows	2.1	0.4	1.9	1.2	18.1	19.3	5.1	38.7	62.1	15.8	13.1	3.6	11.6
Runoff from Ft. Lewis - Outfall 002	1.1	0.1	1.0	0.6	11.1	11.9	3.0	23.7	37.7	9.7	8.0	2.1	7.1
Runoff from Ft. Lewis - Outfall 003	0.9	0.3	0.9	0.6	7.0	7.4	2.0	15.0	24.4	6.1	5.0	1.5	4.5
Evapotranspiration	-3.2	-3.7	-4.5	-4.0	-2.3	-1.0	-0.5	0.0	0.0	-0.6	-1.3	-2.0	-3.2
Recharge (-) Discharge (+)	-0.6	-0.8	-1.8	-2.0	-1.6	0.6	3.0	-3.5	2.2	-0.1	-1.3	0.8	0.6
Surface Water Outflows	-3.2	-1.0	-2.5	-1.7	-13.7	-14.8	-4.0	-32.3	-60.1	-17.4	-14.0	-5.1	-11.8
To Diversion Canal	-1.2	-0.4	-2.0	-1.7	-13.7	-14.8	-4.0	-32.3	-58.5	-13.6	-9.9	-2.3	-8.8
To Seq. Ck. Marsh (surface)	-1.9	-0.7	-0.4	0.0	0.0	0.0	0.0	0.0	-1.5	-3.8	-4.1	-2.8	-3.1
Subsurface Outflows	-1.9	-1.7	-1.6	-1.4	-1.9	-2.0	-2.0	-1.9	-2.6	-2.0	-1.8	-1.9	-1.9
Change in Storage	-5.6	-6.2	-7.4	-7.0	2.0	6.0	3.2	7.6	11.3	0.0	-1.8	-3.1	-1.6
Predicted WSE in feet													
Bell	218.64	218.12	217.51	216.92	217.09	217.59	217.86	218.49	219.43	219.43	219.28	219.03	218.90
McKay	216.49	215.97	215.36	214.77	214.94	215.44	215.71	216.34	217.28	217.28	217.13	216.88	216.75
Hamer	214.71	214.19	213.58	212.99	213.16	213.66	213.93	214.56	215.50	215.50	215.35	215.10	214.97
Observed WSE ('04) in feet													
Bell		218.58	217.47	216.86		218.20				219.71			
McKay		213.99			214.92			213.72	215.28	214.65			
Hamer		213.47	212.68		212.25			213.55	215.55	215.03			

Table F-10. Water Balance for Bell, McKay, and Hamer Marshes - Existing Conditions

Monthly Average in Inches of Water					WY2021								
Hydrologic Process	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
Precipitation	2.5	0.3	0.4	2.8	3.0	5.6	5.2	7.3	4.7	2.5	1.2	2.0	2.4
Surface Water Inflows	8.1	0.0	0.0	10.8	12.3	29.6	26.5	41.2	18.1	8.0	2.2	6.1	8.1
Runoff from Ft. Lewis - Outfall 002	4.9	0.0	0.0	6.6	7.6	18.1	16.2	25.2	11.1	4.9	1.2	3.7	4.9
Runoff from Ft. Lewis - Outfall 003	3.2	0.0	0.0	4.2	4.8	11.5	10.2	16.1	7.0	3.1	0.9	2.4	3.1
Evapotranspiration	-3.7	-4.5	-4.0	-2.3	-1.0	-0.5	0.0	0.0	-0.6	-1.3	-2.0	-3.2	-3.7
Recharge (-) Discharge (+)	0.2	-2.4	-3.1	-2.1	-1.9	0.3	0.3	0.3	1.1	1.3	0.9	0.8	0.2
Surface Water Outflows	-8.8	-0.3	-0.4	-8.1	-9.3	-23.9	-21.3	-38.0	-21.3	-10.1	-3.3	-7.8	-8.2
To Diversion Canal	-6.1	0.0	-0.4	-8.1	-9.3	-23.9	-21.2	-35.7	-17.7	-6.0	-1.2	-4.7	-6.1
To Seq. Ck. Marsh (surface)	-2.7	-0.2	0.0	0.0	0.0	0.0	-0.1	-2.3	-3.7	-4.1	-2.1	-3.1	-2.1
Subsurface Outflows	-1.8	-1.5	-1.4	-1.5	-1.6	-2.0	-2.3	-2.5	-2.0	-2.2	-2.1	-2.1	-2.0
Change in Storage	-3.5	-8.4	-8.5	-0.5	1.5	9.0	8.4	8.4	0.0	-1.8	-3.1	-4.0	-3.2
Predicted WSE in feet													
Bell	218.60	217.90	217.19	217.15	217.28	218.03	218.73	219.43	219.43	219.28	219.02	218.69	218.43
McKay	216.45	215.75	215.04	215.00	215.13	215.88	216.58	217.28	217.28	217.13	216.87	216.54	216.28
Hamer	214.67	213.97	213.26	213.22	213.35	214.10	214.80	215.50	215.50	215.35	215.09	214.76	214.50
Observed WSE ('04) in feet													
Bell					217.23			219.68			219.71	219.41	218.99
McKay						213.87		214.86	214.88	215.59	214.57	214.46	214.38
Hamer						213.15		215.23	215.30	214.89	214.51	214.01	213.58

Table F-10. Water Balance for Bell, McKay, and Hamer Marshes - Existing Conditions

Monthly Average in Inches of Water	WY2021		
Hydrologic Process	Jul	Aug	Sep
Precipitation	0.0	0.3	2.6
Surface Water Inflows	0.0	0.0	9.7
Runoff from Ft. Lewis - Outfall 002	0.0	0.0	5.9
Runoff from Ft. Lewis - Outfall 003	0.0	0.0	3.8
Evapotranspiration	-4.5	-4.0	-2.3
Recharge (-) Discharge (+)	-1.1	-2.0	-1.5
Surface Water Outflows	0.0	-0.3	-7.3
To Diversion Canal	0.0	-0.3	-7.3
To Seq. Ck. Marsh (surface)	0.0	0.0	0.0
Subsurface Outflows	-1.8	-1.7	-1.7
Change in Storage	-7.4	-7.7	-0.6
Predicted WSE in feet			
Bell	217.81	217.17	217.13
McKay	215.66	215.02	214.98
Hamer	213.88	213.24	213.20
Observed WSE ('04) in feet			
Bell	218.05		
McKay		213.27	
Hamer	212.68	212.25	

Table F-11. Water Balance for East Edmond Marsh - Existing Conditions

Monthly Average in Inches of Water	WY2004						WY2005						
Hydrologic Process	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar
Precipitation	2.0	1.0	3.8	0.9	0.1	3.6	2.9	4.0	3.2	4.3	4.3	0.6	4.5
Surface Water Inflows	0.3	0.9	1.0	1.1	0.0	0.2	0.1	0.2	0.1	0.2	1.2	0.6	1.4
From Sequalitchew Lake	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
From Center Drive	0.1	0.0	0.1	0.0	0.0	0.2	0.1	0.2	0.1	0.2	0.2	0.0	0.2
From Hamer (surface)	1.0	0.9	0.9	1.1	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.6	1.3
Subsurface Inflows	1.2	1.6	1.8	1.6	1.3	1.3	1.5	1.5	1.5	1.7	2.0	1.3	1.2
Evapotranspiration	-1.3	-2.0	-3.2	-3.7	-4.5	-4.0	-2.3	-1.0	-0.5	0.0	0.0	-0.6	-1.3
Recharge (-) Discharge (+)	*-5.2*	*-4.2*	*-4.0*	*-2.4*	*-1.1*	*-2.4*	*-1.2*	*-1.3*	*-2.2*	*-2.1*	*-2.9*	*-3.3*	*-5.0*
Surface Water Outflows	-1.8	0.0	-0.4	-0.3	-0.2	0.0	0.0	0.0	-0.1	-0.1	-0.9	0.0	-0.3
To Diversion Canal	-1.5	0.0	-0.7	-0.6	-0.4	-0.1	0.0	0.0	-0.2	-0.3	-1.1	0.0	-0.5
To West Edmond Marsh	-2.0	0.0	-0.3	-0.2	-0.1	0.0	0.0	0.0	-0.1	-0.1	-0.9	0.0	-0.2
Change in Storage	-4.8	-2.8	-0.8	-2.8	-4.4	-1.4	1.0	3.3	2.0	3.9	3.7	-1.4	0.6
Predicted WSE in ft													
EM-2S	212.62	212.32	212.19	211.87	211.51	211.39	211.48	211.75	211.92	212.25	212.48	212.31	212.26
East Edmond	212.62	212.39	212.31	212.06	211.69	211.57	211.66	211.93	212.10	212.42	212.65	212.54	212.58
Eastern East Edmond Marsh	212.36	212.13	211.89	211.53	211.07	210.94	211.03	211.29	211.41	211.66	211.90	211.79	211.71
Observed WSE in ft													
EM-2S	210.72	210.74	210.76	210.70	210.40	209.82	209.92	210.33	210.61	210.76	210.86	210.79	210.64
East Edmond (EM-2E)	212.62	212.50	212.35	212.25	211.85	211.43	211.43	211.80	212.12	212.31	212.47	212.40	212.19
East Edmond (EM-2W)	211.15	211.15	211.22	211.20	210.91	210.32	210.41	210.80	211.08	211.20	211.26	211.24	211.09
East Edmond (EM-3E)	212.42	212.29	212.14	212.04	211.69	211.07	211.43	211.70	211.93	212.09	212.15	212.17	211.97
East Edmond (EM-3W)	212.42	212.29	212.15	212.04	211.70	211.10	211.57	211.70	211.94	212.04	212.26	212.20	211.98
Eastern East Edmond (SCM-1)	212.39	212.26	212.09	211.98	211.58	210.96	211.20	211.63	211.84	212.08	212.27	212.17	211.95

Table F-11. Water Balance for East Edmond Marsh - Existing Conditions

Monthly Average in Inches of Water — WY2006

Hydrologic Process	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr
Precipitation	5.4	3.9	3.8	1.4	0.2	1.6	3.3	6.7	6.5	12.2	3.2	2.6	3.9
Surface Water Inflows	1.2	2.8	2.5	1.8	0.0	0.1	0.2	0.3	0.3	1.0	3.0	3.2	3.2
From Sequalitchew Lake	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
From Center Drive	0.2	0.1	0.1	0.0	0.0	0.1	0.2	0.3	0.3	0.6	0.1	0.1	0.1
From Hamer (surface)	1.0	2.6	2.4	1.8	0.0	0.0	0.0	0.0	0.0	0.5	2.9	3.1	3.0
Subsurface Inflows	2.0	1.9	1.5	1.2	0.9	0.8	0.9	2.0	1.8	2.2	1.7	2.0	1.9
Evapotranspiration	-2.0	-3.2	-3.7	-4.5	-4.0	-2.3	-1.0	-0.5	0.0	0.0	-0.6	-1.3	-2.0
Recharge (-) Discharge (+)	*-2.8*	*-3.7*	*-2.4*	*-3.7*	*-4.2*	*-5.3*	*-4.6*	*-1.5*	*-3.1*	*-2.0*	*-4.1*	*-4.6*	*-4.3*
Surface Water Outflows	-1.6	-0.3	-0.9	-0.3	0.0	0.0	0.0	0.0	0.0	-5.8	-0.9	-1.0	-1.4
To Diversion Canal	-1.8	-0.6	-1.2	-0.6	0.0	0.0	0.0	0.0	0.0	-5.9	-1.4	-1.5	-1.7
To West Edmond Marsh	-1.5	-0.2	-0.9	-0.2	0.0	0.0	0.0	0.0	0.0	-5.8	-0.7	-0.8	-1.3
Change in Storage	2.4	1.4	0.8	-4.1	-7.1	-5.2	-1.3	7.0	5.4	7.6	2.3	0.9	1.4
Predicted WSE in ft													
EM-2S	212.38	212.29	212.16	211.68	211.09	210.66	210.55	211.14	211.59	212.19	212.15	211.98	211.85
East Edmond	212.66	212.76	212.76	212.41	211.82	211.43	211.43	212.01	212.47	212.62	212.77	212.78	212.80
Eastern East Edmond Marsh	211.90	211.87	211.86	211.38	210.79	210.36	210.25	210.84	211.29	212.35	212.34	212.20	212.23
Observed WSE in ft													
EM-2S	210.94	210.90	210.69	210.42	209.82	209.15	209.21	210.48	210.71	210.98	210.88	210.58	210.57
East Edmond (EM-2E)	212.55	212.63	212.47	212.13	211.43	211.43	211.43	211.89	212.22	212.63	212.62	212.51	212.55
East Edmond (EM-2W)	211.28	211.32	211.14	210.88	210.28	209.64	209.67	210.87	211.12	211.31	211.25	210.92	210.89
East Edmond (EM-3E)	212.32	212.40	212.26	211.92	211.13			211.78	212.02	212.42	212.37	212.27	212.30
East Edmond (EM-3W)	212.50	212.41	212.25	211.92	211.15	210.44	210.58	211.75	212.02	212.42	212.38	212.26	212.29
Eastern East Edmond (SCM-1)	212.25	212.43	212.29	211.88	211.08	210.95	210.57	211.69	211.99	212.58	212.47	212.20	212.32

Table F-11. Water Balance for East Edmond Marsh - Existing Conditions

Monthly Average in Inches of Water — WY2007

Hydrologic Process	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May
Precipitation	2.1	2.2	0.4	0.0	0.8	1.6	14.4	8.6	6.5	4.5	5.7	1.7	1.1
Surface Water Inflows	3.2	2.4	0.3	0.0	0.0	0.1	0.7	1.8	3.6	3.2	3.5	3.1	1.9
From Sequalitchew Lake	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
From Center Drive	0.1	0.1	0.0	0.0	0.0	0.1	0.7	0.4	0.3	0.2	0.2	0.1	0.0
From Hamer (surface)	3.2	2.3	0.3	0.0	0.0	0.0	0.0	1.4	3.3	3.1	3.3	3.0	1.9
Subsurface Inflows	1.8	1.8	1.7	1.5	1.3	1.1	2.2	2.3	2.3	2.0	2.2	2.3	2.4
Evapotranspiration	-3.2	-3.7	-4.5	-4.0	-2.3	-1.0	-0.5	0.0	0.0	-0.6	-1.3	-2.0	-3.2
Recharge (-) Discharge (+)	*-4.3*	*-2.5*	*-3.1*	*-0.4*	*-1.8*	*-2.0*	*-0.4*	*0.8*	*-0.9*	*-1.2*	*-0.1*	*-1.3*	*-2.2*
Surface Water Outflows	-0.4	-0.3	0.0	-0.1	0.0	0.0	-7.7	-6.5	-7.5	-2.5	-6.6	-2.1	-0.4
To Diversion Canal	-0.8	-0.6	0.0	-0.3	0.0	0.0	-7.7	-6.9	-10.1	-3.8	-8.3	-3.9	-0.8
To West Edmond Marsh	-0.3	-0.2	0.0	-0.1	0.0	0.0	-7.7	-6.4	-6.7	-2.1	-6.1	-1.6	-0.3
Change in Storage	-0.7	-0.2	-5.3	-2.9	-2.1	-0.2	8.8	7.0	3.9	5.4	3.4	1.8	-0.4
Predicted WSE in ft													
EM-2S	211.54	211.34	210.88	210.63	210.46	210.44	211.17	211.65	211.77	212.00	212.05	211.99	211.81
East Edmond	212.73	212.70	212.26	212.01	211.83	211.82	211.90	211.96	211.80	212.11	211.93	211.99	211.94
Eastern East Edmond Marsh	211.99	211.82	211.38	211.06	210.88	210.86	212.23	212.75	212.54	212.60	212.63	212.10	211.91
Observed WSE in ft													
EM-2S	210.71	210.85	210.62	210.36	210.21	210.06	211.03	211.01	210.90	210.87	210.83	210.79	210.82
East Edmond (EM-2E)	212.55	212.63	212.53	211.36	211.43	211.65	211.87	211.94	211.78	211.79	211.80	211.65	211.73
East Edmond (EM-2W)	211.08	211.28	211.06	210.74	210.64	210.49	211.37	211.37	211.26	211.26	211.22	211.15	211.24
East Edmond (EM-3E)	212.28	212.39	212.04	211.75	211.51	211.32	212.52	212.61	212.44	212.46	212.43	212.30	212.37
East Edmond (EM-3W)	212.27	212.40	212.03	211.75	211.50	211.31	212.51	212.60	212.42	212.42	212.42	212.29	212.36
Eastern East Edmond (SCM-1)	212.26	212.46	211.97	211.70	211.38	211.33	212.58	212.67	212.49	212.48	212.49	212.29	212.44

Table F-11. Water Balance for East Edmond Marsh - Existing Conditions

Monthly Average in Inches of Water — WY2008

Hydrologic Process	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
Precipitation	2.7	1.5	1.0	1.7	5.0	2.8	7.7	4.2	3.6	4.9	1.8	1.3	1.7
Surface Water Inflows	2.1	1.8	0.6	0.1	0.2	1.2	1.9	3.6	3.3	3.6	3.1	2.1	1.2
From Sequalitchew Lake	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
From Center Drive	0.1	0.0	0.0	0.1	0.2	0.1	0.3	0.2	0.1	0.2	0.1	0.0	0.1
From Hamer (surface)	2.0	1.8	0.6	0.0	0.0	1.1	1.6	3.4	3.2	3.4	3.0	2.0	1.1
Subsurface Inflows	2.2	2.0	1.8	1.6	2.3	2.0	2.3	2.2	2.1	2.2	2.0	1.9	1.7
Evapotranspiration	-3.7	-4.5	-4.0	-2.3	-1.0	-0.5	0.0	0.0	-0.6	-1.3	-2.0	-3.2	-3.7
Recharge (-) Discharge (+)	*-2.3*	*-0.5*	*-1.2*	*-1.4*	*-1.1*	*-2.0*	*-1.7*	*-2.1*	*-2.0*	*-2.3*	*-2.0*	*-2.6*	*-1.5*
Surface Water Outflows	-0.3	-0.3	-0.3	-0.1	-1.9	-1.4	-5.0	-4.4	-3.7	-3.5	-2.4	-0.4	-0.3
To Diversion Canal	-0.6	-0.6	-0.5	-0.3	-2.0	-1.6	-5.3	-5.8	-5.0	-4.5	-3.8	-0.8	-0.6
To West Edmond Marsh	-0.2	-0.2	-0.2	-0.1	-1.9	-1.3	-4.9	-4.0	-3.2	-3.2	-2.0	-0.3	-0.2
Change in Storage	0.6	0.0	-2.0	-0.6	3.6	2.2	5.2	3.5	2.7	3.7	0.5	-0.9	-1.0
Predicted WSE in ft													
EM-2S	211.70	211.56	211.35	211.31	211.61	211.70	212.01	212.05	212.05	212.10	211.92	211.68	211.51
East Edmond	211.98	211.97	211.80	211.74	211.89	211.96	211.99	211.98	211.98	212.04	211.95	211.86	211.76
Eastern East Edmond Marsh	211.82	211.70	211.41	211.29	211.68	211.84	212.54	212.54	212.45	212.55	212.12	211.88	211.67
Observed WSE in ft													
EM-2S	210.87	210.86	210.68	210.52	210.85	210.93	211.00	210.98	210.95	210.94	210.83	210.79	210.70
East Edmond (EM-2E)	211.66	211.60	211.45	211.27	211.66	211.77	211.92	211.86	211.80	211.86	211.68	211.69	211.63
East Edmond (EM-2W)	211.30	211.28	211.11	210.95	211.29	211.32	211.37	211.35	211.34	211.32	211.28	211.21	211.15
East Edmond (EM-3E)	212.31	212.23	212.09	211.93	212.32	212.40	212.56	212.50	212.44	212.50	212.37	212.33	212.27
East Edmond (EM-3W)	212.29	212.24	212.09	211.91	212.31	212.40	212.54	212.49	212.43	212.49	212.35	212.33	212.25
Eastern East Edmond (SCM-1)	212.35	212.29	212.13	212.06	212.38	212.48	212.63	212.58	212.52	212.55	212.43	212.39	212.32

Table F-11. Water Balance for East Edmond Marsh - Existing Conditions

Monthly Average in Inches of Water WY2009

Hydrologic Process	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul
Precipitation	0.9	2.1	0.5	2.6	8.3	5.2	7.3	1.6	5.3	3.5	3.4	1.3	0.0
Surface Water Inflows	0.2	0.1	0.0	0.1	0.4	0.2	1.6	2.7	2.7	3.4	3.1	2.1	0.0
From Sequalitchew Lake	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
From Center Drive	0.0	0.1	0.0	0.1	0.4	0.2	0.3	0.0	0.2	0.1	0.1	0.0	0.0
From Hamer (surface)	0.1	0.0	0.0	0.0	0.0	0.0	1.3	2.7	2.4	3.2	3.0	2.1	0.0
Subsurface Inflows	1.5	1.4	1.0	0.7	1.8	1.6	2.1	1.7	2.3	1.9	1.9	1.5	1.3
Evapotranspiration	-4.5	-4.0	-2.3	-1.0	-0.5	0.0	0.0	-0.6	-1.3	-2.0	-3.2	-3.7	-4.5
Recharge (-) Discharge (+)	*-0.8*	*0.3*	*-0.3*	*-1.8*	*-1.0*	*-2.0*	*-2.4*	*-2.3*	*-3.1*	*-3.3*	*-3.3*	*-2.8*	*-2.0*
Surface Water Outflows	-0.2	-0.1	-0.1	0.0	-2.0	-2.8	-3.8	-2.5	-2.0	-1.9	-1.0	-0.4	0.0
To Diversion Canal	-0.5	-0.2	-0.2	-0.1	-2.1	-3.1	-4.2	-4.2	-2.4	-2.6	-1.5	-0.8	0.0
To West Edmond Marsh	-0.2	-0.1	-0.1	0.0	-2.0	-2.7	-3.7	-2.0	-1.9	-1.7	-0.9	-0.3	0.0
Change in Storage	-3.0	-0.2	-1.2	0.6	7.0	2.2	4.8	0.6	3.8	1.6	0.8	-2.1	-5.2
Predicted WSE in ft													
EM-2S	211.26	211.24	211.15	211.19	211.78	211.97	212.27	212.14	212.27	212.15	211.98	211.65	211.22
East Edmond	211.50	211.48	211.43	211.48	211.89	211.86	211.96	211.88	212.05	212.06	212.08	211.89	211.46
Eastern East Edmond Marsh	211.30	211.23	211.08	211.11	211.84	212.10	212.62	212.09	212.39	212.31	212.21	211.87	211.44
Observed WSE in ft													
EM-2S	210.43	210.28	210.14	210.00	210.90	210.97	210.95	210.92	210.89	210.87	210.93	210.61	210.18
East Edmond (EM-2E)	211.43	211.43	211.43	211.43	211.72	211.81	211.81	211.76	211.54	211.44	211.72	211.43	211.43
East Edmond (EM-2W)	210.88	210.70	210.56	210.41	211.31	211.34	211.33	211.30	211.36	211.36	211.37	211.04	210.58
East Edmond (EM-3E)	211.92	211.63	211.47	211.30	212.41	212.42	212.44	212.39	212.25	212.31	212.38	211.93	211.59
East Edmond (EM-3W)	211.92	211.67	211.50	211.33	212.32	212.40	212.43	212.37	212.25	212.29	212.36	211.94	211.67
Eastern East Edmond (SCM-1)	211.96	211.71	211.54	211.38	212.39	212.48	212.53	212.47	212.33	212.37	212.44	211.94	211.51

Table F-11. Water Balance for East Edmond Marsh - Existing Conditions

Monthly Average in Inches of Water WY2010

Hydrologic Process	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug
Precipitation	1.9	2.8	5.6	8.9	3.0	8.0	3.3	3.3	3.3	4.6	4.3	0.4	0.2
Surface Water Inflows	0.1	0.1	0.3	0.4	2.7	3.1	3.1	3.6	3.2	3.4	3.4	0.3	0.1
From Sequalitchew Lake	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
From Center Drive	0.1	0.1	0.3	0.4	0.1	0.3	0.1	0.1	0.1	0.2	0.2	0.0	0.0
From Hamer (surface)	0.0	0.0	0.0	0.0	2.6	2.8	2.9	3.5	3.1	3.2	3.2	0.3	0.1
Subsurface Inflows	1.2	1.1	1.6	2.3	2.1	2.1	2.1	2.1	2.1	2.2	2.1	1.7	1.5
Evapotranspiration	-4.0	-2.3	-1.0	-0.5	0.0	0.0	-0.6	-1.3	-2.0	-3.2	-3.7	-4.5	-4.0
Recharge (-) Discharge (+)	*-1.5*	*-1.3*	*-2.0*	*-1.3*	*-3.1*	*-2.8*	*-1.8*	*-3.4*	*-2.6*	*-3.1*	*-3.0*	*-2.6*	*-1.3*
Surface Water Outflows	-0.1	-0.1	-0.1	-4.6	-1.3	-5.5	-5.1	-0.4	-2.7	-2.2	-1.5	0.0	-0.3
To Diversion Canal	-0.3	-0.1	-0.1	-4.7	-1.7	-6.2	-7.4	-0.8	-3.3	-2.9	-2.1	0.0	-0.6
To West Edmond Marsh	-0.1	0.0	0.0	-4.5	-1.2	-5.3	-4.4	-0.3	-2.5	-2.0	-1.3	0.0	-0.2
Change in Storage	-2.5	0.3	4.3	5.3	3.3	4.9	1.0	4.0	1.4	1.7	1.5	-4.6	-3.8
Predicted WSE in ft													
EM-2S	211.01	211.04	211.40	211.84	211.91	212.10	212.00	212.05	211.93	211.83	211.70	211.28	210.96
East Edmond	211.43	211.45	211.81	211.88	212.06	212.04	211.82	212.14	212.07	212.06	212.09	211.70	211.43
Eastern East Edmond Marsh	211.14	211.14	211.47	212.19	212.37	212.75	212.20	212.36	212.38	212.34	212.30	211.92	211.46
Observed WSE in ft													
EM-2S	210.12	210.11	210.47	211.06	211.04	211.03	211.03	210.86	211.15	211.13	211.10	210.88	210.61
East Edmond (EM-2E)	211.43	211.43	211.43	211.75	211.52	211.58	211.64	211.90	211.59	212.04	211.93	211.73	211.43
East Edmond (EM-2W)	210.51	210.52	210.90	211.41	211.41	211.39	211.40	211.24	211.58	211.54	211.52	211.36	211.03
East Edmond (EM-3E)	211.49	211.46	211.74	212.41	212.33	212.49	212.38	212.42	212.43	212.55	212.48	212.25	211.93
East Edmond (EM-3W)	211.48	211.46	211.72	212.31	212.25	212.27	212.22	212.39	212.25	212.54	212.44	212.25	211.96
Eastern East Edmond (SCM-1)	211.45	211.46	211.78	212.48	212.40	212.57	212.45	212.49	212.52	212.62	212.55	212.24	211.87

Table F-11. Water Balance for East Edmond Marsh - Existing Conditions

Monthly Average in Inches of Water WY2011

Hydrologic Process	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Precipitation	4.0	4.2	6.6	7.2	6.1	3.1	7.2	5.7	4.8	2.8	0.8	0.3	1.3
Surface Water Inflows	0.2	0.4	1.4	3.6	3.3	2.9	3.5	3.2	3.4	3.1	1.1	0.2	0.1
From Sequalitchew Lake	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
From Center Drive	0.2	0.2	0.3	0.3	0.2	0.1	0.3	0.2	0.2	0.1	0.0	0.0	0.0
From Hamer (surface)	0.0	0.3	1.1	3.3	3.1	2.8	3.2	3.0	3.2	3.0	1.1	0.2	0.0
Subsurface Inflows	2.1	1.9	2.3	1.9	1.6	1.6	1.6	1.7	1.8	1.7	3.2	3.1	2.3
Evapotranspiration	-2.3	-1.0	-0.5	0.0	0.0	-0.6	-1.3	-2.0	-3.2	-3.7	-4.5	-4.0	-2.3
Recharge (-) Discharge (+)	*-1.0*	*-2.2*	*-2.0*	*-4.1*	*-4.8*	*-3.1*	*-4.6*	*-3.4*	*-3.9*	*-3.8*	*-26.1*	*3.0*	*0.6*
Surface Water Outflows	-0.1	-0.2	-3.6	-0.5	-3.5	-3.1	-2.7	-4.0	-0.8	-0.6	0.0	0.0	0.0
To Diversion Canal	-0.3	-0.5	-3.8	-0.9	-4.1	-4.3	-3.2	-5.4	-1.5	-1.1	0.0	0.0	0.0
To West Edmond Marsh	-0.1	-0.2	-3.5	-0.4	-3.4	-2.7	-2.5	-3.5	-0.6	-0.4	0.0	0.0	0.0
Change in Storage	2.7	3.0	4.2	8.2	2.7	0.8	3.9	1.2	2.1	-0.5	-25.6	2.6	1.9
Predicted WSE in ft													
EM-2S	211.19	211.43	211.69	212.11	212.09	211.96	212.03	211.93	211.85	211.57	209.35	209.55	209.70
East Edmond	211.65	211.89	211.96	212.62	212.58	212.46	212.58	212.43	212.57	212.50	211.43	211.65	211.81
Eastern East Edmond Marsh	211.60	211.74	212.25	212.75	213.02	212.78	213.06	212.82	212.75	212.49	210.36	210.58	210.74
Observed WSE in ft													
EM-2S	211.01	211.05	211.33	211.43	211.30	211.27	211.25	211.27	211.30	211.22	206.59	211.06	210.85
East Edmond (EM-2E)	211.73	211.75	211.95	212.18	212.13	212.20	212.27	212.30	212.37			212.01	211.69
East Edmond (EM-2W)	211.46	211.48	211.73	211.78	211.68	211.65	211.61	211.58	211.68			211.48	211.33
East Edmond (EM-3E)	212.23	212.37	212.59	212.73	212.73	212.73	212.73	212.76	212.88			212.49	212.06
East Edmond (EM-3W)	212.23	212.25	212.43	212.70	212.63	212.69	212.75	212.77	212.85			212.50	212.18
Eastern East Edmond (SCM-1)	212.28	212.32	212.67	212.81	212.78	212.79	212.80	212.83	212.95			212.58	212.26

Table F-11. Water Balance for East Edmond Marsh - Existing Conditions

Monthly Average in Inches of Water	WY2012												WY2013
Hydrologic Process	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct
Precipitation	4.1	6.1	3.2	7.2	3.9	6.8	4.3	3.1	3.3	1.6	0.0	0.1	6.5
Surface Water Inflows	0.2	0.7	2.5	2.6	3.1	3.4	3.2	3.3	2.9	2.6	0.0	0.1	0.3
From Sequalitchew Lake	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
From Center Drive	0.2	0.3	0.1	0.3	0.1	0.3	0.2	0.1	0.1	0.0	0.0	0.0	0.3
From Hamer (surface)	0.0	0.4	2.4	2.3	2.9	3.1	3.0	3.2	2.8	2.6	0.0	0.1	0.0
Subsurface Inflows	2.1	2.2	1.8	2.0	1.6	1.6	1.7	1.8	1.7	1.7	1.8	1.5	2.0
Evapotranspiration	-1.0	-0.5	0.0	0.0	-0.6	-1.3	-2.0	-3.2	-3.7	-4.5	-4.0	-2.3	-1.0
Recharge (-) Discharge (+)	*-0.7*	*-2.2*	*-3.0*	*-2.0*	*-3.3*	*-3.9*	*-2.2*	*-3.6*	*-3.5*	*-2.6*	*-0.9*	*-1.9*	*-2.5*
Surface Water Outflows	0.0	-1.8	-1.5	-5.0	-2.3	-3.4	-3.5	-0.8	-0.5	-0.5	-0.4	0.0	-0.2
To Diversion Canal	0.0	-1.8	-1.7	-5.3	-2.7	-4.0	-4.7	-1.4	-1.0	-1.0	-0.8	0.0	-0.3
To West Edmond Marsh	0.0	-1.7	-1.4	-5.0	-2.2	-3.3	-3.1	-0.6	-0.4	-0.4	-0.3	0.0	-0.1
Change in Storage	4.6	4.6	3.1	4.7	2.4	3.2	1.4	0.7	0.2	-1.7	-3.5	-2.6	5.1
Predicted WSE in ft													
EM-2S	210.09	210.43	210.49	210.70	210.67	210.68	210.58	210.39	210.18	209.84	209.56	209.34	209.77
East Edmond	212.20	212.43	212.57	212.55	212.59	212.59	212.48	212.51	212.50	212.34	212.03	211.82	212.24
Eastern East Edmond Marsh	211.13	211.63	211.88	212.52	212.70	212.99	212.83	212.63	212.45	212.12	211.66	211.45	211.79
Observed WSE in ft													
EM-2S	210.97	211.29	211.31	211.37	211.36	211.38	211.40	211.41	211.36	211.25	211.14	210.84	211.08
East Edmond (EM-2E)	211.83	212.03	212.25	212.50	212.52	212.55	212.57	212.63	212.54	212.34	212.13	211.72	212.01
East Edmond (EM-2W)	211.40	211.67	211.71	211.72	211.75	211.76	211.77	211.78	211.75	211.65	211.55	211.31	211.50
East Edmond (EM-3E)	212.19	212.38	212.61	212.85	212.88	212.92	212.95	213.00	212.91	212.70	212.50	212.09	212.37
East Edmond (EM-3W)	212.29	212.50	212.73	212.98	212.99	213.02	213.05	213.11	213.03	212.82	212.61	212.20	212.48
Eastern East Edmond (SCM-1)	212.40	212.59	212.85	213.10	213.12	213.15	213.18	213.35	213.17	212.95	212.74	212.21	212.55

Table F-11. Water Balance for East Edmond Marsh - Existing Conditions

Monthly Average in Inches of Water | WY2014

Hydrologic Process	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov
Precipitation	6.5	7.6	3.5	1.7	3.7	5.5	4.4	1.9	0.0	1.6	6.9	2.6	4.1
Surface Water Inflows	1.9	3.5	3.2	2.9	3.2	3.3	4.0	3.3	0.0	0.8	0.3	1.9	2.0
From Sequalitchew Lake	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
From Center Drive	0.3	0.3	0.1	0.0	0.1	0.2	0.2	0.1	0.0	0.0	0.3	0.1	0.2
From Hamer (surface)	1.6	3.2	3.1	2.9	3.1	3.1	3.8	3.2	0.0	0.8	0.0	1.8	1.9
Subsurface Inflows	2.1	1.8	1.8	1.5	1.6	1.7	1.7	1.6	1.6	1.4	2.0	1.9	1.8
Evapotranspiration	-0.5	0.0	0.0	-0.6	-1.3	-2.0	-3.2	-3.7	-4.5	-4.0	-2.3	-1.0	-0.5
Recharge (-) Discharge (+)	*-3.0*	*-2.7*	*-3.8*	*-3.4*	*-3.6*	*-4.1*	*-5.0*	*-4.0*	*-1.9*	*-1.8*	*-1.6*	*-2.0*	*-2.7*
Surface Water Outflows	-2.0	-4.6	-3.0	-1.3	-1.7	-2.3	-1.0	-0.5	0.0	-0.3	-0.2	-0.3	-2.4
To Diversion Canal	-2.3	-5.0	-3.8	-2.1	-2.2	-2.9	-1.8	-1.0	0.0	-0.6	-0.4	-0.6	-2.7
To West Edmond Marsh	-1.9	-4.5	-2.8	-1.1	-1.5	-2.2	-0.8	-0.4	0.0	-0.2	-0.2	-0.3	-2.3
Change in Storage	5.0	5.7	1.7	0.8	2.0	2.1	0.8	-1.5	-4.8	-2.3	5.0	3.0	2.4
Predicted WSE in ft													
EM-2S	210.06	210.28	210.18	210.02	209.94	209.86	209.63	209.25	209.00	209.00	209.42	209.52	209.57
East Edmond	212.50	212.61	212.54	212.54	212.59	212.59	212.61	212.47	212.07	211.87	212.27	212.50	212.51
Eastern East Edmond Marsh	212.23	212.88	212.88	212.70	212.75	212.86	212.66	212.34	211.93	211.60	211.91	212.02	212.24
Observed WSE in ft													
EM-2S	211.31	211.47	211.40	211.40	211.39	211.44	211.43	211.37	211.19	210.88	211.31	211.51	211.47
East Edmond (EM-2E)	212.29	212.69	212.64	212.56	212.59	212.63	212.48	212.39	212.03	211.66	212.05	212.55	212.52
East Edmond (EM-2W)	211.69	211.83	211.78	211.75	211.76	211.81	211.82	211.80	211.64	211.36	211.76	211.89	211.86
East Edmond (EM-3E)	212.65	213.05	212.99	212.91	213.01	212.99	212.86	212.77	212.41	212.03	212.41	212.93	212.88
East Edmond (EM-3W)	212.76	213.17	213.11	213.04	213.06	213.10	212.96	212.88	212.51	212.15	212.53	213.03	212.99
Eastern East Edmond (SCM-1)	212.90	213.32	213.27	213.18	213.21	213.26	213.10	213.03	212.65	212.26	212.66	213.16	213.14

Table F-11. Water Balance for East Edmond Marsh - Existing Conditions

Monthly Average in Inches of Water — WY2015

Hydrologic Process	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Precipitation	2.4	4.2	6.9	9.8	4.5	3.3	1.3	1.2	1.6	1.8	5.9	6.1	4.8
Surface Water Inflows	3.0	2.4	3.0	4.5	4.0	4.4	2.4	2.1	2.3	1.3	1.5	3.3	4.4
From Sequalitchew Lake	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
From Center Drive	0.1	0.2	0.3	0.4	0.2	0.1	0.0	0.0	0.0	0.1	0.3	0.2	0.2
From Hamer (surface)	2.9	2.3	2.7	4.1	3.9	4.3	2.4	2.1	2.3	1.2	1.3	3.1	4.2
Subsurface Inflows	1.5	1.7	1.7	1.8	2.1	2.1	2.0	2.1	2.0	2.1	2.4	2.1	2.0
Evapotranspiration	0.0	0.0	-0.6	-1.3	-2.0	-3.2	-3.7	-4.5	-4.0	-2.3	-1.0	-0.5	0.0
Recharge (-) Discharge (+)	*-4.2*	*-3.4*	*-2.1*	*-3.6*	*-1.8*	*-2.8*	*-3.1*	*-2.8*	*-2.7*	*-1.8*	*-3.2*	*-4.0*	*-3.3*
Surface Water Outflows	-1.0	-2.9	-4.4	-5.9	-5.5	-0.6	-0.7	-0.5	-0.4	-0.3	-1.0	-2.8	-3.6
To Diversion Canal	-1.4	-3.3	-4.8	-7.0	-7.9	-1.1	-1.2	-0.9	-0.7	-0.5	-1.3	-3.1	-4.1
To West Edmond Marsh	-0.9	-2.8	-4.2	-5.5	-4.7	-0.4	-0.5	-0.4	-0.3	-0.2	-1.0	-2.7	-3.5
Change in Storage	1.7	2.0	4.5	5.3	1.4	3.2	-1.8	-2.3	-1.1	0.7	4.6	4.3	4.3
Predicted WSE in ft													
EM-2S	209.48	209.46	209.62	209.76	209.61	209.54	209.21	209.00	209.00	209.00	209.28	209.38	209.40
East Edmond	212.59	212.54	212.57	212.58	212.37	212.61	212.44	212.22	212.12	212.17	212.47	212.61	212.69
Eastern East Edmond Marsh	212.25	212.44	212.97	213.25	212.75	212.80	212.43	212.04	211.80	211.74	212.06	212.46	212.88
Observed WSE in ft													
EM-2S	211.39	211.43	211.51	211.50	211.51	211.54	211.48	211.33	211.22	211.30	211.38	211.49	211.49
East Edmond (EM-2E)	212.33	212.43	212.59	212.59	212.68	212.81	212.73	212.32			212.34	212.53	212.51
East Edmond (EM-2W)	211.80	211.82	211.86	211.87	211.88	211.90	211.87	211.78	211.71	211.76	211.81	211.88	211.89
East Edmond (EM-3E)	212.69	212.80	212.95	212.96	213.04	213.19	213.08	212.66	212.49	212.59	212.69	212.91	212.94
East Edmond (EM-3W)	212.80	212.91	213.06	213.06	213.15	213.29	213.19	212.79	212.61	212.57	212.54	213.02	213.04
Eastern East Edmond (SCM-1)	212.95	213.07	213.21	213.25	213.33	213.46	213.22	212.98	212.76	212.86	212.97	213.20	213.26

Table F-11. Water Balance for East Edmond Marsh - Existing Conditions

Monthly Average in Inches of Water — WY2016

Hydrologic Process	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan
Precipitation	4.1	4.7	4.4	2.1	0.8	0.4	0.2	2.2	1.3	5.0	7.1	12.0	6.9
Surface Water Inflows	4.3	3.8	4.3	3.8	1.3	0.3	0.2	0.1	0.0	0.2	0.3	2.9	4.3
From Sequalitchew Lake	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
From Center Drive	0.2	0.2	0.2	0.1	0.0	0.0	0.0	0.1	0.0	0.2	0.3	0.5	0.3
From Hamer (surface)	4.1	3.7	4.1	3.8	1.3	0.3	0.2	0.0	0.0	0.0	0.0	2.4	4.0
Subsurface Inflows	1.9	1.7	1.9	1.8	1.8	1.7	1.8	1.7	1.5	1.5	2.3	2.0	1.8
Evapotranspiration	0.0	-0.6	-1.3	-2.0	-3.2	-3.7	-4.5	-4.0	-2.3	-1.0	-0.5	0.0	0.0
Recharge (-) Discharge (+)	*-3.9*	*-3.3*	*-3.4*	*-3.9*	*-4.2*	*-3.8*	*-2.4*	*-2.0*	*-1.1*	*-2.4*	*0.1*	*-2.6*	*-4.6*
Surface Water Outflows	-3.8	-4.0	-3.1	-1.0	0.0	0.0	0.0	-0.2	-0.1	-0.1	-0.7	-6.3	-5.1
To Diversion Canal	-4.6	-5.2	-4.4	-1.8	0.0	0.0	0.0	-0.4	-0.2	-0.1	-0.8	-6.6	-6.9
To West Edmond Marsh	-3.5	-3.7	-2.8	-0.7	0.0	0.0	0.0	-0.2	-0.1	0.0	-0.6	-6.2	-4.6
Change in Storage	2.5	2.2	2.8	0.9	-3.4	-5.0	-4.6	-2.3	-0.8	3.3	8.7	8.1	3.2
Predicted WSE in ft													
EM-2S	209.29	209.20	209.12	209.00	209.00	209.00	209.00	209.00	209.00	209.28	210.01	210.49	210.46
East Edmond	212.63	212.54	212.57	212.60	212.32	211.90	211.52	211.43	211.43	211.70	212.38	212.55	212.48
Eastern East Edmond Marsh	213.01	212.99	212.89	212.66	212.37	211.96	211.57	211.28	211.17	211.41	212.10	213.11	212.99
Observed WSE in ft													
EM-2S	211.46	211.44	211.42	211.33	211.28	211.07	210.67	210.28	210.36	210.44	211.37	211.34	
East Edmond (EM-2E)	212.49	212.47	212.45	212.47	212.38	211.92	211.60	211.43	211.43	211.43	212.50	212.38	
East Edmond (EM-2W)	211.84	211.81	211.78	211.21	211.71	211.53	211.17	210.76	210.81	210.86	211.72	211.68	
East Edmond (EM-3E)	212.85	212.82	212.79	212.83	212.74	212.20	211.92	211.62	211.64	211.65	212.85	212.70	
East Edmond (EM-3W)	212.94	212.92	212.91	212.94	212.83	212.39	212.03	211.71	211.73	211.75	212.95	212.82	
Eastern East Edmond (SCM-1)	213.13	213.11	213.09	213.13	213.03	212.53	212.14	211.79	211.81	211.83	213.11	212.99	

Table F-11. Water Balance for East Edmond Marsh - Existing Conditions

Monthly Average in Inches of Water — WY2017

Hydrologic Process	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
Precipitation	5.8	5.9	1.8	1.0	2.3	1.3	0.2	1.5	9.3	6.9	3.9	3.4	8.6
Surface Water Inflows	4.1	4.3	3.4	1.8	2.5	2.0	0.2	0.7	0.7	2.9	4.4	4.2	4.1
From Sequalitchew Lake	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
From Center Drive	0.2	0.2	0.0	0.0	0.1	0.0	0.0	0.0	0.4	0.3	0.1	0.1	0.3
From Hamer (surface)	3.9	4.1	3.3	1.7	2.4	2.0	0.2	0.6	0.2	2.6	4.2	4.1	3.8
Subsurface Inflows	1.7	1.7	1.8	1.9	2.3	2.2	2.2	2.0	2.0	2.4	2.1	2.2	1.8
Evapotranspiration	-0.6	-1.3	-2.0	-3.2	-3.7	-4.5	-4.0	-2.3	-1.0	-0.5	0.0	0.0	-0.6
Recharge (-) Discharge (+)	*-4.9*	*-5.1*	*-4.0*	*-3.2*	*-2.4*	*-2.4*	*-1.1*	*-0.9*	*-3.6*	*-3.3*	*-4.0*	*-5.7*	*-5.1*
Surface Water Outflows	-2.9	-2.9	-1.0	-0.5	-0.4	-0.4	-0.3	-0.1	-1.5	-3.2	-2.7	-3.1	-4.0
To Diversion Canal	-4.1	-4.0	-1.9	-1.0	-0.8	-0.7	-0.5	-0.3	-1.6	-3.5	-3.1	-4.4	-4.4
To West Edmond Marsh	-2.6	-2.6	-0.7	-0.4	-0.3	-0.3	-0.2	-0.1	-1.4	-3.1	-2.5	-2.8	-3.9
Change in Storage	3.2	2.6	0.0	-2.2	0.5	-1.7	-2.8	0.8	5.9	5.2	3.8	1.0	4.8
Predicted WSE in ft													
EM-2S	210.43	210.34	210.08	209.76	209.61	209.31	209.07	209.08	209.56	209.78	209.75	209.52	209.61
East Edmond	212.56	212.59	212.55	212.34	212.37	212.21	211.97	212.03	212.40	212.58	212.69	212.57	212.65
Eastern East Edmond Marsh	212.95	212.90	212.57	212.19	212.07	211.77	211.42	211.40	211.93	212.45	212.75	212.52	213.00
Observed WSE in ft													
EM-2S					211.28	211.15	210.81		210.79	211.31	211.32	211.17	211.47
East Edmond (EM-2E)					212.38	212.27	211.76		211.57	212.24	212.22	212.05	212.04
East Edmond (EM-2W)					211.68	211.57	211.27		211.29	211.90	211.78	211.57	211.59
East Edmond (EM-3E)					212.59	212.34	212.05		211.87	212.33	212.35	212.39	213.34
East Edmond (EM-3W)					212.81	212.60	212.19		212.00	212.69	212.66	212.50	212.46
Eastern East Edmond (SCM-1)					212.88	212.65	212.28		212.08	212.60	212.59	212.62	210.24

Table F-11. Water Balance for East Edmond Marsh - Existing Conditions

Monthly Average in Inches of Water — WY 2018

Hydrologic Process	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar
Precipitation	8.7	4.6	2.8	1.8	0.0	0.1	1.0	5.2	7.2	5.8	7.2	3.3	2.3
Surface Water Inflows	4.4	4.2	4.3	3.4	0.0	0.1	1.6	1.7	2.1	3.7	4.4	3.8	4.3
From Sequalitchew Lake	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
From Center Drive	0.3	0.2	0.1	0.1	0.0	0.0	0.0	0.2	0.3	0.2	0.3	0.1	0.1
From Hamer (surface)	4.0	4.1	4.2	3.3	0.0	0.1	1.6	1.5	1.8	3.5	4.2	3.7	4.2
Subsurface Inflows	2.3	2.3	2.4	2.5	2.8	3.3	2.8	2.0	2.2	2.3	2.1	2.2	2.3
Evapotranspiration	-1.3	-2.0	-3.2	-3.7	-4.5	-4.0	-2.3	-1.0	-0.5	0.0	0.0	-0.6	-1.3
Recharge (-) Discharge (+)	*-2.7*	*-3.2*	*-4.8*	*-5.3*	*-3.2*	*-2.3*	*-2.8*	*-3.3*	*-3.3*	*-4.5*	*-5.6*	*-2.5*	*-5.1*
Surface Water Outflows	-8.1	-2.6	-0.8	-0.4	0.0	-0.2	-0.1	-0.1	-1.4	-3.0	-4.0	-5.3	-0.5
To Diversion Canal	-10.6	-4.1	-1.5	-0.9	0.0	-0.5	-0.2	-0.2	-1.6	-3.4	-4.5	-7.3	-1.0
To West Edmond Marsh	-7.3	-2.1	-0.6	-0.3	0.0	-0.2	-0.1	-0.1	-1.4	-3.0	-3.8	-4.7	-0.4
Change in Storage	3.3	3.4	0.7	-1.8	-4.8	-3.0	0.2	4.5	6.2	4.3	4.1	1.0	2.1
Predicted WSE in ft													
EM-2S	209.62	209.61	209.33	209.00	209.00	209.00	209.00	209.26	209.63	209.71	209.72	209.54	209.37
East Edmond	212.38	212.53	212.56	212.39	211.99	211.73	211.74	212.11	212.52	212.64	212.68	212.42	212.57
Eastern East Edmond Marsh	212.82	212.62	212.39	212.06	211.66	211.29	211.25	211.58	212.11	212.53	212.96	212.50	212.49
Observed WSE in ft													
EM-2S	211.31	211.27		211.18	211.05	211.24	210.72			211.95		211.29	211.12
East Edmond (EM-2E)	212.14	212.21		212.34	212.18	211.95	211.82			212.59		212.35	212.14
East Edmond (EM-2W)	210.67	211.63		211.55	211.44	210.47	211.09			211.69		211.60	211.48
East Edmond (EM-3E)	212.37	212.47		212.67	212.88	212.52	212.03			212.56		212.51	212.40
East Edmond (EM-3W)	212.54	212.62		212.78	212.62	212.37	212.27			213.07		212.79	212.58
Eastern East Edmond (SCM-1)	212.62	212.68		212.95	212.65	212.56	212.64			212.89		212.76	212.65

Table F-11. Water Balance for East Edmond Marsh - Existing Conditions

Monthly Average in Inches of Water — WY2019

Hydrologic Process	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr
Precipitation	6.1	0.7	0.9	0.2	0.3	1.8	4.0	3.8	6.4	3.4	4.8	1.6	3.6
Surface Water Inflows	4.0	0.8	1.5	0.2	0.2	0.1	0.2	0.8	2.2	4.2	4.0	3.2	3.5
From Sequalitchew Lake	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
From Center Drive	0.2	0.0	0.0	0.0	0.0	0.1	0.2	0.2	0.3	0.1	0.2	0.0	0.1
From Hamer (surface)	3.8	0.8	1.5	0.2	0.2	0.0	0.0	0.6	1.9	4.1	3.9	3.1	3.4
Subsurface Inflows	2.2	2.3	2.3	2.6	2.4	2.4	2.4	2.7	2.9	2.5	2.0	2.1	2.0
Evapotranspiration	-2.0	-3.2	-3.7	-4.5	-4.0	-2.3	-1.0	-0.5	0.0	0.0	-0.6	-1.3	-2.0
Recharge (-) Discharge (+)	*-4.5*	*-5.6*	*-5.0*	*-3.5*	*-3.1*	*-2.2*	*-5.2*	*-2.3*	*-3.7*	*-5.3*	*-5.3*	*-6.0*	*-5.6*
Surface Water Outflows	-2.5	0.0	0.0	0.0	0.0	-0.1	-0.1	-0.1	-0.2	-1.0	-2.7	-0.5	-0.5
To Diversion Canal	-3.0	0.0	0.0	0.0	0.0	-0.2	-0.1	-0.1	-0.4	-1.3	-3.1	-1.0	-0.8
To West Edmond Marsh	-2.4	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	-0.1	-0.9	-2.6	-0.4	-0.4
Change in Storage	3.3	-5.1	-3.9	-5.0	-4.1	-0.4	0.3	4.5	7.6	3.8	2.3	-1.0	1.0
Predicted WSE in ft													
EM-2S	209.34	209.00	209.00	209.00	209.00	209.00	209.03	209.35	209.82	209.80	209.68	209.35	209.16
East Edmond	212.66	212.23	211.91	211.49	211.43	211.43	211.45	211.82	212.44	212.69	212.67	212.57	212.63
Eastern East Edmond Marsh	212.74	212.32	211.99	211.57	211.23	211.15	211.15	211.49	212.03	212.24	212.46	212.19	212.11
Observed WSE in ft													
EM-2S	211.17	211.08	211.17	211.01	210.61	210.70	210.71	211.07	211.35	211.39	211.14	211.24	211.37
East Edmond (EM-2E)	212.37	212.41	212.23	212.05	211.65	211.73	211.78	212.21	212.63		212.55	212.37	212.63
East Edmond (EM-2W)	211.51	211.24	211.59	211.44	211.01	211.12	211.07	211.66	211.70		211.48	211.66	211.89
East Edmond (EM-3E)	212.48						212.06	212.42	212.65	212.71	212.83	212.69	212.67
East Edmond (EM-3W)	212.81	212.81	212.50	212.50	212.14	212.19	212.19	212.64	212.98	212.50	213.00	212.81	213.06
Eastern East Edmond (SCM-1)	212.77	212.59	212.85	212.01	211.75	211.84	212.57					212.88	212.90

Table F-11. Water Balance for East Edmond Marsh - Existing Conditions

Monthly Average in Inches of Water — WY2020

Hydrologic Process	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May
Precipitation	1.1	0.7	1.0	0.8	3.5	3.9	1.7	6.5	9.6	4.2	3.5	1.5	3.1
Surface Water Inflows	2.0	0.7	0.5	0.0	0.2	0.2	0.1	0.3	2.0	4.2	4.4	2.9	3.2
From Sequalitchew Lake	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
From Center Drive	0.0	0.0	0.0	0.0	0.2	0.2	0.1	0.3	0.4	0.2	0.1	0.0	0.1
From Hamer (surface)	2.0	0.7	0.5	0.0	0.0	0.0	0.0	0.0	1.6	4.0	4.3	2.9	3.1
Subsurface Inflows	1.9	1.7	1.7	1.5	1.7	2.1	2.0	1.8	2.6	2.1	1.9	2.0	1.9
Evapotranspiration	-3.2	-3.7	-4.5	-4.0	-2.3	-1.0	-0.5	0.0	0.0	-0.6	-1.3	-2.0	-3.2
Recharge (-) Discharge (+)	*-5.2*	*-4.0*	*-2.8*	*-2.7*	*-4.3*	*-0.2*	*0.5*	*-3.7*	*-2.3*	*-5.7*	*-3.6*	*-2.6*	*-3.6*
Surface Water Outflows	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	-1.1	-6.1	-2.4	-2.9	-1.4	-0.5
To Diversion Canal	0.0	0.0	-0.3	0.0	0.0	0.0	0.0	-1.2	-6.3	-2.9	-3.6	-2.3	-0.9
To West Edmond Marsh	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	-1.1	-6.0	-2.3	-2.7	-1.1	-0.4
Change in Storage	-3.5	-4.7	-4.2	-4.4	-1.3	5.0	3.8	3.8	5.8	1.8	2.1	0.5	1.1
Predicted WSE in ft													
EM-2S	209.00	209.00	209.00	209.00	209.00	209.41	209.73	210.05	210.41	210.23	210.06	209.88	209.72
East Edmond	212.34	211.95	211.59	211.43	211.43	211.84	212.16	212.39	212.37	212.34	212.30	212.27	212.34
Eastern East Edmond Marsh	211.82	211.43	210.99	210.63	210.52	210.94	211.26	211.61	212.47	212.60	212.68	212.38	212.29
Observed WSE in ft													
EM-2S		210.80	210.49	210.07	210.20	210.34		210.30	211.41	210.49			
East Edmond (EM-2E)		211.91	211.55	211.43	211.43	211.44		211.43	212.60	212.45			
East Edmond (EM-2W)		211.58	210.92	210.54		210.77		211.58	211.69	211.66			
East Edmond (EM-3E)						211.90		211.74	212.80	212.80			
East Edmond (EM-3W)		212.37	212.00	211.54	212.27	211.89		212.16	213.03	212.89			
Eastern East Edmond (SCM-1)													

Table F-11. Water Balance for East Edmond Marsh - Existing Conditions

Monthly Average in Inches of Water — WY 2021

Hydrologic Process	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
Precipitation	2.5	0.3	0.4	2.8	3.0	5.6	5.2	7.3	4.7	2.5	1.2	2.0	2.4
Surface Water Inflows	2.7	0.2	0.0	0.1	0.1	0.3	0.4	2.6	4.1	4.3	2.3	3.3	2.2
From Sequalitchew Lake	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
From Center Drive	0.1	0.0	0.0	0.1	0.1	0.3	0.2	0.3	0.2	0.1	0.0	0.1	0.1
From Hamer (surface)	2.6	0.2	0.0	0.0	0.0	0.0	0.1	2.3	3.9	4.3	2.2	3.2	2.1
Subsurface Inflows	1.7	1.5	1.4	1.6	1.7	2.1	2.3	2.5	2.1	2.3	2.2	2.2	2.0
Evapotranspiration	-3.7	-4.5	-4.0	-2.3	-1.0	-0.5	0.0	0.0	-0.6	-1.3	-2.0	-3.2	-3.7
Recharge (-) Discharge (+)	*-3.2*	*-4.9*	*-4.5*	*-3.5*	*-3.3*	*-1.6*	*-2.6*	*-3.5*	*-4.5*	*-5.8*	*-6.2*	*-4.6*	*-4.3*
Surface Water Outflows	-0.4	0.0	0.0	0.0	0.0	0.0	-0.1	-4.6	-3.1	-1.5	0.0	-0.4	-0.3
To Diversion Canal	-0.8	0.0	0.0	0.0	0.0	0.0	-0.3	-4.9	-3.5	-2.2	0.0	-0.8	-0.7
To West Edmond Marsh	-0.3	0.0	0.0	0.0	0.0	0.0	-0.1	-4.6	-3.0	-1.3	0.0	-0.3	-0.3
Change in Storage	-0.4	-7.4	-6.7	-1.4	0.5	5.9	5.2	4.3	2.7	0.6	-2.6	-0.7	-1.6
Predicted WSE in ft													
EM-2S	209.48	209.00	209.00	209.00	209.04	209.53	209.95	210.12	210.03	209.75	209.35	209.03	209.00
East Edmond	212.29	211.67	211.43	211.43	211.47	211.96	212.38	212.37	212.35	212.30	212.09	212.02	211.86
Eastern East Edmond Marsh	212.09	211.47	210.92	210.80	210.84	211.33	211.70	212.31	212.60	212.44	212.23	212.00	211.71
Observed WSE in ft													
EM-2S		210.83	210.33		210.25			211.47			211.31	211.27	211.13
East Edmond (EM-2E)		211.43	211.43		211.43	212.93		212.54			212.27	212.16	212.04
East Edmond (EM-2W)			210.76		210.69			211.77	212.14	212.14	211.70	211.69	211.51
East Edmond (EM-3E)					211.47	212.18		212.88	213.54	212.83	212.43		
East Edmond (EM-3W)			211.69		211.56	212.50		212.99	212.50	212.50	212.73	212.60	212.50
Eastern East Edmond (SCM-1)													

Table F-11. Water Balance for East Edmond Marsh - Existing Conditions

Monthly Average in Inches of Water WY 2021

Hydrologic Process	Jul	Aug	Sep
Precipitation	0.0	0.3	2.6
Surface Water Inflows	0.0	0.0	0.1
From Sequalitchew Lake	0.0	0.0	0.0
From Center Drive	0.0	0.0	0.1
From Hamer (surface)	0.0	0.0	0.0
Subsurface Inflows	2.0	1.7	1.8
Evapotranspiration	-4.5	-4.0	-2.3
Recharge (-) Discharge (+)	*-4.1*	*-4.6*	*-4.1*
Surface Water Outflows	0.0	0.0	0.0
To Diversion Canal	0.0	0.0	0.0
To West Edmond Marsh	0.0	0.0	0.0
Change in Storage	-6.6	-6.6	-1.9
Predicted WSE in ft			
EM-2S	209.00	209.00	209.00
East Edmond	211.43	211.43	211.43
Eastern East Edmond Marsh	211.16	210.61	210.45
Observed WSE in ft			
EM-2S	210.73		
East Edmond (EM-2E)	211.69	211.43	
East Edmond (EM-2W)	211.14		
East Edmond (EM-3E)			
East Edmond (EM-3W)	212.23	211.56	
Eastern East Edmond (SCM-1)		210.20	

Table F-12. Water Balance for West Edmond Marsh - Existing Conditions

Monthly Average in Inches of Water	WY2004						WY2005						
Hydrologic Process	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar
Precipitation	2.0	1.0	3.8	0.9	0.1	3.6	2.9	4.0	3.2	4.3	4.3	0.6	4.5
Surface Water Inflows	8.8	0.0	0.7	0.8	0.6	0.1	0.0	0.1	1.4	2.0	5.1	0.0	0.9
From East Edmond	8.8	0.0	0.7	0.8	0.6	0.1	0.0	0.1	1.4	2.0	5.1	0.0	0.9
Evapotranspiration	-1.3	-2.0	-3.2	-3.7	-4.5	-4.0	-2.3	-1.0	-0.5	0.0	0.0	-0.6	-1.3
Recharge (-) Discharge (+)	-5.9	-5.4	-9.0	-8.1	-8.9	-6.6	-0.6	-3.1	-3.6	0.6	2.4	-1.9	-6.1
Surface Water Outflows	0.0	-0.3	-0.3	-0.3	-0.2	-0.1	0.0	0.0	0.0	0.0	-0.1	-0.2	-0.2
To Center Drive	0.0	-0.3	-0.3	-0.3	-0.2	-0.1	0.0	0.0	0.0	0.0	-0.1	-0.2	-0.2
Change in Storage	3.6	-6.7	-7.9	-10.3	-13.0	-6.9	0.0	0.0	0.4	6.9	11.8	-2.1	-2.2
Predicted WSE in ft	209.04	208.48	207.82	206.96	205.88	205.31	205.31	205.31	205.34	205.92	206.90	206.73	206.54
Observed WSE EM-1/EM-1A	209.10	208.59	207.26	206.55	205.27	205.27	205.27	205.86	206.15	207.67	209.18	207.97	206.63

Table F-12. Water Balance for West Edmond Marsh - Existing Conditions

Monthly Average in Inches of Water — WY2006

Hydrologic Process	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr
Precipitation	5.4	3.9	3.8	1.4	0.2	1.6	3.3	6.7	6.5	12.2	3.2	2.6	3.9
Surface Water Inflows	6.7	0.8	3.3	0.8	0.0	0.0	0.0	0.0	0.0	24.9	1.7	1.9	3.4
From East Edmond	6.7	0.8	3.3	0.8	0.0	0.0	0.0	0.0	0.0	24.9	1.7	1.9	3.4
Evapotranspiration	-2.0	-3.2	-3.7	-4.5	-4.0	-2.3	-1.0	-0.5	0.0	0.0	-0.6	-1.3	-2.0
Recharge (-) Discharge (+)	0.5	-1.2	-6.2	-8.8	-7.2	0.7	-2.3	-2.4	0.8	-2.6	-4.8	-4.8	-4.9
Surface Water Outflows	-0.2	-0.2	-0.2	-0.2	-0.1	0.0	0.0	0.0	-0.1	-0.1	-0.2	-0.3	-0.3
To Center Drive	-0.2	-0.2	-0.2	-0.2	-0.1	0.0	0.0	0.0	-0.1	-0.1	-0.2	-0.3	-0.3
Change in Storage	10.5	0.1	-3.0	-11.4	-11.2	0.0	0.0	3.8	7.2	34.4	-0.8	-1.8	0.2
Predicted WSE in ft	207.42	207.43	207.18	206.23	205.31	205.31	205.31	205.63	206.23	209.09	209.03	208.88	208.90
Observed WSE EM-1/EM-1A	209.29	209.08	207.09	205.79	205.27	205.27	205.27	206.05	208.15	208.82	208.53	208.69	208.78

Table F-12. Water Balance for West Edmond Marsh - Existing Conditions

Monthly Average in Inches of Water — WY2007

Hydrologic Process	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May
Precipitation	2.1	2.2	0.4	0.0	0.8	1.6	14.4	8.6	6.5	4.5	5.7	1.7	1.1
Surface Water Inflows	0.8	0.6	0.0	0.4	0.1	0.0	131.8	13.3	14.0	4.4	13.2	3.3	0.7
From East Edmond	0.8	0.6	0.0	0.4	0.1	0.0	131.8	13.3	14.0	4.4	13.2	3.3	0.7
Evapotranspiration	-3.2	-3.7	-4.5	-4.0	-2.3	-1.0	-0.5	0.0	0.0	-0.6	-1.3	-2.0	-3.2
Recharge (-) Discharge (+)	-3.7	-6.7	-10.4	-9.1	-1.9	-0.6	-4.5	-2.6	-5.7	-5.2	-5.2	-5.2	-6.4
Surface Water Outflows	-0.3	-0.3	-0.3	-0.2	-0.1	0.0	-94.6	-19.6	-14.9	-3.1	-12.5	-0.3	-0.3
To Center Drive	-0.3	-0.3	-0.3	-0.2	-0.1	0.0	-94.6	-19.6	-14.9	-3.1	-12.5	-0.3	-0.3
Change in Storage	-4.3	-7.9	-14.8	-12.8	-3.4	0.0	46.7	-0.3	0.0	0.0	0.0	-2.4	-8.0
Predicted WSE in ft	208.54	207.89	206.65	205.59	205.31	205.31	209.20	209.18	209.18	209.18	209.18	208.97	208.30
Observed WSE EM-1/EM-1A	207.56	207.10	205.67	205.27	205.27	205.27	208.74	208.94	208.71	208.75	208.84	208.70	207.84

Table F-12. Water Balance for West Edmond Marsh - Existing Conditions

Monthly Average in Inches of Water — WY2008

Hydrologic Process	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
Precipitation	2.7	1.5	1.0	1.7	5.0	2.8	7.7	4.2	3.6	4.9	1.8	1.3	1.7
Surface Water Inflows	0.6	0.8	0.8	0.6	30.7	4.5	16.8	8.4	6.8	6.7	4.3	0.7	0.6
From East Edmond	0.6	0.8	0.8	0.6	30.7	4.5	16.8	8.4	6.8	6.7	4.3	0.7	0.6
Evapotranspiration	-3.7	-4.5	-4.0	-2.3	-1.0	-0.5	0.0	0.0	-0.6	-1.3	-2.0	-3.2	-3.7
Recharge (-) Discharge (+)	-7.8	-8.0	-7.0	-6.8	-6.8	-4.9	-4.7	-6.0	-6.0	-5.5	-5.9	-9.1	-9.0
Surface Water Outflows	-0.2	-0.3	-0.2	-0.1	0.0	-0.3	-3.6	-6.6	-3.9	-4.8	-0.3	-0.3	-0.2
To Center Drive	-0.2	-0.3	-0.2	-0.1	0.0	-0.3	-3.6	-6.6	-3.9	-4.8	-0.3	-0.3	-0.2
Change in Storage	-8.5	-10.4	-9.4	-6.9	27.8	1.7	16.2	0.0	0.0	0.0	-2.1	-10.6	-10.8
Predicted WSE in ft	207.59	206.72	205.94	205.37	207.68	207.83	209.18	209.18	209.18	209.18	209.00	208.12	207.22
Observed WSE EM-1/EM-1A	206.92	205.84	205.63	205.62	207.09	207.82	209.17	209.07	209.02	209.23	209.03	206.96	206.38

Table F-12. Water Balance for West Edmond Marsh - Existing Conditions

Monthly Average in Inches of Water WY2009

Hydrologic Process	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul
Precipitation	0.9	2.1	0.5	2.6	8.3	5.2	7.3	1.6	5.3	3.5	3.4	1.3	0.0
Surface Water Inflows	0.6	0.3	1.0	0.4	32.2	6.4	8.8	4.2	4.0	3.6	1.9	0.8	0.0
From East Edmond	0.6	0.3	1.0	0.4	32.2	6.4	8.8	4.2	4.0	3.6	1.9	0.8	0.0
Evapotranspiration	-4.5	-4.0	-2.3	-1.0	-0.5	0.0	0.0	-0.6	-1.3	-2.0	-3.2	-3.7	-4.5
Recharge (-) Discharge (+)	-9.9	-8.4	0.8	-1.9	-4.7	-5.7	-6.7	-6.7	-4.1	-5.9	-7.2	-11.7	-15.2
Surface Water Outflows	-0.2	-0.1	0.0	0.0	0.0	-0.2	-4.1	-0.3	-2.2	-0.3	-0.3	-0.3	0.0
To Center Drive	-0.2	-0.1	0.0	0.0	0.0	-0.2	-4.1	-0.3	-2.2	-0.3	-0.3	-0.3	0.0
Change in Storage	-13.0	-10.0	0.0	0.0	35.4	5.6	5.4	-1.7	1.7	-1.1	-5.5	-13.6	-19.7
Predicted WSE in ft	206.14	205.31	205.31	205.31	208.26	208.73	209.18	209.03	209.18	209.08	208.63	207.50	205.86
Observed WSE EM-1/EM-1A	205.27	205.27		205.27	208.19	208.61	208.52	208.60	209.22	209.09	208.22	206.01	205.27

Table F-12. Water Balance for West Edmond Marsh - Existing Conditions

Monthly Average in Inches of Water WY2010

Hydrologic Process	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug
Precipitation	1.9	2.8	5.6	8.9	3.0	8.0	3.3	3.3	3.3	4.6	4.3	0.4	0.2
Surface Water Inflows	0.6	0.7	0.7	77.1	2.5	11.5	9.4	0.6	6.0	4.2	3.3	0.0	0.7
From East Edmond	0.6	0.7	0.7	77.1	2.5	11.5	9.4	0.6	6.0	4.2	3.3	0.0	0.7
Evapotranspiration	-4.0	-2.3	-1.0	-0.5	0.0	0.0	-0.6	-1.3	-2.0	-3.2	-3.7	-4.5	-4.0
Recharge (-) Discharge (+)	-5.1	-1.1	-5.2	-4.4	-3.3	-5.3	-6.3	-6.6	-3.9	-8.6	-7.3	-11.5	-13.2
Surface Water Outflows	-0.1	0.0	0.0	-34.5	-2.4	-14.2	-5.8	-0.3	-0.3	-0.3	-0.3	-0.3	-0.2
To Center Drive	-0.1	0.0	0.0	-34.5	-2.4	-14.2	-5.8	-0.3	-0.3	-0.3	-0.3	-0.3	-0.2
Change in Storage	-6.7	0.0	0.0	46.7	-0.3	0.0	0.0	-4.2	3.3	-3.3	-3.7	-15.8	-16.5
Predicted WSE in ft	205.31	205.31	205.31	209.20	209.18	209.18	209.18	208.83	209.10	208.83	208.52	207.20	205.82
Observed WSE EM-1/EM-1A	205.27	205.27	205.98	209.21	209.55	208.68	208.58	208.34	209.17	207.87	207.82	206.07	206.07

Table F-12. Water Balance for West Edmond Marsh - Existing Conditions

Monthly Average in Inches of Water WY2011

Hydrologic Process	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Precipitation	4.0	4.2	6.6	7.2	6.1	3.1	7.2	5.7	4.8	2.8	0.8	0.3	1.3
Surface Water Inflows	0.5	1.0	20.0	1.2	8.8	6.1	5.5	8.1	1.3	1.0	0.0	0.0	0.0
From East Edmond	0.5	1.0	20.0	1.2	8.8	6.1	5.5	8.1	1.3	1.0	0.0	0.0	0.0
Evapotranspiration	-2.3	-1.0	-0.5	0.0	0.0	-0.6	-1.3	-2.0	-3.2	-3.7	-4.5	-4.0	-2.3
Recharge (-) Discharge (+)	-2.8	-4.1	0.1	-0.3	-7.1	-6.5	-7.2	-4.5	1.8	-3.4	-6.3	-8.4	-9.3
Surface Water Outflows	-0.1	-0.1	-0.1	-0.3	-0.5	-2.2	-4.3	-7.4	-4.7	-0.3	-0.3	-0.2	-0.2
To Center Drive	-0.1	-0.1	-0.1	-0.3	-0.5	-2.2	-4.3	-7.4	-4.7	-0.3	-0.3	-0.2	-0.2
Change in Storage	-0.8	-0.1	26.1	7.8	7.3	0.0	0.0	0.0	0.0	-3.6	-10.3	-12.4	-10.5
Predicted WSE in ft	205.76	205.75	207.92	208.57	209.18	209.18	209.18	209.18	209.18	208.88	208.01	206.98	206.11
Observed WSE EM-1/EM-1A	206.07	206.05	208.98	209.46	207.57		208.99	209.34	209.95		207.28	206.60	206.03

Table F-12. Water Balance for West Edmond Marsh - Existing Conditions

Monthly Average in Inches of Water	WY2012												WY2013
Hydrologic Process	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct
Precipitation	4.1	6.1	3.2	7.2	3.9	6.8	4.3	3.1	3.3	1.6	0.0	0.1	6.5
Surface Water Inflows	0.0	10.2	6.2	18.5	5.6	7.5	7.2	1.2	0.9	0.9	1.1	0.0	0.7
From East Edmond	0.0	10.2	6.2	18.5	5.6	7.5	7.2	1.2	0.9	0.9	1.1	0.0	0.7
Evapotranspiration	-1.0	-0.5	0.0	0.0	-0.6	-1.3	-2.0	-3.2	-3.7	-4.5	-4.0	-2.3	-1.0
Recharge (-) Discharge (+)	-6.7	-5.2	-2.6	-6.6	-4.7	-7.3	-7.7	-6.1	-5.9	-7.7	-8.6	-9.7	-8.0
Surface Water Outflows	-0.1	-0.1	-0.2	-0.2	-0.3	-0.3	-0.3	-0.3	-0.3	-0.3	-0.3	-0.1	-0.1
To Center Drive	-0.1	-0.1	-0.2	-0.2	-0.3	-0.3	-0.3	-0.3	-0.3	-0.3	-0.3	-0.1	-0.1
Change in Storage	-3.8	10.6	6.7	18.8	3.9	5.5	1.5	-5.3	-5.7	-10.0	-11.9	-12.0	-2.0
Predicted WSE in ft	205.79	206.68	207.23	208.80	209.13	209.59	209.71	209.26	208.79	207.95	206.96	205.96	205.80
Observed WSE EM-1/EM-1A	206.28	206.94	207.83	209.23	209.32	209.55	209.78	209.52	209.14		206.36	205.73	206.56

Table F-12. Water Balance for West Edmond Marsh - Existing Conditions

Monthly Average in Inches of Water | WY2014

Hydrologic Process	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov
Precipitation	6.5	7.6	3.5	1.7	3.7	5.5	4.4	1.9	0.0	1.6	6.9	2.6	4.1
Surface Water Inflows	11.4	19.9	7.2	2.9	3.9	5.0	1.8	0.9	0.0	1.0	0.9	1.1	10.3
From East Edmond	11.4	19.9	7.2	2.9	3.9	5.0	1.8	0.9	0.0	1.0	0.9	1.1	10.3
Evapotranspiration	-0.5	0.0	0.0	-0.6	-1.3	-2.0	-3.2	-3.7	-4.5	-4.0	-2.3	-1.0	-0.5
Recharge (-) Discharge (+)	-4.0	-7.1	-6.4	-3.8	-4.7	-1.6	-9.1	-8.4	-11.3	-10.7	-2.7	3.7	-1.6
Surface Water Outflows	-0.1	-0.2	-0.3	-0.3	-0.3	-0.3	-0.3	-0.3	0.0	-0.2	-0.1	-0.1	-0.2
To Center Drive	-0.1	-0.2	-0.3	-0.3	-0.3	-0.3	-0.3	-0.3	0.0	-0.2	-0.1	-0.1	-0.2
Change in Storage	13.4	20.2	4.0	0.0	1.4	6.6	-6.4	-9.5	-15.8	-12.3	2.6	6.2	12.1
Predicted WSE in ft	206.91	208.60	208.93	208.93	209.05	209.60	209.06	208.27	206.95	205.93	206.15	206.67	207.68
Observed WSE EM-1/EM-1A	208.21	209.83	209.07	209.27	209.37	209.44	208.41	207.37	205.95	206.06	206.17	208.73	208.72

Table F-12. Water Balance for West Edmond Marsh - Existing Conditions

Monthly Average in Inches of Water — WY2015

Hydrologic Process	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Precipitation	2.4	4.2	6.9	9.8	4.5	3.3	1.3	1.2	1.6	1.8	5.9	6.1	4.8
Surface Water Inflows	3.2	7.3	11.0	12.7	10.7	1.0	1.1	0.9	1.0	0.9	4.0	11.5	9.1
From East Edmond	3.2	7.3	11.0	12.7	10.7	1.0	1.1	0.9	1.0	0.9	4.0	11.5	9.1
Evapotranspiration	0.0	0.0	-0.6	-1.3	-2.0	-3.2	-3.7	-4.5	-4.0	-2.3	-1.0	-0.5	0.0
Recharge (-) Discharge (+)	-1.3	-2.6	-4.7	-5.0	-5.2	-4.6	-6.1	-10.5	-9.4	-3.8	-2.2	-0.1	-4.0
Surface Water Outflows	-0.3	-0.2	-0.7	-16.3	-8.1	-0.3	-0.3	-0.3	-0.3	-0.2	-0.2	-0.2	-0.3
To Center Drive	-0.3	-0.2	-0.7	-16.3	-8.1	-0.3	-0.3	-0.3	-0.3	-0.2	-0.2	-0.2	-0.3
Change in Storage	4.0	8.6	12.0	-0.1	0.0	-3.8	-7.7	-13.2	-11.1	-3.6	6.5	16.8	9.6
Predicted WSE in ft	208.01	208.73	209.73	209.72	209.72	209.41	208.77	207.67	206.75	206.45	206.99	208.39	209.19
Observed WSE EM-1/EM-1A	207.55	208.55	209.72	209.98	210.01	209.99	209.05	205.30	205.87	206.07	208.63	208.73	209.84

Table F-12. Water Balance for West Edmond Marsh - Existing Conditions

Monthly Average in Inches of Water — WY2016

Hydrologic Process	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan
Precipitation	4.1	4.7	4.4	2.1	0.8	0.4	0.2	2.2	1.3	5.0	7.1	12.0	6.9
Surface Water Inflows	8.0	8.4	6.4	1.7	0.0	0.0	0.0	0.9	1.3	0.8	10.2	26.7	10.5
From East Edmond	8.0	8.4	6.4	1.7	0.0	0.0	0.0	0.9	1.3	0.8	10.2	26.7	10.5
Evapotranspiration	0.0	-0.6	-1.3	-2.0	-3.2	-3.7	-4.5	-4.0	-2.3	-1.0	-0.5	0.0	0.0
Recharge (-) Discharge (+)	-6.4	-6.4	-7.3	-6.4	-9.7	-12.1	-10.1	-4.6	-0.2	-4.8	3.1	-5.8	-8.0
Surface Water Outflows	-0.3	-5.2	-2.2	-0.3	-0.3	-0.2	-0.2	-0.1	0.0	0.0	0.0	-26.8	-2.8
To Center Drive	-0.3	-5.2	-2.2	-0.3	-0.3	-0.2	-0.2	-0.1	0.0	0.0	0.0	-26.8	-2.8
Change in Storage	5.4	1.0	0.0	-4.8	-12.3	-15.6	-14.6	-5.7	0.0	0.0	20.0	6.1	6.6
Predicted WSE in ft	209.64	209.73	209.72	209.32	208.29	206.99	205.77	205.31	205.31	205.31	206.98	209.70	209.73
Observed WSE EM-1/EM-1A	209.79	209.76	209.74	209.48	207.29	205.54	205.27	205.27	205.27	205.27	209.37	210.02	

Table F-12. Water Balance for West Edmond Marsh - Existing Conditions

Monthly Average in Inches of Water — WY2017

Hydrologic Process	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
Precipitation	5.8	5.9	1.8	1.0	2.3	1.3	0.2	1.5	9.3	6.9	3.9	3.4	8.6
Surface Water Inflows	5.7	6.0	1.7	1.0	0.7	0.7	0.7	0.4	25.2	11.3	9.5	7.2	8.9
From East Edmond	5.7	6.0	1.7	1.0	0.7	0.7	0.7	0.4	25.2	11.3	9.5	7.2	8.9
Evapotranspiration	-0.6	-1.3	-2.0	-3.2	-3.7	-4.5	-4.0	-2.3	-1.0	-0.5	0.0	0.0	-0.6
Recharge (-) Discharge (+)	-7.2	-7.5	-3.1	-5.6	-4.3	-9.4	-8.7	-5.7	-15.6	1.1	-3.1	-5.1	-0.4
Surface Water Outflows	-0.3	-0.3	-0.2	-0.3	-0.3	-0.3	-0.2	-0.1	-0.3	0.0	-0.3	-0.3	-9.9
To Center Drive	-0.3	-0.3	-0.2	-0.3	-0.3	-0.3	-0.2	-0.1	-0.3	0.0	-0.3	-0.3	-9.9
Change in Storage	3.5	2.8	-1.9	-7.1	-5.3	-12.2	-12.0	-6.2	17.5	18.7	10.1	5.3	6.6
Predicted WSE in ft	209.47	209.41	208.68	208.51	208.39	207.50	206.20	205.31	207.22	207.31	208.76	209.02	209.73
Observed WSE EM-1/EM-1A					208.90	206.26	205.31		206.87	208.72	209.45	209.29	209.86

Table F-12. Water Balance for West Edmond Marsh - Existing Conditions

Monthly Average in Inches of Water — WY2018

Hydrologic Process	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar
Precipitation	8.7	4.6	2.8	1.8	0.0	0.1	1.0	5.2	7.2	5.8	7.2	3.3	2.3
Surface Water Inflows	16.8	4.7	1.4	0.8	0.0	0.6	0.3	0.3	8.1	13.1	10.0	12.2	0.8
From East Edmond	16.8	4.7	1.4	0.8	0.0	0.6	0.3	0.3	8.1	13.1	10.0	12.2	0.8
Evapotranspiration	-1.3	-2.0	-3.2	-3.7	-4.5	-4.0	-2.3	-1.0	-0.5	0.0	0.0	-0.6	-1.3
Recharge (-) Discharge (+)	0.1	0.6	-1.4	-4.3	-7.7	-8.4	-8.8	-8.2	-0.5	3.1	0.2	-5.3	-4.2
Surface Water Outflows	-17.8	-1.4	-0.3	-0.3	0.0	-0.3	-0.2	-0.1	-0.1	-0.2	-0.2	-0.3	-0.3
To Center Drive	-17.8	-1.4	-0.3	-0.3	0.0	-0.3	-0.2	-0.1	-0.1	-0.2	-0.2	-0.3	-0.3
Change in Storage	6.6	6.6	-0.7	-5.7	-12.2	-12.0	-10.0	-3.8	14.2	21.8	17.3	9.3	-2.6
Predicted WSE in ft	209.73	209.73	209.12	208.70	207.86	207.01	206.15	205.79	206.97	208.49	208.67	209.58	208.91
Observed WSE EM-1/EM-1A	210.22	208.64		209.58	207.22	206.67	205.31			209.98		209.98	209.67

Table F-12. Water Balance for West Edmond Marsh - Existing Conditions

Monthly Average in Inches of Water — WY2019

Hydrologic Process	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr
Precipitation	6.1	0.7	0.9	0.2	0.3	1.8	4.0	3.8	6.4	3.4	4.8	1.6	3.6
Surface Water Inflows	6.3	0.0	0.0	0.0	0.0	0.3	0.2	0.7	0.8	3.2	6.8	0.8	1.0
From East Edmond	6.3	0.0	0.0	0.0	0.0	0.3	0.2	0.7	0.8	3.2	6.8	0.8	1.0
Evapotranspiration	-2.0	-3.2	-3.7	-4.5	-4.0	-2.3	-1.0	-0.5	0.0	0.0	-0.6	-1.3	-2.0
Recharge (-) Discharge (+)	-6.0	-8.7	-11.9	-13.0	-13.5	-11.6	-9.8	-2.2	1.6	-1.6	-1.6	-6.4	-6.2
Surface Water Outflows	-2.8	-0.3	-0.3	-0.2	-0.3	-0.2	-0.1	-0.3	-0.3	-0.4	-0.3	-0.3	-0.3
To Center Drive	-2.8	-0.3	-0.3	-0.2	-0.3	-0.2	-0.1	-0.3	-0.3	-0.4	-0.3	-0.3	-0.3
Change in Storage	1.6	-11.5	-15.0	-17.5	-17.5	-12.1	-6.8	1.5	8.5	4.6	9.1	-5.5	-3.9
Predicted WSE in ft	209.72	208.75	208.02	207.33	206.50	205.96	205.40	205.92	207.62	208.98	209.69	208.47	208.72
Observed WSE EM-1/EM-1A	209.97	208.18	205.31	205.31	205.31	205.31	205.31	206.55	209.32	209.38	209.41	208.53	208.79

Table F-12. Water Balance for West Edmond Marsh - Existing Conditions

Monthly Average in Inches of Water — WY2020

Hydrologic Process	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May
Precipitation	1.1	0.7	1.0	0.8	3.5	3.9	1.7	6.5	9.6	4.2	3.5	1.5	3.1
Surface Water Inflows	0.0	0.0	0.4	0.0	0.0	0.0	0.0	4.7	21.8	5.1	6.0	2.5	0.8
From East Edmond	0.0	0.0	0.4	0.0	0.0	0.0	0.0	4.7	21.8	5.1	6.0	2.5	0.8
Evapotranspiration	-3.2	-3.7	-4.5	-4.0	-2.3	-1.0	-0.5	0.0	0.0	-0.6	-1.3	-2.0	-3.2
Recharge (-) Discharge (+)	-11.9	-14.7	-16.0	-13.0	-4.5	-6.8	-7.1	-10.5	-4.3	-1.8	-8.7	-6.1	-8.2
Surface Water Outflows	-0.4	-0.3	-0.3	-0.2	-0.1	-0.2	-0.3	-0.3	-6.6	-0.2	-0.3	-0.3	-0.3
To Center Drive	-0.4	-0.3	-0.3	-0.2	-0.1	-0.2	-0.3	-0.3	-6.6	-0.2	-0.3	-0.3	-0.3
Change in Storage	-14.4	-18.0	-19.4	-16.3	-3.5	-4.1	-6.2	0.4	20.5	6.8	-0.8	-4.3	-7.7
Predicted WSE in ft	208.40	207.56	206.65	205.59	205.64	205.80	206.15	207.71	209.72	209.29	209.67	209.37	209.08
Observed WSE EM-1/EM-1A		205.31	205.31	205.31	205.31	205.31		206.97	209.81	209.35			

Table F-12. Water Balance for West Edmond Marsh - Existing Conditions

Monthly Average in Inches of Water — WY2021

Hydrologic Process	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
Precipitation	2.5	0.3	0.4	2.8	3.0	5.6	5.2	7.3	4.7	2.5	1.2	2.0	2.4
Surface Water Inflows	0.7	0.0	0.0	0.0	0.0	0.0	0.4	11.6	6.7	2.9	0.0	0.7	0.6
From East Edmond	0.7	0.0	0.0	0.0	0.0	0.0	0.4	11.6	6.7	2.9	0.0	0.7	0.6
Evapotranspiration	-3.7	-4.5	-4.0	-2.3	-1.0	-0.5	0.0	0.0	-0.6	-1.3	-2.0	-3.2	-3.7
Recharge (-) Discharge (+)	-10.6	-15.8	-14.9	-10.0	-9.4	-1.6	-4.3	-6.6	-8.0	-7.6	-6.8	-13.4	-12.0
Surface Water Outflows	-0.3	-0.3	-0.3	-0.2	-0.2	-0.3	-0.4	-5.8	-1.9	-0.3	-0.3	-0.3	-0.2
To Center Drive	-0.3	-0.3	-0.3	-0.2	-0.2	-0.3	-0.4	-5.8	-1.9	-0.3	-0.3	-0.3	-0.2
Change in Storage	-11.4	-20.3	-18.8	-9.8	-7.7	3.1	1.0	6.4	1.0	-3.7	-7.9	-14.2	-12.8
Predicted WSE in ft	208.46	207.08	206.11	205.93	205.81	207.25	208.47	209.72	209.73	209.42	209.06	208.14	207.22
Observed WSE EM-1/EM-1A			205.31		205.31	206.87		209.40	209.72	209.15	208.13	205.31	205.31

Table F-12. Water Balance for West Edmond Marsh - Existing Conditions

Monthly Average in Inches of Water WY2021

Hydrologic Process	Jul	Aug	Sep
Precipitation	0.0	0.3	2.6
Surface Water Inflows	0.0	0.0	0.0
From East Edmond	0.0	0.0	0.0
Evapotranspiration	-4.5	-4.0	-2.3
Recharge (-) Discharge (+)	-10.7	-1.3	-0.7
Surface Water Outflows	0.0	-0.1	0.0
To Center Drive	0.0	-0.1	0.0
Change in Storage	-15.1	-5.1	-0.5
Predicted WSE in ft	205.73	205.35	205.31
Observed WSE EM-1/EM-1A	205.31	206.87	

Table F-13. Water Balance for Bell, McKay, and Hamer Marshes with Mining - Low Groundwater

Monthly Average in Inches of Water	WY2004					WY2005							
Hydrologic Process	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar
Precipitation	2.0	1.0	3.8	0.9	0.1	3.6	2.9	4.0	3.2	4.3	4.3	0.6	4.5
Surface Water Inflows	6.3	1.5	17.8	1.6	0.0	19.4	13.9	22.2	13.7	21.1	21.1	0.3	22.5
Runoff from Ft. Lewis - Outfall 002	3.8	0.8	10.9	0.8	0.0	11.9	8.5	13.6	8.4	12.9	13.0	0.0	13.8
Runoff from Ft. Lewis - Outfall 003	2.5	0.7	6.9	0.8	0.0	7.5	5.4	8.6	5.3	8.1	8.1	0.3	8.7
Evapotranspiration	-1.3	-2.0	-3.2	-3.7	-4.5	-4.0	-2.3	-1.0	-0.5	0.0	0.0	-0.6	-1.3
Recharge (-) Discharge (+)	-2.5	-2.6	-3.1	-3.4	-3.2	-3.5	-2.0	-2.0	-2.4	-2.1	-1.4	-3.6	-5.4
Surface Water Outflows	-5.9	-2.4	-13.7	-1.9	-0.1	-14.8	-10.5	-17.1	-10.3	-16.4	-16.4	-0.9	-17.6
To Diversion Canal	-4.8	-1.5	-13.7	-1.9	-0.1	-14.8	-10.5	-17.1	-10.3	-16.4	-16.4	-0.6	-17.6
To Seq. Ck. Marsh (surface)	-1.1	-0.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.3	0.0
Subsurface Outflows	-1.3	-1.0	-1.3	-1.0	-0.8	-1.1	-1.1	-1.3	-1.1	-1.3	-1.6	-0.9	-1.2
Change in Storage	-2.7	-5.5	0.4	-7.5	-8.6	-0.3	0.9	4.8	2.5	5.6	6.0	-5.1	1.5
Predicted WSE in feet													
Bell	218.34	217.88	217.91	217.28	216.57	216.54	216.62	217.02	217.22	217.69	218.19	217.77	217.89
McKay	216.19	215.73	215.76	215.13	214.42	214.39	214.47	214.87	215.07	215.54	216.04	215.62	215.74
Hamer	214.41	213.95	213.98	213.35	212.64	212.61	212.69	213.09	213.29	213.76	214.26	213.84	213.96
Observed WSE ('04) in feet													
Bell						216.36	217.40	217.36	217.72	218.30	219.11	217.92	216.95
McKay	216.19	215.81	214.71	214.26				213.70	213.84	214.35	215.15	214.68	213.74
Hamer	214.41	214.17	213.61	213.34	212.76	211.93	212.68	212.95	213.27	213.50	213.93	213.69	213.28

Table F-13. Water Balance for Bell, McKay, and Hamer Marshes with Mining - Low Groundwater

Monthly Average in Inches of Water — WY2006

Hydrologic Process	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr
Precipitation	5.4	3.9	3.8	1.4	0.2	1.6	3.3	6.7	6.5	12.2	3.2	2.6	3.9
Surface Water Inflows	28.7	16.4	15.5	3.2	0.0	6.0	25.4	69.0	42.9	100.4	10.5	8.7	16.1
Runoff from Ft. Lewis - Outfall 002	17.6	10.1	9.5	1.9	0.0	3.6	15.6	42.2	26.2	60.5	6.5	5.3	9.9
Runoff from Ft. Lewis - Outfall 003	11.1	6.3	6.0	1.4	0.0	2.4	9.8	26.8	16.7	39.9	4.1	3.4	6.2
Evapotranspiration	-2.0	-3.2	-3.7	-4.5	-4.0	-2.3	-1.0	-0.5	0.0	0.0	-0.6	-1.3	-2.0
Recharge (-) Discharge (+)	-2.1	-2.1	-3.3	-4.5	-12.0	-9.6	-6.7	1.3	-1.1	0.0	-2.8	-2.3	-2.6
Surface Water Outflows	-23.1	-13.6	-12.9	-3.4	-0.2	-4.9	-19.2	-57.8	-35.7	-95.2	-10.4	-8.9	-14.1
To Diversion Canal	-23.1	-12.6	-11.9	-2.8	-0.2	-4.9	-19.2	-57.8	-35.7	-95.2	-7.9	-6.5	-12.4
To Seq. Ck. Marsh (surface)	0.0	-1.1	-1.0	-0.5	0.0	0.0	0.0	0.0	0.0	0.0	-2.4	-2.4	-1.7
Subsurface Outflows	-1.6	-1.5	-1.3	-1.0	-0.4	-0.3	-0.8	-2.3	-1.7	-2.2	-1.3	-1.4	-1.4
Change in Storage	5.3	-0.2	-1.9	-8.8	-16.3	-9.5	1.0	16.5	10.8	15.2	-1.4	-2.6	-0.1
Predicted WSE in feet													
Bell	218.34	218.32	218.17	217.43	216.07	215.28	215.36	216.74	217.64	218.90	218.79	218.57	218.56
McKay	216.19	216.17	216.02	215.28	213.92	213.57	213.65	215.02	215.92	217.19	217.07	216.85	216.85
Hamer	214.41	214.39	214.24	213.50	212.14	211.35	211.43	212.81	213.71	214.97	214.86	214.64	214.63
Observed WSE ('04) in feet													
Bell			218.33	217.05	215.63			218.25	217.95				
McKay	216.07	215.43	214.48	213.57				214.39	214.34	216.95	216.28	216.60	216.49
Hamer	214.26	214.05	213.69	213.13	212.13	211.67	211.69	213.20	213.27	214.09	213.65	214.13	214.14

Table F-13. Water Balance for Bell, McKay, and Hamer Marshes with Mining - Low Groundwater

Monthly Average in Inches of Water	WY2007												
Hydrologic Process	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May
Precipitation	2.1	2.2	0.4	0.0	0.8	1.6	14.4	8.6	6.5	4.5	5.7	1.7	1.1
Surface Water Inflows	6.7	6.8	0.0	0.0	1.1	5.9	153.8	58.3	33.0	16.8	26.1	4.3	2.2
Runoff from Ft. Lewis - Outfall 002	4.1	4.1	0.0	0.0	0.5	3.5	92.3	35.4	20.2	10.3	16.0	2.6	1.2
Runoff from Ft. Lewis - Outfall 003	2.6	2.7	0.0	0.0	0.6	2.4	61.5	22.8	12.8	6.5	10.1	1.7	1.0
Evapotranspiration	-3.2	-3.7	-4.5	-4.0	-2.3	-1.0	-0.5	0.0	0.0	-0.6	-1.3	-2.0	-3.2
Recharge (-) Discharge (+)	-0.5	-1.4	-1.9	-2.5	-2.9	-4.1	5.9	1.8	-0.5	-1.2	-0.6	-2.1	-1.8
Surface Water Outflows	-6.9	-6.0	-0.4	0.0	-1.7	-4.8	-150.9	-51.3	-35.3	-17.9	-28.0	-6.0	-3.3
To Diversion Canal	-5.1	-5.2	-0.4	0.0	-1.7	-4.8	-150.9	-51.3	-32.5	-15.2	-24.9	-3.2	-1.7
To Seq. Ck. Marsh (surface)	-1.8	-0.9	0.0	0.0	0.0	0.0	0.0	0.0	-2.8	-2.8	-3.1	-2.8	-1.5
Subsurface Outflows	-1.6	-1.3	-1.2	-1.0	-0.8	-0.7	-2.2	-2.4	-2.0	-1.6	-1.9	-1.5	-1.5
Change in Storage	-3.4	-3.5	-7.6	-7.5	-5.9	-3.0	20.5	14.9	1.7	0.0	0.0	-5.6	-6.5
Predicted WSE in feet													
Bell	218.28	217.99	217.35	216.73	216.24	215.99	217.70	218.94	219.08	219.08	219.08	218.62	218.08
McKay	216.57	216.27	215.64	215.02	214.52	214.27	215.98	217.22	217.37	217.37	217.37	216.90	216.36
Hamer	214.35	214.06	213.42	212.80	212.31	212.06	213.77	215.01	215.15	215.15	215.15	214.69	214.15
Observed WSE ('04) in feet													
Bell			218.46	217.75	217.19	216.57							
McKay	216.06	216.27	214.34	213.60			216.87	217.29	217.02	216.97	216.90	217.35	216.64
Hamer	214.89	214.08	213.26	212.65	212.31	212.19	214.53	215.05	214.60	214.64	214.72	214.14	214.21

Table F-13. Water Balance for Bell, McKay, and Hamer Marshes with Mining - Low Groundwater

Monthly Average in Inches of Water						WY2008							
Hydrologic Process	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
Precipitation	2.7	1.5	1.0	1.7	5.0	2.8	7.7	4.2	3.6	4.9	1.8	1.3	1.7
Surface Water Inflows	9.1	4.3	2.1	5.8	29.4	11.0	49.4	18.6	12.9	22.0	4.5	2.8	4.4
Runoff from Ft. Lewis - Outfall 002	5.6	2.5	1.1	3.5	18.0	6.7	30.1	11.4	7.9	13.5	2.7	1.6	2.6
Runoff from Ft. Lewis - Outfall 003	3.5	1.7	1.0	2.3	11.4	4.3	19.3	7.2	5.0	8.5	1.8	1.2	1.8
Evapotranspiration	-3.7	-4.5	-4.0	-2.3	-1.0	-0.5	0.0	0.0	-0.6	-1.3	-2.0	-3.2	-3.7
Recharge (-) Discharge (+)	-2.3	-1.7	-1.8	-1.0	-0.5	-1.5	0.2	-1.6	-2.3	-2.4	-2.6	-1.1	-2.8
Surface Water Outflows	-7.1	-3.5	-2.2	-4.6	-23.4	-8.3	-42.6	-16.5	-12.3	-20.1	-6.3	-4.0	-3.6
To Diversion Canal	-6.9	-3.5	-2.2	-4.6	-23.4	-8.3	-42.6	-14.4	-9.8	-17.4	-3.5	-2.5	-3.5
To Seq. Ck. Marsh (surface)	-0.3	0.0	0.0	0.0	0.0	0.0	0.0	-2.1	-2.4	-2.7	-2.8	-1.6	-0.1
Subsurface Outflows	-1.4	-1.3	-1.1	-1.2	-1.5	-1.4	-2.2	-1.8	-1.6	-1.8	-1.4	-1.6	-1.2
Change in Storage	-2.7	-5.2	-6.0	-1.7	7.9	2.2	12.5	2.9	-0.2	1.4	-6.1	-5.8	-5.3
Predicted WSE in feet													
Bell	217.85	217.42	216.92	216.78	217.44	217.62	218.67	218.91	218.90	219.01	218.51	218.02	217.58
McKay	216.14	215.70	215.20	215.06	215.73	215.91	216.95	217.19	217.18	217.30	216.79	216.31	215.86
Hamer	213.92	213.49	212.99	212.85	213.51	213.69	214.74	214.98	214.97	215.08	214.58	214.09	213.65
Observed WSE ('04) in feet													
Bell				218.18									
McKay	216.01	214.98	214.26	213.68	215.97	214.67	216.83	216.83	216.91	216.98	215.93	215.06	214.63
Hamer	213.85	213.68	213.29	213.04	213.88	213.81	214.52	214.47	214.43	214.52	214.23	214.75	213.55

Table F-13. Water Balance for Bell, McKay, and Hamer Marshes with Mining - Low Groundwater

Monthly Average in Inches of Water WY2009

Hydrologic Process	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul
Precipitation	0.9	2.1	0.5	2.6	8.3	5.2	7.3	1.6	5.3	3.5	3.4	1.3	0.0
Surface Water Inflows	1.5	8.3	0.2	11.8	64.3	27.5	41.4	3.6	25.4	12.9	13.2	3.0	0.0
Runoff from Ft. Lewis - Outfall 002	0.8	5.0	0.0	7.2	39.1	16.9	25.3	2.1	15.6	7.9	8.1	1.7	0.0
Runoff from Ft. Lewis - Outfall 003	0.8	3.3	0.2	4.6	25.2	10.6	16.1	1.5	9.8	5.0	5.1	1.3	0.0
Evapotranspiration	-4.5	-4.0	-2.3	-1.0	-0.5	0.0	0.0	-0.6	-1.3	-2.0	-3.2	-3.7	-4.5
Recharge (-) Discharge (+)	-3.0	-3.1	-2.5	-3.0	2.6	-1.2	-1.7	-3.0	-2.3	-2.9	-2.2	-3.0	-4.6
Surface Water Outflows	-1.9	-6.3	-0.7	-8.9	-56.3	-22.0	-36.0	-5.2	-22.0	-12.1	-12.0	-4.0	0.0
To Diversion Canal	-1.9	-6.3	-0.7	-8.9	-56.3	-22.0	-35.3	-2.8	-20.3	-9.8	-10.0	-2.7	0.0
To Seq. Ck. Marsh (surface)	0.0	0.0	0.0	0.0	0.0	0.0	-0.6	-2.4	-1.7	-2.3	-2.0	-1.3	0.0
Subsurface Outflows	-1.1	-1.0	-0.8	-0.8	-1.8	-1.7	-1.9	-1.4	-1.8	-1.5	-1.6	-1.2	-0.9
Change in Storage	-8.1	-4.0	-5.6	0.7	16.6	7.8	9.1	-5.0	3.2	-2.1	-2.4	-7.6	-10.0
Predicted WSE in feet													
Bell	216.91	216.57	216.11	216.16	217.55	218.20	218.95	218.54	218.81	218.63	218.44	217.80	216.97
McKay	215.19	214.86	214.39	214.45	215.83	216.48	217.24	216.83	217.09	216.92	216.72	216.09	215.25
Hamer	212.98	212.64	212.18	212.23	213.62	214.27	215.02	214.61	214.88	214.70	214.51	213.87	213.04
Observed WSE ('04) in feet													
Bell													
McKay					216.11	214.61	216.38	215.34	216.31	215.69	215.73	214.44	
Hamer	212.98	212.63	212.51	212.39	214.37	213.94	214.42	214.08	214.34	214.18	214.24	213.49	212.68

Table F-13. Water Balance for Bell, McKay, and Hamer Marshes with Mining - Low Groundwater

Monthly Average in Inches of Water			WY2010										
Hydrologic Process	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug
Precipitation	1.9	2.8	5.6	8.9	3.0	8.0	3.3	3.3	3.3	4.6	4.3	0.4	0.2
Surface Water Inflows	6.3	12.9	36.8	60.0	11.0	47.2	10.7	12.0	12.2	20.0	17.5	0.0	0.0
Runoff from Ft. Lewis - Outfall 002	3.8	7.9	22.6	36.5	6.7	28.8	6.6	7.4	7.5	12.3	10.7	0.0	0.0
Runoff from Ft. Lewis - Outfall 003	2.5	5.0	14.2	23.6	4.3	18.5	4.1	4.6	4.7	7.7	6.7	0.0	0.0
Evapotranspiration	-4.0	-2.3	-1.0	-0.5	0.0	0.0	-0.6	-1.3	-2.0	-3.2	-3.7	-4.5	-4.0
Recharge (-) Discharge (+)	-3.6	-3.1	-2.1	0.5	-1.2	-0.1	-1.7	-1.2	-1.0	-1.7	-1.6	-3.5	-3.5
Surface Water Outflows	-4.9	-9.7	-29.8	-53.4	-9.3	-45.7	-10.9	-12.0	-11.9	-18.2	-15.9	-0.4	-0.2
To Diversion Canal	-4.9	-9.7	-29.8	-53.4	-8.3	-44.2	-8.1	-9.1	-9.3	-15.7	-13.6	-0.1	-0.2
To Seq. Ck. Marsh (surface)	0.0	0.0	0.0	0.0	-1.0	-1.5	-2.8	-2.9	-2.7	-2.5	-2.4	-0.3	0.0
Subsurface Outflows	-0.9	-1.0	-1.4	-1.9	-1.7	-2.1	-1.8	-1.8	-1.8	-1.8	-1.7	-1.3	-1.1
Change in Storage	-5.1	-0.5	8.0	13.7	1.8	7.4	-0.9	-0.9	-1.1	-0.2	-1.2	-9.3	-8.5
Predicted WSE in feet													
Bell	216.54	216.50	217.17	218.31	218.46	219.08	219.01	218.93	218.84	218.82	218.73	217.95	217.24
McKay	214.83	214.79	215.46	216.60	216.75	217.37	217.29	217.21	217.12	217.11	217.01	216.23	215.52
Hamer	212.61	212.57	213.24	214.38	214.53	215.15	215.08	215.00	214.91	214.89	214.80	214.02	213.31
Observed WSE ('04) in feet													
Bell													
McKay				216.08	215.95	216.60	216.40	216.04	216.36	216.01	215.95	214.27	214.28
Hamer	212.35	212.48	213.05	214.46	214.53	214.80	214.56	214.47	214.59	214.32	214.44	213.62	213.02

Table F-13. Water Balance for Bell, McKay, and Hamer Marshes with Mining - Low Groundwater

Monthly Average in Inches of Water	WY2011												
Hydrologic Process	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Precipitation	4.0	4.2	6.6	7.2	6.1	3.1	7.2	5.7	4.8	2.8	0.8	0.3	1.3
Surface Water Inflows	18.2	20.0	36.4	40.0	28.8	9.7	37.6	25.4	20.0	8.9	0.9	0.0	3.2
Runoff from Ft. Lewis - Outfall 002	11.2	12.3	22.2	24.4	17.6	6.0	23.0	15.5	12.3	5.4	0.4	0.0	1.8
Runoff from Ft. Lewis - Outfall 003	7.0	7.7	14.1	15.6	11.2	3.8	14.7	9.8	7.7	3.5	0.5	0.0	1.3
Evapotranspiration	-2.3	-1.0	-0.5	0.0	0.0	-0.6	-1.3	-2.0	-3.2	-3.7	-4.5	-4.0	-2.3
Recharge (-) Discharge (+)	-1.5	-2.6	-0.6	-1.4	-0.9	-1.5	-0.6	-2.5	-1.8	-1.8	-0.5	-0.5	-1.1
Surface Water Outflows	-14.0	-15.5	-30.4	-37.9	-32.5	-10.1	-40.9	-25.2	-18.8	-9.6	-1.7	-0.3	-2.8
To Diversion Canal	-14.0	-15.5	-30.4	-36.1	-29.4	-7.3	-37.9	-22.3	-15.8	-6.7	-0.7	-0.2	-2.8
To Seq. Ck. Marsh (surface)	0.0	0.0	0.0	-1.8	-3.1	-2.8	-2.9	-3.0	-3.1	-2.9	-1.0	0.0	0.0
Subsurface Outflows	-1.4	-1.5	-1.9	-1.8	-1.5	-1.3	-1.5	-1.4	-1.5	-1.3	-2.7	-2.0	-1.6
Change in Storage	2.9	3.6	9.5	6.0	0.0	-0.6	0.6	0.0	-0.5	-4.7	-7.7	-6.5	-3.5
Predicted WSE in feet													
Bell	217.48	217.78	218.58	219.08	219.08	219.03	219.08	219.08	219.04	218.65	218.00	217.47	217.18
McKay	215.77	216.07	216.86	217.37	217.37	217.31	217.37	217.37	217.33	216.93	216.29	215.75	215.46
Hamer	213.55	213.85	214.65	215.15	215.15	215.10	215.15	215.15	215.11	214.72	214.07	213.54	213.25
Observed WSE ('04) in feet													
Bell													
McKay	214.29	215.23	216.18	216.90	217.01	217.07	217.13						
Hamer	213.60	213.51	214.64	214.45	214.30	214.29	214.28	214.31	214.72	214.68	214.63	214.01	213.35

Table F-13. Water Balance for Bell, McKay, and Hamer Marshes with Mining - Low Groundwater

Monthly Average in Inches of Water	WY2012												WY2013
Hydrologic Process	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct
Precipitation	4.1	6.1	3.2	7.2	3.9	6.8	4.3	3.1	3.3	1.6	0.0	0.1	6.5
Surface Water Inflows	19.3	34.1	12.6	40.0	13.4	33.5	16.5	10.7	11.8	4.3	0.0	0.0	38.6
Runoff from Ft. Lewis - Outfall 002	11.9	20.8	7.7	24.4	8.2	20.5	10.1	6.5	7.3	2.5	0.0	0.0	23.6
Runoff from Ft. Lewis - Outfall 003	7.4	13.2	4.9	15.6	5.2	13.0	6.4	4.1	4.6	1.7	0.0	0.0	15.0
Evapotranspiration	-1.0	-0.5	0.0	0.0	-0.6	-1.3	-2.0	-3.2	-3.7	-4.5	-4.0	-2.3	-1.0
Recharge (-) Discharge (+)	-1.5	-1.8	-2.4	-1.0	-2.1	-0.7	-2.4	-1.3	-1.5	-0.8	-0.7	-1.8	-0.9
Surface Water Outflows	-14.9	-28.1	-10.2	-35.3	-13.2	-36.8	-15.8	-11.0	-11.2	-5.2	0.0	-0.1	-32.2
To Diversion Canal	-14.9	-28.1	-9.5	-34.2	-10.4	-33.7	-12.8	-8.0	-9.0	-3.5	0.0	-0.1	-32.2
To Seq. Ck. Marsh (surface)	0.0	0.0	-0.7	-1.1	-2.8	-3.1	-3.0	-2.9	-2.2	-1.7	0.0	0.0	0.0
Subsurface Outflows	-1.6	-1.8	-1.6	-2.0	-1.4	-1.5	-1.3	-1.4	-1.4	-1.4	-1.3	-1.1	-1.6
Change in Storage	4.3	8.1	1.7	8.8	0.0	0.0	-0.7	-3.1	-2.6	-6.0	-6.0	-5.3	9.5
Predicted WSE in feet													
Bell	217.54	218.21	218.35	219.08	219.08	219.08	219.02	218.76	218.54	218.04	217.54	217.10	217.89
McKay	215.82	216.50	216.63	217.37	217.37	217.37	217.31	217.04	216.83	216.33	215.83	215.39	216.18
Hamer	213.61	214.28	214.42	215.15	215.15	215.15	215.09	214.83	214.61	214.11	213.61	213.17	213.96
Observed WSE ('04) in feet													
Bell					219.68	219.77	219.87	219.91	219.77	219.42	219.07	218.23	218.84
McKay	214.03	214.15	214.78	215.42	215.25	215.08	214.91	214.89	215.43	215.18	214.93	213.70	214.59
Hamer	213.44	213.63	214.25	215.05	214.90	215.03	215.15	215.00	214.78	214.40	214.02	213.24	213.96

Table F-13. Water Balance for Bell, McKay, and Hamer Marshes with Mining - Low Groundwater

Monthly Average in Inches of Water — WY2014

Hydrologic Process	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov
Precipitation	6.5	7.6	3.5	1.7	3.7	5.5	4.4	1.9	0.0	1.6	6.9	2.6	4.1
Surface Water Inflows	35.4	44.0	12.7	3.9	14.5	24.8	18.5	5.2	0.0	4.8	40.5	9.5	17.3
Runoff from Ft. Lewis - Outfall 002	21.6	26.8	7.8	2.4	8.9	15.2	11.4	3.1	0.0	2.8	24.7	5.8	10.6
Runoff from Ft. Lewis - Outfall 003	13.7	17.2	4.9	1.6	5.6	9.6	7.1	2.1	0.0	1.9	15.8	3.7	6.7
Evapotranspiration	-0.5	0.0	0.0	-0.6	-1.3	-2.0	-3.2	-3.7	-4.5	-4.0	-2.3	-1.0	-0.5
Recharge (-) Discharge (+)	-0.8	0.7	-1.3	-2.2	-1.5	-3.8	-3.2	-2.3	-1.9	-3.2	-0.7	0.4	-0.3
Surface Water Outflows	-29.5	-45.4	-12.7	-5.7	-13.5	-22.5	-17.1	-6.2	0.0	-3.9	-34.1	-7.1	-13.6
To Diversion Canal	-29.5	-43.3	-9.7	-3.0	-11.1	-20.0	-14.4	-4.1	0.0	-3.9	-34.1	-7.1	-13.4
To Seq. Ck. Marsh (surface)	0.0	-2.1	-3.1	-2.7	-2.4	-2.4	-2.7	-2.2	0.0	0.0	0.0	0.0	-0.2
Subsurface Outflows	-1.9	-1.9	-1.6	-1.2	-1.5	-1.3	-1.3	-1.2	-1.2	-1.0	-1.5	-1.6	-1.6
Change in Storage	9.2	5.0	0.6	-3.9	0.5	0.8	-2.0	-6.3	-7.5	-5.8	8.8	2.6	5.3
Predicted WSE in feet													
Bell	218.66	219.08	219.13	218.81	218.85	218.91	218.75	218.23	217.60	217.12	217.85	218.07	218.52
McKay	216.95	217.37	217.42	217.09	217.13	217.20	217.04	216.51	215.89	215.41	216.14	216.36	216.80
Hamer	214.73	215.15	215.20	214.88	214.92	214.98	214.82	214.30	213.67	213.19	213.92	214.14	214.59
Observed WSE ('04) in feet													
Bell	219.44	219.62	219.81	219.57	219.35	219.49	219.46	219.25	218.80	218.09	219.27	219.36	219.48
McKay	215.49	215.65	215.47	215.46	215.49	215.57	215.97	216.22	214.67	213.77	214.98	216.08	216.03
Hamer	214.68	214.86	215.05	214.97	215.11	215.07	214.61	214.57	213.93	213.35	214.07	214.78	214.76

Table F-13. Water Balance for Bell, McKay, and Hamer Marshes with Mining - Low Groundwater

Monthly Average in Inches of Water — WY2015

Hydrologic Process	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Precipitation	2.4	4.2	6.9	9.8	4.5	3.3	1.3	1.2	1.6	1.8	5.9	6.1	4.8
Surface Water Inflows	8.0	18.1	34.5	58.6	17.9	11.8	2.5	2.5	4.2	5.5	31.7	30.4	20.8
Runoff from Ft. Lewis - Outfall 002	4.9	11.1	21.0	35.5	11.0	7.2	1.4	1.4	2.5	3.3	19.4	18.6	12.7
Runoff from Ft. Lewis - Outfall 003	3.1	7.0	13.4	23.1	6.9	4.5	1.1	1.1	1.7	2.2	12.3	11.8	8.0
Evapotranspiration	0.0	0.0	-0.6	-1.3	-2.0	-3.2	-3.7	-4.5	-4.0	-2.3	-1.0	-0.5	0.0
Recharge (-) Discharge (+)	-2.9	-2.1	-1.9	-1.0	-2.2	-0.7	0.0	0.4	-0.3	1.1	0.3	-1.9	-0.2
Surface Water Outflows	-7.6	-15.2	-30.9	-61.7	-17.9	-12.6	-3.7	-3.7	-4.0	-4.3	-25.9	-26.8	-19.4
To Diversion Canal	-6.0	-14.0	-29.1	-58.3	-14.0	-8.9	-1.6	-2.0	-3.4	-4.3	-25.9	-25.0	-16.4
To Seq. Ck. Marsh (surface)	-1.6	-1.2	-1.9	-3.4	-3.9	-3.7	-2.1	-1.7	-0.5	0.0	0.0	-1.7	-3.0
Subsurface Outflows	-1.4	-1.6	-1.6	-1.6	-1.7	-1.6	-1.5	-1.7	-1.5	-1.7	-2.1	-1.9	-2.0
Change in Storage	-1.6	3.3	6.4	2.8	-1.4	-2.9	-5.2	-5.7	-4.0	0.0	8.9	5.5	4.1
Predicted WSE in feet													
Bell	218.38	218.66	219.19	219.43	219.32	219.07	218.64	218.16	217.83	217.84	218.58	219.03	219.37
McKay	216.67	216.94	217.48	217.72	217.60	217.36	216.93	216.45	216.12	216.12	216.86	217.32	217.66
Hamer	214.45	214.73	215.26	215.50	215.39	215.14	214.71	214.23	213.90	213.91	214.65	215.10	215.44
Observed WSE ('04) in feet													
Bell	218.67	219.27	219.76										
McKay	215.03	215.78	216.09	215.95	216.19	215.94	215.82	215.62	215.27	215.36	215.45	215.97	216.17
Hamer	214.33	214.68	215.58	215.43			215.02	214.50	214.15	214.20	214.25	214.93	215.39

Table F-13. Water Balance for Bell, McKay, and Hamer Marshes with Mining - Low Groundwater

Monthly Average in Inches of Water — WY2016

Hydrologic Process	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan
Precipitation	4.1	4.7	4.4	2.1	0.8	0.4	0.2	2.2	1.3	5.0	7.1	12.0	6.9
Surface Water Inflows	16.1	17.6	17.6	5.8	1.0	0.0	0.0	7.7	3.5	31.3	43.2	88.5	34.0
Runoff from Ft. Lewis - Outfall 002	9.9	10.8	10.8	3.5	0.5	0.0	0.0	4.7	2.0	19.2	26.4	53.4	20.8
Runoff from Ft. Lewis - Outfall 003	6.2	6.8	6.8	2.3	0.5	0.0	0.0	3.0	1.5	12.1	16.8	35.1	13.2
Evapotranspiration	0.0	-0.6	-1.3	-2.0	-3.2	-3.7	-4.5	-4.0	-2.3	-1.0	-0.5	0.0	0.0
Recharge (-) Discharge (+)	-1.4	-2.1	-1.2	-2.5	-1.5	-2.1	-1.6	-3.3	-2.3	-4.0	2.5	0.3	-0.9
Surface Water Outflows	-16.4	-18.2	-17.7	-7.9	-1.8	-0.4	-0.2	-5.9	-3.2	-24.9	-36.7	-84.1	-37.4
To Diversion Canal	-12.5	-14.6	-13.7	-4.2	-0.6	-0.2	-0.2	-5.9	-3.2	-24.9	-36.7	-83.7	-33.6
To Seq. Ck. Marsh (surface)	-3.8	-3.6	-4.0	-3.7	-1.2	-0.3	0.0	0.0	0.0	0.0	0.0	-0.4	-3.8
Subsurface Outflows	-1.7	-1.4	-1.8	-1.3	-1.4	-1.3	-1.3	-1.1	-1.0	-1.2	-1.8	-2.1	-1.7
Change in Storage	0.7	0.0	0.0	-5.8	-6.1	-7.1	-7.4	-4.3	-4.0	5.3	13.9	14.6	0.9
Predicted WSE in feet													
Bell	219.43	219.43	219.43	218.94	218.43	217.84	217.23	216.87	216.53	216.97	218.13	219.35	219.43
McKay	217.72	217.72	217.72	217.23	216.72	216.13	215.51	215.15	214.82	215.26	216.42	217.64	217.72
Hamer	215.50	215.50	215.50	215.01	214.50	213.91	213.30	212.94	212.60	213.04	214.20	215.42	215.50
Observed WSE ('04) in feet													
Bell					219.23	219.09	218.69	217.87	217.69	217.50	219.85		
McKay	216.10	215.99	215.89	215.65	215.44	214.58	213.88				215.69	216.17	
Hamer	215.29	215.29	215.29	215.26	214.68	213.91	213.36	212.70	212.67	212.64	215.55		

Table F-13. Water Balance for Bell, McKay, and Hamer Marshes with Mining - Low Groundwater

Monthly Average in Inches of Water — WY2017

Hydrologic Process	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
Precipitation	5.8	5.9	1.8	1.0	2.3	1.3	0.2	1.5	9.3	6.9	3.9	3.4	8.6
Surface Water Inflows	24.6	27.1	4.4	1.6	7.0	2.9	0.0	4.1	65.7	36.3	15.2	12.4	42.9
Runoff from Ft. Lewis - Outfall 002	15.1	16.6	2.6	0.9	4.2	1.7	0.0	2.4	39.9	22.2	9.4	7.6	26.1
Runoff from Ft. Lewis - Outfall 003	9.5	10.5	1.8	0.7	2.7	1.2	0.0	1.7	25.8	14.1	5.9	4.8	16.8
Evapotranspiration	-0.6	-1.3	-2.0	-3.2	-3.7	-4.5	-4.0	-2.3	-1.0	-0.5	0.0	0.0	-0.6
Recharge (-) Discharge (+)	-0.8	-0.9	0.1	1.1	0.9	1.0	-0.2	0.0	-3.4	0.8	0.5	-0.9	-0.9
Surface Water Outflows	-27.3	-29.1	-6.2	-2.6	-7.6	-4.2	-0.2	-3.4	-58.8	-31.6	-14.9	-13.3	-47.5
To Diversion Canal	-23.6	-25.1	-2.9	-0.9	-5.3	-2.5	-0.1	-3.4	-58.8	-30.5	-11.7	-9.4	-44.0
To Seq. Ck. Marsh (surface)	-3.7	-4.0	-3.2	-1.7	-2.3	-1.7	-0.1	0.0	0.0	-1.0	-3.2	-3.8	-3.4
Subsurface Outflows	-1.7	-1.7	-1.7	-1.9	-1.8	-1.8	-1.6	-1.6	-1.7	-2.2	-2.0	-1.9	-1.6
Change in Storage	0.0	0.0	-3.6	-4.0	-2.9	-5.2	-5.7	-1.8	10.0	9.7	2.7	-0.2	0.9
Predicted WSE in feet													
Bell	219.43	219.43	219.13	218.80	218.56	218.12	217.65	217.50	218.34	219.15	219.37	219.35	219.43
McKay	217.72	217.72	217.41	217.08	216.85	216.41	215.94	215.79	216.63	217.43	217.65	217.64	217.72
Hamer	215.50	215.50	215.20	214.87	214.63	214.19	213.72	213.57	214.41	215.22	215.44	215.42	215.50
Observed WSE ('04) in feet													
Bell							219.47		218.88				
McKay					215.60	215.55	214.85		214.09	215.95	216.30	216.16	216.16
Hamer					212.25	214.62	213.94		213.45	215.32			

Table F-13. Water Balance for Bell, McKay, and Hamer Marshes with Mining - Low Groundwater

Monthly Average in Inches of Water — WY2018

Hydrologic Process	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar
Precipitation	8.7	4.6	2.8	1.8	0.0	0.1	1.0	5.2	7.2	5.8	7.2	3.3	2.3
Surface Water Inflows	48.5	18.4	9.3	4.6	0.0	0.0	1.8	26.6	38.8	26.6	36.8	10.6	7.0
Runoff from Ft. Lewis - Outfall 002	29.5	11.3	5.7	2.7	0.0	0.0	0.9	16.3	23.7	16.3	22.4	6.5	4.3
Runoff from Ft. Lewis - Outfall 003	19.0	7.1	3.6	1.8	0.0	0.0	0.8	10.3	15.1	10.3	14.3	4.1	2.7
Evapotranspiration	-1.3	-2.0	-3.2	-3.7	-4.5	-4.0	-2.3	-1.0	-0.5	0.0	0.0	-0.6	-1.3
Recharge (-) Discharge (+)	1.5	-1.0	0.0	1.1	1.9	2.6	0.8	1.2	-1.0	0.6	0.2	-0.1	0.9
Surface Water Outflows	-55.3	-18.4	-11.0	-6.3	0.0	-0.1	-2.0	-21.3	-34.4	-27.3	-42.4	-11.6	-9.2
To Diversion Canal	-51.3	-14.5	-7.0	-3.5	0.0	0.0	-1.9	-21.3	-32.9	-24.1	-38.3	-8.0	-5.3
To Seq. Ck. Marsh (surface)	-4.0	-3.9	-4.0	-2.9	0.0	-0.1	-0.1	0.0	-1.5	-3.2	-4.0	-3.6	-3.9
Subsurface Outflows	-2.2	-1.9	-1.9	-1.9	-2.1	-2.3	-2.0	-2.5	-2.2	-2.2	-1.9	-1.9	-2.0
Change in Storage	0.0	-0.1	-3.9	-4.5	-4.7	-3.7	-2.7	8.2	7.9	3.5	0.0	-0.3	-2.3
Predicted WSE in feet													
Bell	219.43	219.42	219.09	218.72	218.33	218.02	217.79	218.48	219.14	219.43	219.43	219.41	219.22
McKay	217.72	217.71	217.38	217.00	216.61	216.30	216.08	216.77	217.42	217.72	217.72	217.69	217.50
Hamer	215.50	215.49	215.16	214.79	214.40	214.09	213.86	214.55	215.21	215.50	215.50	215.48	215.29
Observed WSE ('04) in feet													
Bell							219.80						
McKay	216.28	216.12		215.96	216.02	215.96	216.12			216.35		216.30	216.35
Hamer				215.45	214.76	213.95	213.83						

Table F-13. Water Balance for Bell, McKay, and Hamer Marshes with Mining - Low Groundwater

Monthly Average in Inches of Water — WY2019

Hydrologic Process	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr
Precipitation	6.1	0.7	0.9	0.2	0.3	1.8	4.0	3.8	6.4	3.4	4.8	1.6	3.6
Surface Water Inflows	27.5	0.3	1.3	0.0	0.0	5.5	18.6	16.9	33.7	12.8	18.6	3.7	13.4
Runoff from Ft. Lewis - Outfall 002	16.8	0.0	0.6	0.0	0.0	3.3	11.4	10.4	20.6	7.8	11.4	2.2	8.2
Runoff from Ft. Lewis - Outfall 003	10.7	0.3	0.6	0.0	0.0	2.2	7.2	6.5	13.1	4.9	7.2	1.5	5.2
Evapotranspiration	-2.0	-3.2	-3.7	-4.5	-4.0	-2.3	-1.0	-0.5	0.0	0.0	-0.6	-1.3	-2.0
Recharge (-) Discharge (+)	-1.5	-0.8	-0.5	0.0	-0.9	-0.2	-2.2	0.6	1.3	0.2	-1.3	-1.0	-3.1
Surface Water Outflows	-25.9	-1.0	-2.2	-0.2	-0.3	-4.3	-14.3	-12.9	-28.0	-12.4	-17.5	-5.3	-12.8
To Diversion Canal	-22.6	-0.2	-0.8	0.0	-0.3	-4.3	-14.3	-12.9	-27.9	-9.7	-14.7	-2.4	-10.2
To Seq. Ck. Marsh (surface)	-3.3	-0.8	-1.4	-0.2	0.0	0.0	0.0	0.0	0.0	-2.7	-2.7	-2.8	-2.6
Subsurface Outflows	-1.8	-1.8	-1.8	-1.9	-1.6	-1.7	-1.8	-2.1	-2.5	-2.2	-1.8	-1.8	-1.6
Change in Storage	2.4	-5.9	-5.9	-6.3	-6.5	-1.3	3.2	5.7	10.9	1.8	2.3	-4.1	-2.5
Predicted WSE in feet													
Bell	219.42	218.93	218.43	217.90	217.36	217.26	217.53	218.00	218.91	219.06	219.25	218.91	218.70
McKay	217.70	217.21	216.72	216.19	215.65	215.54	215.81	216.29	217.20	217.34	217.54	217.20	216.99
Hamer	215.49	215.00	214.50	213.97	213.43	213.33	213.60	214.07	214.98	215.13	215.32	214.98	214.77
Observed WSE ('04) in feet													
Bell				219.79	219.20	219.09	218.29					219.89	219.77
McKay	216.38	214.68	214.31	214.30	213.97	213.79		214.25	214.52	214.67	215.96	214.44	214.37
Hamer		215.01	214.47	214.10	213.30	213.11	212.99	213.63	214.85		215.27	214.79	214.64

Table F-13. Water Balance for Bell, McKay, and Hamer Marshes with Mining - Low Groundwater

Monthly Average in Inches of Water	WY2020												
Hydrologic Process	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May
Precipitation	1.1	0.7	1.0	0.8	3.5	3.9	1.7	6.5	9.6	4.2	3.5	1.5	3.1
Surface Water Inflows	2.1	0.4	2.0	1.4	18.1	21.8	5.7	38.7	65.6	15.9	12.9	3.7	12.1
Runoff from Ft. Lewis - Outfall 002	1.2	0.1	1.1	0.6	11.1	13.4	3.4	23.7	39.8	9.8	7.9	2.2	7.4
Runoff from Ft. Lewis - Outfall 003	1.0	0.3	0.9	0.7	7.0	8.4	2.3	15.0	25.8	6.1	5.0	1.5	4.7
Evapotranspiration	-3.2	-3.7	-4.5	-4.0	-2.3	-1.0	-0.5	0.0	0.0	-0.6	-1.3	-2.0	-3.2
Recharge (-) Discharge (+)	-2.9	-2.5	-3.1	-3.5	-2.2	0.9	0.3	-2.2	1.7	-1.8	-4.6	-2.9	-2.5
Surface Water Outflows	-3.2	-1.0	-2.2	-1.9	-13.7	-16.8	-4.5	-32.3	-59.2	-15.2	-13.0	-5.2	-10.1
To Diversion Canal	-1.6	-0.8	-2.2	-1.9	-13.7	-16.8	-4.5	-32.3	-59.2	-12.3	-9.8	-2.9	-9.1
To Seq. Ck. Marsh (surface)	-1.6	-0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-2.8	-3.2	-2.3	-1.0
Subsurface Outflows	-1.4	-1.2	-1.2	-0.9	-1.2	-1.7	-1.3	-1.4	-2.4	-1.7	-1.3	-1.1	-1.2
Change in Storage	-7.5	-7.5	-7.9	-8.2	2.1	7.2	1.4	9.4	15.3	0.9	-3.7	-6.0	-1.9
Predicted WSE in feet													
Bell	218.08	217.45	216.79	216.11	216.29	216.89	217.00	217.78	219.06	219.14	218.83	218.33	218.17
McKay	216.36	215.74	215.08	214.40	214.57	215.17	215.29	216.07	217.35	217.42	217.11	216.61	216.46
Hamer	214.15	213.52	212.86	212.18	212.36	212.96	213.07	213.85	215.13	215.21	214.90	214.40	214.24
Observed WSE ('04) in feet													
Bell		218.58	217.47	216.86		218.20				219.71			
McKay		213.99			214.92			213.72	215.28	214.65			
Hamer		213.47	212.68		212.25			213.55	215.55	215.03			

Table F-13. Water Balance for Bell, McKay, and Hamer Marshes with Mining - Low Groundwater

Monthly Average in Inches of Water	WY2021												
Hydrologic Process	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
Precipitation	2.5	0.3	0.4	2.8	3.0	5.6	5.2	7.3	4.7	2.5	1.2	2.0	2.4
Surface Water Inflows	8.1	0.0	0.0	12.9	14.7	29.6	25.3	37.3	17.8	7.9	2.1	5.7	7.3
Runoff from Ft. Lewis - Outfall 002	4.9	0.0	0.0	7.9	9.0	18.1	15.5	22.8	10.9	4.8	1.2	3.5	4.5
Runoff from Ft. Lewis - Outfall 003	3.2	0.0	0.0	5.0	5.7	11.5	9.8	14.5	6.9	3.1	0.9	2.3	2.9
Evapotranspiration	-3.7	-4.5	-4.0	-2.3	-1.0	-0.5	0.0	0.0	-0.6	-1.3	-2.0	-3.2	-3.7
Recharge (-) Discharge (+)	-1.7	-3.0	-3.5	-1.5	0.4	3.5	5.4	4.8	3.0	4.2	2.2	3.8	3.7
Surface Water Outflows	-6.7	-0.3	-0.4	-9.7	-11.0	-23.9	-20.9	-46.4	-23.3	-11.2	-3.3	-7.8	-8.9
To Diversion Canal	-6.1	-0.3	-0.4	-9.7	-11.0	-23.9	-20.3	-42.7	-19.7	-7.2	-1.1	-4.3	-5.5
To Seq. Ck. Marsh (surface)	-0.5	0.0	0.0	0.0	0.0	0.0	-0.7	-3.7	-3.6	-4.0	-2.2	-3.5	-3.3
Subsurface Outflows	-1.2	-0.9	-0.7	-0.9	-0.9	-1.0	-1.5	-1.8	-1.7	-2.1	-1.7	-1.7	-1.5
Change in Storage	-2.6	-8.5	-8.2	1.3	5.2	13.3	13.5	1.2	0.0	0.0	-1.4	-1.1	-0.6
Predicted WSE in feet													
Bell	217.95	217.25	216.56	216.67	217.10	218.21	219.33	219.43	219.43	219.43	219.31	219.22	219.17
McKay	216.24	215.53	214.85	214.96	215.39	216.49	217.61	217.72	217.72	217.72	217.59	217.50	217.45
Hamer	214.02	213.32	212.63	212.74	213.17	214.28	215.40	215.50	215.50	215.50	215.38	215.29	215.24
Observed WSE ('04) in feet													
Bell					217.23			219.68			219.71	219.41	218.99
McKay						213.87		214.86	214.88	215.59	214.57	214.46	214.38
Hamer						213.15		215.23	215.30	214.89	214.51	214.01	213.58

Table F-13. Water Balance for Bell, McKay, and Hamer Marshes with Mining - Low Groundwater

Monthly Average in Inches of Water	WY2021		
Hydrologic Process	Jul	Aug	Sep
Precipitation	0.0	0.3	2.6
Surface Water Inflows	0.0	0.0	8.3
Runoff from Ft. Lewis - Outfall 002	0.0	0.0	5.1
Runoff from Ft. Lewis - Outfall 003	0.0	0.0	3.2
Evapotranspiration	-4.5	-4.0	-2.3
Recharge (-) Discharge (+)	5.3	2.1	2.5
Surface Water Outflows	0.0	-0.3	-8.7
To Diversion Canal	0.0	0.0	-6.3
To Seq. Ck. Marsh (surface)	0.0	-0.2	-2.4
Subsurface Outflows	-1.5	-1.5	-1.7
Change in Storage	-0.7	-3.4	0.7
Predicted WSE in feet			
Bell	219.11	218.83	218.89
McKay	217.40	217.11	217.17
Hamer	215.18	214.90	214.96
Observed WSE ('04) in feet			
Bell	218.05		
McKay		213.27	
Hamer	212.68	212.25	

Table F-14. Water Balance for East Edmond Marsh with Mining - Low Groundwater

Monthly Average in Inches of Water	WY2004						WY2005						
Hydrologic Process	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar
Precipitation	2.0	1.0	3.8	0.9	0.1	3.6	2.9	4.0	3.2	4.3	4.3	0.6	4.5
Surface Water Inflows	0.3	0.9	0.1	0.0	0.0	0.2	0.1	0.2	0.1	0.2	0.2	0.3	0.2
From Sequalitchew Lake	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
From Center Drive	0.1	0.0	0.1	0.0	0.0	0.2	0.1	0.2	0.1	0.2	0.2	0.0	0.2
From Hamer (surface)	1.0	0.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.0
Subsurface Inflows	1.2	0.9	1.2	0.9	0.8	0.9	1.0	1.1	1.0	1.3	1.5	0.9	1.1
Evapotranspiration	-1.3	-2.0	-3.2	-3.7	-4.5	-4.0	-2.3	-1.0	-0.5	0.0	0.0	-0.6	-1.3
Recharge (-) Discharge (+)	*-5.7*	*-4.2*	*-3.4*	*-2.1*	*-1.0*	*-2.2*	*-0.9*	*-1.0*	*-1.9*	*-1.9*	*-2.5*	*-2.7*	*-4.1*
Surface Water Outflows	1.1	0.0	-0.6	0.0	0.0	0.0	0.0	0.0	-0.2	-0.3	-0.4	0.0	-0.4
To Diversion Canal	-1.5	0.0	-0.4	0.0	0.0	0.0	0.0	0.0	-0.1	-0.2	-0.3	0.0	-0.3
To West Edmond Marsh	2.0	0.0	-0.2	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1	-0.2	0.0	-0.2
Change in Storage	-1.5	-3.4	-1.7	-3.9	-4.6	-1.5	0.8	3.3	1.8	3.8	3.3	-1.4	0.2
Predicted WSE in ft													
EM-2S	212.62	212.26	212.12	211.80	211.41	211.29	211.35	211.63	211.78	212.10	212.37	212.23	212.25
East Edmond	212.62	212.33	212.17	211.85	211.47	211.43	211.50	211.77	211.92	212.22	212.49	212.37	212.37
Eastern East Edmond Marsh	212.36	212.07	211.77	211.44	211.06	210.92	210.99	211.26	211.36	211.61	211.78	211.66	211.55
Observed WSE in ft													
EM-2S	210.72	210.74	210.76	210.70	210.40	209.82	209.92	210.33	210.61	210.76	210.86	210.79	210.64
East Edmond (EM-2E)	212.62	212.50	212.35	212.25	211.85	211.43	211.43	211.80	212.12	212.31	212.47	212.40	212.19
East Edmond (EM-2W)	211.15	211.15	211.22	211.20	210.91	210.32	210.41	210.80	211.08	211.20	211.26	211.24	211.09
East Edmond (EM-3E)	212.42	212.29	212.14	212.04	211.69	211.07	211.43	211.70	211.93	212.09	212.15	212.17	211.97
East Edmond (EM-3W)	212.42	212.29	212.15	212.04	211.70	211.10	211.57	211.70	211.94	212.04	212.26	212.20	211.98
Eastern East Edmond (SCM-1)	212.39	212.26	212.09	211.98	211.58	210.96	211.20	211.63	211.84	212.08	212.27	212.17	211.95

Table F-14. Water Balance for East Edmond Marsh with Mining - Low Groundwater

Monthly Average in Inches of Water — WY2006

Hydrologic Process	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr
Precipitation	5.4	3.9	3.8	1.4	0.2	1.6	3.3	6.7	6.5	12.2	3.2	2.6	3.9
Surface Water Inflows	0.2	1.2	1.1	0.6	0.0	0.1	0.2	0.3	0.3	0.6	2.5	2.4	1.8
From Sequalitchew Lake	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
From Center Drive	0.2	0.2	0.1	0.0	0.0	0.1	0.2	0.3	0.3	0.6	0.1	0.1	0.1
From Hamer (surface)	0.0	1.1	1.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0	2.4	2.3	1.7
Subsurface Inflows	1.5	1.5	1.3	1.0	0.3	0.3	0.5	1.4	1.5	2.0	1.3	1.4	1.4
Evapotranspiration	-2.0	-3.2	-3.7	-4.5	-4.0	-2.3	-1.0	-0.5	0.0	0.0	-0.6	-1.3	-2.0
Recharge (-) Discharge (+)	*-2.1*	*-2.6*	*-1.4*	*-2.6*	*-3.4*	*-4.8*	*-3.9*	*-1.0*	*-2.7*	*-1.6*	*-3.9*	*-4.3*	*-3.5*
Surface Water Outflows	-0.5	-0.4	-0.5	-0.4	0.0	0.0	0.0	0.0	0.0	-5.0	-0.7	-0.9	-1.3
To Diversion Canal	-0.2	-0.3	-0.3	-0.3	0.0	0.0	0.0	0.0	0.0	0.0	-0.4	-0.5	-0.4
To West Edmond Marsh	-0.3	-0.2	-0.3	-0.2	0.0	0.0	0.0	0.0	0.0	-5.9	-0.3	-0.5	-1.1
Change in Storage	2.8	0.6	0.8	-4.3	-6.9	-5.1	-1.0	7.0	5.7	7.3	2.3	0.3	0.5
Predicted WSE in ft													
EM-2S	212.47	212.44	212.43	212.02	211.44	211.02	210.93	211.51	211.98	212.59	212.57	212.40	212.31
East Edmond	212.58	212.61	212.66	212.28	211.71	211.43	211.43	212.01	212.48	212.60	212.76	212.74	212.70
Eastern East Edmond Marsh	211.70	211.63	211.60	211.13	210.55	210.12	210.04	210.62	211.09	212.16	212.20	212.06	212.01
Observed WSE in ft													
EM-2S	210.94	210.90	210.69	210.42	209.82	209.15	209.21	210.48	210.71	210.98	210.88	210.58	210.57
East Edmond (EM-2E)	212.55	212.63	212.47	212.13	211.43	211.43	211.43	211.89	212.22	212.63	212.62	212.51	212.55
East Edmond (EM-2W)	211.28	211.32	211.14	210.88	210.28	209.64	209.67	210.87	211.12	211.31	211.25	210.92	210.89
East Edmond (EM-3E)	212.32	212.40	212.26	211.92	211.13			211.78	212.02	212.42	212.37	212.27	212.30
East Edmond (EM-3W)	212.50	212.41	212.25	211.92	211.15	210.44	210.58	211.75	212.02	212.42	212.38	212.26	212.29
Eastern East Edmond (SCM-1)	212.25	212.43	212.29	211.88	211.08	210.95	210.57	211.69	211.99	212.58	212.47	212.20	212.32

Table F-14. Water Balance for East Edmond Marsh with Mining - Low Groundwater

Monthly Average in Inches of Water WY2007

Hydrologic Process	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May
Precipitation	2.1	2.2	0.4	0.0	0.8	1.6	14.4	8.6	6.5	4.5	5.7	1.7	1.1
Surface Water Inflows	1.8	0.9	0.0	0.0	0.0	0.1	0.7	0.4	3.2	3.2	3.5	3.1	1.6
From Sequalitchew Lake	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
From Center Drive	0.1	0.1	0.0	0.0	0.0	0.1	0.7	0.4	0.3	0.2	0.2	0.1	0.0
From Hamer (surface)	1.7	0.9	0.0	0.0	0.0	0.0	0.0	0.0	2.9	3.0	3.3	3.1	1.6
Subsurface Inflows	1.5	1.3	1.2	1.0	0.7	0.6	2.0	2.2	2.1	1.8	2.1	1.7	1.5
Evapotranspiration	-3.2	-3.7	-4.5	-4.0	-2.3	-1.0	-0.5	0.0	0.0	-0.6	-1.3	-2.0	-3.2
Recharge (-) Discharge (+)	*-3.3*	*-1.3*	*-2.1*	*0.3*	*-1.4*	*-1.5*	*-0.1*	*0.6*	*-1.6*	*-1.5*	*-0.1*	*-1.9*	*-2.2*
Surface Water Outflows	-0.6	-0.5	0.0	-0.1	0.0	0.0	-5.8	-5.4	-6.2	-4.2	-6.9	-2.2	-0.7
To Diversion Canal	-0.4	-0.3	0.0	-0.1	0.0	0.0	0.0	-0.5	-3.4	-1.1	-2.5	-1.9	-0.5
To West Edmond Marsh	-0.3	-0.2	0.0	0.0	0.0	0.0	-6.7	-6.2	-3.7	-4.0	-5.7	-0.4	-0.3
Change in Storage	-1.3	-0.8	-5.0	-2.8	-2.1	-0.2	9.8	5.6	6.5	3.4	4.2	2.3	-1.4
Predicted WSE in ft													
EM-2S	212.06	211.92	211.51	211.28	211.10	211.09	211.90	212.37	212.67	212.70	212.78	212.71	212.46
East Edmond	212.57	212.49	212.07	211.84	211.66	211.65	211.90	211.85	212.09	212.03	211.91	212.06	211.92
Eastern East Edmond Marsh	211.75	211.56	211.15	210.89	210.71	210.69	212.07	212.75	212.43	212.64	212.56	212.10	211.82
Observed WSE in ft													
EM-2S	210.71	210.85	210.62	210.36	210.21	210.06	211.03	211.01	210.90	210.87	210.83	210.79	210.82
East Edmond (EM-2E)	212.55	212.63	212.53	211.36	211.43	211.65	211.87	211.94	211.78	211.79	211.80	211.65	211.73
East Edmond (EM-2W)	211.08	211.28	211.06	210.74	210.64	210.49	211.37	211.37	211.26	211.26	211.22	211.15	211.24
East Edmond (EM-3E)	212.28	212.39	212.04	211.75	211.51	211.32	212.52	212.61	212.44	212.46	212.43	212.30	212.37
East Edmond (EM-3W)	212.27	212.40	212.03	211.75	211.50	211.31	212.51	212.60	212.42	212.42	212.42	212.29	212.36
Eastern East Edmond (SCM-1)	212.26	212.46	211.97	211.70	211.38	211.33	212.58	212.67	212.49	212.48	212.49	212.29	212.44

Table F-14. Water Balance for East Edmond Marsh with Mining - Low Groundwater

Monthly Average in Inches of Water WY2008

Hydrologic Process	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
Precipitation	2.7	1.5	1.0	1.7	5.0	2.8	7.7	4.2	3.6	4.9	1.8	1.3	1.7
Surface Water Inflows	0.4	0.0	0.0	0.1	0.2	0.1	0.4	2.3	2.6	3.1	3.0	1.6	0.2
From Sequalitchew Lake	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
From Center Drive	0.1	0.0	0.0	0.1	0.2	0.1	0.4	0.2	0.1	0.2	0.1	0.0	0.1
From Hamer (surface)	0.3	0.0	0.0	0.0	0.0	0.0	0.0	2.1	2.5	2.9	2.9	1.6	0.1
Subsurface Inflows	1.4	1.3	1.1	1.1	1.4	1.3	2.1	1.9	1.6	1.9	1.5	1.6	1.3
Evapotranspiration	-3.7	-4.5	-4.0	-2.3	-1.0	-0.5	0.0	0.0	-0.6	-1.3	-2.0	-3.2	-3.7
Recharge (-) Discharge (+)	*-1.5*	*0.8*	*-0.1*	*-0.7*	*-0.8*	*-1.2*	*-0.7*	*-2.5*	*-2.0*	*-2.5*	*-2.3*	*-2.5*	*-1.0*
Surface Water Outflows	-0.5	-0.4	-0.3	-0.1	-0.3	-1.4	-4.1	-2.2	-4.2	-2.8	-2.7	-0.7	-0.5
To Diversion Canal	-0.4	-0.3	-0.2	-0.1	-0.1	-0.2	-0.3	-0.6	-1.7	-1.0	-1.6	-0.5	-0.3
To West Edmond Marsh	-0.2	-0.2	-0.1	0.0	-0.3	-1.4	-4.7	-2.0	-3.3	-2.4	-1.4	-0.3	-0.2
Change in Storage	-0.9	-1.0	-2.0	-0.2	4.6	1.2	4.7	3.8	2.1	3.7	0.6	-1.4	-1.8
Predicted WSE in ft													
EM-2S	212.36	212.28	212.12	212.10	212.48	212.58	212.97	213.11	213.08	213.15	212.95	212.70	212.54
East Edmond	211.82	211.73	211.56	211.54	211.89	211.88	211.87	212.02	211.93	212.04	211.96	211.82	211.65
Eastern East Edmond Marsh	211.61	211.42	211.17	211.12	211.50	211.60	212.26	212.54	212.39	212.52	212.09	211.80	211.52
Observed WSE in ft													
EM-2S	210.87	210.86	210.68	210.52	210.85	210.93	211.00	210.98	210.95	210.94	210.83	210.79	210.70
East Edmond (EM-2E)	211.66	211.60	211.45	211.27	211.66	211.77	211.92	211.86	211.80	211.86	211.68	211.69	211.63
East Edmond (EM-2W)	211.30	211.28	211.11	210.95	211.29	211.32	211.37	211.35	211.34	211.32	211.28	211.21	211.15
East Edmond (EM-3E)	212.31	212.23	212.09	211.93	212.32	212.40	212.56	212.50	212.44	212.50	212.37	212.33	212.27
East Edmond (EM-3W)	212.29	212.24	212.09	211.91	212.31	212.40	212.54	212.49	212.43	212.49	212.35	212.33	212.25
Eastern East Edmond (SCM-1)	212.35	212.29	212.13	212.06	212.38	212.48	212.63	212.58	212.52	212.55	212.43	212.39	212.32

Table F-14. Water Balance for East Edmond Marsh with Mining - Low Groundwater

Monthly Average in Inches of Water WY2009

Hydrologic Process	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul
Precipitation	0.9	2.1	0.5	2.6	8.3	5.2	7.3	1.6	5.3	3.5	3.4	1.3	0.0
Surface Water Inflows	0.0	0.1	0.0	0.1	0.4	0.2	1.0	2.6	1.9	2.6	2.1	1.4	0.0
From Sequalitchew Lake	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
From Center Drive	0.0	0.1	0.0	0.1	0.4	0.2	0.3	0.0	0.2	0.1	0.1	0.0	0.0
From Hamer (surface)	0.0	0.0	0.0	0.0	0.0	0.0	0.7	2.5	1.7	2.5	2.0	1.3	0.0
Subsurface Inflows	1.1	0.9	0.7	0.7	1.6	1.7	2.0	1.4	1.8	1.6	1.6	1.2	0.9
Evapotranspiration	-4.5	-4.0	-2.3	-1.0	-0.5	0.0	0.0	-0.6	-1.3	-2.0	-3.2	-3.7	-4.5
Recharge (-) Discharge (+)	*-0.5*	*0.5*	*-0.1*	*-1.8*	*-1.0*	*-2.0*	*-2.2*	*-3.0*	*-3.1*	*-3.4*	*-3.1*	*-2.5*	*-1.8*
Surface Water Outflows	-0.4	-0.1	-0.1	0.0	-1.6	-2.6	-3.4	-1.8	-2.4	-1.4	-0.9	-0.7	0.0
To Diversion Canal	-0.2	-0.1	0.0	0.0	0.0	-0.3	-0.4	-1.5	-0.5	-0.7	-0.5	-0.5	0.0
To West Edmond Marsh	-0.1	0.0	0.0	0.0	-1.9	-2.8	-3.8	-0.4	-2.4	-0.9	-0.5	-0.3	0.0
Change in Storage	-3.2	-0.4	-1.2	0.5	7.0	2.3	4.3	1.6	2.2	1.4	0.2	-2.5	-5.3
Predicted WSE in ft													
EM-2S	212.27	212.24	212.13	212.18	212.76	212.95	213.25	213.17	213.22	213.13	212.98	212.66	212.21
East Edmond	211.43	211.43	211.43	211.47	211.90	211.86	211.91	212.00	211.99	212.03	212.01	211.77	211.43
Eastern East Edmond Marsh	211.17	211.09	210.97	211.01	211.75	212.02	212.51	212.14	212.32	212.25	212.11	211.74	211.29
Observed WSE in ft													
EM-2S	210.43	210.28	210.14	210.00	210.90	210.97	210.95	210.92	210.89	210.87	210.93	210.61	210.18
East Edmond (EM-2E)	211.43	211.43	211.43	211.43	211.72	211.81	211.81	211.76	211.54	211.44	211.72	211.43	211.43
East Edmond (EM-2W)	210.88	210.70	210.56	210.41	211.31	211.34	211.33	211.30	211.36	211.36	211.37	211.04	210.58
East Edmond (EM-3E)	211.92	211.63	211.47	211.30	212.41	212.42	212.44	212.39	212.25	212.31	212.38	211.93	211.59
East Edmond (EM-3W)	211.92	211.67	211.50	211.33	212.32	212.40	212.43	212.37	212.25	212.29	212.36	211.94	211.67
Eastern East Edmond (SCM-1)	211.96	211.71	211.54	211.38	212.39	212.48	212.53	212.47	212.33	212.37	212.44	211.94	211.51

Table F-14. Water Balance for East Edmond Marsh with Mining - Low Groundwater

Monthly Average in Inches of Water WY2010

Hydrologic Process	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug
Precipitation	1.9	2.8	5.6	8.9	3.0	8.0	3.3	3.3	3.3	4.6	4.3	0.4	0.2
Surface Water Inflows	0.1	0.1	0.3	0.4	1.1	1.9	3.2	3.4	2.9	2.8	2.6	0.3	0.0
From Sequalitchew Lake	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
From Center Drive	0.1	0.1	0.3	0.4	0.1	0.4	0.1	0.1	0.1	0.2	0.2	0.0	0.0
From Hamer (surface)	0.0	0.0	0.0	0.0	1.0	1.5	3.1	3.2	2.8	2.6	2.5	0.3	0.0
Subsurface Inflows	0.9	0.9	1.2	1.9	1.8	2.1	2.0	2.0	1.9	1.9	1.8	1.4	1.1
Evapotranspiration	-4.0	-2.3	-1.0	-0.5	0.0	0.0	-0.6	-1.3	-2.0	-3.2	-3.7	-4.5	-4.0
Recharge (-) Discharge (+)	*-1.5*	*-1.3*	*-2.0*	*-1.3*	*-2.5*	*-3.0*	*-2.2*	*-3.4*	*-2.9*	*-3.1*	*-3.0*	*-2.4*	*-1.7*
Surface Water Outflows	-0.2	0.0	0.0	-3.5	-1.5	-3.9	-5.5	-0.9	-2.2	-2.0	-1.3	0.0	0.0
To Diversion Canal	-0.1	0.0	0.0	-0.2	-0.5	-0.5	-2.8	-0.5	-0.6	-0.8	-0.6	0.0	0.0
To West Edmond Marsh	-0.1	0.0	0.0	-4.1	-1.3	-4.3	-3.6	-0.4	-2.0	-1.6	-1.0	0.0	0.0
Change in Storage	-2.7	0.1	4.1	5.3	2.0	4.7	2.1	3.6	1.3	1.3	1.0	-4.8	-4.4
Predicted WSE in ft													
EM-2S	211.98	211.99	212.34	212.78	212.86	213.13	213.05	213.08	212.96	212.85	212.73	212.30	211.93
East Edmond	211.43	211.44	211.78	211.88	211.94	211.97	211.85	212.12	212.06	212.04	212.04	211.64	211.43
Eastern East Edmond Marsh	211.01	211.02	211.35	212.06	212.15	212.71	212.18	212.31	212.34	212.29	212.23	211.83	211.46
Observed WSE in ft													
EM-2S	210.12	210.11	210.47	211.06	211.04	211.03	211.03	210.86	211.15	211.13	211.10	210.88	210.61
East Edmond (EM-2E)	211.43	211.43	211.43	211.75	211.52	211.58	211.64	211.90	211.59	212.04	211.93	211.73	211.43
East Edmond (EM-2W)	210.51	210.52	210.90	211.41	211.41	211.39	211.40	211.24	211.58	211.54	211.52	211.36	211.03
East Edmond (EM-3E)	211.49	211.46	211.74	212.41	212.33	212.49	212.38	212.42	212.43	212.55	212.48	212.25	211.93
East Edmond (EM-3W)	211.48	211.46	211.72	212.31	212.25	212.27	212.22	212.39	212.25	212.54	212.44	212.25	211.96
Eastern East Edmond (SCM-1)	211.45	211.46	211.78	212.48	212.40	212.57	212.45	212.49	212.52	212.62	212.55	212.24	211.87

Table F-14. Water Balance for East Edmond Marsh with Mining - Low Groundwater

Monthly Average in Inches of Water WY2011

Hydrologic Process	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Precipitation	4.0	4.2	6.6	7.2	6.1	3.1	7.2	5.7	4.8	2.8	0.8	0.3	1.3
Surface Water Inflows	0.2	0.2	0.3	2.2	3.5	2.9	3.2	3.2	3.4	3.0	1.0	0.0	0.0
From Sequalitchew Lake	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
From Center Drive	0.2	0.2	0.3	0.3	0.2	0.1	0.3	0.2	0.2	0.1	0.0	0.0	0.0
From Hamer (surface)	0.0	0.0	0.0	1.9	3.2	2.8	3.0	3.0	3.2	2.9	1.0	0.0	0.0
Subsurface Inflows	1.4	1.4	2.0	1.9	1.6	1.3	1.5	1.4	1.5	1.3	2.7	2.4	1.7
Evapotranspiration	-2.3	-1.0	-0.5	0.0	0.0	-0.6	-1.3	-2.0	-3.2	-3.7	-4.5	-4.0	-2.3
Recharge (-) Discharge (+)	*-1.0*	*-2.0*	*-1.6*	*-3.4*	*-4.7*	*-3.6*	*-4.7*	*-3.8*	*-4.1*	*-3.8*	*-26.0*	*3.3*	*1.0*
Surface Water Outflows	-0.3	-0.4	-2.7	-0.7	-2.6	-2.4	-3.0	-3.8	-1.2	-1.0	0.0	0.0	0.0
To Diversion Canal	-0.2	-0.3	-0.3	-0.5	-0.6	-0.9	-0.8	-1.7	-0.8	-0.7	0.0	0.0	0.0
To West Edmond Marsh	-0.1	-0.2	-3.0	-0.3	-2.5	-2.0	-2.8	-2.9	-0.5	-0.4	0.0	0.0	0.0
Change in Storage	2.1	2.6	3.8	7.5	4.0	1.2	3.2	1.7	1.9	-0.9	-26.1	2.0	1.8
Predicted WSE in ft													
EM-2S	212.11	212.32	212.64	213.11	213.18	213.04	213.06	212.96	212.85	212.53	210.28	210.44	210.59
East Edmond	211.60	211.80	211.87	212.47	212.60	212.53	212.56	212.46	212.58	212.47	211.43	211.60	211.75
Eastern East Edmond Marsh	211.55	211.66	212.10	212.56	212.87	212.80	213.02	212.80	212.71	212.42	210.25	210.42	210.57
Observed WSE in ft													
EM-2S	211.01	211.05	211.33	211.43	211.30	211.27	211.25	211.27	211.30	211.22	206.59	211.06	210.85
East Edmond (EM-2E)	211.73	211.75	211.95	212.18	212.13	212.20	212.27	212.30	212.37			212.01	211.69
East Edmond (EM-2W)	211.46	211.48	211.73	211.78	211.68	211.65	211.61	211.58	211.68			211.48	211.33
East Edmond (EM-3E)	212.23	212.37	212.59	212.73	212.73	212.73	212.73	212.76	212.88			212.49	212.06
East Edmond (EM-3W)	212.23	212.25	212.43	212.70	212.63	212.69	212.75	212.77	212.85			212.50	212.18
Eastern East Edmond (SCM-1)	212.28	212.32	212.67	212.81	212.78	212.79	212.80	212.83	212.95			212.58	212.26

Table F-14. Water Balance for East Edmond Marsh with Mining - Low Groundwater

Monthly Average in Inches of Water	WY2012												WY2013
Hydrologic Process	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct
Precipitation	4.1	6.1	3.2	7.2	3.9	6.8	4.3	3.1	3.3	1.6	0.0	0.1	6.5
Surface Water Inflows	0.2	0.3	0.8	1.4	3.1	3.4	3.2	3.0	2.3	1.7	0.0	0.0	0.3
From Sequalitchew Lake	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
From Center Drive	0.2	0.3	0.1	0.3	0.1	0.3	0.2	0.1	0.1	0.0	0.0	0.0	0.3
From Hamer (surface)	0.0	0.0	0.7	1.1	3.0	3.1	3.0	2.9	2.1	1.7	0.0	0.0	0.0
Subsurface Inflows	1.7	1.8	1.7	2.0	1.5	1.6	1.3	1.4	1.3	1.3	1.3	1.1	1.6
Evapotranspiration	-1.0	-0.5	0.0	0.0	-0.6	-1.3	-2.0	-3.2	-3.7	-4.5	-4.0	-2.3	-1.0
Recharge (-) Discharge (+)	*-0.3*	*-1.8*	*-2.2*	*-1.3*	*-2.9*	*-3.7*	*-2.8*	*-3.6*	*-3.2*	*-2.1*	*-0.5*	*-1.4*	*-2.1*
Surface Water Outflows	0.0	-1.2	-1.5	-4.0	-1.8	-3.2	-2.7	-1.4	-0.9	-0.8	-0.6	0.0	-0.2
To Diversion Canal	0.0	0.0	-0.2	-0.3	-0.5	-0.6	-0.9	-0.9	-0.6	-0.5	-0.4	0.0	-0.1
To West Edmond Marsh	0.0	-1.3	-1.5	-4.5	-1.7	-3.4	-2.2	-0.6	-0.4	-0.3	-0.2	0.0	-0.1
Change in Storage	4.7	4.5	2.0	4.8	3.3	3.4	1.7	0.1	-0.5	-2.3	-3.4	-2.6	5.2
Predicted WSE in ft													
EM-2S	210.98	211.36	211.47	211.77	211.80	211.82	211.71	211.48	211.26	210.93	210.65	210.44	210.87
East Edmond	212.14	212.40	212.44	212.47	212.60	212.60	212.55	212.51	212.44	212.22	211.92	211.71	212.13
Eastern East Edmond Marsh	210.96	211.45	211.64	212.29	212.52	212.85	212.84	212.56	212.33	211.95	211.51	211.30	211.67
Observed WSE in ft													
EM-2S	210.97	211.29	211.31	211.37	211.36	211.38	211.40	211.41	211.36	211.25	211.14	210.84	211.08
East Edmond (EM-2E)	211.83	212.03	212.25	212.50	212.52	212.55	212.57	212.63	212.54	212.34	212.13	211.72	212.01
East Edmond (EM-2W)	211.40	211.67	211.71	211.72	211.75	211.76	211.77	211.78	211.75	211.65	211.55	211.31	211.50
East Edmond (EM-3E)	212.19	212.38	212.61	212.85	212.88	212.92	212.95	213.00	212.91	212.70	212.50	212.09	212.37
East Edmond (EM-3W)	212.29	212.50	212.73	212.98	212.99	213.02	213.05	213.11	213.03	212.82	212.61	212.20	212.48
Eastern East Edmond (SCM-1)	212.40	212.59	212.85	213.10	213.12	213.15	213.18	213.35	213.17	212.95	212.74	212.21	212.55

Table F-14. Water Balance for East Edmond Marsh with Mining - Low Groundwater

Monthly Average in Inches of Water — WY2014

Hydrologic Process	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov
Precipitation	6.5	7.6	3.5	1.7	3.7	5.5	4.4	1.9	0.0	1.6	6.9	2.6	4.1
Surface Water Inflows	0.3	2.4	3.3	2.8	2.5	2.6	2.8	2.2	0.0	0.1	0.3	0.1	0.4
From Sequalitchew Lake	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
From Center Drive	0.3	0.3	0.1	0.0	0.1	0.2	0.2	0.1	0.0	0.1	0.3	0.1	0.2
From Hamer (surface)	0.0	2.1	3.1	2.8	2.4	2.4	2.7	2.1	0.0	0.0	0.0	0.0	0.2
Subsurface Inflows	1.8	1.9	1.6	1.2	1.4	1.2	1.3	1.2	1.1	1.0	1.5	1.6	1.7
Evapotranspiration	-0.5	0.0	0.0	-0.6	-1.3	-2.0	-3.2	-3.7	-4.5	-4.0	-2.3	-1.0	-0.5
Recharge (-) Discharge (+)	*-2.3*	*-2.0*	*-3.9*	*-3.7*	*-3.5*	*-3.8*	*-4.5*	*-3.2*	*-1.3*	*-1.1*	*-1.1*	*-1.0*	*-1.9*
Surface Water Outflows	-1.5	-3.6	-2.1	-1.4	-1.9	-2.0	-1.0	-0.9	0.0	-0.5	-0.3	-0.5	-1.3
To Diversion Canal	-0.3	-0.4	-0.7	-0.7	-0.7	-0.6	-0.7	-0.6	0.0	-0.3	-0.2	-0.3	-0.3
To West Edmond Marsh	-1.5	-4.0	-1.8	-0.9	-1.6	-1.7	-0.4	-0.4	0.0	-0.2	-0.1	-0.2	-1.2
Change in Storage	4.4	5.9	2.6	0.5	1.3	1.8	0.4	-2.1	-4.6	-2.7	5.1	2.0	2.6
Predicted WSE in ft													
EM-2S	211.23	211.55	211.50	211.32	211.23	211.18	210.99	210.64	210.25	210.03	210.46	210.62	210.82
East Edmond	212.37	212.53	212.59	212.56	212.53	212.53	212.53	212.32	211.94	211.70	212.12	212.27	212.39
Eastern East Edmond Marsh	212.03	212.67	212.78	212.66	212.65	212.70	212.51	212.14	211.76	211.41	211.76	211.80	211.98
Observed WSE in ft													
EM-2S	211.31	211.47	211.40	211.40	211.39	211.44	211.43	211.37	211.19	210.88	211.31	211.51	211.47
East Edmond (EM-2E)	212.29	212.69	212.64	212.56	212.59	212.63	212.48	212.39	212.03	211.66	212.05	212.55	212.52
East Edmond (EM-2W)	211.69	211.83	211.78	211.75	211.76	211.81	211.82	211.80	211.64	211.36	211.76	211.89	211.86
East Edmond (EM-3E)	212.65	213.05	212.99	212.91	213.01	212.99	212.86	212.77	212.41	212.03	212.41	212.93	212.88
East Edmond (EM-3W)	212.76	213.17	213.11	213.04	213.06	213.10	212.96	212.88	212.51	212.15	212.53	213.03	212.99
Eastern East Edmond (SCM-1)	212.90	213.32	213.27	213.18	213.21	213.26	213.10	213.03	212.65	212.26	212.66	213.16	213.14

Table F-14. Water Balance for East Edmond Marsh with Mining - Low Groundwater

Monthly Average in Inches of Water — WY2015

Hydrologic Process	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Precipitation	2.4	4.2	6.9	9.8	4.5	3.3	1.3	1.2	1.6	1.8	5.9	6.1	4.8
Surface Water Inflows	1.7	1.4	2.1	3.9	4.0	4.0	2.2	1.7	0.6	0.1	0.3	2.0	3.3
From Sequalitchew Lake	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
From Center Drive	0.1	0.2	0.3	0.4	0.2	0.1	0.0	0.0	0.0	0.1	0.3	0.2	0.2
From Hamer (surface)	1.6	1.2	1.8	3.5	3.9	3.9	2.2	1.6	0.6	0.0	0.0	1.8	3.1
Subsurface Inflows	1.4	1.6	1.6	1.6	1.7	1.7	1.6	1.6	1.6	1.8	2.1	1.9	2.1
Evapotranspiration	0.0	0.0	-0.6	-1.3	-2.0	-3.2	-3.7	-4.5	-4.0	-2.3	-1.0	-0.5	0.0
Recharge (-) Discharge (+)	*-3.4*	*-2.6*	*-1.5*	*-4.0*	*-2.0*	*-2.6*	*-2.9*	*-2.4*	*-1.7*	*-0.8*	*-2.3*	*-3.1*	*-2.5*
Surface Water Outflows	-0.8	-2.4	-3.6	-4.1	-6.6	-1.0	-1.0	-0.8	-0.6	-0.4	-0.3	-2.0	-3.1
To Diversion Canal	-0.4	-0.4	-0.4	-0.7	-3.2	-0.7	-0.7	-0.5	-0.4	-0.3	-0.2	-0.3	-0.5
To West Edmond Marsh	-0.4	-2.5	-4.0	-4.4	-4.6	-0.4	-0.4	-0.3	-0.2	-0.2	-0.1	-2.0	-3.2
Change in Storage	1.7	2.1	4.6	5.7	1.6	2.8	-2.0	-2.8	-2.2	0.4	4.8	4.3	4.4
Predicted WSE in ft													
EM-2S	210.83	210.90	211.13	211.31	211.12	211.03	210.68	210.32	210.09	210.12	210.53	210.74	210.85
East Edmond	212.49	212.46	212.51	212.62	212.37	212.57	212.37	212.11	211.91	211.93	212.32	212.51	212.61
Eastern East Edmond Marsh	211.97	212.16	212.70	213.25	212.70	212.71	212.33	211.91	211.58	211.51	211.82	212.20	212.63
Observed WSE in ft													
EM-2S	211.39	211.43	211.51	211.50	211.51	211.54	211.48	211.33	211.22	211.30	211.38	211.49	211.49
East Edmond (EM-2E)	212.33	212.43	212.59	212.59	212.68	212.81	212.73	212.32			212.34	212.53	212.51
East Edmond (EM-2W)	211.80	211.82	211.86	211.87	211.88	211.90	211.87	211.78	211.71	211.76	211.81	211.88	211.89
East Edmond (EM-3E)	212.69	212.80	212.95	212.96	213.04	213.19	213.08	212.66	212.49	212.59	212.69	212.91	212.94
East Edmond (EM-3W)	212.80	212.91	213.06	213.06	213.15	213.29	213.19	212.79	212.61	212.57	212.54	213.02	213.04
Eastern East Edmond (SCM-1)	212.95	213.07	213.21	213.25	213.33	213.46	213.22	212.98	212.76	212.86	212.97	213.20	213.26

Table F-14. Water Balance for East Edmond Marsh with Mining - Low Groundwater

Monthly Average in Inches of Water — WY2016

Hydrologic Process	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan
Precipitation	4.1	4.7	4.4	2.1	0.8	0.4	0.2	2.2	1.3	5.0	7.1	12.0	6.9
Surface Water Inflows	4.1	3.9	4.3	3.8	1.2	0.3	0.0	0.1	0.0	0.2	0.3	1.0	4.2
From Sequalitchew Lake	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
From Center Drive	0.2	0.2	0.2	0.1	0.0	0.0	0.0	0.1	0.0	0.2	0.3	0.5	0.3
From Hamer (surface)	4.0	3.7	4.1	3.8	1.2	0.3	0.0	0.0	0.0	0.0	0.0	0.4	4.0
Subsurface Inflows	1.8	1.5	1.8	1.4	1.4	1.2	1.3	1.1	1.0	1.0	1.8	2.1	1.7
Evapotranspiration	0.0	-0.6	-1.3	-2.0	-3.2	-3.7	-4.5	-4.0	-2.3	-1.0	-0.5	0.0	0.0
Recharge (-) Discharge (+)	*-4.0*	*-3.8*	*-3.6*	*-4.0*	*-4.0*	*-3.5*	*-2.0*	*-1.9*	*-1.0*	*-2.2*	*0.2*	*-1.8*	*-5.4*
Surface Water Outflows	-2.7	-3.4	-4.0	-1.4	0.0	0.0	0.0	-0.3	-0.1	0.0	-0.4	-5.8	-3.0
To Diversion Canal	-0.6	-1.0	-1.6	-0.9	0.0	0.0	0.0	-0.2	-0.1	0.0	-0.1	-0.4	-1.1
To West Edmond Marsh	-2.7	-3.2	-3.0	-0.6	0.0	0.0	0.0	-0.1	0.0	0.0	-0.3	-6.6	-2.4
Change in Storage	3.4	2.5	2.6	0.7	-3.8	-5.3	-5.0	-2.6	-1.1	3.1	8.7	6.7	5.0
Predicted WSE in ft													
EM-2S	210.80	210.69	210.56	210.31	209.89	209.42	209.01	209.00	209.00	209.26	209.98	210.50	210.59
East Edmond	212.66	212.60	212.56	212.57	212.25	211.81	211.43	211.43	211.43	211.69	212.39	212.39	212.61
Eastern East Edmond Marsh	212.88	213.00	212.86	212.62	212.30	211.86	211.44	211.14	211.02	211.27	211.96	212.89	213.10
Observed WSE in ft													
EM-2S	211.46	211.44	211.42	211.33	211.28	211.07	210.67	210.28	210.36	210.44	211.37	211.34	
East Edmond (EM-2E)	212.49	212.47	212.45	212.47	212.38	211.92	211.60	211.43	211.43	211.43	212.50	212.38	
East Edmond (EM-2W)	211.84	211.81	211.78	211.21	211.71	211.53	211.17	210.76	210.81	210.86	211.72	211.68	
East Edmond (EM-3E)	212.85	212.82	212.79	212.83	212.74	212.20	211.92	211.62	211.64	211.65	212.85	212.70	
East Edmond (EM-3W)	212.94	212.92	212.91	212.94	212.83	212.39	212.03	211.71	211.73	211.75	212.95	212.82	
Eastern East Edmond (SCM-1)	213.13	213.11	213.09	213.13	213.03	212.53	212.14	211.79	211.81	211.83	213.11	212.99	

Table F-14. Water Balance for East Edmond Marsh with Mining - Low Groundwater

Monthly Average in Inches of Water — WY2017

Hydrologic Process	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
Precipitation	5.8	5.9	1.8	1.0	2.3	1.3	0.2	1.5	9.3	6.9	3.9	3.4	8.6
Surface Water Inflows	4.0	4.4	3.4	1.8	2.5	1.7	0.1	0.0	0.4	1.3	3.6	4.1	3.9
From Sequalitchew Lake	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
From Center Drive	0.2	0.2	0.0	0.0	0.1	0.0	0.0	0.0	0.4	0.3	0.2	0.1	0.3
From Hamer (surface)	3.8	4.2	3.3	1.7	2.4	1.7	0.1	0.0	0.0	1.0	3.5	4.0	3.6
Subsurface Inflows	1.7	1.8	1.8	1.9	1.8	1.8	1.6	1.5	1.6	2.2	2.2	2.0	1.6
Evapotranspiration	-0.6	-1.3	-2.0	-3.2	-3.7	-4.5	-4.0	-2.3	-1.0	-0.5	0.0	0.0	-0.6
Recharge (-) Discharge (+)	*-4.4*	*-5.3*	*-3.9*	*-3.1*	*-2.5*	*-2.2*	*-0.8*	*-0.4*	*-3.4*	*-2.6*	*-3.5*	*-6.4*	*-5.3*
Surface Water Outflows	-5.1	-2.8	-2.0	-0.9	-0.7	-0.6	-0.4	-0.2	-0.4	-3.0	-2.1	-1.9	-3.9
To Diversion Canal	-2.0	-1.3	-1.3	-0.6	-0.5	-0.4	-0.3	-0.1	-0.1	-0.3	-0.5	-0.7	-0.6
To West Edmond Marsh	-4.0	-2.0	-1.0	-0.4	-0.3	-0.3	-0.2	-0.1	-0.3	-3.2	-2.0	-1.5	-4.2
Change in Storage	2.5	3.6	0.1	-2.0	0.1	-2.2	-3.0	0.3	6.6	4.0	4.2	1.7	3.9
Predicted WSE in ft													
EM-2S	210.48	210.43	210.16	209.85	209.66	209.33	209.07	209.09	209.64	209.89	209.95	209.76	209.79
East Edmond	212.49	212.62	212.54	212.34	212.32	212.12	211.85	211.87	212.39	212.45	212.63	212.65	212.63
Eastern East Edmond Marsh	212.92	212.93	212.56	212.19	212.02	211.68	211.31	211.27	211.79	212.25	212.56	212.54	212.99
Observed WSE in ft													
EM-2S					211.28	211.15	210.81		210.79	211.31	211.32	211.17	211.47
East Edmond (EM-2E)					212.38	212.27	211.76		211.57	212.24	212.22	212.05	212.04
East Edmond (EM-2W)					211.68	211.57	211.27		211.29	211.90	211.78	211.57	211.59
East Edmond (EM-3E)					212.59	212.34	212.05		211.87	212.33	212.35	212.39	213.34
East Edmond (EM-3W)					212.81	212.60	212.19		212.00	212.69	212.66	212.50	212.46
Eastern East Edmond (SCM-1)					212.88	212.65	212.28		212.08	212.60	212.59	212.62	210.24

Table F-14. Water Balance for East Edmond Marsh with Mining - Low Groundwater

Monthly Average in Inches of Water — WY 2018

Hydrologic Process	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar
Precipitation	8.7	4.6	2.8	1.8	0.0	0.1	1.0	5.2	7.2	5.8	7.2	3.3	2.3
Surface Water Inflows	4.4	4.2	4.2	3.1	0.0	0.1	0.1	0.2	1.9	3.6	4.5	3.8	4.3
From Sequalitchew Lake	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
From Center Drive	0.3	0.2	0.1	0.1	0.0	0.0	0.0	0.2	0.3	0.2	0.3	0.1	0.1
From Hamer (surface)	4.1	4.1	4.1	3.0	0.0	0.1	0.1	0.0	1.6	3.4	4.2	3.7	4.2
Subsurface Inflows	2.2	2.0	1.9	2.0	2.3	2.5	2.2	2.7	2.4	2.3	2.0	1.9	2.1
Evapotranspiration	-1.3	-2.0	-3.2	-3.7	-4.5	-4.0	-2.3	-1.0	-0.5	0.0	0.0	-0.6	-1.3
Recharge (-) Discharge (+)	*-2.8*	*-3.7*	*-4.9*	*-5.1*	*-2.8*	*-1.9*	*-1.9*	*-1.9*	*-3.2*	*-4.5*	*-5.7*	*-3.1*	*-5.3*
Surface Water Outflows	-8.6	-2.8	-1.4	-0.8	0.0	-0.4	-0.1	0.0	-0.7	-2.7	-3.5	-5.2	-1.0
To Diversion Canal	-3.2	-1.6	-0.9	-0.5	0.0	-0.2	-0.1	0.0	-0.2	-0.4	-0.6	-2.1	-0.7
To West Edmond Marsh	-7.0	-1.6	-0.6	-0.3	0.0	-0.1	0.0	0.0	-0.6	-2.8	-3.7	-3.9	-0.4
Change in Storage	4.2	3.6	0.3	-2.3	-5.0	-3.3	-0.9	5.2	7.2	4.3	4.3	1.4	1.6
Predicted WSE in ft													
EM-2S	209.80	209.76	209.44	209.00	209.00	209.00	209.00	209.43	209.90	209.98	209.98	209.80	209.58
East Edmond	212.40	212.57	212.54	212.32	211.90	211.61	211.53	211.96	212.51	212.64	212.69	212.48	212.58
Eastern East Edmond Marsh	212.76	212.61	212.33	211.96	211.54	211.16	211.05	211.47	212.02	212.44	212.87	212.55	212.46
Observed WSE in ft													
EM-2S	211.31	211.27		211.18	211.05	211.24	210.72			211.95		211.29	211.12
East Edmond (EM-2E)	212.14	212.21		212.34	212.18	211.95	211.82			212.59		212.35	212.14
East Edmond (EM-2W)	210.67	211.63		211.55	211.44	210.47	211.09			211.69		211.60	211.48
East Edmond (EM-3E)	212.37	212.47		212.67	212.88	212.52	212.03			212.56		212.51	212.40
East Edmond (EM-3W)	212.54	212.62		212.78	212.62	212.37	212.27			213.07		212.79	212.58
Eastern East Edmond (SCM-1)	212.62	212.68		212.95	212.65	212.56	212.64			212.89		212.76	212.65

Table F-14. Water Balance for East Edmond Marsh with Mining - Low Groundwater

Monthly Average in Inches of Water WY2019

Hydrologic Process	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr
Precipitation	6.1	0.7	0.9	0.2	0.3	1.8	4.0	3.8	6.4	3.4	4.8	1.6	3.6
Surface Water Inflows	3.7	0.8	1.5	0.2	0.0	0.1	0.2	0.2	0.3	3.0	3.1	3.0	2.8
From Sequalitchew Lake	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
From Center Drive	0.2	0.0	0.0	0.0	0.0	0.1	0.2	0.2	0.3	0.1	0.2	0.0	0.1
From Hamer (surface)	3.5	0.8	1.4	0.2	0.0	0.0	0.0	0.0	0.0	2.8	2.9	3.0	2.7
Subsurface Inflows	1.9	1.9	1.9	2.0	1.8	1.7	1.9	2.3	2.7	2.3	1.9	1.9	1.6
Evapotranspiration	-2.0	-3.2	-3.7	-4.5	-4.0	-2.3	-1.0	-0.5	0.0	0.0	-0.6	-1.3	-2.0
Recharge (-) Discharge (+)	*-4.5*	*-5.5*	*-4.7*	*-3.2*	*-2.8*	*-1.9*	*-4.9*	*-1.8*	*-2.8*	*-4.5*	*-4.6*	*-5.4*	*-5.0*
Surface Water Outflows	-2.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.2	-0.5	-2.2	-0.7	-0.6
To Diversion Canal	-0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.3	-0.4	-0.5	-0.4
To West Edmond Marsh	-2.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.2	-2.3	-0.3	-0.2
Change in Storage	2.9	-5.3	-4.2	-5.3	-4.7	-0.7	0.1	3.9	6.5	3.9	2.3	-0.5	0.7
Predicted WSE in ft													
EM-2S	209.53	209.03	209.00	209.00	209.00	209.00	209.01	209.33	209.87	209.96	209.91	209.62	209.46
East Edmond	212.63	212.19	211.84	211.43	211.43	211.43	211.44	211.76	212.29	212.60	212.60	212.54	212.58
Eastern East Edmond Marsh	212.66	212.22	211.87	211.43	211.04	210.97	210.98	211.31	211.79	211.98	212.20	211.98	211.88
Observed WSE in ft													
EM-2S	211.17	211.08	211.17	211.01	210.61	210.70	210.71	211.07	211.35	211.39	211.14	211.24	211.37
East Edmond (EM-2E)	212.37	212.41	212.23	212.05	211.65	211.73	211.78	212.21	212.63		212.55	212.37	212.63
East Edmond (EM-2W)	211.51	211.24	211.59	211.44	211.01	211.12	211.07	211.66	211.70		211.48	211.66	211.89
East Edmond (EM-3E)	212.48						212.06	212.42	212.65	212.71	212.83	212.69	212.67
East Edmond (EM-3W)	212.81	212.81	212.50	212.50	212.14	212.19	212.19	212.64	212.98	212.50	213.00	212.81	213.06
Eastern East Edmond (SCM-1)	212.77	212.59	212.85	212.01	211.75	211.84	212.57					212.88	212.90

Table F-14. Water Balance for East Edmond Marsh with Mining - Low Groundwater

Monthly Average in Inches of Water — WY2020

Hydrologic Process	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May
Precipitation	1.1	0.7	1.0	0.8	3.5	3.9	1.7	6.5	9.6	4.2	3.5	1.5	3.1
Surface Water Inflows	1.6	0.2	0.0	0.0	0.2	0.2	0.1	0.3	0.4	3.1	3.6	2.3	1.1
From Sequalitchew Lake	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
From Center Drive	0.0	0.0	0.0	0.0	0.2	0.2	0.1	0.3	0.4	0.1	0.1	0.0	0.1
From Hamer (surface)	1.6	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.0	3.4	2.3	1.0
Subsurface Inflows	1.4	1.2	1.1	0.9	1.1	1.6	1.2	1.3	2.3	1.8	1.3	1.1	1.2
Evapotranspiration	-3.2	-3.7	-4.5	-4.0	-2.3	-1.0	-0.5	0.0	0.0	-0.6	-1.3	-2.0	-3.2
Recharge (-) Discharge (+)	*-4.5*	*-3.3*	*-2.0*	*-2.2*	*-3.8*	*0.5*	*1.4*	*-3.1*	*-1.5*	*-4.6*	*-2.8*	*-2.2*	*-1.9*
Surface Water Outflows	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	-1.0	-4.8	-2.2	-2.3	-1.0	-0.8
To Diversion Canal	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	-0.2	-0.5	-0.6	-0.7	-0.6
To West Edmond Marsh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-1.2	-5.5	-2.2	-2.2	-0.5	-0.4
Change in Storage	-3.5	-4.9	-4.4	-4.5	-1.3	5.1	3.9	3.9	5.3	1.8	2.1	0.4	0.0
Predicted WSE in ft													
EM-2S	209.03	209.00	209.00	209.00	209.00	209.43	209.75	210.07	210.51	210.41	210.30	210.14	210.06
East Edmond	212.28	211.88	211.51	211.43	211.43	211.86	212.18	212.40	212.38	212.35	212.34	212.33	212.30
Eastern East Edmond Marsh	211.59	211.18	210.78	210.41	210.30	210.72	211.05	211.46	212.26	212.41	212.54	212.36	212.17
Observed WSE in ft													
EM-2S		210.80	210.49	210.07	210.20	210.34		210.30	211.41	210.49			
East Edmond (EM-2E)		211.91	211.55	211.43	211.43	211.44		211.43	212.60	212.45			
East Edmond (EM-2W)		211.58	210.92	210.54		210.77		211.58	211.69	211.66			
East Edmond (EM-3E)						211.90		211.74	212.80	212.80			
East Edmond (EM-3W)		212.37	212.00	211.54	212.27	211.89		212.16	213.03	212.89			
Eastern East Edmond (SCM-1)													

Table F-14. Water Balance for East Edmond Marsh with Mining - Low Groundwater

Monthly Average in Inches of Water — WY 2021

Hydrologic Process	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
Precipitation	2.5	0.3	0.4	2.8	3.0	5.6	5.2	7.3	4.7	2.5	1.2	2.0	2.4
Surface Water Inflows	0.6	0.0	0.0	0.1	0.1	0.2	0.9	4.1	4.0	4.4	2.4	3.8	3.5
From Sequalitchew Lake	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
From Center Drive	0.1	0.0	0.0	0.1	0.1	0.2	0.2	0.3	0.2	0.1	0.0	0.1	0.1
From Hamer (surface)	0.5	0.0	0.0	0.0	0.0	0.0	0.6	3.9	3.8	4.3	2.4	3.8	3.5
Subsurface Inflows	1.2	0.9	0.7	0.8	0.7	0.9	1.4	1.8	1.8	2.3	1.9	1.8	1.6
Evapotranspiration	-3.7	-4.5	-4.0	-2.3	-1.0	-0.5	0.0	0.0	-0.6	-1.3	-2.0	-3.2	-3.7
Recharge (-) Discharge (+)	*-0.8*	*-2.1*	*-1.9*	*-0.1*	*2.3*	*7.1*	*8.4*	*5.0*	*2.2*	*0.1*	*0.0*	*1.7*	*1.9*
Surface Water Outflows	-0.7	0.0	0.0	-0.1	-0.1	-3.6	-7.2	-10.8	-7.4	-6.6	-1.4	-3.2	-4.6
To Diversion Canal	-0.5	0.0	0.0	0.0	-0.1	-0.2	-0.7	-3.3	-3.1	-3.3	-0.6	-0.7	-1.8
To West Edmond Marsh	-0.3	0.0	0.0	0.0	-0.1	-4.1	-8.3	-9.8	-5.8	-4.2	-1.0	-3.2	-3.6
Change in Storage	-0.5	-5.4	-4.8	1.2	5.0	9.2	7.6	8.5	6.4	3.8	2.5	3.0	2.2
Predicted WSE in ft													
EM-2S	209.97	209.51	209.12	209.22	209.64	210.41	210.99	211.37	211.58	211.54	211.55	211.49	211.38
East Edmond	212.23	211.78	211.43	211.53	211.94	212.37	212.32	212.20	212.25	212.21	212.34	212.32	212.21
Eastern East Edmond Marsh	211.95	211.50	211.10	211.18	211.56	212.56	213.00	213.00	212.99	212.49	212.55	212.80	212.62
Observed WSE in ft													
EM-2S		210.83	210.33		210.25			211.47			211.31	211.27	211.13
East Edmond (EM-2E)		211.43	211.43		211.43	212.93		212.54			212.27	212.16	212.04
East Edmond (EM-2W)			210.76		210.69			211.77	212.14	212.14	211.70	211.69	211.51
East Edmond (EM-3E)					211.47	212.18		212.88	213.54	212.83	212.43		
East Edmond (EM-3W)			211.69		211.56	212.50		212.99	212.50	212.50	212.73	212.60	212.50
Eastern East Edmond (SCM-1)													

Table F-14. Water Balance for East Edmond Marsh with Mining - Low Groundwater

Monthly Average in Inches of Water WY 2021

Hydrologic Process	Jul	Aug	Sep
Precipitation	0.0	0.3	2.6
Surface Water Inflows	0.0	0.3	2.7
From Sequalitchew Lake	0.0	0.0	0.0
From Center Drive	0.0	0.0	0.1
From Hamer (surface)	0.0	0.3	2.6
Subsurface Inflows	1.7	1.7	1.8
Evapotranspiration	-4.5	-4.0	-2.3
Recharge (-) Discharge (+)	*3.0*	*0.4*	*0.1*
Surface Water Outflows	-1.4	-0.8	-0.6
To Diversion Canal	-1.0	-0.5	-0.4
To West Edmond Marsh	-0.6	-0.3	-0.2
Change in Storage	-0.4	-1.7	4.7
Predicted WSE in ft			
EM-2S	211.34	211.18	211.35
East Edmond	212.12	211.94	212.32
Eastern East Edmond Marsh	212.27	211.95	212.19
Observed WSE in ft			
EM-2S	210.73		
East Edmond (EM-2E)	211.69	211.43	
East Edmond (EM-2W)	211.14		
East Edmond (EM-3E)			
East Edmond (EM-3W)	212.23	211.56	
Eastern East Edmond (SCM-1)		210.20	

Table F-15. Water Balance for West Edmond Marsh with Mining - Low Groundwater

Monthly Average in Inches of Water	WY2004						WY2005						
Hydrologic Process	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar
Precipitation	2.0	1.0	3.8	0.9	0.1	3.6	2.9	4.0	3.2	4.3	4.3	0.6	4.5
Surface Water Inflows	-8.8	0.0	1.0	0.0	0.0	0.3	0.0	0.0	1.3	1.7	3.0	0.0	3.1
From East Edmond	-8.8	0.0	1.0	0.0	0.0	0.3	0.0	0.0	1.3	1.7	3.0	0.0	3.1
Evapotranspiration	-1.3	-2.0	-3.2	-3.7	-4.5	-4.0	-2.3	-1.0	-0.5	0.0	0.0	-0.6	-1.3
Recharge (-) Discharge (+)	-44.6	-33.6	-11.5	2.8	4.4	0.1	-0.6	-2.9	-3.9	-6.0	-7.3	-0.1	-6.3
Surface Water Outflows	0.0	-0.3	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
To Center Drive	0.0	-0.3	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Change in Storage	-52.6	-34.9	-10.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Predicted WSE in ft	209.04	206.13	205.31	205.31	205.31	205.31	205.31	205.31	205.31	205.31	205.31	205.31	205.31
Observed WSE EM-1/EM-1A	209.10	208.59	207.26	206.55	205.27	205.27	205.27	205.86	206.15	207.67	209.18	207.97	206.63

Table F-15. Water Balance for West Edmond Marsh with Mining - Low Groundwater

Monthly Average in Inches of Water — WY2006

Hydrologic Process	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr
Precipitation	5.4	3.9	3.8	1.4	0.2	1.6	3.3	6.7	6.5	12.2	3.2	2.6	3.9
Surface Water Inflows	5.3	3.4	6.1	2.8	0.0	0.0	0.0	0.0	0.0	106.7	0.7	1.9	6.8
From East Edmond	5.3	3.4	6.1	2.8	0.0	0.0	0.0	0.0	0.0	106.7	0.7	1.9	6.8
Evapotranspiration	-2.0	-3.2	-3.7	-4.5	-4.0	-2.3	-1.0	-0.5	0.0	0.0	-0.6	-1.3	-2.0
Recharge (-) Discharge (+)	-8.8	-4.1	-6.2	0.3	3.8	0.7	-2.3	-6.2	-6.5	-26.0	-23.2	-23.0	-15.3
Surface Water Outflows	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-46.1	-0.3	-0.3	-0.1
To Center Drive	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-46.1	-0.3	-0.3	-0.1
Change in Storage	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	46.7	-20.2	-20.0	-6.7
Predicted WSE in ft	205.31	205.31	205.31	205.31	205.31	205.31	205.31	205.31	205.31	209.20	207.52	205.86	205.31
Observed WSE EM-1/EM-1A	209.29	209.08	207.09	205.79	205.27	205.27	205.27	206.05	208.15	208.82	208.53	208.69	208.78

Table F-15. Water Balance for West Edmond Marsh with Mining - Low Groundwater

Monthly Average in Inches of Water — WY2007

Hydrologic Process	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May
Precipitation	2.1	2.2	0.4	0.0	0.8	1.6	14.4	8.6	6.5	4.5	5.7	1.7	1.1
Surface Water Inflows	4.8	3.4	0.0	0.7	0.0	0.0	111.0	13.0	8.7	9.9	20.2	1.5	1.8
From East Edmond	4.8	3.4	0.0	0.7	0.0	0.0	111.0	13.0	8.7	9.9	20.2	1.5	1.8
Evapotranspiration	-3.2	-3.7	-4.5	-4.0	-2.3	-1.0	-0.5	0.0	0.0	-0.6	-1.3	-2.0	-3.2
Recharge (-) Discharge (+)	-3.7	-1.9	4.1	3.3	1.5	-0.6	-28.1	-25.8	-23.8	-21.9	-23.2	-21.5	-5.2
Surface Water Outflows	0.0	0.0	0.0	0.0	0.0	0.0	-50.1	-0.3	-0.3	-0.2	-0.2	-0.2	-0.1
To Center Drive	0.0	0.0	0.0	0.0	0.0	0.0	-50.1	-0.3	-0.3	-0.2	-0.2	-0.2	-0.1
Change in Storage	0.0	0.0	0.0	0.0	0.0	0.0	46.7	-4.6	-9.0	-8.3	1.2	-20.5	-5.6
Predicted WSE in ft	205.31	205.31	205.31	205.31	205.31	205.31	209.20	208.82	208.07	207.38	207.48	205.77	205.31
Observed WSE EM-1/EM-1A	207.56	207.10	205.67	205.27	205.27	205.27	208.74	208.94	208.71	208.75	208.84	208.70	207.84

Table F-15. Water Balance for West Edmond Marsh with Mining - Low Groundwater

Monthly Average in Inches of Water WY2008

Hydrologic Process	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
Precipitation	2.7	1.5	1.0	1.7	5.0	2.8	7.7	4.2	3.6	4.9	1.8	1.3	1.7
Surface Water Inflows	3.6	2.9	1.9	0.8	4.7	23.5	80.7	4.3	11.5	9.6	8.4	5.0	3.7
From East Edmond	3.6	2.9	1.9	0.8	4.7	23.5	80.7	4.3	11.5	9.6	8.4	5.0	3.7
Evapotranspiration	-3.7	-4.5	-4.0	-2.3	-1.0	-0.5	0.0	0.0	-0.6	-1.3	-2.0	-3.2	-3.7
Recharge (-) Discharge (+)	-2.6	0.1	1.0	-0.2	-8.7	-25.8	-34.8	-28.2	-24.7	-23.0	-14.6	-3.1	-1.6
Surface Water Outflows	0.0	0.0	0.0	0.0	0.0	0.0	-6.9	-0.3	-0.2	-0.2	-0.1	0.0	0.0
To Center Drive	0.0	0.0	0.0	0.0	0.0	0.0	-6.9	-0.3	-0.2	-0.2	-0.1	0.0	0.0
Change in Storage	0.0	0.0	0.0	0.0	0.0	0.0	46.7	-19.9	-10.4	-10.0	-6.5	0.0	0.0
Predicted WSE in ft	205.31	205.31	205.31	205.31	205.31	205.31	209.20	207.54	206.68	205.85	205.31	205.31	205.31
Observed WSE EM-1/EM-1A	206.92	205.84	205.63	205.62	207.09	207.82	209.17	209.07	209.02	209.23	209.03	206.96	206.38

Table F-15. Water Balance for West Edmond Marsh with Mining - Low Groundwater

Monthly Average in Inches of Water WY2009

Hydrologic Process	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul
Precipitation	0.9	2.1	0.5	2.6	8.3	5.2	7.3	1.6	5.3	3.5	3.4	1.3	0.0
Surface Water Inflows	2.4	0.8	0.4	0.0	29.7	11.2	21.4	1.7	41.9	3.6	9.5	5.1	0.0
From East Edmond	2.4	0.8	0.4	0.0	29.7	11.2	21.4	1.7	41.9	3.6	9.5	5.1	0.0
Evapotranspiration	-4.5	-4.0	-2.3	-1.0	-0.5	0.0	0.0	-0.6	-1.3	-2.0	-3.2	-3.7	-4.5
Recharge (-) Discharge (+)	1.2	1.1	1.4	-1.5	-26.5	-23.0	-20.5	-15.0	-27.6	-22.8	-10.0	-2.7	4.5
Surface Water Outflows	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1	-0.1	0.0	-0.2	0.0	0.0	0.0
To Center Drive	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1	-0.1	0.0	-0.2	0.0	0.0	0.0
Change in Storage	0.0	0.0	0.0	0.0	11.0	-6.8	8.1	-12.4	18.3	-17.8	-0.4	0.0	0.0
Predicted WSE in ft	205.31	205.31	205.31	205.31	206.22	205.66	206.34	205.31	206.83	205.35	205.31	205.31	205.31
Observed WSE EM-1/EM-1A	205.27	205.27		205.27	208.19	208.61	208.52	208.60	209.22	209.09	208.22	206.01	205.27

Table F-15. Water Balance for West Edmond Marsh with Mining - Low Groundwater

Monthly Average in Inches of Water WY2010

Hydrologic Process	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug
Precipitation	1.9	2.8	5.6	8.9	3.0	8.0	3.3	3.3	3.3	4.6	4.3	0.4	0.2
Surface Water Inflows	1.3	0.0	0.1	69.6	2.8	14.7	12.1	1.8	11.5	28.6	4.0	0.0	0.0
From East Edmond	1.3	0.0	0.1	69.6	2.8	14.7	12.1	1.8	11.5	28.6	4.0	0.0	0.0
Evapotranspiration	-4.0	-2.3	-1.0	-0.5	0.0	0.0	-0.6	-1.3	-2.0	-3.2	-3.7	-4.5	-4.0
Recharge (-) Discharge (+)	0.8	-0.5	-4.7	-33.3	-29.2	-21.3	-21.3	-16.7	-15.5	-20.8	-13.8	4.1	3.8
Surface Water Outflows	0.0	0.0	0.0	0.0	-0.3	-0.2	-0.2	-0.2	0.0	0.0	-0.1	0.0	0.0
To Center Drive	0.0	0.0	0.0	0.0	-0.3	-0.2	-0.2	-0.2	0.0	0.0	-0.1	0.0	0.0
Change in Storage	0.0	0.0	0.0	44.8	-23.7	1.1	-6.6	-13.0	-2.6	9.2	-9.3	0.0	0.0
Predicted WSE in ft	205.31	205.31	205.31	209.04	207.07	207.16	206.61	205.53	205.31	206.08	205.31	205.31	205.31
Observed WSE EM-1/EM-1A	205.27	205.27	205.98	209.21	209.55	208.68	208.58	208.34	209.17	207.87	207.82	206.07	206.07

Table F-15. Water Balance for West Edmond Marsh with Mining - Low Groundwater

Monthly Average in Inches of Water WY2011

Hydrologic Process	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Precipitation	4.0	4.2	6.6	7.2	6.1	3.1	7.2	5.7	4.8	2.8	0.8	0.3	1.3
Surface Water Inflows	1.6	2.7	50.6	1.0	10.9	8.8	17.6	17.8	3.1	8.1	0.0	0.0	0.0
From East Edmond	1.6	2.7	50.6	1.0	10.9	8.8	17.6	17.8	3.1	8.1	0.0	0.0	0.0
Evapotranspiration	-2.3	-1.0	-0.5	0.0	0.0	-0.6	-1.3	-2.0	-3.2	-3.7	-4.5	-4.0	-2.3
Recharge (-) Discharge (+)	-3.2	-5.8	-29.7	-21.0	-20.5	-19.0	-21.9	-22.0	-8.1	-7.1	3.7	3.7	1.0
Surface Water Outflows	0.0	0.0	0.0	-0.3	-0.2	-0.1	0.0	-0.1	-0.1	0.0	0.0	0.0	0.0
To Center Drive	0.0	0.0	0.0	-0.3	-0.2	-0.1	0.0	-0.1	-0.1	0.0	0.0	0.0	0.0
Change in Storage	0.0	0.0	27.0	-13.1	-3.7	-7.9	1.6	-0.5	-3.5	0.0	0.0	0.0	0.0
Predicted WSE in ft	205.31	205.31	207.56	206.47	206.16	205.50	205.64	205.60	205.31	205.31	205.31	205.31	205.31
Observed WSE EM-1/EM-1A	206.07	206.05	208.98	209.46	207.57		208.99	209.34	209.95		207.28	206.60	206.03

Table F-15. Water Balance for West Edmond Marsh with Mining - Low Groundwater

Monthly Average in Inches of Water	WY2012												WY2013
Hydrologic Process	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct
Precipitation	4.1	6.1	3.2	7.2	3.9	6.8	4.3	3.1	3.3	1.6	0.0	0.1	6.5
Surface Water Inflows	0.0	23.6	28.1	27.2	7.5	21.1	10.0	11.1	7.1	6.1	4.3	0.0	1.4
From East Edmond	0.0	23.6	28.1	27.2	7.5	21.1	10.0	11.1	7.1	6.1	4.3	0.0	1.4
Evapotranspiration	-1.0	-0.5	0.0	0.0	-0.6	-1.3	-2.0	-3.2	-3.7	-4.5	-4.0	-2.3	-1.0
Recharge (-) Discharge (+)	-3.0	-28.5	-26.2	-24.0	-19.1	-22.9	-22.1	-12.2	-6.7	-3.2	-0.4	2.2	-6.9
Surface Water Outflows	0.0	0.0	0.0	-0.1	-0.2	-0.1	-0.1	-0.1	0.0	0.0	0.0	0.0	0.0
To Center Drive	0.0	0.0	0.0	-0.1	-0.2	-0.1	-0.1	-0.1	0.0	0.0	0.0	0.0	0.0
Change in Storage	0.0	0.8	5.1	10.3	-8.5	3.6	-10.0	-1.3	0.0	0.0	0.0	0.0	0.0
Predicted WSE in ft	205.31	205.38	205.80	206.66	205.95	206.24	205.41	205.31	205.31	205.31	205.31	205.31	205.31
Observed WSE EM-1/EM-1A	206.28	206.94	207.83	209.23	209.32	209.55	209.78	209.52	209.14		206.36	205.73	206.56

Table F-15. Water Balance for West Edmond Marsh with Mining - Low Groundwater

Monthly Average in Inches of Water WY2014

Hydrologic Process	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov
Precipitation	6.5	7.6	3.5	1.7	3.7	5.5	4.4	1.9	0.0	1.6	6.9	2.6	4.1
Surface Water Inflows	26.3	24.2	8.1	5.7	30.5	7.8	2.7	6.9	0.0	3.4	1.8	3.8	21.7
From East Edmond	26.3	24.2	8.1	5.7	30.5	7.8	2.7	6.9	0.0	3.4	1.8	3.8	21.7
Evapotranspiration	-0.5	0.0	0.0	-0.6	-1.3	-2.0	-3.2	-3.7	-4.5	-4.0	-2.3	-1.0	-0.5
Recharge (-) Discharge (+)	-27.6	-26.2	-18.4	-10.2	-22.4	-17.5	-7.9	-5.1	4.5	-1.0	-6.4	-5.4	-21.6
Surface Water Outflows	0.0	-0.1	-0.1	0.0	0.0	-0.1	-0.1	0.0	0.0	0.0	0.0	0.0	0.0
To Center Drive	0.0	-0.1	-0.1	0.0	0.0	-0.1	-0.1	0.0	0.0	0.0	0.0	0.0	0.0
Change in Storage	4.7	5.5	-6.9	-3.4	10.5	-6.4	-4.1	0.0	0.0	0.0	0.0	0.0	3.7
Predicted WSE in ft	205.70	206.16	205.59	205.31	206.18	205.65	205.31	205.31	205.31	205.31	205.31	205.31	205.62
Observed WSE EM-1/EM-1A	208.21	209.83	209.07	209.27	209.37	209.44	208.41	207.37	205.95	206.06	206.17	208.73	208.72

Table F-15. Water Balance for West Edmond Marsh with Mining - Low Groundwater

Monthly Average in Inches of Water WY2015

Hydrologic Process	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Precipitation	2.4	4.2	6.9	9.8	4.5	3.3	1.3	1.2	1.6	1.8	5.9	6.1	4.8
Surface Water Inflows	2.6	44.7	14.5	16.3	17.2	1.9	8.0	6.1	4.2	2.6	2.4	36.7	14.4
From East Edmond	2.6	44.7	14.5	16.3	17.2	1.9	8.0	6.1	4.2	2.6	2.4	36.7	14.4
Evapotranspiration	0.0	0.0	-0.6	-1.3	-2.0	-3.2	-3.7	-4.5	-4.0	-2.3	-1.0	-0.5	0.0
Recharge (-) Discharge (+)	-8.6	-23.6	-22.2	-24.7	-25.4	-18.6	-6.5	-2.8	-1.8	-2.1	-7.3	-22.8	-22.6
Surface Water Outflows	-0.1	0.0	-0.2	-0.2	-0.2	-0.2	0.0	0.0	0.0	0.0	0.0	0.0	-0.2
To Center Drive	-0.1	0.0	-0.2	-0.2	-0.2	-0.2	0.0	0.0	0.0	0.0	0.0	0.0	-0.2
Change in Storage	-3.8	25.2	-1.5	0.0	-5.9	-16.8	-1.0	0.0	0.0	0.0	0.0	19.5	-3.6
Predicted WSE in ft	205.31	207.41	207.28	207.28	206.79	205.39	205.31	205.31	205.31	205.31	205.31	206.94	206.64
Observed WSE EM-1/EM-1A	207.55	208.55	209.72	209.98	210.01	209.99	209.05	205.30	205.87	206.07	208.63	208.73	209.84

Table F-15. Water Balance for West Edmond Marsh with Mining - Low Groundwater

Monthly Average in Inches of Water — WY2016

Hydrologic Process	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan
Precipitation	4.1	4.7	4.4	2.1	0.8	0.4	0.2	2.2	1.3	5.0	7.1	12.0	6.9
Surface Water Inflows	11.9	14.2	13.5	3.8	0.0	0.0	0.0	1.6	0.6	0.1	4.7	120.1	5.4
From East Edmond	11.9	14.2	13.5	3.8	0.0	0.0	0.0	1.6	0.6	0.1	4.7	120.1	5.4
Evapotranspiration	0.0	-0.6	-1.3	-2.0	-3.2	-3.7	-4.5	-4.0	-2.3	-1.0	-0.5	0.0	0.0
Recharge (-) Discharge (+)	-18.8	-19.8	-20.8	-11.0	2.3	3.3	4.2	0.2	1.0	-4.1	-33.8	-27.9	-24.6
Surface Water Outflows	-0.2	-0.1	-0.1	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-97.8	-0.1
To Center Drive	-0.2	-0.1	-0.1	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-97.8	-0.1
Change in Storage	-3.0	-1.6	-4.3	-7.2	0.0	0.0	0.0	0.0	0.6	0.0	-22.5	6.3	-12.5
Predicted WSE in ft	206.39	206.26	205.90	205.31	205.31	205.31	205.31	205.31	205.36	205.31	205.31	209.57	206.03
Observed WSE EM-1/EM-1A	209.79	209.76	209.74	209.48	207.29	205.54	205.27	205.27	205.27	205.27	209.37	210.02	

Table F-15. Water Balance for West Edmond Marsh with Mining - Low Groundwater

Monthly Average in Inches of Water — WY2017

Hydrologic Process	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
Precipitation	5.8	5.9	1.8	1.0	2.3	1.3	0.2	1.5	9.3	6.9	3.9	3.4	8.6
Surface Water Inflows	17.6	7.4	6.3	7.4	5.3	4.8	3.1	0.5	5.8	19.6	36.2	3.4	78.2
From East Edmond	17.6	7.4	6.3	7.4	5.3	4.8	3.1	0.5	5.8	19.6	36.2	3.4	78.2
Evapotranspiration	-0.6	-1.3	-2.0	-3.2	-3.7	-4.5	-4.0	-2.3	-1.0	-0.5	0.0	0.0	-0.6
Recharge (-) Discharge (+)	-23.2	-20.3	-24.1	-17.4	-15.6	-5.5	3.8	-0.7	-10.9	-29.2	-21.4	-18.9	-14.2
Surface Water Outflows	-0.2	-0.2	0.0	0.0	-0.4	0.0	0.0	0.0	0.0	0.0	-1.3	-0.1	-29.3
To Center Drive	-0.2	-0.2	0.0	0.0	-0.4	0.0	0.0	0.0	0.0	0.0	-1.3	-0.1	-29.3
Change in Storage	-0.6	-8.5	-18.1	-12.2	-12.1	-3.9	3.1	-1.1	3.1	-3.2	17.4	-12.2	42.6
Predicted WSE in ft	207.11	205.90	205.31	205.31	205.31	205.31	205.57	205.31	205.57	205.31	209.01	205.46	209.71
Observed WSE EM-1/EM-1A					208.90	206.26	205.31		206.87	208.72	209.45	209.29	209.86

Table F-15. Water Balance for West Edmond Marsh with Mining - Low Groundwater

Monthly Average in Inches of Water — WY2018

Hydrologic Process	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar
Precipitation	8.7	4.6	2.8	1.8	0.0	0.1	1.0	5.2	7.2	5.8	7.2	3.3	2.3
Surface Water Inflows	16.1	6.8	11.2	2.0	0.0	2.4	0.2	0.3	10.1	52.9	8.4	73.8	1.0
From East Edmond	16.1	6.8	11.2	2.0	0.0	2.4	0.2	0.3	10.1	52.9	8.4	73.8	1.0
Evapotranspiration	-1.3	-2.0	-3.2	-3.7	-4.5	-4.0	-2.3	-1.0	-0.5	0.0	0.0	-0.6	-1.3
Recharge (-) Discharge (+)	-15.1	-16.2	-10.9	-6.2	4.5	3.9	1.3	-4.2	-23.5	-13.5	-21.8	-18.2	-21.7
Surface Water Outflows	0.0	0.0	-0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-21.9	0.0
To Center Drive	0.0	0.0	-0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-21.9	0.0
Change in Storage	8.4	-6.7	-0.2	-6.0	0.0	2.4	0.2	0.3	-6.7	45.1	-6.2	36.4	-19.7
Predicted WSE in ft	206.21	205.31	205.58	205.31	205.31	205.51	205.33	205.33	205.31	209.13	205.31	209.69	205.31
Observed WSE EM-1/EM-1A	210.22	208.64		209.58	207.22	206.67	205.31			209.98		209.98	209.67

Table F-15. Water Balance for West Edmond Marsh with Mining - Low Groundwater

Monthly Average in Inches of Water — WY2019

Hydrologic Process	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr
Precipitation	6.1	0.7	0.9	0.2	0.3	1.8	4.0	3.8	6.4	3.4	4.8	1.6	3.6
Surface Water Inflows	43.2	0.0	0.0	0.0	0.0	0.2	0.0	0.0	1.6	4.2	14.3	1.4	4.5
From East Edmond	43.2	0.0	0.0	0.0	0.0	0.2	0.0	0.0	1.6	4.2	14.3	1.4	4.5
Evapotranspiration	-2.0	-3.2	-3.7	-4.5	-4.0	-2.3	-1.0	-0.5	0.0	0.0	-0.6	-1.3	-2.0
Recharge (-) Discharge (+)	-22.3	-7.9	-4.4	-1.8	-0.7	0.6	-4.3	-28.8	-35.7	-13.6	-11.8	-25.0	-18.2
Surface Water Outflows	-0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.2	-0.5	0.0	0.0	-0.5
To Center Drive	-0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.2	-0.5	0.0	0.0	-0.5
Change in Storage	24.4	-10.5	-7.1	-6.1	-4.3	0.2	-1.4	-25.5	-28.0	-6.6	6.7	-23.4	-12.7
Predicted WSE in ft	208.28	205.31	205.31	205.31	205.31	205.32	205.31	205.31	205.31	205.61	206.15	205.31	205.31
Observed WSE EM-1/EM-1A	209.97	208.18	205.31	205.31	205.31	205.31	205.31	206.55	209.32	209.38	209.41	208.53	208.79

Table F-15. Water Balance for West Edmond Marsh with Mining - Low Groundwater

Monthly Average in Inches of Water WY2020

Hydrologic Process	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May
Precipitation	1.1	0.7	1.0	0.8	3.5	3.9	1.7	6.5	9.6	4.2	3.5	1.5	3.1
Surface Water Inflows	0.0	0.0	0.8	0.0	0.0	0.0	0.0	21.4	23.9	9.3	9.7	2.8	6.4
From East Edmond	0.0	0.0	0.8	0.0	0.0	0.0	0.0	21.4	23.9	9.3	9.7	2.8	6.4
Evapotranspiration	-3.2	-3.7	-4.5	-4.0	-2.3	-1.0	-0.5	0.0	0.0	-0.6	-1.3	-2.0	-3.2
Recharge (-) Discharge (+)	-5.1	-3.9	3.5	-0.2	-3.0	-6.7	-22.9	-14.2	-15.0	-21.9	-29.6	-29.2	-16.0
Surface Water Outflows	-0.2	0.0	0.0	0.0	0.0	0.0	0.0	-0.2	0.0	-0.3	-0.3	-0.4	-0.9
To Center Drive	-0.2	0.0	0.0	0.0	0.0	0.0	0.0	-0.2	0.0	-0.3	-0.3	-0.4	-0.9
Change in Storage	-7.4	-6.9	0.8	-3.4	-1.8	-3.8	-21.7	13.6	18.5	-9.2	-17.9	-27.2	-10.5
Predicted WSE in ft	205.31	205.31	205.38	205.31	205.31	205.31	205.31	206.75	206.85	206.64	205.79	205.31	205.92
Observed WSE EM-1/EM-1A		205.31	205.31	205.31	205.31	205.31		206.97	209.81	209.35			

Table F-15. Water Balance for West Edmond Marsh with Mining - Low Groundwater

Monthly Average in Inches of Water WY2021

Hydrologic Process	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
Precipitation	2.5	0.3	0.4	2.8	3.0	5.6	5.2	7.3	4.7	2.5	1.2	2.0	2.4
Surface Water Inflows	1.8	0.0	0.0	0.4	0.9	69.3	18.5	42.5	12.5	17.7	4.3	19.2	15.4
From East Edmond	1.8	0.0	0.0	0.4	0.9	69.3	18.5	42.5	12.5	17.7	4.3	19.2	15.4
Evapotranspiration	-3.7	-4.5	-4.0	-2.3	-1.0	-0.5	0.0	0.0	-0.6	-1.3	-2.0	-3.2	-3.7
Recharge (-) Discharge (+)	-4.8	-1.9	-0.6	-3.0	-4.3	-29.4	-29.4	-19.6	-20.8	-21.0	-8.0	-0.8	1.3
Surface Water Outflows	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.2	-0.1	-0.1	-0.1	0.0	0.0
To Center Drive	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.2	-0.1	-0.1	-0.1	0.0	0.0
Change in Storage	-4.3	-6.1	-4.2	-2.1	-1.5	44.9	-5.8	30.1	-4.2	-2.1	-4.5	17.3	15.4
Predicted WSE in ft	205.31	205.31	205.31	205.31	205.31	209.05	206.46	209.14	206.04	206.08	205.52	206.75	206.59
Observed WSE EM-1/EM-1A			205.31		205.31	206.87		209.40	209.72	209.15	208.13	205.31	205.31

Table F-15. Water Balance for West Edmond Marsh with Mining - Low Groundwater

Monthly Average in Inches of Water WY2021

Hydrologic Process	Jul	Aug	Sep
Precipitation	0.0	0.3	2.6
Surface Water Inflows	2.5	2.0	4.2
From East Edmond	2.5	2.0	4.2
Evapotranspiration	-4.5	-4.0	-2.3
Recharge (-) Discharge (+)	4.5	2.1	-0.9
Surface Water Outflows	0.0	0.0	0.0
To Center Drive	0.0	0.0	0.0
Change in Storage	2.5	0.4	3.6
Predicted WSE in ft	205.52	205.34	205.61
Observed WSE EM-1/EM-1A	205.31	206.87	

Table F-16. Water Balance for Bell, McKay, and Hamer Marshes with Mining Restoration - Low Groundwater

Monthly Average in Inches of Water	WY2004							WY2005					
Hydrologic Process	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar
Precipitation	2.0	1.0	3.8	0.9	0.1	3.6	2.9	4.0	3.2	4.3	4.3	0.6	4.5
Surface Water Inflows	6.3	1.5	17.0	1.4	0.0	17.4	12.3	18.7	11.7	19.0	18.4	0.3	21.4
Runoff from Ft. Lewis - Outfall 002	3.8	0.8	10.4	0.7	0.0	10.7	7.5	11.5	7.2	11.7	11.3	0.0	13.2
Runoff from Ft. Lewis - Outfall 003	2.5	0.7	6.5	0.7	0.0	6.7	4.8	7.2	4.5	7.3	7.1	0.3	8.3
Evapotranspiration	-1.3	-2.0	-3.2	-3.7	-4.5	-4.0	-2.3	-1.0	-0.5	0.0	0.0	-0.6	-1.3
Recharge (-) Discharge (+)	-2.6	-2.0	-4.3	-3.7	-3.0	-5.3	-4.8	-6.2	-6.1	-5.1	-2.2	-3.6	-7.6
Surface Water Outflows	-7.4	-2.4	-0.6	-2.3	0.0	0.0	0.0	0.0	-2.2	-10.3	-17.5	-0.9	-1.4
To Diversion Canal	-4.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-7.6	-14.3	0.0	-0.6
To E. East Edmond (surface)	-2.6	-2.4	-0.6	-2.3	0.0	0.0	0.0	0.0	-2.2	-2.7	-3.2	-0.9	-0.8
Subsurface Outflows	-6.2	-4.2	-5.6	-3.5	-3.2	-4.1	-4.5	-5.7	-4.6	-5.2	-4.9	-3.9	-5.6
Change in Storage	-9.2	-8.1	7.2	-10.8	-10.6	7.6	3.6	9.8	1.5	2.7	-1.9	-8.1	10.0
Predicted WSE in feet													
Bell	218.34	217.66	218.26	217.36	216.48	217.11	217.41	218.23	218.35	218.58	218.42	217.74	218.58
McKay	216.19	215.51	216.11	215.21	214.33	214.96	215.26	216.08	216.20	216.43	216.27	215.59	216.43
Hamer	214.91	214.23	214.83	213.93	213.05	213.68	213.98	214.80	214.92	215.15	214.99	214.31	215.15
Observed WSE ('04) in feet													
Bell						216.36	217.40	217.36	217.72	218.30	219.11	217.92	216.95
McKay	216.19	215.81	214.71	214.26				213.70	213.84	214.35	215.15	214.68	213.74
Hamer	214.41	214.17	213.61	213.34	212.76	211.93	212.68	212.95	213.27	213.50	213.93	213.69	213.28

Table F-16. Water Balance for Bell, McKay, and Hamer Marshes with Mining Restoration - Low Groundwater

Monthly Average in Inches of Water — WY2006

Hydrologic Process	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr
Precipitation	5.4	3.9	3.8	1.4	0.2	1.6	3.3	6.7	6.5	12.2	3.2	2.6	3.9
Surface Water Inflows	24.9	16.4	14.9	3.4	0.0	6.1	21.6	46.3	33.2	87.3	10.6	9.0	16.1
Runoff from Ft. Lewis - Outfall 002	15.3	10.1	9.2	2.0	0.0	3.6	13.2	28.3	20.3	52.6	6.5	5.5	9.9
Runoff from Ft. Lewis - Outfall 003	9.6	6.3	5.8	1.4	0.0	2.5	8.3	18.0	12.9	34.7	4.1	3.5	6.2
Evapotranspiration	-2.0	-3.2	-3.7	-4.5	-4.0	-2.3	-1.0	-0.5	0.0	0.0	-0.6	-1.3	-2.0
Recharge (-) Discharge (+)	-2.3	-3.0	-2.9	-4.2	-11.3	-9.5	-9.4	-5.9	-4.1	0.9	-1.4	-1.8	-2.8
Surface Water Outflows	-23.2	-6.8	-14.6	-1.8	0.0	0.0	0.0	-11.3	-30.9	-94.5	-10.9	-2.5	-7.4
To Diversion Canal	-20.1	-3.9	-11.4	0.0	0.0	0.0	0.0	-11.3	-27.6	-91.3	-8.0	0.0	-4.8
To E. East Edmond (surface)	-3.1	-2.9	-3.1	-1.8	0.0	0.0	0.0	0.0	-3.2	-3.2	-2.9	-2.5	-2.6
Subsurface Outflows	-4.7	-5.3	-4.1	-3.6	-1.8	-1.8	-3.7	-7.4	-4.9	-5.6	-4.4	-5.3	-5.3
Change in Storage	-1.9	1.9	-6.5	-9.3	-16.9	-5.9	10.8	27.9	-0.3	0.3	-3.5	0.9	2.6
Predicted WSE in feet													
Bell	218.42	218.58	218.04	217.26	215.85	215.36	216.26	218.58	218.56	218.58	218.29	218.36	218.58
McKay	216.27	216.43	215.89	215.11	213.70	213.57	214.47	216.79	216.77	216.79	216.50	216.57	216.79
Hamer	214.99	215.15	214.61	213.83	212.42	211.93	212.83	215.15	215.13	215.15	214.86	214.93	215.15
Observed WSE ('04) in feet													
Bell			218.33	217.05	215.63			218.25	217.95				
McKay	216.07	215.43	214.48	213.57				214.39	214.34	216.95	216.28	216.60	216.49
Hamer	214.26	214.05	213.69	213.13	212.13	211.67	211.69	213.20	213.27	214.09	213.65	214.13	214.14

Table F-16. Water Balance for Bell, McKay, and Hamer Marshes with Mining Restoration - Low Groundwater

Monthly Average in Inches of Water — WY2007

Hydrologic Process	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May
Precipitation	2.1	2.2	0.4	0.0	0.8	1.6	14.4	8.6	6.5	4.5	5.7	1.7	1.1
Surface Water Inflows	6.5	6.9	0.0	0.0	1.1	6.0	153.8	50.6	33.2	17.8	27.6	4.5	2.2
Runoff from Ft. Lewis - Outfall 002	3.9	4.2	0.0	0.0	0.5	3.6	92.3	30.8	20.3	10.9	16.9	2.7	1.2
Runoff from Ft. Lewis - Outfall 003	2.5	2.7	0.0	0.0	0.6	2.4	61.5	19.8	12.9	6.9	10.7	1.8	1.0
Evapotranspiration	-3.2	-3.7	-4.5	-4.0	-2.3	-1.0	-0.5	0.0	0.0	-0.6	-1.3	-2.0	-3.2
Recharge (-) Discharge (+)	0.3	-1.0	-1.1	-1.3	-1.9	-3.7	2.7	2.7	1.1	0.2	0.9	-0.4	0.0
Surface Water Outflows	-8.2	-1.5	-0.4	0.0	0.0	0.0	-129.6	-56.2	-35.2	-16.9	-27.4	-6.2	-1.6
To Diversion Canal	-4.9	0.0	0.0	0.0	0.0	0.0	-129.6	-52.9	-32.0	-14.0	-24.2	-3.3	0.0
To E. East Edmond (surface)	-3.2	-1.5	-0.4	0.0	0.0	0.0	0.0	-3.2	-3.2	-2.9	-3.2	-2.9	-1.6
Subsurface Outflows	-4.6	-4.6	-3.8	-3.2	-3.0	-2.9	-8.8	-5.8	-5.6	-5.0	-5.6	-4.4	-4.3
Change in Storage	-7.0	-1.8	-9.4	-8.5	-5.3	0.0	32.0	0.0	0.0	0.0	0.0	-6.8	-5.9
Predicted WSE in feet													
Bell	218.00	217.85	217.06	216.36	215.91	215.91	218.58	218.58	218.58	218.58	218.58	218.02	217.53
McKay	216.20	216.06	215.27	214.57	214.12	214.12	216.79	216.79	216.79	216.79	216.79	216.23	215.74
Hamer	214.57	214.42	213.63	212.93	212.48	212.48	215.15	215.15	215.15	215.15	215.15	214.59	214.10
Observed WSE ('04) in feet													
Bell			218.46	217.75	217.19	216.57							
McKay	216.06	216.27	214.34	213.60			216.87	217.29	217.02	216.97	216.90	217.35	216.64
Hamer	214.89	214.08	213.26	212.65	212.31	212.19	214.53	215.05	214.60	214.64	214.72	214.14	214.21

Table F-16. Water Balance for Bell, McKay, and Hamer Marshes with Mining Restoration - Low Groundwater

Monthly Average in Inches of Water					WY2008								
Hydrologic Process	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
Precipitation	2.7	1.5	1.0	1.7	5.0	2.8	7.7	4.2	3.6	4.9	1.8	1.3	1.7
Surface Water Inflows	9.6	4.3	2.1	5.5	27.8	9.6	44.6	17.9	13.5	22.9	4.7	2.8	4.6
Runoff from Ft. Lewis - Outfall 002	5.9	2.5	1.1	3.3	17.1	5.9	27.2	11.0	8.3	14.1	2.8	1.6	2.8
Runoff from Ft. Lewis - Outfall 003	3.7	1.7	1.0	2.2	10.8	3.7	17.4	6.9	5.2	8.9	1.9	1.2	1.9
Evapotranspiration	-3.7	-4.5	-4.0	-2.3	-1.0	-0.5	0.0	0.0	-0.6	-1.3	-2.0	-3.2	-3.7
Recharge (-) Discharge (+)	-1.8	-1.3	-1.4	-1.0	-4.3	-2.9	0.4	-0.4	-0.8	-1.1	-1.1	0.3	-1.9
Surface Water Outflows	-0.1	-0.6	0.0	0.0	0.0	-10.1	-40.3	-17.1	-13.1	-17.1	-6.5	-1.5	-0.3
To Diversion Canal	0.0	0.0	0.0	0.0	0.0	-7.2	-38.5	-13.9	-10.3	-14.4	-3.5	0.0	0.0
To E. East Edmond (surface)	-0.1	-0.6	0.0	0.0	0.0	-2.9	-1.7	-3.2	-2.9	-2.7	-3.0	-1.5	-0.3
Subsurface Outflows	-4.8	-4.2	-3.8	-4.0	-6.8	-4.2	-6.1	-5.3	-4.8	-5.7	-4.3	-4.5	-4.1
Change in Storage	1.9	-4.9	-6.0	-0.1	20.7	-5.3	6.3	-0.6	-2.1	2.7	-7.3	-4.8	-3.6
Predicted WSE in feet													
Bell	217.69	217.28	216.77	216.77	218.50	218.05	218.58	218.53	218.35	218.58	217.97	217.57	217.27
McKay	215.89	215.49	214.98	214.98	216.70	216.26	216.79	216.74	216.56	216.79	216.18	215.78	215.48
Hamer	214.26	213.85	213.34	213.34	215.07	214.62	215.15	215.10	214.92	215.15	214.54	214.14	213.84
Observed WSE ('04) in feet													
Bell				218.18									
McKay	216.01	214.98	214.26	213.68	215.97	214.67	216.83	216.83	216.91	216.98	215.93	215.06	214.63
Hamer	213.85	213.68	213.29	213.04	213.88	213.81	214.52	214.47	214.43	214.52	214.23	214.75	213.55

Table F-16. Water Balance for Bell, McKay, and Hamer Marshes with Mining Restoration - Low Groundwater

Monthly Average in Inches of Water WY2009

Hydrologic Process	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul
Precipitation	0.9	2.1	0.5	2.6	8.3	5.2	7.3	1.6	5.3	3.5	3.4	1.3	0.0
Surface Water Inflows	1.5	7.8	0.2	11.8	57.5	23.9	39.9	3.6	25.4	13.0	13.2	3.0	0.0
Runoff from Ft. Lewis - Outfall 002	0.8	4.7	0.0	7.2	35.0	14.7	24.4	2.2	15.6	8.0	8.1	1.7	0.0
Runoff from Ft. Lewis - Outfall 003	0.8	3.1	0.2	4.6	22.5	9.2	15.6	1.5	9.8	5.0	5.1	1.3	0.0
Evapotranspiration	-4.5	-4.0	-2.3	-1.0	-0.5	0.0	0.0	-0.6	-1.3	-2.0	-3.2	-3.7	-4.5
Recharge (-) Discharge (+)	-2.1	-3.0	-2.1	-4.3	-1.2	-2.3	-0.5	-1.7	-1.7	-1.6	-2.4	-2.6	-3.7
Surface Water Outflows	0.0	0.0	0.0	0.0	-31.7	-22.3	-40.6	-5.2	-15.5	-13.0	-2.2	-4.3	0.0
To Diversion Canal	0.0	0.0	0.0	0.0	-31.7	-19.1	-37.6	-2.6	-13.8	-9.9	0.0	-2.1	0.0
To E. East Edmond (surface)	0.0	0.0	0.0	0.0	0.0	-3.2	-3.1	-2.6	-1.7	-3.1	-2.2	-2.3	0.0
Subsurface Outflows	-3.5	-3.6	-2.8	-3.7	-7.2	-5.1	-5.4	-4.1	-5.8	-4.5	-5.4	-3.9	-3.3
Change in Storage	-7.7	-0.6	-6.5	5.3	25.3	-0.6	0.6	-6.3	6.3	-4.6	3.3	-10.2	-11.4
Predicted WSE in feet													
Bell	216.63	216.58	216.03	216.48	218.58	218.53	218.58	218.05	218.58	218.20	218.48	217.63	216.68
McKay	214.83	214.78	214.24	214.68	216.79	216.74	216.79	216.26	216.79	216.41	216.69	215.84	214.88
Hamer	213.20	213.15	212.60	213.05	215.15	215.10	215.15	214.62	215.15	214.77	215.05	214.20	213.25
Observed WSE ('04) in feet													
Bell													
McKay					216.11	214.61	216.38	215.34	216.31	215.69	215.73	214.44	
Hamer	212.98	212.63	212.51	212.39	214.37	213.94	214.42	214.08	214.34	214.18	214.24	213.49	212.68

Table F-16. Water Balance for Bell, McKay, and Hamer Marshes with Mining Restoration - Low Groundwater

Monthly Average in Inches of Water WY2010

Hydrologic Process	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug
Precipitation	1.9	2.8	5.6	8.9	3.0	8.0	3.3	3.3	3.3	4.6	4.3	0.4	0.2
Surface Water Inflows	6.7	11.5	31.3	52.2	10.6	47.2	11.4	13.0	12.3	20.9	17.6	0.0	0.0
Runoff from Ft. Lewis - Outfall 002	4.0	7.1	19.2	31.7	6.5	28.8	7.0	8.0	7.5	12.9	10.8	0.0	0.0
Runoff from Ft. Lewis - Outfall 003	2.6	4.5	12.1	20.5	4.1	18.5	4.4	5.0	4.8	8.1	6.8	0.0	0.0
Evapotranspiration	-4.0	-2.3	-1.0	-0.5	0.0	0.0	-0.6	-1.3	-2.0	-3.2	-3.7	-4.5	-4.0
Recharge (-) Discharge (+)	-3.6	-4.0	-6.7	-0.5	-0.7	1.5	-0.1	-0.2	0.6	-1.0	-0.2	-1.9	-1.8
Surface Water Outflows	0.0	0.0	-1.8	-54.9	-11.2	-47.4	-11.5	-7.0	-12.4	-12.6	-16.8	-0.4	0.0
To Diversion Canal	0.0	0.0	-1.8	-51.8	-8.0	-44.9	-8.6	-4.2	-9.3	-10.0	-13.7	0.0	0.0
To E. East Edmond (surface)	0.0	0.0	0.0	-3.1	-3.2	-2.5	-2.9	-2.8	-3.1	-2.6	-3.1	-0.4	0.0
Subsurface Outflows	-3.4	-3.7	-6.4	-5.2	-4.9	-6.0	-4.7	-5.8	-5.0	-5.7	-4.8	-4.2	-3.6
Change in Storage	-2.4	4.2	21.0	0.0	-3.3	3.3	-2.2	2.2	-3.1	3.1	-3.6	-10.5	-9.1
Predicted WSE in feet													
Bell	216.48	216.83	218.58	218.58	218.31	218.58	218.40	218.58	218.32	218.58	218.28	217.40	216.64
McKay	214.69	215.04	216.79	216.79	216.52	216.79	216.61	216.79	216.53	216.79	216.49	215.61	214.84
Hamer	213.05	213.40	215.15	215.15	214.88	215.15	214.97	215.15	214.89	215.15	214.85	213.97	213.21
Observed WSE ('04) in feet													
Bell													
McKay				216.08	215.95	216.60	216.40	216.04	216.36	216.01	215.95	214.27	214.28
Hamer	212.35	212.48	213.05	214.46	214.53	214.80	214.56	214.47	214.59	214.32	214.44	213.62	213.02

Table F-16. Water Balance for Bell, McKay, and Hamer Marshes with Mining Restoration - Low Groundwater

Monthly Average in Inches of Water	WY2011												
Hydrologic Process	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Precipitation	4.0	4.2	6.6	7.2	6.1	3.1	7.2	5.7	4.8	2.8	0.8	0.3	1.3
Surface Water Inflows	19.3	19.1	33.2	38.5	30.5	10.3	40.7	26.9	21.2	9.6	0.9	0.0	3.2
Runoff from Ft. Lewis - Outfall 002	11.9	11.7	20.3	23.5	18.7	6.3	24.9	16.5	13.0	5.9	0.4	0.0	1.8
Runoff from Ft. Lewis - Outfall 003	7.4	7.4	12.9	15.0	11.8	4.0	15.9	10.4	8.2	3.7	0.5	0.0	1.3
Evapotranspiration	-2.3	-1.0	-0.5	0.0	0.0	-0.6	-1.3	-2.0	-3.2	-3.7	-4.5	-4.0	-2.3
Recharge (-) Discharge (+)	-2.4	-5.3	-0.7	0.2	0.6	0.3	1.0	-1.0	0.3	-1.0	0.6	0.8	-0.2
Surface Water Outflows	0.0	-0.8	-33.4	-40.4	-31.7	-10.7	-39.5	-25.0	-19.8	-2.6	-1.7	-0.3	0.0
To Diversion Canal	0.0	0.0	-30.3	-37.2	-28.5	-7.8	-36.7	-21.9	-16.7	0.0	0.0	0.0	0.0
To E. East Edmond (surface)	0.0	-0.8	-3.1	-3.2	-3.2	-2.9	-2.8	-3.1	-3.1	-2.6	-1.7	-0.3	0.0
Subsurface Outflows	-5.4	-6.0	-5.2	-5.5	-5.5	-4.7	-5.9	-5.1	-5.2	-5.1	-4.6	-4.2	-4.0
Change in Storage	13.1	10.2	0.0	0.0	0.0	-2.3	2.3	-0.5	-2.0	-0.1	-8.5	-7.4	-2.0
Predicted WSE in feet													
Bell	217.73	218.58	218.58	218.58	218.58	218.39	218.58	218.54	218.38	218.37	217.66	217.04	216.87
McKay	215.94	216.79	216.79	216.79	216.79	216.60	216.79	216.75	216.59	216.57	215.87	215.25	215.08
Hamer	214.30	215.15	215.15	215.15	215.15	214.96	215.15	215.11	214.95	214.94	214.23	213.61	213.44
Observed WSE ('04) in feet													
Bell													
McKay	214.29	215.23	216.18	216.90	217.01	217.07	217.13						
Hamer	213.60	213.51	214.64	214.45	214.30	214.29	214.28	214.31	214.72	214.68	214.63	214.01	213.35

Table F-16. Water Balance for Bell, McKay, and Hamer Marshes with Mining Restoration - Low Groundwater

Monthly Average in Inches of Water	WY2012												WY2013
Hydrologic Process	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct
Precipitation	4.1	6.1	3.2	7.2	3.9	6.8	4.3	3.1	3.3	1.6	0.0	0.1	6.5
Surface Water Inflows	19.5	30.7	12.2	40.0	14.7	36.8	17.5	11.6	11.9	4.3	0.0	0.0	41.1
Runoff from Ft. Lewis - Outfall 002	12.0	18.8	7.5	24.4	9.0	22.5	10.7	7.1	7.3	2.5	0.0	0.0	25.1
Runoff from Ft. Lewis - Outfall 003	7.5	11.9	4.7	15.6	5.7	14.3	6.7	4.5	4.6	1.7	0.0	0.0	16.0
Evapotranspiration	-1.0	-0.5	0.0	0.0	-0.6	-1.3	-2.0	-3.2	-3.7	-4.5	-4.0	-2.3	-1.0
Recharge (-) Discharge (+)	-3.1	-3.0	-2.1	0.6	-0.4	0.9	-0.6	-0.8	-0.2	0.2	0.8	-0.1	-3.3
Surface Water Outflows	0.0	-21.0	-12.4	-38.0	-14.3	-35.7	-16.7	-2.7	-12.1	-1.9	0.0	0.0	-12.2
To Diversion Canal	0.0	-19.4	-9.2	-35.6	-11.3	-32.8	-13.6	0.0	-9.0	0.0	0.0	0.0	-12.2
To E. East Edmond (surface)	0.0	-1.6	-3.2	-2.4	-3.0	-2.9	-3.1	-2.7	-3.1	-1.9	0.0	0.0	0.0
Subsurface Outflows	-5.7	-5.5	-4.7	-5.9	-4.9	-5.8	-4.9	-5.7	-4.5	-4.6	-4.3	-3.6	-7.2
Change in Storage	13.7	6.8	-3.8	3.8	-1.6	1.6	-2.4	2.2	-5.4	-4.9	-7.5	-5.9	23.9
Predicted WSE in feet													
Bell	218.01	218.58	218.26	218.58	218.44	218.58	218.38	218.56	218.12	217.71	217.08	216.59	218.58
McKay	216.22	216.79	216.47	216.79	216.65	216.79	216.59	216.77	216.32	215.91	215.29	214.79	216.79
Hamer	214.58	215.15	214.83	215.15	215.01	215.15	214.95	215.13	214.69	214.28	213.65	213.16	215.15
Observed WSE ('04) in feet													
Bell					219.68	219.77	219.87	219.91	219.77	219.42	219.07	218.23	218.84
McKay	214.03	214.15	214.78	215.42	215.25	215.08	214.91	214.89	215.43	215.18	214.93	213.70	214.59
Hamer	213.44	213.63	214.25	215.05	214.90	215.03	215.15	215.00	214.78	214.40	214.02	213.24	213.96

Table F-16. Water Balance for Bell, McKay, and Hamer Marshes with Mining Restoration - Low Groundwater

Monthly Average in Inches of Water — WY2014

Hydrologic Process	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov
Precipitation	6.5	7.6	3.5	1.7	3.7	5.5	4.4	1.9	0.0	1.6	6.9	2.6	4.1
Surface Water Inflows	32.3	42.4	13.5	4.2	15.2	25.0	18.6	5.5	0.0	4.8	40.9	8.3	17.3
Runoff from Ft. Lewis - Outfall 002	19.7	25.8	8.3	2.5	9.3	15.3	11.4	3.3	0.0	2.8	25.0	5.0	10.6
Runoff from Ft. Lewis - Outfall 003	12.5	16.5	5.2	1.7	5.9	9.7	7.2	2.2	0.0	1.9	15.9	3.2	6.7
Evapotranspiration	-0.5	0.0	0.0	-0.6	-1.3	-2.0	-3.2	-3.7	-4.5	-4.0	-2.3	-1.0	-0.5
Recharge (-) Discharge (+)	-0.6	2.3	0.7	-0.2	-1.3	-2.6	-1.5	-1.2	-0.3	-2.3	-4.2	-0.9	-1.7
Surface Water Outflows	-32.5	-46.5	-13.5	-5.9	-1.8	-23.8	-17.6	-2.1	0.0	0.0	-8.7	-10.3	-7.2
To Diversion Canal	-29.4	-43.3	-10.2	-3.3	0.0	-20.1	-14.5	0.0	0.0	0.0	-8.7	-6.2	-4.4
To E. East Edmond (surface)	-3.1	-3.2	-3.2	-2.6	-1.8	-3.6	-3.1	-2.1	0.0	0.0	0.0	-4.1	-2.8
Subsurface Outflows	-5.2	-5.7	-5.4	-4.3	-6.2	-4.8	-4.7	-4.4	-4.1	-3.8	-7.1	-4.6	-5.9
Change in Storage	0.0	0.0	-1.2	-5.0	8.3	-2.8	-3.9	-4.1	-8.9	-3.6	25.4	-6.0	6.0
Predicted WSE in feet													
Bell	218.58	218.58	218.48	218.07	218.76	218.53	218.20	217.86	217.12	216.82	218.93	218.43	218.93
McKay	216.79	216.79	216.69	216.27	216.97	216.74	216.41	216.07	215.33	215.02	217.14	216.64	217.14
Hamer	215.15	215.15	215.05	214.64	215.33	215.10	214.77	214.43	213.69	213.39	215.50	215.00	215.50
Observed WSE ('04) in feet													
Bell	219.44	219.62	219.81	219.57	219.35	219.49	219.46	219.25	218.80	218.09	219.27	219.36	219.48
McKay	215.49	215.65	215.47	215.46	215.49	215.57	215.97	216.22	214.67	213.77	214.98	216.08	216.03
Hamer	214.68	214.86	215.05	214.97	215.11	215.07	214.61	214.57	213.93	213.35	214.07	214.78	214.76

Table F-16. Water Balance for Bell, McKay, and Hamer Marshes with Mining Restoration - Low Groundwater

Monthly Average in Inches of Water — WY2015

Hydrologic Process	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Precipitation	2.4	4.2	6.9	9.8	4.5	3.3	1.3	1.2	1.6	1.8	5.9	6.1	4.8
Surface Water Inflows	7.4	18.1	31.8	59.6	18.3	12.5	2.7	2.5	4.5	5.8	31.7	28.1	20.8
Runoff from Ft. Lewis - Outfall 002	4.5	11.1	19.5	36.1	11.2	7.7	1.6	1.4	2.6	3.5	19.4	17.2	12.7
Runoff from Ft. Lewis - Outfall 003	2.9	7.0	12.4	23.5	7.1	4.8	1.2	1.1	1.8	2.3	12.3	10.9	8.0
Evapotranspiration	0.0	0.0	-0.6	-1.3	-2.0	-3.2	-3.7	-4.5	-4.0	-2.3	-1.0	-0.5	0.0
Recharge (-) Discharge (+)	-2.7	-3.1	-1.1	0.5	-0.4	1.6	2.3	2.3	1.1	2.0	-0.9	-1.5	1.1
Surface Water Outflows	-9.7	-6.2	-32.2	-62.9	-18.3	-13.1	-2.6	-1.4	-0.2	0.0	-11.9	-27.1	-20.9
To Diversion Canal	-5.6	-3.5	-28.5	-58.8	-14.3	-9.5	0.0	0.0	0.0	0.0	-11.6	-23.1	-16.8
To E. East Edmond (surface)	-4.1	-2.6	-3.7	-4.1	-4.0	-3.6	-2.6	-1.4	-0.2	0.0	-0.2	-4.0	-4.1
Subsurface Outflows	-4.3	-6.1	-5.0	-5.6	-5.0	-5.2	-4.9	-4.8	-4.8	-5.3	-7.4	-5.2	-5.7
Change in Storage	-7.0	7.0	0.0	0.0	-2.8	-4.0	-5.0	-4.7	-1.9	1.9	16.4	-0.1	0.1
Predicted WSE in feet													
Bell	218.35	218.93	218.93	218.93	218.70	218.36	217.95	217.56	217.40	217.56	218.93	218.92	218.93
McKay	216.56	217.14	217.14	217.14	216.90	216.57	216.16	215.76	215.61	215.77	217.14	217.13	217.14
Hamer	214.92	215.50	215.50	215.50	215.27	214.93	214.52	214.13	213.97	214.13	215.50	215.49	215.50
Observed WSE ('04) in feet													
Bell	218.67	219.27	219.76										
McKay	215.03	215.78	216.09	215.95	216.19	215.94	215.82	215.62	215.27	215.36	215.45	215.97	216.17
Hamer	214.33	214.68	215.58	215.43			215.02	214.50	214.15	214.20	214.25	214.93	215.39

Table F-16. Water Balance for Bell, McKay, and Hamer Marshes with Mining Restoration - Low Groundwater

Monthly Average in Inches of Water — WY2016

Hydrologic Process	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan
Precipitation	4.1	4.7	4.4	2.1	0.8	0.4	0.2	2.2	1.3	5.0	7.1	12.0	6.9
Surface Water Inflows	16.4	18.0	18.7	6.2	1.0	0.0	0.0	8.2	3.4	31.3	38.6	81.8	34.7
Runoff from Ft. Lewis - Outfall 002	10.1	11.1	11.5	3.8	0.5	0.0	0.0	5.0	1.9	19.2	23.6	49.3	21.2
Runoff from Ft. Lewis - Outfall 003	6.3	7.0	7.2	2.4	0.6	0.0	0.0	3.2	1.4	12.1	15.0	32.5	13.5
Evapotranspiration	0.0	-0.6	-1.3	-2.0	-3.2	-3.7	-4.5	-4.0	-2.3	-1.0	-0.5	0.0	0.0
Recharge (-) Discharge (+)	0.4	-0.3	1.2	-0.1	1.2	0.5	1.0	-2.1	-1.5	-8.2	-0.2	1.5	0.6
Surface Water Outflows	-16.8	-17.6	-18.4	-8.2	-1.9	-0.4	0.0	0.0	0.0	0.0	-28.0	-89.6	-36.6
To Diversion Canal	-12.7	-14.2	-14.6	-4.7	0.0	0.0	0.0	0.0	0.0	0.0	-26.3	-85.5	-32.5
To E. East Edmond (surface)	-4.1	-3.4	-3.8	-3.4	-1.9	-0.4	0.0	0.0	0.0	0.0	-1.6	-4.1	-4.1
Subsurface Outflows	-5.4	-4.9	-5.6	-4.5	-4.5	-4.0	-3.6	-3.6	-3.2	-6.2	-6.4	-5.7	-5.6
Change in Storage	-1.2	-0.7	-1.0	-6.5	-6.5	-7.1	-6.8	0.8	-2.4	20.9	10.6	0.0	0.0
Predicted WSE in feet													
Bell	218.83	218.77	218.69	218.15	217.60	217.01	216.44	216.50	216.30	218.04	218.93	218.93	218.93
McKay	217.03	216.98	216.89	216.35	215.81	215.22	214.65	214.71	214.51	216.25	217.14	217.14	217.14
Hamer	215.40	215.34	215.26	214.72	214.17	213.58	213.01	213.07	212.87	214.61	215.50	215.50	215.50
Observed WSE ('04) in feet													
Bell					219.23	219.09	218.69	217.87	217.69	217.50	219.85		
McKay	216.10	215.99	215.89	215.65	215.44	214.58	213.88				215.69	216.17	
Hamer	215.29	215.29	215.29	215.26	214.68	213.91	213.36	212.70	212.67	212.64	215.55		

Table F-16. Water Balance for Bell, McKay, and Hamer Marshes with Mining Restoration - Low Groundwater

Monthly Average in Inches of Water — WY2017

Hydrologic Process	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
Precipitation	5.8	5.9	1.8	1.0	2.3	1.3	0.2	1.5	9.3	6.9	3.9	3.4	8.6
Surface Water Inflows	25.2	27.7	4.5	1.7	7.3	2.9	0.0	4.1	65.7	33.5	15.5	12.7	45.7
Runoff from Ft. Lewis - Outfall 002	15.4	17.0	2.7	0.9	4.4	1.7	0.0	2.4	39.9	20.5	9.5	7.8	27.8
Runoff from Ft. Lewis - Outfall 003	9.7	10.7	1.8	0.8	2.9	1.2	0.0	1.7	25.8	13.0	6.0	4.9	17.9
Evapotranspiration	-0.6	-1.3	-2.0	-3.2	-3.7	-4.5	-4.0	-2.3	-1.0	-0.5	0.0	0.0	-0.6
Recharge (-) Discharge (+)	0.6	0.6	1.9	3.5	2.3	2.3	1.4	1.1	-5.6	1.3	1.9	1.0	0.5
Surface Water Outflows	-25.6	-27.3	-6.3	-2.7	-1.7	-2.0	-0.2	0.0	-39.7	-35.6	-16.0	-13.6	-46.3
To Diversion Canal	-21.8	-23.2	-3.0	-1.0	0.0	0.0	0.0	0.0	-39.7	-31.7	-11.9	-9.7	-43.0
To E. East Edmond (surface)	-3.8	-4.1	-3.3	-1.7	-1.7	-2.0	-0.2	0.0	0.0	-4.0	-4.1	-4.0	-3.3
Subsurface Outflows	-5.3	-5.6	-5.1	-5.4	-5.4	-4.9	-4.5	-4.5	-7.2	-5.6	-5.7	-5.4	-5.5
Change in Storage	0.0	0.0	-5.2	-5.1	1.0	-4.9	-7.0	-0.2	21.5	0.0	-0.4	-1.9	2.4
Predicted WSE in feet													
Bell	218.93	218.93	218.50	218.07	218.15	217.74	217.15	217.14	218.93	218.93	218.89	218.73	218.93
McKay	217.14	217.14	216.71	216.28	216.36	215.95	215.36	215.35	217.14	217.14	217.10	216.94	217.14
Hamer	215.50	215.50	215.07	214.64	214.72	214.31	213.72	213.71	215.50	215.50	215.46	215.30	215.50
Observed WSE ('04) in feet													
Bell							219.47		218.88				
McKay					215.60	215.55	214.85		214.09	215.95	216.30	216.16	216.16
Hamer					212.25	214.62	213.94		213.45	215.32			

Table F-16. Water Balance for Bell, McKay, and Hamer Marshes with Mining Restoration - Low Groundwater

Monthly Average in Inches of Water — WY2018

Hydrologic Process	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar
Precipitation	8.7	4.6	2.8	1.8	0.0	0.1	1.0	5.2	7.2	5.8	7.2	3.3	2.3
Surface Water Inflows	49.6	18.8	9.9	5.0	0.0	0.0	1.9	28.0	35.8	27.0	37.6	10.8	7.4
Runoff from Ft. Lewis - Outfall 002	30.1	11.6	6.1	3.0	0.0	0.0	1.0	17.2	21.9	16.6	22.9	6.6	4.5
Runoff from Ft. Lewis - Outfall 003	19.4	7.3	3.8	2.0	0.0	0.0	0.9	10.8	14.0	10.5	14.6	4.2	2.9
Evapotranspiration	-1.3	-2.0	-3.2	-3.7	-4.5	-4.0	-2.3	-1.0	-0.5	0.0	0.0	-0.6	-1.3
Recharge (-) Discharge (+)	3.0	0.9	2.2	2.8	4.0	4.8	2.8	-0.4	-0.4	2.1	1.7	1.6	3.2
Surface Water Outflows	-54.0	-18.8	-11.3	-2.7	0.0	-0.1	0.0	-3.4	-36.7	-29.1	-40.7	-11.9	-9.5
To Diversion Canal	-49.9	-14.8	-7.4	0.0	0.0	0.0	0.0	-3.4	-32.8	-25.0	-36.6	-8.2	-5.6
To E. East Edmond (surface)	-4.1	-4.0	-3.8	-2.7	0.0	-0.1	0.0	0.0	-4.0	-4.1	-4.1	-3.7	-3.8
Subsurface Outflows	-6.0	-5.3	-5.3	-5.4	-5.5	-5.3	-4.9	-7.9	-5.4	-5.8	-5.8	-5.1	-5.6
Change in Storage	0.0	-1.7	-4.8	-2.1	-6.0	-4.4	-1.5	20.5	0.0	0.0	0.0	-1.8	-3.4
Predicted WSE in feet													
Bell	218.93	218.79	218.39	218.21	217.71	217.34	217.22	218.93	218.93	218.93	218.93	218.78	218.50
McKay	217.14	217.00	216.60	216.42	215.92	215.55	215.43	217.14	217.14	217.14	217.14	216.99	216.71
Hamer	215.50	215.36	214.96	214.78	214.28	213.91	213.79	215.50	215.50	215.50	215.50	215.35	215.07
Observed WSE ('04) in feet													
Bell							219.80						
McKay	216.28	216.12		215.96	216.02	215.96	216.12			216.35		216.30	216.35
Hamer				215.45	214.76	213.95	213.83						

Table F-16. Water Balance for Bell, McKay, and Hamer Marshes with Mining Restoration - Low Groundwater

Monthly Average in Inches of Water — WY2019

Hydrologic Process	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr
Precipitation	6.1	0.7	0.9	0.2	0.3	1.8	4.0	3.8	6.4	3.4	4.8	1.6	3.6
Surface Water Inflows	29.1	0.3	1.3	0.0	0.0	5.8	19.8	15.3	32.5	12.3	19.4	3.9	14.0
Runoff from Ft. Lewis - Outfall 002	17.8	0.0	0.7	0.0	0.0	3.5	12.2	9.4	19.9	7.6	11.9	2.3	8.6
Runoff from Ft. Lewis - Outfall 003	11.3	0.3	0.7	0.0	0.0	2.3	7.6	5.9	12.6	4.8	7.5	1.6	5.4
Evapotranspiration	-2.0	-3.2	-3.7	-4.5	-4.0	-2.3	-1.0	-0.5	0.0	0.0	-0.6	-1.3	-2.0
Recharge (-) Discharge (+)	0.8	1.9	2.1	2.7	1.7	1.3	-3.6	-1.8	1.1	1.0	0.1	0.9	-3.2
Surface Water Outflows	-26.8	-1.0	-1.7	-0.2	0.0	0.0	0.0	-1.2	-31.0	-13.4	-18.7	-5.5	-2.4
To Diversion Canal	-23.9	-0.2	0.0	0.0	0.0	0.0	0.0	0.0	-27.5	-9.4	-15.4	-2.6	0.0
To E. East Edmond (surface)	-2.9	-0.7	-1.7	-0.2	0.0	0.0	0.0	-1.2	-3.6	-4.1	-3.4	-2.9	-2.4
Subsurface Outflows	-5.6	-5.4	-4.5	-4.6	-3.9	-4.3	-5.8	-6.0	-6.1	-5.4	-5.1	-5.2	-5.5
Change in Storage	1.7	-6.7	-5.6	-6.3	-5.9	2.3	13.4	9.6	2.8	-2.1	-0.1	-5.5	4.6
Predicted WSE in feet													
Bell	218.64	218.08	217.61	217.08	216.59	216.78	217.90	218.70	218.93	218.75	218.74	218.29	218.67
McKay	216.85	216.28	215.82	215.29	214.80	214.99	216.11	216.91	217.14	216.96	216.95	216.50	216.88
Hamer	215.21	214.65	214.18	213.65	213.16	213.35	214.47	215.27	215.50	215.32	215.31	214.86	215.24
Observed WSE ('04) in feet													
Bell				219.79	219.20	219.09	218.29					219.89	219.77
McKay	216.38	214.68	214.31	214.30	213.97	213.79		214.25	214.52	214.67	215.96	214.44	214.37
Hamer		215.01	214.47	214.10	213.30	213.11	212.99	213.63	214.85		215.27	214.79	214.64

Table F-16. Water Balance for Bell, McKay, and Hamer Marshes with Mining Restoration - Low Groundwater

Monthly Average in Inches of Water — WY2020

Hydrologic Process	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May
Precipitation	1.1	0.7	1.0	0.8	3.5	3.9	1.7	6.5	9.6	4.2	3.5	1.5	3.1
Surface Water Inflows	2.1	0.4	2.0	1.3	18.3	18.5	4.6	36.9	57.4	15.9	13.7	3.9	12.7
Runoff from Ft. Lewis - Outfall 002	1.1	0.1	1.1	0.6	11.2	11.4	2.7	22.6	34.8	9.8	8.4	2.3	7.8
Runoff from Ft. Lewis - Outfall 003	0.9	0.3	0.9	0.7	7.1	7.2	1.9	14.3	22.6	6.1	5.3	1.6	4.9
Evapotranspiration	-3.2	-3.7	-4.5	-4.0	-2.3	-1.0	-0.5	0.0	0.0	-0.6	-1.3	-2.0	-3.2
Recharge (-) Discharge (+)	-2.2	-1.5	-2.3	-2.8	-4.2	-2.9	-2.3	-6.4	1.5	-0.8	-3.0	-1.7	-2.7
Surface Water Outflows	-3.2	-1.0	0.0	0.0	0.0	0.0	-1.3	-16.3	-61.6	-16.2	-13.9	-2.0	-0.9
To Diversion Canal	-1.2	0.0	0.0	0.0	0.0	0.0	0.0	-15.5	-57.5	-12.3	-10.4	0.0	0.0
To E. East Edmond (surface)	-2.0	-1.0	0.0	0.0	0.0	0.0	-1.3	-0.8	-4.1	-3.8	-3.5	-2.0	-0.9
Subsurface Outflows	-4.3	-3.6	-3.4	-2.7	-4.2	-5.6	-4.4	-6.5	-6.8	-5.7	-5.2	-4.7	-5.5
Change in Storage	-9.7	-8.8	-7.1	-7.3	11.0	13.0	-2.1	14.2	0.0	-3.0	-6.2	-4.9	3.6
Predicted WSE in feet													
Bell	217.86	217.12	216.53	215.92	216.84	217.92	217.75	218.93	218.93	218.68	218.16	217.75	218.05
McKay	216.07	215.33	214.74	214.13	215.05	216.13	215.95	217.14	217.14	216.89	216.37	215.96	216.26
Hamer	214.43	213.69	213.10	212.49	213.41	214.49	214.32	215.50	215.50	215.25	214.73	214.32	214.62
Observed WSE ('04) in feet													
Bell		218.58	217.47	216.86		218.20				219.71			
McKay		213.99			214.92			213.72	215.28	214.65			
Hamer		213.47	212.68		212.25			213.55	215.55	215.03			

Table F-16. Water Balance for Bell, McKay, and Hamer Marshes with Mining Restoration - Low Groundwater

Monthly Average in Inches of Water WY2021

Hydrologic Process	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
Precipitation	2.5	0.3	0.4	2.8	3.0	5.6	5.2	7.3	4.7	2.5	1.2	2.0	2.4
Surface Water Inflows	8.1	0.0	0.0	12.9	13.1	29.6	23.4	39.7	18.2	8.0	2.4	6.4	8.5
Runoff from Ft. Lewis - Outfall 002	4.9	0.0	0.0	7.9	8.0	18.1	14.3	24.3	11.2	4.9	1.3	3.9	5.2
Runoff from Ft. Lewis - Outfall 003	3.2	0.0	0.0	5.0	5.1	11.5	9.0	15.5	7.0	3.1	1.0	2.5	3.3
Evapotranspiration	-3.7	-4.5	-4.0	-2.3	-1.0	-0.5	0.0	0.0	-0.6	-1.3	-2.0	-3.2	-3.7
Recharge (-) Discharge (+)	-2.2	-3.0	-3.6	-3.9	-3.9	-5.1	-2.0	-0.3	0.0	2.0	0.3	0.1	-1.6
Surface Water Outflows	-1.7	-0.3	0.0	0.0	0.0	-1.4	-22.8	-37.7	-18.0	-9.8	-3.5	-1.2	-0.9
To Diversion Canal	0.0	0.0	0.0	0.0	0.0	-1.4	-18.7	-34.0	-14.3	-6.0	-1.6	0.0	0.0
To E. East Edmond (surface)	-1.7	-0.3	0.0	0.0	0.0	0.0	-4.1	-3.7	-3.7	-3.8	-2.0	-1.2	-0.9
Subsurface Outflows	-4.9	-3.6	-2.7	-3.8	-4.4	-7.0	-6.0	-6.8	-5.8	-6.0	-5.1	-5.2	-5.0
Change in Storage	-1.8	-11.1	-10.0	5.6	6.7	21.1	-2.2	2.2	-1.4	-4.5	-6.8	-1.0	-0.3
Predicted WSE in feet													
Bell	217.90	216.98	216.15	216.61	217.17	218.93	218.75	218.93	218.81	218.44	217.87	217.79	217.76
McKay	216.11	215.19	214.36	214.82	215.38	217.14	216.95	217.14	217.02	216.64	216.08	216.00	215.97
Hamer	214.47	213.55	212.72	213.18	213.74	215.50	215.32	215.50	215.38	215.01	214.44	214.36	214.33
Observed WSE ('04) in feet													
Bell					217.23			219.68			219.71	219.41	218.99
McKay						213.87		214.86	214.88	215.59	214.57	214.46	214.38
Hamer						213.15		215.23	215.30	214.89	214.51	214.01	213.58

Table F-16. Water Balance for Bell, McKay, and Hamer Marshes with Mining Restoration - Low Groundwater

Monthly Average in Inches of Water	WY2021		
Hydrologic Process	Jul	Aug	Sep
Precipitation	0.0	0.3	2.6
Surface Water Inflows	0.0	0.0	11.5
Runoff from Ft. Lewis - Outfall 002	0.0	0.0	7.0
Runoff from Ft. Lewis - Outfall 003	0.0	0.0	4.5
Evapotranspiration	-4.5	-4.0	-2.3
Recharge (-) Discharge (+)	-1.8	-2.7	-4.2
Surface Water Outflows	0.0	0.0	0.0
To Diversion Canal	0.0	0.0	0.0
To E. East Edmond (surface)	0.0	0.0	0.0
Subsurface Outflows	-3.8	-2.8	-3.6
Change in Storage	-10.1	-9.2	3.9
Predicted WSE in feet			
Bell	216.92	216.15	216.48
McKay	215.13	214.36	214.69
Hamer	213.49	212.72	213.05
Observed WSE ('04) in feet			
Bell	218.05		
McKay		213.27	
Hamer	212.68	212.25	

Table F-17. Water Balance for East Edmond Marsh with Mining Restoration - Low Groundwater

Monthly Average in Inches of Water	WY2004							WY2005					
Hydrologic Process	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar
Precipitation	2.0	1.0	3.8	0.9	0.1	3.6	2.9	4.0	3.2	4.3	4.3	0.6	4.5
Surface Water Inflows	122.8	107.4	68.2	30.6	7.8	4.7	17.0	28.7	62.7	10.4	16.9	21.3	30.4
From Sequalitchew Lake	118.6	103.4	67.1	26.8	7.8	4.4	16.8	28.4	58.9	5.7	11.1	19.9	28.8
From Center Drive	0.1	0.0	0.2	0.0	0.0	0.2	0.2	0.3	0.2	0.3	0.3	0.0	0.3
From Hamer (surface)	4.1	4.0	0.9	3.8	0.0	0.0	0.0	0.0	3.6	4.4	5.5	1.5	1.3
Subsurface Inflows	9.7	6.8	8.7	5.7	4.7	5.7	6.3	8.4	7.6	8.5	8.3	6.4	8.8
Evapotranspiration	-1.3	-2.0	-3.2	-3.7	-4.5	-4.0	-2.3	-1.0	-0.5	0.0	0.0	-0.6	-1.3
Recharge (-) Discharge (+)	*16.4*	*12.9*	*13.9*	*11.2*	*12.1*	*10.2*	*11.5*	*13.6*	*11.1*	*12.8*	*12.9*	*12.4*	*12.3*
Surface Water Outflows	-106.4	-99.8	-75.7	-31.1	-17.6	-14.9	-26.0	-40.8	-64.2	-25.9	-30.9	-32.9	-42.0
To Diversion Canal	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
To West Edmond Marsh	-129.8	-116.3	-88.3	-36.3	-20.5	-17.4	-30.4	-47.5	-74.9	-30.2	-36.0	-38.4	-49.0
Change in Storage	19.9	9.8	3.2	8.5	-0.4	2.9	5.0	6.1	9.2	5.8	6.4	1.8	5.7
Predicted WSE in ft													
EM-2S	209.00	209.49	209.68	210.07	210.04	210.28	210.70	211.21	211.67	211.78	211.86	211.89	212.26
East Edmond	209.00	209.33	209.07	209.31	209.00	209.00	209.00	209.00	209.30	209.36	209.46	209.12	209.11
Eastern East Edmond Marsh	209.00	209.33	209.20	209.44	209.20	209.20	209.20	209.20	209.50	209.56	209.66	209.32	209.31
Observed WSE in ft													
EM-2S	210.72	210.74	210.76	210.70	210.40	209.82	209.92	210.33	210.61	210.76	210.86	210.79	210.64
East Edmond (EM-2E)	212.62	212.50	212.35	212.25	211.85	211.43	211.43	211.80	212.12	212.31	212.47	212.40	212.19
East Edmond (EM-2W)	211.15	211.15	211.22	211.20	210.91	210.32	210.41	210.80	211.08	211.20	211.26	211.24	211.09
East Edmond (EM-3E)	212.42	212.29	212.14	212.04	211.69	211.07	211.43	211.70	211.93	212.09	212.15	212.17	211.97
East Edmond (EM-3W)	212.42	212.29	212.15	212.04	211.70	211.10	211.57	211.70	211.94	212.04	212.26	212.20	211.98
Eastern East Edmond (SCM-1)	212.39	212.26	212.09	211.98	211.58	210.96	211.20	211.63	211.84	212.08	212.27	212.17	211.95

Table F-17. Water Balance for East Edmond Marsh with Mining Restoration - Low Groundwater

Monthly Average in Inches of Water — WY2006

Hydrologic Process	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr
Precipitation	5.4	3.9	3.8	1.4	0.2	1.6	3.3	6.7	6.5	12.2	3.2	2.6	3.9
Surface Water Inflows	80.4	57.0	55.6	9.9	0.0	0.1	0.2	0.4	24.4	198.6	213.5	191.7	168.6
From Sequalitchew Lake	74.7	52.0	50.1	7.1	0.0	0.0	0.0	0.0	18.5	192.3	208.4	187.5	164.1
From Center Drive	0.4	0.3	0.2	0.1	0.0	0.1	0.2	0.4	0.4	0.9	0.2	0.2	0.2
From Hamer (surface)	5.3	4.7	5.3	2.8	0.0	0.0	0.0	0.0	5.5	5.4	5.0	4.0	4.3
Subsurface Inflows	8.0	8.8	7.0	5.7	2.6	2.1	3.6	9.3	8.4	9.5	7.5	8.6	8.7
Evapotranspiration	-2.0	-3.2	-3.7	-4.5	-4.0	-2.3	-1.0	-0.5	0.0	0.0	-0.6	-1.3	-2.0
Recharge (-) Discharge (+)	*12.8*	*12.9*	*13.4*	*11.2*	*8.3*	*4.4*	*5.2*	*11.3*	*10.1*	*15.6*	*12.3*	*13.6*	*13.4*
Surface Water Outflows	-81.8	-64.0	-60.2	-19.3	-7.2	-4.3	-8.3	-20.0	-33.2	-197.9	-198.1	-180.7	-160.4
To Diversion Canal	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
To West Edmond Marsh	-95.3	-74.6	-70.2	-22.5	-8.4	-5.0	-9.7	-23.3	-38.7	-230.6	-231.0	-210.7	-187.0
Change in Storage	9.3	4.8	5.9	1.2	-1.4	0.8	1.6	3.9	10.8	5.2	4.9	4.5	5.7
Predicted WSE in ft													
EM-2S	212.59	212.60	212.65	212.51	212.40	212.47	212.60	212.92	213.36	213.35	213.34	213.38	213.50
East Edmond	209.44	209.39	209.44	209.23	209.00	209.00	209.00	209.00	209.46	209.45	209.41	209.34	209.35
Eastern East Edmond Marsh	209.64	209.59	209.64	209.43	209.20	209.20	209.20	209.20	209.66	209.65	209.61	209.54	209.55
Observed WSE in ft													
EM-2S	210.94	210.90	210.69	210.42	209.82	209.15	209.21	210.48	210.71	210.98	210.88	210.58	210.57
East Edmond (EM-2E)	212.55	212.63	212.47	212.13	211.43	211.43	211.43	211.89	212.22	212.63	212.62	212.51	212.55
East Edmond (EM-2W)	211.28	211.32	211.14	210.88	210.28	209.64	209.67	210.87	211.12	211.31	211.25	210.92	210.89
East Edmond (EM-3E)	212.32	212.40	212.26	211.92	211.13			211.78	212.02	212.42	212.37	212.27	212.30
East Edmond (EM-3W)	212.50	212.41	212.25	211.92	211.15	210.44	210.58	211.75	212.02	212.42	212.38	212.26	212.29
Eastern East Edmond (SCM-1)	212.25	212.43	212.29	211.88	211.08	210.95	210.57	211.69	211.99	212.58	212.47	212.20	212.32

Table F-17. Water Balance for East Edmond Marsh with Mining Restoration - Low Groundwater

Monthly Average in Inches of Water — WY2007

Hydrologic Process	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May
Precipitation	2.1	2.2	0.4	0.0	0.8	1.6	14.4	8.6	6.5	4.5	5.7	1.7	1.1
Surface Water Inflows	120.0	110.7	76.7	42.2	14.1	16.7	127.0	203.1	297.3	232.0	365.1	345.6	177.5
From Sequalitchew Lake	114.4	108.1	76.1	42.2	14.1	16.6	126.0	197.0	291.4	226.8	359.2	340.5	174.8
From Center Drive	0.1	0.1	0.0	0.0	0.0	0.1	1.0	0.6	0.4	0.3	0.4	0.1	0.0
From Hamer (surface)	5.5	2.5	0.6	0.0	0.0	0.0	0.0	5.5	5.5	5.0	5.5	4.9	2.7
Subsurface Inflows	7.8	7.5	6.2	4.8	3.8	3.6	10.8	9.9	9.5	8.5	9.5	7.5	7.1
Evapotranspiration	-3.2	-3.7	-4.5	-4.0	-2.3	-1.0	-0.5	0.0	0.0	-0.6	-1.3	-2.0	-3.2
Recharge (-) Discharge (+)	*12.3*	*14.3*	*12.5*	*13.6*	*10.5*	*10.6*	*17.2*	*18.2*	*15.3*	*14.6*	*16.8*	*13.5*	*13.5*
Surface Water Outflows	-113.6	-110.1	-74.9	-43.9	-19.7	-23.2	-139.8	-196.4	-277.4	-218.2	-334.6	-310.2	-165.3
To Diversion Canal	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
To West Edmond Marsh	-132.5	-128.3	-87.3	-51.1	-23.0	-27.1	-162.9	-228.9	-323.3	-254.3	-390.1	-361.6	-192.6
Change in Storage	6.5	2.7	4.1	5.5	3.8	4.5	6.1	10.8	5.3	4.8	5.8	4.8	3.4
Predicted WSE in ft													
EM-2S	213.59	213.60	213.90	214.35	214.67	215.04	215.55	215.99	215.97	215.95	215.98	215.97	216.03
East Edmond	209.46	209.21	209.05	209.00	209.00	209.00	209.00	209.46	209.46	209.41	209.46	209.41	209.22
Eastern East Edmond Marsh	209.66	209.41	209.25	209.20	209.20	209.20	209.20	209.66	209.66	209.61	209.66	209.61	209.42
Observed WSE in ft													
EM-2S	210.71	210.85	210.62	210.36	210.21	210.06	211.03	211.01	210.90	210.87	210.83	210.79	210.82
East Edmond (EM-2E)	212.55	212.63	212.53	211.36	211.43	211.65	211.87	211.94	211.78	211.79	211.80	211.65	211.73
East Edmond (EM-2W)	211.08	211.28	211.06	210.74	210.64	210.49	211.37	211.37	211.26	211.26	211.22	211.15	211.24
East Edmond (EM-3E)	212.28	212.39	212.04	211.75	211.51	211.32	212.52	212.61	212.44	212.46	212.43	212.30	212.37
East Edmond (EM-3W)	212.27	212.40	212.03	211.75	211.50	211.31	212.51	212.60	212.42	212.42	212.42	212.29	212.36
Eastern East Edmond (SCM-1)	212.26	212.46	211.97	211.70	211.38	211.33	212.58	212.67	212.49	212.48	212.49	212.29	212.44

Table F-17. Water Balance for East Edmond Marsh with Mining Restoration - Low Groundwater

Monthly Average in Inches of Water — WY2008

Hydrologic Process	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
Precipitation	2.7	1.5	1.0	1.7	5.0	2.8	7.7	4.2	3.6	4.9	1.8	1.3	1.7
Surface Water Inflows	79.0	7.6	110.7	90.8	63.2	81.4	139.0	150.2	137.5	124.1	127.7	86.7	52.3
From Sequalitchew Lake	78.6	6.5	110.6	90.8	62.9	76.3	135.6	144.4	132.4	119.4	122.6	84.2	51.8
From Center Drive	0.2	0.1	0.0	0.1	0.3	0.2	0.5	0.3	0.2	0.3	0.1	0.1	0.1
From Hamer (surface)	0.2	1.0	0.0	0.0	0.0	4.9	2.9	5.5	4.9	4.3	5.0	2.4	0.4
Subsurface Inflows	7.4	6.6	5.6	5.5	9.5	7.1	10.0	9.0	8.1	9.3	7.2	7.3	6.4
Evapotranspiration	-3.7	-4.5	-4.0	-2.3	-1.0	-0.5	0.0	0.0	-0.6	-1.3	-2.0	-3.2	-3.7
Recharge (-) Discharge (+)	*13.9*	*15.3*	*13.6*	*12.4*	*15.0*	*11.9*	*16.4*	*14.6*	*13.2*	*15.2*	*12.7*	*13.0*	*13.6*
Surface Water Outflows	-82.1	-18.9	-104.6	-87.5	-73.5	-79.3	-145.3	-146.0	-134.7	-126.3	-121.3	-87.5	-56.8
To Diversion Canal	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
To West Edmond Marsh	-95.7	-22.1	-121.9	-102.0	-85.6	-92.5	-169.4	-170.1	-157.0	-147.3	-141.5	-102.0	-66.2
Change in Storage	3.6	4.5	5.1	6.1	6.1	10.3	3.6	7.9	4.8	4.9	6.0	3.1	4.0
Predicted WSE in ft													
EM-2S	216.31	216.60	217.02	217.52	218.03	218.47	218.53	218.74	218.72	218.77	218.85	218.91	219.21
East Edmond	209.02	209.08	209.00	209.00	209.00	209.41	209.24	209.46	209.41	209.36	209.42	209.20	209.03
Eastern East Edmond Marsh	209.22	209.28	209.20	209.20	209.20	209.61	209.44	209.66	209.61	209.56	209.62	209.40	209.23
Observed WSE in ft													
EM-2S	210.87	210.86	210.68	210.52	210.85	210.93	211.00	210.98	210.95	210.94	210.83	210.79	210.70
East Edmond (EM-2E)	211.66	211.60	211.45	211.27	211.66	211.77	211.92	211.86	211.80	211.86	211.68	211.69	211.63
East Edmond (EM-2W)	211.30	211.28	211.11	210.95	211.29	211.32	211.37	211.35	211.34	211.32	211.28	211.21	211.15
East Edmond (EM-3E)	212.31	212.23	212.09	211.93	212.32	212.40	212.56	212.50	212.44	212.50	212.37	212.33	212.27
East Edmond (EM-3W)	212.29	212.24	212.09	211.91	212.31	212.40	212.54	212.49	212.43	212.49	212.35	212.33	212.25
Eastern East Edmond (SCM-1)	212.35	212.29	212.13	212.06	212.38	212.48	212.63	212.58	212.52	212.55	212.43	212.39	212.32

Table F-17. Water Balance for East Edmond Marsh with Mining Restoration - Low Groundwater

Monthly Average in Inches of Water WY2009

Hydrologic Process	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul
Precipitation	0.9	2.1	0.5	2.6	8.3	5.2	7.3	1.6	5.3	3.5	3.4	1.3	0.0
Surface Water Inflows	14.1	31.9	17.2	5.3	56.4	39.0	193.9	90.2	117.1	118.6	106.8	71.7	43.2
From Sequalitchew Lake	14.1	31.7	17.2	5.1	55.8	33.2	188.2	85.8	113.9	113.1	103.0	67.9	43.1
From Center Drive	0.0	0.1	0.0	0.2	0.6	0.3	0.5	0.1	0.4	0.2	0.2	0.1	0.0
From Hamer (surface)	0.0	0.0	0.0	0.0	0.0	5.5	5.2	4.4	2.8	5.3	3.6	3.8	0.0
Subsurface Inflows	5.2	5.0	3.9	4.6	10.0	8.7	9.2	7.0	9.5	7.7	8.9	6.4	5.1
Evapotranspiration	-4.5	-4.0	-2.3	-1.0	-0.5	0.0	0.0	-0.6	-1.3	-2.0	-3.2	-3.7	-4.5
Recharge (-) Discharge (+)	*12.9*	*13.6*	*12.1*	*11.1*	*15.1*	*12.8*	*14.7*	*11.6*	*14.5*	*12.3*	*13.4*	*11.5*	*12.0*
Surface Water Outflows	-21.3	-36.4	-23.1	-16.6	-71.4	-47.1	-188.8	-90.2	-120.9	-113.5	-107.6	-69.9	-45.9
To Diversion Canal	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
To West Edmond Marsh	-24.8	-42.5	-26.9	-19.3	-83.3	-54.9	-220.1	-105.2	-141.0	-132.3	-125.5	-81.5	-53.5
Change in Storage	3.7	6.1	4.5	3.2	6.1	10.8	5.0	4.6	4.1	7.8	3.8	5.7	2.3
Predicted WSE in ft													
EM-2S	219.52	220.02	220.39	220.66	221.16	221.60	221.59	221.60	221.71	221.91	221.93	222.09	222.28
East Edmond	209.00	209.00	209.00	209.00	209.00	209.46	209.44	209.37	209.24	209.44	209.30	209.31	209.00
Eastern East Edmond Marsh	209.20	209.20	209.20	209.20	209.20	209.66	209.64	209.57	209.44	209.64	209.50	209.51	209.20
Observed WSE in ft													
EM-2S	210.43	210.28	210.14	210.00	210.90	210.97	210.95	210.92	210.89	210.87	210.93	210.61	210.18
East Edmond (EM-2E)	211.43	211.43	211.43	211.43	211.72	211.81	211.81	211.76	211.54	211.44	211.72	211.43	211.43
East Edmond (EM-2W)	210.88	210.70	210.56	210.41	211.31	211.34	211.33	211.30	211.36	211.36	211.37	211.04	210.58
East Edmond (EM-3E)	211.92	211.63	211.47	211.30	212.41	212.42	212.44	212.39	212.25	212.31	212.38	211.93	211.59
East Edmond (EM-3W)	211.92	211.67	211.50	211.33	212.32	212.40	212.43	212.37	212.25	212.29	212.36	211.94	211.67
Eastern East Edmond (SCM-1)	211.96	211.71	211.54	211.38	212.39	212.48	212.53	212.47	212.33	212.37	212.44	211.94	211.51

Table F-17. Water Balance for East Edmond Marsh with Mining Restoration - Low Groundwater

Monthly Average in Inches of Water WY2010

Hydrologic Process	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug
Precipitation	1.9	2.8	5.6	8.9	3.0	8.0	3.3	3.3	3.3	4.6	4.3	0.4	0.2
Surface Water Inflows	33.8	27.4	42.2	103.9	96.9	161.8	140.9	173.0	242.7	176.3	150.9	88.3	50.7
From Sequalitchew Lake	33.7	27.3	41.8	98.0	91.3	157.1	135.7	168.2	237.2	171.8	145.3	87.7	50.7
From Center Drive	0.1	0.2	0.4	0.6	0.2	0.6	0.2	0.2	0.2	0.3	0.3	0.0	0.0
From Hamer (surface)	0.0	0.0	0.0	5.3	5.5	4.1	5.0	4.6	5.3	4.2	5.3	0.6	0.0
Subsurface Inflows	4.7	5.2	9.3	8.9	8.4	9.9	8.0	9.5	8.4	9.4	8.1	6.9	5.3
Evapotranspiration	-4.0	-2.3	-1.0	-0.5	0.0	0.0	-0.6	-1.3	-2.0	-3.2	-3.7	-4.5	-4.0
Recharge (-) Discharge (+)	*11.3*	*11.1*	*13.0*	*13.3*	*13.0*	*15.4*	*11.9*	*13.6*	*13.2*	*13.8*	*12.7*	*13.7*	*12.8*
Surface Water Outflows	-35.7	-32.6	-54.1	-106.3	-99.3	-163.9	-135.0	-165.7	-222.8	-168.6	-142.3	-88.8	-51.0
To Diversion Canal	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
To West Edmond Marsh	-41.6	-38.1	-63.0	-123.9	-115.8	-191.0	-157.4	-193.1	-259.7	-196.6	-165.9	-103.5	-59.5
Change in Storage	6.0	6.1	6.1	10.6	5.5	4.1	6.2	5.0	6.0	4.3	6.4	1.3	5.4
Predicted WSE in ft													
EM-2S	222.79	223.29	223.79	224.24	224.23	224.23	224.33	224.37	224.43	224.44	224.53	224.58	225.03
East Edmond	209.00	209.00	209.00	209.44	209.46	209.34	209.41	209.38	209.44	209.35	209.44	209.05	209.00
Eastern East Edmond Marsh	209.20	209.20	209.20	209.64	209.66	209.54	209.61	209.58	209.64	209.55	209.64	209.25	209.20
Observed WSE in ft													
EM-2S	210.12	210.11	210.47	211.06	211.04	211.03	211.03	210.86	211.15	211.13	211.10	210.88	210.61
East Edmond (EM-2E)	211.43	211.43	211.43	211.75	211.52	211.58	211.64	211.90	211.59	212.04	211.93	211.73	211.43
East Edmond (EM-2W)	210.51	210.52	210.90	211.41	211.41	211.39	211.40	211.24	211.58	211.54	211.52	211.36	211.03
East Edmond (EM-3E)	211.49	211.46	211.74	212.41	212.33	212.49	212.38	212.42	212.43	212.55	212.48	212.25	211.93
East Edmond (EM-3W)	211.48	211.46	211.72	212.31	212.25	212.27	212.22	212.39	212.25	212.54	212.44	212.25	211.96
Eastern East Edmond (SCM-1)	211.45	211.46	211.78	212.48	212.40	212.57	212.45	212.49	212.52	212.62	212.55	212.24	211.87

Table F-17. Water Balance for East Edmond Marsh with Mining Restoration - Low Groundwater

Monthly Average in Inches of Water WY2011

Hydrologic Process	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Precipitation	4.0	4.2	6.6	7.2	6.1	3.1	7.2	5.7	4.8	2.8	0.8	0.3	1.3
Surface Water Inflows	67.0	80.3	116.7	149.7	324.2	289.4	378.5	398.4	313.8	183.8	89.8	42.2	26.7
From Sequalitchew Lake	66.8	78.8	110.9	143.7	318.2	284.3	373.5	392.7	308.2	179.3	87.1	41.8	26.7
From Center Drive	0.2	0.3	0.4	0.5	0.4	0.2	0.5	0.4	0.3	0.2	0.0	0.0	0.1
From Hamer (surface)	0.0	1.2	5.3	5.5	5.5	5.0	4.5	5.3	5.3	4.3	2.8	0.4	0.0
Subsurface Inflows	7.5	9.3	8.9	9.3	9.4	8.1	9.7	8.7	8.8	8.4	7.5	6.5	5.9
Evapotranspiration	-2.3	-1.0	-0.5	0.0	0.0	-0.6	-1.3	-2.0	-3.2	-3.7	-4.5	-4.0	-2.3
Recharge (-) Discharge (+)	*13.7*	*13.5*	*13.1*	*15.0*	*15.1*	*14.1*	*16.1*	*14.9*	*15.2*	*14.0*	*-17.5*	*14.1*	*12.5*
Surface Water Outflows	-71.9	-85.0	-116.1	-150.7	-303.2	-268.7	-351.0	-363.3	-289.9	-175.5	-65.1	-50.8	-36.3
To Diversion Canal	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
To West Edmond Marsh	-83.8	-99.1	-135.4	-175.6	-353.4	-313.2	-409.1	-423.5	-337.9	-204.6	-75.9	-59.3	-42.3
Change in Storage	6.1	7.1	9.4	5.5	1.4	1.0	1.1	2.3	1.4	0.6	0.2	-0.2	1.8
Predicted WSE in ft													
EM-2S	225.54	226.03	226.37	226.36	226.02	225.69	225.41	225.15	224.83	224.52	224.31	224.26	224.41
East Edmond	209.00	209.10	209.44	209.46	209.46	209.41	209.38	209.44	209.44	209.36	209.23	209.03	209.00
Eastern East Edmond Marsh	209.20	209.30	209.64	209.66	209.66	209.61	209.58	209.64	209.64	209.56	209.43	209.23	209.20
Observed WSE in ft													
EM-2S	211.01	211.05	211.33	211.43	211.30	211.27	211.25	211.27	211.30	211.22	206.59	211.06	210.85
East Edmond (EM-2E)	211.73	211.75	211.95	212.18	212.13	212.20	212.27	212.30	212.37			212.01	211.69
East Edmond (EM-2W)	211.46	211.48	211.73	211.78	211.68	211.65	211.61	211.58	211.68			211.48	211.33
East Edmond (EM-3E)	212.23	212.37	212.59	212.73	212.73	212.73	212.73	212.76	212.88			212.49	212.06
East Edmond (EM-3W)	212.23	212.25	212.43	212.70	212.63	212.69	212.75	212.77	212.85			212.50	212.18
Eastern East Edmond (SCM-1)	212.28	212.32	212.67	212.81	212.78	212.79	212.80	212.83	212.95			212.58	212.26

Table F-17. Water Balance for East Edmond Marsh with Mining Restoration - Low Groundwater

Monthly Average in Inches of Water	WY2012												WY2013
Hydrologic Process	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct
Precipitation	4.1	6.1	3.2	7.2	3.9	6.8	4.3	3.1	3.3	1.6	0.0	0.1	6.5
Surface Water Inflows	88.0	93.1	97.8	135.3	183.3	253.6	325.7	303.6	150.3	94.5	25.2	2.5	42.1
From Sequalitchew Lake	87.8	90.1	92.1	130.9	177.9	248.3	320.1	299.0	144.9	91.3	25.2	2.5	41.6
From Center Drive	0.3	0.4	0.2	0.5	0.2	0.5	0.3	0.2	0.2	0.1	0.0	0.0	0.5
From Hamer (surface)	0.0	2.6	5.5	3.9	5.1	4.8	5.3	4.5	5.3	3.2	0.0	0.0	0.0
Subsurface Inflows	8.4	9.1	8.0	9.8	8.4	9.6	8.3	9.3	7.7	7.5	6.7	5.3	10.0
Evapotranspiration	-1.0	-0.5	0.0	0.0	-0.6	-1.3	-2.0	-3.2	-3.7	-4.5	-4.0	-2.3	-1.0
Recharge (-) Discharge (+)	*14.0*	*13.2*	*12.6*	*16.8*	*14.1*	*16.3*	*16.2*	*15.3*	*13.7*	*14.6*	*15.4*	*12.6*	*14.8*
Surface Water Outflows	-95.4	-100.0	-100.6	-144.9	-177.0	-243.5	-300.8	-280.8	-145.1	-97.8	-38.0	-13.6	-60.2
To Diversion Canal	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
To West Edmond Marsh	-111.3	-116.5	-117.3	-169.0	-206.3	-283.8	-350.6	-327.4	-169.1	-114.0	-44.3	-15.9	-70.2
Change in Storage	2.2	4.4	4.4	0.1	2.7	1.2	2.0	0.7	2.2	-0.3	-0.9	2.2	2.2
Predicted WSE in ft													
EM-2S	224.60	224.75	224.66	224.34	224.14	223.84	223.56	223.24	222.99	222.70	222.62	222.81	222.99
East Edmond	209.00	209.21	209.46	209.33	209.43	209.40	209.44	209.37	209.44	209.26	209.00	209.00	209.00
Eastern East Edmond Marsh	209.20	209.41	209.66	209.53	209.63	209.60	209.64	209.57	209.64	209.46	209.20	209.20	209.20
Observed WSE in ft													
EM-2S	210.97	211.29	211.31	211.37	211.36	211.38	211.40	211.41	211.36	211.25	211.14	210.84	211.08
East Edmond (EM-2E)	211.83	212.03	212.25	212.50	212.52	212.55	212.57	212.63	212.54	212.34	212.13	211.72	212.01
East Edmond (EM-2W)	211.40	211.67	211.71	211.72	211.75	211.76	211.77	211.78	211.75	211.65	211.55	211.31	211.50
East Edmond (EM-3E)	212.19	212.38	212.61	212.85	212.88	212.92	212.95	213.00	212.91	212.70	212.50	212.09	212.37
East Edmond (EM-3W)	212.29	212.50	212.73	212.98	212.99	213.02	213.05	213.11	213.03	212.82	212.61	212.20	212.48
Eastern East Edmond (SCM-1)	212.40	212.59	212.85	213.10	213.12	213.15	213.18	213.35	213.17	212.95	212.74	212.21	212.55

Table F-17. Water Balance for East Edmond Marsh with Mining Restoration - Low Groundwater

Monthly Average in Inches of Water — WY2014

Hydrologic Process	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov
Precipitation	6.5	7.6	3.5	1.7	3.7	5.5	4.4	1.9	0.0	1.6	6.9	2.6	4.1
Surface Water Inflows	102.5	188.3	229.0	150.9	185.0	180.6	142.3	95.8	43.0	35.1	26.6	88.0	81.6
From Sequalitchew Lake	96.7	182.3	223.3	146.3	181.9	174.0	136.7	92.3	43.0	35.1	26.2	80.6	76.8
From Center Drive	0.4	0.5	0.2	0.1	0.2	0.4	0.3	0.1	0.0	0.1	0.5	0.2	0.3
From Hamer (surface)	5.3	5.5	5.5	4.5	2.9	6.2	5.3	3.5	0.0	0.0	0.0	7.3	4.6
Subsurface Inflows	8.9	9.7	9.1	7.3	10.1	8.1	8.0	7.3	6.6	5.6	10.5	8.2	9.7
Evapotranspiration	-0.5	0.0	0.0	-0.6	-1.3	-2.0	-3.2	-3.7	-4.5	-4.0	-2.3	-1.0	-0.5
Recharge (-) Discharge (+)	*13.4*	*16.8*	*15.6*	*13.9*	*16.7*	*14.3*	*13.9*	*13.6*	*15.6*	*13.8*	*15.7*	*13.1*	*14.0*
Surface Water Outflows	-106.3	-189.5	-219.4	-148.1	-183.6	-173.1	-141.4	-98.6	-53.2	-42.9	-47.3	-87.9	-94.5
To Diversion Canal	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
To West Edmond Marsh	-123.9	-220.9	-255.7	-172.7	-214.0	-201.8	-164.8	-115.0	-62.0	-50.0	-55.1	-102.5	-110.1
Change in Storage	6.8	1.6	1.4	0.5	0.3	4.6	0.5	0.0	-1.3	2.2	2.2	8.5	-1.1
Predicted WSE in ft													
EM-2S	223.11	222.79	222.45	222.13	221.90	221.77	221.38	221.08	220.98	221.16	221.34	221.44	220.97
East Edmond	209.44	209.46	209.46	209.37	209.24	209.52	209.44	209.29	209.00	209.00	209.00	209.61	209.38
Eastern East Edmond Marsh	209.64	209.66	209.66	209.57	209.44	209.72	209.64	209.49	209.20	209.20	209.20	209.81	209.58
Observed WSE in ft													
EM-2S	211.31	211.47	211.40	211.40	211.39	211.44	211.43	211.37	211.19	210.88	211.31	211.51	211.47
East Edmond (EM-2E)	212.29	212.69	212.64	212.56	212.59	212.63	212.48	212.39	212.03	211.66	212.05	212.55	212.52
East Edmond (EM-2W)	211.69	211.83	211.78	211.75	211.76	211.81	211.82	211.80	211.64	211.36	211.76	211.89	211.86
East Edmond (EM-3E)	212.65	213.05	212.99	212.91	213.01	212.99	212.86	212.77	212.41	212.03	212.41	212.93	212.88
East Edmond (EM-3W)	212.76	213.17	213.11	213.04	213.06	213.10	212.96	212.88	212.51	212.15	212.53	213.03	212.99
Eastern East Edmond (SCM-1)	212.90	213.32	213.27	213.18	213.21	213.26	213.10	213.03	212.65	212.26	212.66	213.16	213.14

Table F-17. Water Balance for East Edmond Marsh with Mining Restoration - Low Groundwater

Monthly Average in Inches of Water — WY2015

Hydrologic Process	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Precipitation	2.4	4.2	6.9	9.8	4.5	3.3	1.3	1.2	1.6	1.8	5.9	6.1	4.8
Surface Water Inflows	81.5	99.7	160.3	443.9	378.8	308.7	142.5	71.6	37.0	22.2	57.5	117.2	218.4
From Sequalitchew Lake	74.1	95.1	153.3	436.0	371.5	302.4	138.2	69.2	36.6	22.1	56.8	109.7	210.9
From Center Drive	0.1	0.3	0.4	0.7	0.3	0.2	0.1	0.0	0.1	0.1	0.4	0.4	0.3
From Hamer (surface)	7.3	4.3	6.6	7.3	7.0	6.1	4.3	2.3	0.3	0.0	0.4	7.0	7.2
Subsurface Inflows	7.7	9.9	8.8	10.0	8.9	8.9	8.0	7.8	7.5	7.9	11.5	9.2	10.1
Evapotranspiration	0.0	0.0	-0.6	-1.3	-2.0	-3.2	-3.7	-4.5	-4.0	-2.3	-1.0	-0.5	0.0
Recharge (-) Discharge (+)	*11.9*	*14.8*	*15.2*	*16.4*	*15.2*	*16.2*	*14.4*	*14.2*	*14.2*	*14.6*	*15.6*	*12.6*	*15.5*
Surface Water Outflows	-85.5	-111.5	-160.6	-409.1	-346.9	-286.1	-139.6	-77.5	-48.1	-36.3	-74.5	-117.3	-212.3
To Diversion Canal	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
To West Edmond Marsh	-99.6	-129.9	-187.2	-476.9	-404.4	-333.5	-162.7	-90.3	-56.1	-42.3	-86.9	-136.7	-247.5
Change in Storage	3.9	-1.3	3.5	1.9	1.0	0.4	-0.2	-0.1	0.2	1.9	2.5	7.9	1.4
Predicted WSE in ft													
EM-2S	220.68	220.21	219.96	219.51	219.00	218.53	218.16	217.96	217.95	218.10	218.28	218.36	217.87
East Edmond	209.61	209.36	209.55	209.61	209.59	209.51	209.36	209.19	209.03	209.00	209.03	209.59	209.60
Eastern East Edmond Marsh	209.81	209.56	209.75	209.81	209.79	209.71	209.56	209.39	209.23	209.20	209.23	209.79	209.80
Observed WSE in ft													
EM-2S	211.39	211.43	211.51	211.50	211.51	211.54	211.48	211.33	211.22	211.30	211.38	211.49	211.49
East Edmond (EM-2E)	212.33	212.43	212.59	212.59	212.68	212.81	212.73	212.32			212.34	212.53	212.51
East Edmond (EM-2W)	211.80	211.82	211.86	211.87	211.88	211.90	211.87	211.78	211.71	211.76	211.81	211.88	211.89
East Edmond (EM-3E)	212.69	212.80	212.95	212.96	213.04	213.19	213.08	212.66	212.49	212.59	212.69	212.91	212.94
East Edmond (EM-3W)	212.80	212.91	213.06	213.06	213.15	213.29	213.19	212.79	212.61	212.57	212.54	213.02	213.04
Eastern East Edmond (SCM-1)	212.95	213.07	213.21	213.25	213.33	213.46	213.22	212.98	212.76	212.86	212.97	213.20	213.26

Table F-17. Water Balance for East Edmond Marsh with Mining Restoration - Low Groundwater

Monthly Average in Inches of Water — WY2016

Hydrologic Process	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan
Precipitation	4.1	4.7	4.4	2.1	0.8	0.4	0.2	2.2	1.3	5.0	7.1	12.0	6.9
Surface Water Inflows	301.6	330.3	310.8	213.3	116.4	31.9	0.2	0.7	8.7	23.5	117.1	282.6	387.3
From Sequalitchew Lake	294.1	324.0	304.1	207.4	113.3	31.4	0.2	0.6	8.6	23.2	113.9	274.4	379.5
From Center Drive	0.3	0.3	0.3	0.1	0.0	0.0	0.0	0.1	0.1	0.3	0.5	0.9	0.5
From Hamer (surface)	7.3	6.1	6.5	5.8	3.1	0.5	0.0	0.0	0.0	0.0	2.7	7.3	7.3
Subsurface Inflows	9.7	8.7	9.6	7.7	7.4	6.2	5.4	5.0	4.5	7.8	10.6	10.2	10.0
Evapotranspiration	0.0	-0.6	-1.3	-2.0	-3.2	-3.7	-4.5	-4.0	-2.3	-1.0	-0.5	0.0	0.0
Recharge (-) Discharge (+)	*15.1*	*14.3*	*15.6*	*14.0*	*14.0*	*12.6*	*12.4*	*11.4*	*11.4*	*12.2*	*17.0*	*16.7*	*14.4*
Surface Water Outflows	-282.5	-306.5	-289.4	-201.1	-117.1	-41.0	-10.5	-11.2	-18.3	-38.8	-125.9	-270.8	-358.0
To Diversion Canal	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
To West Edmond Marsh	-329.3	-357.2	-337.4	-234.4	-136.5	-47.8	-12.2	-13.1	-21.3	-45.3	-146.7	-315.7	-417.3
Change in Storage	1.2	0.2	1.7	0.8	-1.0	-0.4	1.5	2.2	2.2	2.2	4.5	5.7	1.2
Predicted WSE in ft													
EM-2S	217.37	216.87	216.47	216.05	215.71	215.63	215.76	215.94	216.12	216.31	216.46	216.33	215.83
East Edmond	209.61	209.51	209.54	209.49	209.26	209.05	209.00	209.00	209.00	209.00	209.23	209.61	209.61
Eastern East Edmond Marsh	209.81	209.71	209.74	209.69	209.46	209.25	209.20	209.20	209.20	209.20	209.43	209.81	209.81
Observed WSE in ft													
EM-2S	211.46	211.44	211.42	211.33	211.28	211.07	210.67	210.28	210.36	210.44	211.37	211.34	
East Edmond (EM-2E)	212.49	212.47	212.45	212.47	212.38	211.92	211.60	211.43	211.43	211.43	212.50	212.38	
East Edmond (EM-2W)	211.84	211.81	211.78	211.21	211.71	211.53	211.17	210.76	210.81	210.86	211.72	211.68	
East Edmond (EM-3E)	212.85	212.82	212.79	212.83	212.74	212.20	211.92	211.62	211.64	211.65	212.85	212.70	
East Edmond (EM-3W)	212.94	212.92	212.91	212.94	212.83	212.39	212.03	211.71	211.73	211.75	212.95	212.82	
Eastern East Edmond (SCM-1)	213.13	213.11	213.09	213.13	213.03	212.53	212.14	211.79	211.81	211.83	213.11	212.99	

Table F-17. Water Balance for East Edmond Marsh with Mining Restoration - Low Groundwater

Monthly Average in Inches of Water — WY2017

Hydrologic Process	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
Precipitation	5.8	5.9	1.8	1.0	2.3	1.3	0.2	1.5	9.3	6.9	3.9	3.4	8.6
Surface Water Inflows	650.4	646.3	372.9	137.3	92.9	64.0	8.4	12.4	71.2	134.5	212.6	110.5	176.8
From Sequalitchew Lake	643.2	638.6	367.0	134.4	90.0	60.6	8.1	12.3	70.6	127.0	205.1	103.2	170.6
From Center Drive	0.4	0.4	0.1	0.0	0.1	0.1	0.0	0.1	0.7	0.5	0.3	0.2	0.5
From Hamer (surface)	6.8	7.3	5.9	2.9	2.8	3.3	0.3	0.0	0.0	7.0	7.3	7.1	5.7
Subsurface Inflows	9.4	10.0	9.1	9.2	8.9	8.0	7.0	6.7	10.6	9.9	10.2	9.6	9.4
Evapotranspiration	-0.6	-1.3	-2.0	-3.2	-3.7	-4.5	-4.0	-2.3	-1.0	-0.5	0.0	0.0	-0.6
Recharge (-) Discharge (+)	*12.8*	*13.9*	*13.8*	*14.9*	*14.3*	*13.0*	*14.0*	*14.0*	*14.7*	*13.2*	*14.3*	*11.5*	*13.0*
Surface Water Outflows	-580.8	-577.5	-339.4	-137.6	-96.8	-68.2	-22.7	-26.0	-88.0	-133.6	-201.9	-111.3	-174.0
To Diversion Canal	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
To West Edmond Marsh	-677.0	-673.2	-395.7	-160.4	-112.9	-79.6	-26.5	-30.3	-102.6	-155.7	-235.3	-129.7	-202.9
Change in Storage	0.8	1.7	0.0	-1.2	1.8	2.2	-0.9	1.9	2.2	8.3	5.7	5.3	4.3
Predicted WSE in ft													
EM-2S	215.32	214.86	214.37	214.03	213.94	213.85	213.75	213.91	214.10	214.20	214.06	213.92	213.80
East Edmond	209.57	209.61	209.49	209.24	209.24	209.28	209.03	209.00	209.00	209.59	209.61	209.59	209.47
Eastern East Edmond Marsh	209.77	209.81	209.69	209.44	209.44	209.48	209.23	209.20	209.20	209.79	209.81	209.79	209.67
Observed WSE in ft													
EM-2S					211.28	211.15	210.81		210.79	211.31	211.32	211.17	211.47
East Edmond (EM-2E)					212.38	212.27	211.76		211.57	212.24	212.22	212.05	212.04
East Edmond (EM-2W)					211.68	211.57	211.27		211.29	211.90	211.78	211.57	211.59
East Edmond (EM-3E)					212.59	212.34	212.05		211.87	212.33	212.35	212.39	213.34
East Edmond (EM-3W)					212.81	212.60	212.19		212.00	212.69	212.66	212.50	212.46
Eastern East Edmond (SCM-1)					212.88	212.65	212.28		212.08	212.60	212.59	212.62	210.24

Table F-17. Water Balance for East Edmond Marsh with Mining Restoration - Low Groundwater

Monthly Average in Inches of Water — WY 2018

Hydrologic Process	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar
Precipitation	8.7	4.6	2.8	1.8	0.0	0.1	1.0	5.2	7.2	5.8	7.2	3.3	2.3
Surface Water Inflows	340.8	280.4	199.7	63.0	7.9	0.2	8.0	16.8	20.9	94.9	156.4	215.9	175.7
From Sequalitchew Lake	332.9	273.1	193.0	58.6	7.9	0.0	7.9	16.4	13.4	87.2	148.7	209.1	169.1
From Center Drive	0.6	0.3	0.2	0.1	0.0	0.0	0.0	0.4	0.5	0.4	0.5	0.2	0.1
From Hamer (surface)	7.3	7.0	6.6	4.4	0.0	0.2	0.0	0.0	7.0	7.3	7.3	6.6	6.5
Subsurface Inflows	10.6	9.4	9.0	8.8	9.0	8.2	7.2	11.7	9.5	10.4	10.3	9.1	9.5
Evapotranspiration	-1.3	-2.0	-3.2	-3.7	-4.5	-4.0	-2.3	-1.0	-0.5	0.0	0.0	-0.6	-1.3
Recharge (-) Discharge (+)	*15.2*	*13.7*	*12.2*	*10.6*	*13.1*	*11.8*	*10.9*	*13.9*	*11.9*	*12.8*	*13.4*	*13.0*	*12.3*
Surface Water Outflows	-314.8	-258.2	-184.8	-66.0	-22.0	-11.9	-18.3	-34.4	-31.4	-101.4	-156.1	-202.3	-165.7
To Diversion Canal	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
To West Edmond Marsh	-366.9	-301.0	-215.5	-76.9	-25.6	-13.9	-21.4	-40.1	-36.6	-118.2	-181.9	-235.8	-193.2
Change in Storage	7.0	5.2	5.1	3.7	-0.1	2.4	3.4	6.5	12.5	5.7	5.4	4.8	5.5
Predicted WSE in ft													
EM-2S	213.78	213.63	213.51	213.45	213.44	213.63	213.91	214.45	214.90	214.77	214.62	214.48	214.39
East Edmond	209.61	209.59	209.55	209.37	209.00	209.01	209.00	209.00	209.59	209.61	209.61	209.55	209.54
Eastern East Edmond Marsh	209.81	209.79	209.75	209.57	209.20	209.21	209.20	209.20	209.79	209.81	209.81	209.75	209.74
Observed WSE in ft													
EM-2S	211.31	211.27		211.18	211.05	211.24	210.72			211.95		211.29	211.12
East Edmond (EM-2E)	212.14	212.21		212.34	212.18	211.95	211.82			212.59		212.35	212.14
East Edmond (EM-2W)	210.67	211.63		211.55	211.44	210.47	211.09			211.69		211.60	211.48
East Edmond (EM-3E)	212.37	212.47		212.67	212.88	212.52	212.03			212.56		212.51	212.40
East Edmond (EM-3W)	212.54	212.62		212.78	212.62	212.37	212.27			213.07		212.79	212.58
Eastern East Edmond (SCM-1)	212.62	212.68		212.95	212.65	212.56	212.64			212.89		212.76	212.65

Table F-17. Water Balance for East Edmond Marsh with Mining Restoration - Low Groundwater

Monthly Average in Inches of Water — WY2019

Hydrologic Process	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr
Precipitation	6.1	0.7	0.9	0.2	0.3	1.8	4.0	3.8	6.4	3.4	4.8	1.6	3.6
Surface Water Inflows	110.3	49.0	24.9	3.7	3.1	21.0	22.0	25.2	114.7	87.3	139.5	17.2	126.8
From Sequalitchew Lake	104.9	47.7	22.0	3.4	3.1	20.9	21.7	22.9	108.2	79.8	133.4	12.1	122.7
From Center Drive	0.4	0.0	0.0	0.0	0.0	0.1	0.3	0.2	0.4	0.2	0.3	0.1	0.2
From Hamer (surface)	4.9	1.3	2.9	0.3	0.0	0.0	0.0	2.0	6.1	7.3	5.8	5.0	3.9
Subsurface Inflows	9.5	9.3	7.4	7.1	5.8	6.0	8.0	9.8	10.4	9.6	8.8	8.8	9.0
Evapotranspiration	-2.0	-3.2	-3.7	-4.5	-4.0	-2.3	-1.0	-0.5	0.0	0.0	-0.6	-1.3	-2.0
Recharge (-) Discharge (+)	*14.3*	*13.1*	*10.3*	*11.1*	*10.1*	*10.3*	*7.8*	*11.4*	*11.8*	*11.1*	*10.9*	*11.1*	*11.3*
Surface Water Outflows	-114.9	-56.8	-28.1	-14.8	-11.5	-27.1	-30.0	-35.6	-114.6	-89.8	-136.6	-28.1	-123.4
To Diversion Canal	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
To West Edmond Marsh	-133.9	-66.2	-32.8	-17.3	-13.4	-31.5	-35.0	-41.5	-133.6	-104.7	-159.2	-32.7	-143.9
Change in Storage	4.2	2.6	7.0	0.3	1.9	5.2	5.8	8.2	9.7	6.6	4.2	4.7	4.8
Predicted WSE in ft													
EM-2S	214.33	214.45	214.79	214.79	214.95	215.39	215.87	216.39	216.69	216.64	216.50	216.47	216.55
East Edmond	209.41	209.11	209.24	209.02	209.00	209.00	209.00	209.17	209.51	209.61	209.48	209.42	209.32
Eastern East Edmond Marsh	209.61	209.31	209.44	209.22	209.20	209.20	209.20	209.37	209.71	209.81	209.68	209.62	209.52
Observed WSE in ft													
EM-2S	211.17	211.08	211.17	211.01	210.61	210.70	210.71	211.07	211.35	211.39	211.14	211.24	211.37
East Edmond (EM-2E)	212.37	212.41	212.23	212.05	211.65	211.73	211.78	212.21	212.63		212.55	212.37	212.63
East Edmond (EM-2W)	211.51	211.24	211.59	211.44	211.01	211.12	211.07	211.66	211.70		211.48	211.66	211.89
East Edmond (EM-3E)	212.48						212.06	212.42	212.65	212.71	212.83	212.69	212.67
East Edmond (EM-3W)	212.81	212.81	212.50	212.50	212.14	212.19	212.19	212.64	212.98	212.50	213.00	212.81	213.06
Eastern East Edmond (SCM-1)	212.77	212.59	212.85	212.01	211.75	211.84	212.57					212.88	212.90

Table F-17. Water Balance for East Edmond Marsh with Mining Restoration - Low Groundwater

Monthly Average in Inches of Water — WY2020

Hydrologic Process	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May
Precipitation	1.1	0.7	1.0	0.8	3.5	3.9	1.7	6.5	9.6	4.2	3.5	1.5	3.1
Surface Water Inflows	77.2	21.9	2.7	2.2	2.0	7.6	12.5	43.8	12.9	155.9	243.6	221.4	150.0
From Sequalitchew Lake	73.8	20.2	2.6	2.2	1.8	7.4	10.3	42.1	5.0	148.8	237.4	218.1	148.5
From Center Drive	0.0	0.0	0.0	0.0	0.2	0.3	0.1	0.5	0.7	0.3	0.2	0.1	0.2
From Hamer (surface)	3.4	1.7	0.0	0.0	0.0	0.0	2.1	1.3	7.3	6.8	6.0	3.3	1.3
Subsurface Inflows	7.4	5.9	5.0	3.7	5.1	8.2	7.1	10.1	12.1	10.0	8.8	7.7	8.6
Evapotranspiration	-3.2	-3.7	-4.5	-4.0	-2.3	-1.0	-0.5	0.0	0.0	-0.6	-1.3	-2.0	-3.2
Recharge (-) Discharge (+)	*10.8*	*9.9*	*10.0*	*8.2*	*5.9*	*13.0*	*14.2*	*12.7*	*17.9*	*13.2*	*17.2*	*16.3*	*15.9*
Surface Water Outflows	-75.4	-26.7	-11.7	-8.2	-10.5	-23.3	-24.2	-58.0	-40.6	-151.2	-227.6	-204.6	-144.1
To Diversion Canal	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
To West Edmond Marsh	-87.8	-31.1	-13.6	-9.5	-12.2	-27.1	-28.2	-67.6	-47.3	-176.3	-265.4	-238.5	-168.0
Change in Storage	5.5	3.5	0.6	1.6	2.0	4.5	6.8	5.5	5.2	6.5	6.5	6.5	6.5
Predicted WSE in ft													
EM-2S	216.73	216.87	216.92	217.05	217.22	217.60	217.99	218.33	218.16	218.13	218.17	218.44	218.87
East Edmond	209.28	209.14	209.00	209.00	209.00	209.00	209.18	209.11	209.00	209.00	209.00	209.00	209.00
Eastern East Edmond Marsh	209.48	209.34	209.20	209.20	209.20	209.20	209.38	209.31	209.20	209.20	209.20	209.20	209.20
Observed WSE in ft													
EM-2S		210.80	210.49	210.07	210.20	210.34		210.30	211.41	210.49			
East Edmond (EM-2E)		211.91	211.55	211.43	211.43	211.44		211.43	212.60	212.45			
East Edmond (EM-2W)		211.58	210.92	210.54		210.77		211.58	211.69	211.66			
East Edmond (EM-3E)						211.90		211.74	212.80	212.80			
East Edmond (EM-3W)		212.37	212.00	211.54	212.27	211.89		212.16	213.03	212.89			
Eastern East Edmond (SCM-1)													

Table F-17. Water Balance for East Edmond Marsh with Mining Restoration - Low Groundwater

Monthly Average in Inches of Water — WY 2021

Hydrologic Process	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
Precipitation	2.5	0.3	0.4	2.8	3.0	5.6	5.2	7.3	4.7	2.5	1.2	2.0	2.4
Surface Water Inflows	84.5	38.4	26.6	22.8	40.2	74.5	126.4	151.6	127.1	168.1	134.1	82.9	68.9
From Sequalitchew Lake	81.6	38.0	26.6	22.6	40.0	74.2	118.8	144.7	120.2	161.3	130.8	80.9	67.3
From Center Drive	0.1	0.0	0.0	0.2	0.2	0.4	0.4	0.5	0.3	0.1	0.0	0.1	0.1
From Hamer (surface)	2.8	0.4	0.0	0.0	0.0	0.0	7.3	6.3	6.6	6.7	3.2	1.9	1.5
Subsurface Inflows	8.0	5.8	4.0	4.8	6.1	10.3	10.7	11.6	10.3	10.7	8.4	8.4	7.7
Evapotranspiration	-3.7	-4.5	-4.0	-2.3	-1.0	-0.5	0.0	0.0	-0.6	-1.3	-2.0	-3.2	-3.7
Recharge (-) Discharge (+)	*14.8*	*9.9*	*7.6*	*7.7*	*8.6*	*12.8*	*14.7*	*16.1*	*14.2*	*14.3*	*11.8*	*13.1*	*11.3*
Surface Water Outflows	-85.4	-37.3	-25.5	-26.3	-43.2	-82.6	-129.2	-154.5	-128.0	-161.2	-126.1	-83.0	-68.8
To Diversion Canal	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
To West Edmond Marsh	-99.5	-43.4	-29.7	-30.6	-50.4	-96.3	-150.6	-180.1	-149.2	-187.9	-147.0	-96.8	-80.2
Change in Storage	6.5	6.5	4.9	5.1	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5
Predicted WSE in ft													
EM-2S	219.18	219.68	220.09	220.52	221.06	221.60	221.53	221.54	221.54	221.52	221.79	222.17	222.59
East Edmond	209.00	209.00	209.00	209.00	209.00	209.00	209.00	209.00	209.00	209.00	209.00	209.00	209.00
Eastern East Edmond Marsh	209.20	209.20	209.20	209.20	209.20	209.20	209.20	209.20	209.20	209.20	209.20	209.20	209.20
Observed WSE in ft													
EM-2S		210.83	210.33		210.25			211.47			211.31	211.27	211.13
East Edmond (EM-2E)		211.43	211.43		211.43	212.93		212.54			212.27	212.16	212.04
East Edmond (EM-2W)			210.76		210.69			211.77	212.14	212.14	211.70	211.69	211.51
East Edmond (EM-3E)					211.47	212.18		212.88	213.54	212.83	212.43		
East Edmond (EM-3W)			211.69		211.56	212.50		212.99	212.50	212.50	212.73	212.60	212.50
Eastern East Edmond (SCM-1)													

Table F-17. Water Balance for East Edmond Marsh with Mining Restoration - Low Groundwater

Monthly Average in Inches of Water WY 2021

Hydrologic Process	Jul	Aug	Sep
Precipitation	0.0	0.3	2.6
Surface Water Inflows	21.7	26.6	22.8
From Sequalitchew Lake	21.7	26.6	22.6
From Center Drive	0.0	0.0	0.1
From Hamer (surface)	0.0	0.0	0.0
Subsurface Inflows	5.9	4.2	4.5
Evapotranspiration	-4.5	-4.0	-2.3
Recharge (-) Discharge (+)	*8.9*	*6.3*	*5.9*
Surface Water Outflows	-23.6	-24.6	-24.6
To Diversion Canal	0.0	0.0	0.0
To West Edmond Marsh	-27.5	-28.6	-28.6
Change in Storage	4.5	4.7	4.7
Predicted WSE in ft			
EM-2S	222.97	223.36	223.76
East Edmond	209.00	209.00	209.00
Eastern East Edmond Marsh	209.20	209.20	209.20
Observed WSE in ft			
EM-2S	210.73		
East Edmond (EM-2E)	211.69	211.43	
East Edmond (EM-2W)	211.14		
East Edmond (EM-3E)			
East Edmond (EM-3W)	212.23	211.56	
Eastern East Edmond (SCM-1)		210.20	

Table F-18. Water Balance for West Edmond Marsh with Mining Restoration - Low Groundwater

Monthly Average in Inches of Water	WY2004						WY2005						
Hydrologic Process	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar
Precipitation	2.0	1.0	3.8	0.9	0.1	3.6	2.9	4.0	3.2	4.3	4.3	0.6	4.5
Surface Water Inflows	441.8	378.0	286.8	117.9	66.7	56.4	98.7	154.5	243.4	98.3	117.0	124.8	159.2
From East Edmond	441.8	378.0	286.8	117.9	66.7	56.4	98.7	154.5	243.4	98.3	117.0	124.8	159.2
Evapotranspiration	-1.3	-2.0	-3.2	-3.7	-4.5	-4.0	-2.3	-1.0	-0.5	0.0	0.0	-0.6	-1.3
Recharge (-) Discharge (+)	-33.3	-35.2	-35.4	-37.7	-43.3	-39.9	-37.5	-36.3	-34.9	-33.2	-30.2	-32.6	-32.4
Surface Water Outflows	-409.3	-342.0	-252.1	-77.4	-19.0	-16.2	-61.7	-121.1	-211.1	-69.4	-91.1	-92.3	-130.1
To Center Drive	-409.3	-342.0	-252.1	-77.4	-19.0	-16.2	-61.7	-121.1	-211.1	-69.4	-91.1	-92.3	-130.1
Change in Storage	0.0	-0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Predicted WSE in ft	206.50	206.49	206.49	206.49	206.49	206.49	206.49	206.49	206.49	206.49	206.49	206.49	206.49
Observed WSE EM-1/EM-1A	209.10	208.59	207.26	206.55	205.27	205.27	205.27	205.86	206.15	207.67	209.18	207.97	206.63

Table F-18. Water Balance for West Edmond Marsh with Mining Restoration - Low Groundwater

Monthly Average in Inches of Water — WY2006

Hydrologic Process	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr
Precipitation	5.4	3.9	3.8	1.4	0.2	1.6	3.3	6.7	6.5	12.2	3.2	2.6	3.9
Surface Water Inflows	309.8	242.5	228.1	73.2	27.4	68.4	31.5	75.8	125.6	749.5	750.5	684.7	607.6
From East Edmond	309.8	242.5	228.1	73.2	27.4	68.4	31.5	75.8	125.6	749.5	750.5	684.7	607.6
Evapotranspiration	-2.0	-3.2	-3.7	-4.5	-4.0	-2.3	-1.0	-0.5	0.0	0.0	-0.6	-1.3	-2.0
Recharge (-) Discharge (+)	-29.2	-29.7	-31.7	-36.5	-36.9	-42.8	-38.6	-32.4	-27.3	-13.9	-19.1	-25.8	-27.5
Surface Water Outflows	-284.1	-213.5	-196.6	-33.5	-0.2	-11.3	-0.2	-44.6	-104.8	-747.7	-734.0	-660.2	-582.1
To Center Drive	-284.1	-213.5	-196.6	-33.5	-0.2	-11.3	-0.2	-44.6	-104.8	-747.7	-734.0	-660.2	-582.1
Change in Storage	0.0	0.0	0.0	0.0	-13.4	13.6	-5.1	5.0	-0.1	0.0	0.0	0.0	0.0
Predicted WSE in ft	206.49	206.49	206.49	206.49	205.37	206.50	206.07	206.49	206.49	206.49	206.49	206.49	206.49
Observed WSE EM-1/EM-1A	209.29	209.08	207.09	205.79	205.27	205.27	205.27	206.05	208.15	208.82	208.53	208.69	208.78

Table F-18. Water Balance for West Edmond Marsh with Mining Restoration - Low Groundwater

Monthly Average in Inches of Water WY2007

Hydrologic Process	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May
Precipitation	2.1	2.2	0.4	0.0	0.8	1.6	14.4	8.6	6.5	4.5	5.7	1.7	1.1
Surface Water Inflows	430.5	417.0	283.6	166.1	74.6	87.9	529.4	743.9	1050.7	826.4	1267.5	1175.0	626.0
From East Edmond	430.5	417.0	283.6	166.1	74.6	87.9	529.4	743.9	1050.7	826.4	1267.5	1175.0	626.0
Evapotranspiration	-3.2	-3.7	-4.5	-4.0	-2.3	-1.0	-0.5	0.0	0.0	-0.6	-1.3	-2.0	-3.2
Recharge (-) Discharge (+)	-31.2	-32.1	-38.4	-42.3	-43.4	-45.3	-16.4	-15.4	-16.8	-18.3	-18.8	-24.6	-31.6
Surface Water Outflows	-398.2	-383.4	-241.1	-119.8	-29.6	-43.3	-527.0	-737.0	-1040.4	-812.1	-1253.2	-1150.1	-592.3
To Center Drive	-398.2	-383.4	-241.1	-119.8	-29.6	-43.3	-527.0	-737.0	-1040.4	-812.1	-1253.2	-1150.1	-592.3
Change in Storage	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Predicted WSE in ft	206.49	206.49	206.49	206.49	206.49	206.49	206.49	206.49	206.49	206.49	206.49	206.49	206.49
Observed WSE EM-1/EM-1A	207.56	207.10	205.67	205.27	205.27	205.27	208.74	208.94	208.71	208.75	208.84	208.70	207.84

Table F-18. Water Balance for West Edmond Marsh with Mining Restoration - Low Groundwater

Monthly Average in Inches of Water WY2008

Hydrologic Process	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
Precipitation	2.7	1.5	1.0	1.7	5.0	2.8	7.7	4.2	3.6	4.9	1.8	1.3	1.7
Surface Water Inflows	311.0	71.7	396.2	331.6	278.3	300.5	550.5	552.9	510.3	478.6	459.7	331.6	215.0
From East Edmond	311.0	71.7	396.2	331.6	278.3	300.5	550.5	552.9	510.3	478.6	459.7	331.6	215.0
Evapotranspiration	-3.7	-4.5	-4.0	-2.3	-1.0	-0.5	0.0	0.0	-0.6	-1.3	-2.0	-3.2	-3.7
Recharge (-) Discharge (+)	-33.0	-36.2	-39.2	-38.1	-34.7	-33.7	-22.7	-23.5	-23.9	-25.9	-29.2	-34.7	-36.0
Surface Water Outflows	-277.0	-32.6	-354.1	-292.8	-247.5	-269.1	-535.5	-533.7	-489.5	-456.4	-430.3	-295.0	-177.0
To Center Drive	-277.0	-32.6	-354.1	-292.8	-247.5	-269.1	-535.5	-533.7	-489.5	-456.4	-430.3	-295.0	-177.0
Change in Storage	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Predicted WSE in ft	206.49	206.49	206.49	206.49	206.49	206.49	206.49	206.49	206.49	206.49	206.49	206.49	206.49
Observed WSE EM-1/EM-1A	206.92	205.84	205.63	205.62	207.09	207.82	209.17	209.07	209.02	209.23	209.03	206.96	206.38

Table F-18. Water Balance for West Edmond Marsh with Mining Restoration - Low Groundwater

Monthly Average in Inches of Water WY2009

Hydrologic Process	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul
Precipitation	0.9	2.1	0.5	2.6	8.3	5.2	7.3	1.6	5.3	3.5	3.4	1.3	0.0
Surface Water Inflows	80.7	138.0	87.4	62.8	270.6	178.3	715.1	341.9	458.2	429.9	407.7	264.9	173.7
From East Edmond	80.7	138.0	87.4	62.8	270.6	178.3	715.1	341.9	458.2	429.9	407.7	264.9	173.7
Evapotranspiration	-4.5	-4.0	-2.3	-1.0	-0.5	0.0	0.0	-0.6	-1.3	-2.0	-3.2	-3.7	-4.5
Recharge (-) Discharge (+)	-40.6	-40.7	-42.7	-42.8	-27.7	-26.7	-21.2	-26.4	-26.0	-27.7	-29.2	-32.6	-40.6
Surface Water Outflows	-36.6	-95.4	-42.9	-21.5	-250.8	-156.8	-701.3	-316.5	-436.1	-403.7	-378.7	-229.9	-128.6
To Center Drive	-36.6	-95.4	-42.9	-21.5	-250.8	-156.8	-701.3	-316.5	-436.1	-403.7	-378.7	-229.9	-128.6
Change in Storage	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Predicted WSE in ft	206.49	206.49	206.49	206.49	206.49	206.49	206.49	206.49	206.49	206.49	206.49	206.49	206.49
Observed WSE EM-1/EM-1A	205.27	205.27		205.27	208.19	208.61	208.52	208.60	209.22	209.09	208.22	206.01	205.27

Table F-18. Water Balance for West Edmond Marsh with Mining Restoration - Low Groundwater

Monthly Average in Inches of Water WY2010

Hydrologic Process	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug
Precipitation	1.9	2.8	5.6	8.9	3.0	8.0	3.3	3.3	3.3	4.6	4.3	0.4	0.2
Surface Water Inflows	135.2	123.7	204.8	402.7	376.2	620.7	511.4	627.5	843.9	638.8	539.0	336.3	193.2
From East Edmond	135.2	123.7	204.8	402.7	376.2	620.7	511.4	627.5	843.9	638.8	539.0	336.3	193.2
Evapotranspiration	-4.0	-2.3	-1.0	-0.5	0.0	0.0	-0.6	-1.3	-2.0	-3.2	-3.7	-4.5	-4.0
Recharge (-) Discharge (+)	-40.4	-38.3	-33.6	-22.3	-26.6	-18.3	-20.8	-21.0	-20.8	-22.6	-23.8	-33.2	-38.1
Surface Water Outflows	-92.7	-85.8	-175.8	-388.9	-352.6	-610.4	-493.3	-608.6	-824.5	-617.6	-515.8	-299.0	-151.3
To Center Drive	-92.7	-85.8	-175.8	-388.9	-352.6	-610.4	-493.3	-608.6	-824.5	-617.6	-515.8	-299.0	-151.3
Change in Storage	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Predicted WSE in ft	206.49	206.49	206.49	206.49	206.49	206.49	206.49	206.49	206.49	206.49	206.49	206.49	206.49
Observed WSE EM-1/EM-1A	205.27	205.27	205.98	209.21	209.55	208.68	208.58	208.34	209.17	207.87	207.82	206.07	206.07

Table F-18. Water Balance for West Edmond Marsh with Mining Restoration - Low Groundwater

Monthly Average in Inches of Water WY2011

Hydrologic Process	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Precipitation	4.0	4.2	6.6	7.2	6.1	3.1	7.2	5.7	4.8	2.8	0.8	0.3	1.3
Surface Water Inflows	272.3	321.9	440.0	570.8	1148.3	1017.8	1329.5	1376.1	1098.1	664.9	246.6	192.6	137.4
From East Edmond	272.3	321.9	440.0	570.8	1148.3	1017.8	1329.5	1376.1	1098.1	664.9	246.6	192.6	137.4
Evapotranspiration	-2.3	-1.0	-0.5	0.0	0.0	-0.6	-1.3	-2.0	-3.2	-3.7	-4.5	-4.0	-2.3
Recharge (-) Discharge (+)	-33.1	-33.1	-25.0	-21.1	-22.0	-23.0	-25.7	-25.8	-18.1	-21.9	-27.1	-32.1	-35.5
Surface Water Outflows	-240.9	-292.0	-421.1	-556.8	-1132.4	-997.3	-1309.8	-1354.1	-1081.6	-642.0	-215.8	-156.8	-100.9
To Center Drive	-240.9	-292.0	-421.1	-556.8	-1132.4	-997.3	-1309.8	-1354.1	-1081.6	-642.0	-215.8	-156.8	-100.9
Change in Storage	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Predicted WSE in ft	206.49	206.49	206.49	206.49	206.49	206.49	206.49	206.49	206.49	206.49	206.49	206.49	206.49
Observed WSE EM-1/EM-1A	206.07	206.05	208.98	209.46	207.57		208.99	209.34	209.95		207.28	206.60	206.03

Table F-18. Water Balance for West Edmond Marsh with Mining Restoration - Low Groundwater

Monthly Average in Inches of Water	WY2012												WY2013
Hydrologic Process	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct
Precipitation	4.1	6.1	3.2	7.2	3.9	6.8	4.3	3.1	3.3	1.6	0.0	0.1	6.5
Surface Water Inflows	361.5	378.7	381.1	549.0	670.4	922.3	1139.3	1063.8	549.5	370.5	143.8	51.7	228.0
From East Edmond	361.5	378.7	381.1	549.0	670.4	922.3	1139.3	1063.8	549.5	370.5	143.8	51.7	228.0
Evapotranspiration	-1.0	-0.5	0.0	0.0	-0.6	-1.3	-2.0	-3.2	-3.7	-4.5	-4.0	-2.3	-1.0
Recharge (-) Discharge (+)	-34.6	-33.3	-29.2	-23.2	-21.3	-24.0	-26.7	-25.7	-24.9	-28.8	-32.4	-36.5	-35.9
Surface Water Outflows	-330.0	-351.1	-355.1	-533.0	-652.4	-903.8	-1114.8	-1038.0	-524.2	-338.8	-107.4	-13.0	-197.6
To Center Drive	-330.0	-351.1	-355.1	-533.0	-652.4	-903.8	-1114.8	-1038.0	-524.2	-338.8	-107.4	-13.0	-197.6
Change in Storage	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Predicted WSE in ft	206.49	206.49	206.49	206.49	206.49	206.49	206.49	206.49	206.49	206.49	206.49	206.49	206.49
Observed WSE EM-1/EM-1A	206.28	206.94	207.83	209.23	209.32	209.55	209.78	209.52	209.14		206.36	205.73	206.56

Table F-18. Water Balance for West Edmond Marsh with Mining Restoration - Low Groundwater

Monthly Average in Inches of Water | WY2014

Hydrologic Process	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov
Precipitation	6.5	7.6	3.5	1.7	3.7	5.5	4.4	1.9	0.0	1.6	6.9	2.6	4.1
Surface Water Inflows	402.7	717.8	831.0	561.1	695.3	655.8	535.6	373.6	201.5	162.4	179.1	333.0	357.8
From East Edmond	402.7	717.8	831.0	561.1	695.3	655.8	535.6	373.6	201.5	162.4	179.1	333.0	357.8
Evapotranspiration	-0.5	0.0	0.0	-0.6	-1.3	-2.0	-3.2	-3.7	-4.5	-4.0	-2.3	-1.0	-0.5
Recharge (-) Discharge (+)	-31.0	-27.6	-22.4	-21.3	-23.8	-21.1	-29.6	-29.6	-36.8	-39.1	-28.7	-20.3	-25.4
Surface Water Outflows	-377.7	-697.8	-812.1	-540.9	-674.0	-638.2	-507.2	-342.2	-160.2	-121.0	-154.9	-314.2	-336.0
To Center Drive	-377.7	-697.8	-812.1	-540.9	-674.0	-638.2	-507.2	-342.2	-160.2	-121.0	-154.9	-314.2	-336.0
Change in Storage	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Predicted WSE in ft	206.49	206.49	206.49	206.49	206.49	206.49	206.49	206.49	206.49	206.49	206.49	206.49	206.49
Observed WSE EM-1/EM-1A	208.21	209.83	209.07	209.27	209.37	209.44	208.41	207.37	205.95	206.06	206.17	208.73	208.72

Table F-18. Water Balance for West Edmond Marsh with Mining Restoration - Low Groundwater

Monthly Average in Inches of Water WY2015

Hydrologic Process	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Precipitation	2.4	4.2	6.9	9.8	4.5	3.3	1.3	1.2	1.6	1.8	5.9	6.1	4.8
Surface Water Inflows	323.7	422.2	608.4	1549.7	1314.1	1083.7	528.8	293.5	182.4	137.5	282.3	444.2	804.1
From East Edmond	323.7	422.2	608.4	1549.7	1314.1	1083.7	528.8	293.5	182.4	137.5	282.3	444.2	804.1
Evapotranspiration	0.0	0.0	-0.6	-1.3	-2.0	-3.2	-3.7	-4.5	-4.0	-2.3	-1.0	-0.5	0.0
Recharge (-) Discharge (+)	-24.4	-19.5	-19.0	-21.1	-24.1	-23.5	-25.1	-32.8	-34.2	-28.5	-24.8	-20.8	-21.9
Surface Water Outflows	-301.6	-406.9	-595.8	-1537.1	-1292.6	-1060.4	-501.2	-257.5	-145.8	-108.5	-262.4	-429.0	-787.0
To Center Drive	-301.6	-406.9	-595.8	-1537.1	-1292.6	-1060.4	-501.2	-257.5	-145.8	-108.5	-262.4	-429.0	-787.0
Change in Storage	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Predicted WSE in ft	206.49	206.49	206.49	206.49	206.49	206.49	206.49	206.49	206.49	206.49	206.49	206.49	206.49
Observed WSE EM-1/EM-1A	207.55	208.55	209.72	209.98	210.01	209.99	209.05	205.30	205.87	206.07	208.63	208.73	209.84

Table F-18. Water Balance for West Edmond Marsh with Mining Restoration - Low Groundwater

Monthly Average in Inches of Water — WY2016

Hydrologic Process	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan
Precipitation	4.1	4.7	4.4	2.1	0.8	0.4	0.2	2.2	1.3	5.0	7.1	12.0	6.9
Surface Water Inflows	1070.1	1160.8	1096.4	761.7	443.5	155.5	39.7	42.6	69.3	147.0	476.9	1025.9	1356.1
From East Edmond	1070.1	1160.8	1096.4	761.7	443.5	155.5	39.7	42.6	69.3	147.0	476.9	1025.9	1356.1
Evapotranspiration	0.0	-0.6	-1.3	-2.0	-3.2	-3.7	-4.5	-4.0	-2.3	-1.0	-0.5	0.0	0.0
Recharge (-) Discharge (+)	-19.3	-20.7	-23.4	-27.1	-33.6	-38.8	-39.4	-40.6	-41.0	-42.7	-23.7	-21.4	-23.2
Surface Water Outflows	-1054.9	-1144.2	-1076.2	-734.7	-407.5	-113.3	-0.2	-0.1	-27.2	-108.4	-459.8	-1016.5	-1339.8
To Center Drive	-1054.9	-1144.2	-1076.2	-734.7	-407.5	-113.3	-0.2	-0.1	-27.2	-108.4	-459.8	-1016.5	-1339.8
Change in Storage	0.0	0.0	0.0	0.0	0.0	0.0	-4.0	0.1	0.0	0.0	0.0	0.0	0.0
Predicted WSE in ft	206.49	206.49	206.49	206.49	206.49	206.49	206.15	206.16	206.49	206.49	206.49	206.49	206.49
Observed WSE EM-1/EM-1A	209.79	209.76	209.74	209.48	207.29	205.54	205.27	205.27	205.27	205.27	209.37	210.02	

Table F-18. Water Balance for West Edmond Marsh with Mining Restoration - Low Groundwater

Monthly Average in Inches of Water — WY2017

Hydrologic Process	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
Precipitation	5.8	5.9	1.8	1.0	2.3	1.3	0.2	1.5	9.3	6.9	3.9	3.4	8.6
Surface Water Inflows	2200.1	2187.6	1285.8	521.3	366.8	258.5	86.0	98.5	333.4	506.0	764.8	421.6	659.3
From East Edmond	2200.1	2187.6	1285.8	521.3	366.8	258.5	86.0	98.5	333.4	506.0	764.8	421.6	659.3
Evapotranspiration	-0.6	-1.3	-2.0	-3.2	-3.7	-4.5	-4.0	-2.3	-1.0	-0.5	0.0	0.0	-0.6
Recharge (-) Discharge (+)	-21.7	-25.0	-24.6	-25.4	-25.0	-32.5	-35.9	-35.4	-37.2	-24.3	-22.9	-20.7	-14.8
Surface Water Outflows	-2183.6	-2167.2	-1260.9	-493.7	-340.4	-222.9	-46.3	-62.3	-304.4	-488.0	-745.9	-404.3	-652.5
To Center Drive	-2183.6	-2167.2	-1260.9	-493.7	-340.4	-222.9	-46.3	-62.3	-304.4	-488.0	-745.9	-404.3	-652.5
Change in Storage	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Predicted WSE in ft	206.49	206.49	206.49	206.49	206.49	206.49	206.49	206.49	206.49	206.49	206.49	206.49	206.49
Observed WSE EM-1/EM-1A					208.90	206.26	205.31		206.87	208.72	209.45	209.29	209.86

Table F-18. Water Balance for West Edmond Marsh with Mining Restoration - Low Groundwater

Monthly Average in Inches of Water — WY2018

Hydrologic Process	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar
Precipitation	8.7	4.6	2.8	1.8	0.0	0.1	1.0	5.2	7.2	5.8	7.2	3.3	2.3
Surface Water Inflows	1192.4	978.0	700.1	249.8	83.3	45.0	69.5	130.2	118.8	384.0	591.2	766.2	627.7
From East Edmond	1192.4	978.0	700.1	249.8	83.3	45.0	69.5	130.2	118.8	384.0	591.2	766.2	627.7
Evapotranspiration	-1.3	-2.0	-3.2	-3.7	-4.5	-4.0	-2.3	-1.0	-0.5	0.0	0.0	-0.6	-1.3
Recharge (-) Discharge (+)	-17.6	-18.3	-21.6	-23.6	-29.1	-32.6	-34.8	-27.0	-26.1	-17.9	-20.2	-20.2	-24.0
Surface Water Outflows	-1182.2	-962.3	-678.1	-224.4	-49.7	-8.6	-33.3	-107.5	-99.4	-371.9	-578.2	-748.7	-604.8
To Center Drive	-1182.2	-962.3	-678.1	-224.4	-49.7	-8.6	-33.3	-107.5	-99.4	-371.9	-578.2	-748.7	-604.8
Change in Storage	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Predicted WSE in ft	206.49	206.49	206.49	206.49	206.49	206.49	206.49	206.49	206.49	206.49	206.49	206.49	206.49
Observed WSE EM-1/EM-1A	210.22	208.64		209.58	207.22	206.67	205.31			209.98		209.98	209.67

Table F-18. Water Balance for West Edmond Marsh with Mining Restoration - Low Groundwater

Monthly Average in Inches of Water — WY2019

Hydrologic Process	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr
Precipitation	6.1	0.7	0.9	0.2	0.3	1.8	4.0	3.8	6.4	3.4	4.8	1.6	3.6
Surface Water Inflows	435.1	215.1	106.6	56.2	43.4	102.5	113.6	134.7	434.1	340.3	517.4	106.4	467.5
From East Edmond	435.1	215.1	106.6	56.2	43.4	102.5	113.6	134.7	434.1	340.3	517.4	106.4	467.5
Evapotranspiration	-2.0	-3.2	-3.7	-4.5	-4.0	-2.3	-1.0	-0.5	0.0	0.0	-0.6	-1.3	-2.0
Recharge (-) Discharge (+)	-24.9	-30.5	-34.1	-36.8	-39.3	-38.4	-39.5	-33.6	-23.3	-17.4	-16.1	-28.1	-29.5
Surface Water Outflows	-414.2	-182.1	-69.7	-15.1	-0.4	-63.5	-77.0	-104.4	-417.2	-326.3	-505.5	-78.5	-439.6
To Center Drive	-414.2	-182.1	-69.7	-15.1	-0.4	-63.5	-77.0	-104.4	-417.2	-326.3	-505.5	-78.5	-439.6
Change in Storage	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Predicted WSE in ft	206.49	206.49	206.49	206.49	206.49	206.49	206.49	206.49	206.49	206.49	206.49	206.49	206.49
Observed WSE EM-1/EM-1A	209.97	208.18	205.31	205.31	205.31	205.31	205.31	206.55	209.32	209.38	209.41	208.53	208.79

Table F-18. Water Balance for West Edmond Marsh with Mining Restoration - Low Groundwater

Monthly Average in Inches of Water — WY2020

Hydrologic Process	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May
Precipitation	1.1	0.7	1.0	0.8	3.5	3.9	1.7	6.5	9.6	4.2	3.5	1.5	3.1
Surface Water Inflows	285.4	101.2	44.2	30.9	166.5	88.2	91.6	219.6	153.6	572.9	862.3	775.1	545.9
From East Edmond	285.4	101.2	44.2	30.9	166.5	88.2	91.6	219.6	153.6	572.9	862.3	775.1	545.9
Evapotranspiration	-3.2	-3.7	-4.5	-4.0	-2.3	-1.0	-0.5	0.0	0.0	-0.6	-1.3	-2.0	-3.2
Recharge (-) Discharge (+)	-35.3	-38.9	-42.3	-40.0	-40.0	-38.6	-35.6	-35.0	-16.7	-18.4	-30.2	-29.2	-30.2
Surface Water Outflows	-248.1	-59.2	-0.2	-0.2	-128.1	-52.5	-57.2	-191.2	-146.4	-558.1	-834.4	-745.4	-515.7
To Center Drive	-248.1	-59.2	-0.2	-0.2	-128.1	-52.5	-57.2	-191.2	-146.4	-558.1	-834.4	-745.4	-515.7
Change in Storage	0.0	0.0	-1.7	-12.3	-0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Predicted WSE in ft	206.49	206.49	206.34	205.46	206.44	206.49	206.49	206.49	206.49	206.49	206.49	206.49	206.49
Observed WSE EM-1/EM-1A		205.31	205.31	205.31	205.31	205.31		206.97	209.81	209.35			

Table F-18. Water Balance for West Edmond Marsh with Mining Restoration - Low Groundwater

Monthly Average in Inches of Water WY2021

Hydrologic Process	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
Precipitation	2.5	0.3	0.4	2.8	3.0	5.6	5.2	7.3	4.7	2.5	1.2	2.0	2.4
Surface Water Inflows	323.4	141.2	96.4	99.6	163.8	312.9	489.3	585.3	485.0	610.6	477.7	314.5	260.6
From East Edmond	323.4	141.2	96.4	99.6	163.8	312.9	489.3	585.3	485.0	610.6	477.7	314.5	260.6
Evapotranspiration	-3.7	-4.5	-4.0	-2.3	-1.0	-0.5	0.0	0.0	-0.6	-1.3	-2.0	-3.2	-3.7
Recharge (-) Discharge (+)	-29.2	-40.7	-42.5	-41.4	-43.1	-30.1	-31.1	-19.1	-22.0	-24.4	-28.7	-38.0	-37.7
Surface Water Outflows	-292.9	-96.3	-50.4	-58.6	-122.7	-287.9	-463.5	-573.4	-467.1	-587.5	-448.2	-275.3	-221.6
To Center Drive	-292.9	-96.3	-50.4	-58.6	-122.7	-287.9	-463.5	-573.4	-467.1	-587.5	-448.2	-275.3	-221.6
Change in Storage	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Predicted WSE in ft	206.49	206.49	206.49	206.49	206.49	206.49	206.49	206.49	206.49	206.49	206.49	206.49	206.49
Observed WSE EM-1/EM-1A			205.31		205.31	206.87		209.40	209.72	209.15	208.13	205.31	205.31

Table F-18. Water Balance for West Edmond Marsh with Mining Restoration - Low Groundwater

Monthly Average in Inches of Water WY2021

Hydrologic Process	Jul	Aug	Sep
Precipitation	0.0	0.3	2.6
Surface Water Inflows	89.2	93.0	93.0
From East Edmond	89.2	93.0	93.0
Evapotranspiration	-4.5	-4.0	-2.3
Recharge (-) Discharge (+)	-41.6	-41.6	-40.3
Surface Water Outflows	-43.1	-43.6	-49.0
To Center Drive	-43.1	-43.6	-49.0
Change in Storage	0.0	4.1	4.0
Predicted WSE in ft	206.49	206.49	206.49
Observed WSE EM-1/EM-1A	205.31	206.87	

Appendix C

Air Quality Assessment

Prepared for

CalPortland

Prepared by

Ramboll US Corporation
Lynnwood, Washington

Date

September 27, 2022

PIONEER AGGREGATES SOUTH PARCEL EXPANSION PROJECT

AIR QUALITY ASSESSMENT

RAMBOLL Bright ideas. Sustainable change.

CONTENTS

1. Introduction 1

2. Affected Environment 1

2.1 Regulatory Overview 1
2.2 Existing Air Quality 3
2.2.1 Carbon Monoxide 3
2.2.2 Ozone 4
2.2.3 Inhalable Particulate Matter – PM10 and PM2.5 4
2.2.4 Greenhouse Gases and Global Climate Change 5
2.3 Local Climate and Terrain 6

3. Impacts 6

3.1 Operational Impacts 6
3.1.1 Fugitive Dust Deposition 7
3.1.2 Greenhouse Gas Emissions 7
3.2 Construction Impacts 10

4. Mitigation 11

5. Conclusion 11

TABLES

Table 1. Applicable Ambient Air Quality Standards for Criteria Pollutants 2
Table 2. Scope 1 Estimated Greenhouse Gas Emissions (mtpy CO_2e) 8

1. INTRODUCTION

The Pioneer Aggregates South Parcel Project ("South Parcel Project") includes horizontal expansion of mining into approximately 188 acres previously undisturbed by mining and vertical expansion of approximately 125 acres where mining will deepen a portion of the existing mine. The South Parcel Project would extend mining at the current rate for approximately 14 additional years but would not increase current throughput. As under current conditions, all the material from the expansion will be processed in the already permissible processing facilities.

Mining under the South Parcel Project will proceed slowly from the north to the south over a period of five to eight years. The method of mining will be identical to that currently used in the permitted mine area. A dozer would push excavated material from the top of the mine face to two front-end loaders working on the mine floor. The front-end loaders would scoop-up the sand and gravel and dump it into portable hoppers that feed conveyors leading to the processing area.

A conveyor will start at the north end of the Expansion Area and will be extended south as mining progresses. The conveyor is comprised of a 48-inch-wide rubberized belt that is supported by a series of rollers, called idlers, mounted on steel framed segments that support the conveyor about five feet off the ground.

As excavation of the South Parcel proceeds, water wells will be installed to create a "curtain" that intercepts groundwater along the future pit edge. Water that intercepts these wells will be pumped. At its peak, when the pit edge is at the greatest extent, approximately 50 pumps may be working simultaneously.

Ramboll US Consulting (Ramboll) evaluated the air quality implications of the above mining activities associated with the expansion. For sand and gravel excavation, particulate matter (dust) is typically the only pollutant emitted in sufficient quantities to be a potential concern and is the focus of this air quality analysis. In addition, we are providing an assessment of potential greenhouse gas (GHG) emissions associated with the Project. The following information is based on a qualitative analysis of particulate matter (i.e., no air quality monitoring or modeling) and simple GHG calculations.

2. AFFECTED ENVIRONMENT

2.1 Regulatory Overview

Air quality is generally assessed in terms of whether concentrations of air pollutants are higher or lower than ambient air quality standards established to protect human health and welfare. Three agencies have jurisdiction over ambient air quality in the project area: the U.S. Environmental Protection Agency (EPA), the Washington Department of Ecology (Ecology), and the Puget Sound Clean Air Agency (PSCAA). These agencies establish regulations that govern both the concentrations of pollutants in the outdoor air and contaminant emissions from air pollution sources. Although their regulations are similar in stringency, each agency has established its own standards. Unless the state or local jurisdiction has adopted more stringent standards, the EPA standards pertain.

To track air quality conditions over time, Ecology and PSCAA maintain a network of monitoring stations throughout the Puget Sound region. These stations are typically located where air quality problems may be expected to occur, and so are usually in or near urban areas or close to specific large air pollution sources. Other stations are used to indicate regional air pollution levels. Based on monitoring information collected over a period of years, the EPA and Ecology designate regions as being "attainment" or "nonattainment" for particular air pollutants. Attainment status is therefore a benchmark of whether air quality in an area complies with the National Ambient Air Quality Standard (NAAQS) for one or more "criteria" air pollutants.[1] Regions once designated nonattainment that have since attained the standard are considered air quality "maintenance" areas through two 10-year cycles of review, after which the area achieves "attainment" if the ambient standards have been maintained.

The project area is considered in attainment for all monitored air pollutants. This suggests air quality in the project vicinity is generally good. Pertinent air pollutants are discussed in greater detail below. A complete list of local, state, and federal ambient air quality standards is displayed in **Table 1**.

Table 1. Applicable Ambient Air Quality Standards for Criteria Pollutants

Pollutant	Terms of Compliance [(a)]	Concentration
Inhalable Particulate Matter (PM_{10})		
Annual Average ($\mu g/m^{3)}$	Arithmetic mean not to be exceeded	50 $\mu g/m^3$
24-Hour Average ($\mu g/m^3$)	The 3-year average of the 98th percentile of the daily concentrations must not exceed	150 $\mu g/m^3$
Fine Particulate Matter ($PM_{2.5}$)		
Annual Average ($\mu g/m^3$)	The 3-year average of the annual mean must not exceed	12 $\mu g/m^3$
24-Hour Average ($\mu g/m^3$)	The 3-year average of the 98th percentile of daily concentrations must not exceed	35 $\mu g/m^3$
Carbon Monoxide (CO)		
8-Hour Average (ppm)	The 8-hour average must not exceed more than once per year	9 ppm
1-Hour Average (ppm)	The 1-hour average must not exceed more than once per year	35 ppm
Ozone (O_3)		
8-Hour Average (ppm)	The 3-year average of the 4th highest daily maximum 8-hour average must not exceed	0.070 ppm

[1] The criteria air pollutants are particulate matter, CO, SO_2, NO_2, ozone, and lead.

Pollutant	Terms of Compliance [a]	Concentration
Sulfur Dioxide (SO_2) [b]		
Annual Average (ppm)	Annual arithmetic mean of 1-hour averages must not exceed	0.02 ppm [b]
24-Hour Average (ppm)	24-hour average must not exceed	0.10 ppm [b]
1-Hour Average (ppm)	1-hour average must not exceed	0.40 ppm [b]
1-Hour Average (ppm)	The 3-year average of the 99th percentile of daily max 1-hour conc. must not exceed	0.075 ppm
1-Hour Average (ppm)	No more than twice in 7 consecutive days may 1-hour average exceed	0.25 ppm [b]
Nitrogen Dioxide (NO_2)		
Annual Average (ppm)	The annual mean of 1-hour averages must not exceed	0.053 ppm
1-Hour Average (ppm)	3-year average of 98th percentile of daily max 1 hour averages must not exceed	0.1 ppm
Lead (Pb)		
Quarterly Average ($\mu g/m^3$)	3-month average must not exceed	0.15 $\mu g/m^3$

Note: $\mu g/m^3$ = micrograms per cubic meter; ppm = parts per million; note that some standards also are sometimes expressed as parts per billion (ppb)

[a] All limits are federal and state air quality standards except as noted. All indicated limits represent "primary" air quality standards intended to protect human health.

[b] Washington State standards; Washington applies more stringent annual and 24-hour limits for SO_2 than in federal rules. There is also a federal 0.5 ppm 3-hour average "secondary" standard for SO_2 to protect welfare.

2.2 Existing Air Quality

2.2.1 Carbon Monoxide

Carbon monoxide (CO) is a by-product of incomplete combustion. CO is generated by vehicular traffic and other fuel-burning activities, such as residential space heating, especially space heating using solid fuels such as coal or wood. There are two short-term air quality standards for CO: a 1-hour average standard of 35 ppm and an 8-hour average standard of 9 ppm.

The impacts of CO are usually localized near the source(s), with the highest ambient concentrations typically occurring near congested roadways and intersections during periods of cold temperatures (autumn and winter months), light winds, and stable atmospheric conditions. Such weather conditions reduce the atmospheric mechanisms that disperse and dilute pollutants.

The project site is located next to a past CO maintenance area where the 20-year maintenance period ended in 2016. Due to violations of the federal 1-hour CO standard, the Puget Sound region was designated as nonattainment for CO. In 1996, EPA determined that the Puget Sound ozone nonattainment area had attained the health-based CO standard in effect at that time. EPA then reclassified the Puget Sound region as attainment for CO and approved the associated air quality maintenance plan. Under present plans and policies, the CO attainment/nonattainment status of the area would have no direct effects on the proposed project.

2.2.2 Ozone

Ozone is a reactive form of oxygen created by sunlight-activated chemical transformations of nitrogen oxides and volatile organic compounds (hydrocarbons) in the atmosphere. Ozone problems tend to be regional in nature because the atmospheric chemical reactions that produce ozone occur over a period of time, during which ozone precursors can be transported far from their sources. Transportation sources like automobiles and trucks are among the sources that produce ozone precursors.

The project site is located next to a past ozone maintenance area within the Puget Sound region where the 20-year maintenance period ended in 2016. In the past, due to violations of the federal 1-hour ozone standard, the Puget Sound region was designated as nonattainment for ozone. In 1997, EPA determined that the Puget Sound ozone nonattainment area had attained the health-based ozone standard in effect at that time. EPA then reclassified the Puget Sound region as attainment for ozone and approved the associated air quality maintenance plan. In 2005, EPA revoked the 1-hour ozone standard in most areas of the US including the Puget Sound region, which ended the ozone maintenance status of this region. In March of 2008, the EPA adopted a new more stringent 8-hour average ozone standard of 75 parts per billion (ppb). The 8-hour standard was later strengthened to 70 ppb for most areas, effective December 2015.[(2)] Under present plans and policies, the ozone attainment/nonattainment status of the area would have no direct effects on the proposed project.

2.2.3 Inhalable Particulate Matter – PM_{10} and $PM_{2.5}$

Particulate matter air pollution is comprised of particles either emitted directly into the air (e.g., dust) or formed when hot gases cool and condense. Such air pollution is generated primarily by industrial activities and operations involving fuel combustion and material handling, and by other fuel combustion sources like motor vehicle engines, vessel engines, and residential wood burning. Federal, state, and local regulations set limits for particle concentrations in the air (i.e., weight per unit volume) based on the size of the particles and the related potential threat to health. When first regulated, particle pollution limits were based on "total suspended particulate," which included all size fractions. As sampling technology improved and the importance of particle size and chemical composition became more apparent, ambient standards were revised to focus on the size fractions thought to be most dangerous to human health. Based on the most recent studies, EPA has redefined the size fractions and set new, more stringent standards for particulate matter based on fine and coarse inhalable particulate matter to focus control efforts on the smaller size fractions.

The previous PM_{10} maintenance area for health-based ambient air quality standards for PM_{10}, or particles less than or equal to about 10 micrometers (microns) in diameter, was for all of Pierce County. The 20-year maintenance period ended in 2021 and is now classified as an attainment area for PM_{10}. This site is close to a current maintenance area for $PM_{2.5}$, or particulate matter less than or equal to 2.5 microns in diameter, which was designated in 2015. The latter size fraction and even smaller (ultra-fine) particles are now considered the most dangerous size fractions of airborne particulate matter because such small particles (e.g. a typical human hair is about 100 microns in diameter) can be breathed deeply into lungs. In addition, such particles are often associated with toxic

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(2) 80 Fed. Reg. 65,292 (Oct. 26, 2015).

substances that are deleterious in their own right and that adsorb to the particles and be carried into respiratory system.

The nearest PM2.5 maintenance area encompasses Tacoma and surrounding lowland areas in Pierce County.(3) The project site is south of Tacoma in the lowlands of Pierce County and is considered part of this maintenance area.

In gravel excavation and processing operations, particulate matter (dust) is typically the only pollutant emitted in sufficient quantities to be a potential concern. Therefore, particulate emissions, inhalable and fine particulate matter (PM10/PM2.5), are a focus of this analysis.

PSCAA states that reasonable precautions must be in place to control fugitive dust if visible emissions are present. PSCAA must respond to any emission of fugitive dust that is or can be damaging to human health, plant or animal life, property, or the enjoyment of life. The Agency can respond to complaints and will take enforcement action if necessary.

2.2.4 Greenhouse Gases and Global Climate Change

The phenomena of natural and human-caused effects on the atmosphere that cause changes in long-term meteorological patterns is known as climate change. Due to the importance of the greenhouse effect and related atmospheric warming to climate change, the gases that affect such warming are called greenhouse gasses (GHGs). The GHGs of primary importance are CO_2, methane, and nitrous oxide. Because CO_2 is the most abundant of these gases, GHGs are usually quantified in terms of CO_2e (carbon dioxide equivalent), based on their relative longevity in the atmosphere and the related "global warming potential" of these constituents. CO_2 is not considered an air "pollutant" that causes direct health-related effects, so it is not subject to ambient air quality standards used to gauge pollutant concentrations in the air.

Fuel combustion used for transportation is a significant source of GHG emissions, primarily through the burning of gasoline and diesel fuels. National estimates indicate the transportation sector (including on-road, construction, airplanes, and vessels) accounts for about 29 percent of total domestic CO_2e emissions from fossil fuels in 2017.[4] In a tabulation of 2017 emissions within Washington, Ecology estimated transportation accounted for about 45 percent of statewide GHG emissions;[5] the higher percentage is due to lower GHG emissions from electrical generation because the state relies heavily on hydropower for electricity.

No specific federal, state, or local emission reduction requirements or targets are applicable to the proposed Project, and there are no generally accepted emission level thresholds against which to assess potential localized or global consequences of GHG emissions. Therefore, this assessment

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(3) The maintenance area is called the Tacoma – Pierce County area. See information and maps at: https://ecology.wa.gov/Regulations-Permits/Plans-policies/State-implementation-plans/Maintenance-SIPs.

4 *Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990–2017*, February 2020, https://www.epa.gov/ghgemissions/inventory-us-greenhouse-gas-emissions-and-sinks

5 *2017 Greenhouse Gas Data,* https://ecology.wa.gov/Air-Climate/Climate-change/Greenhouse-gases/2017-greenhouse-gas-data

includes a qualitative consideration of GHG emissions that may be associated with emissions related to operations at the facility.

2.3 Local Climate and Terrain

Weather is one of several variables that influence air quality, with wind (speed and direction) and atmospheric stability being two major factors that affect dispersion. Periods with stable high-pressure systems and periods that include nighttime thermal inversions due to the low solar heating of the land in winter create stable atmospheric conditions. It is during these very stable atmospheric conditions when little vertical dispersion occurs high concentrations of air pollutants emitted at ground level typically occur. Ground-level emitted pollutants include CO from motor vehicles and particulate matter from vehicles and wood stoves.

In the Puget Sound region, summers are cool and comparatively dry, and winters are mild, wet, and cloudy. The winter months are dominated by a stronger south wind and frequent precipitation. Annual average precipitation in the region is approximately 50.82 inches. Annual mean temperature in the urban areas of Olympia is about 50°F. The annual mean wind speed is about 4.5 mph, with a predominately southerly wind direction (i.e., from the south). Ecology maintains records of wind data, and wind roses which are available on their website at: (https://enviwa.ecology.wa.gov/home/map).

In some instances, terrain can also influence air quality. The proposed area is in the south Puget Sound area and is characterized as relatively flat terrain.

3. IMPACTS

3.1 Operational Impacts

The proposal would enable the Dupont site to expand its mining operations to a neighboring parcel. The proposed site would operate much like the existing site. A new loader will be purchased to operate in the area and will feed material onto conveyor belts to be transported to the processing plant. Their existing dozer will be used to maintain the high wall. Water pumps will be used to pump groundwater that intercepts the edge of the pit. The processing plant and other operations in the current site will continue unchanged.

Fugitive dust emissions could continue to be emitted in the current and new pit, in the processing areas, and on the transport roads from a number of sources; with the potential effects discussed below.

- **Wind erosion.** Wind erosion over exposed surfaces and stockpiles generates fugitive dust. Emissions of wind-blown dust are directly related to the number of exposed areas and are affected by a number of other factors such as moisture content and soil type. Groundwater is expected to come in contact with the material during mining operations. Therefore, there is little potential for wind erosion associated with the mining pit. The potential for wind erosion and wind-blown dust would continue for the current mining areas and for stockpiles and transport of materials.

- **Automobiles and off-site haul trucks.** Employee vehicles and haul trucks traveling on area roadways could be sources of fugitive dust and exhaust particulate. Haul trucks may be used to

export mined materials from the site. With the proposal, these sources would not notably differ from the current activities.

- **Heavy equipment.** Mobile heavy equipment (such as a front-end loader) would continue excavating and dropping material into hoppers feeding conveyors transporting material to the existing processing area.

- **On-site haul trucks.** On-site haul trucks typically generate the greatest fugitive dust emissions compared with other air pollution sources at a mining site. However, material at the site is transported from active mining areas to the processing areas via conveyors, and the use of on-site haul trucks is limited.

Fugitive dust emissions from the sources listed above are likely to be greatest in the dry summer months. It is not likely that gravel extraction would significantly affect particulate matter concentrations during the winter months (when existing concentrations are typically higher due to residential wood burning and other factors) because greater precipitation keeps the material wet.

Heavy equipment and trucks generate diesel engine exhaust pollutants, but engine emissions from these existing sources are inconsequential considering the limited number of these vehicles.

3.1.1 Fugitive Dust Deposition

Due to the nature of the process, excavation of the proposed mine may cause dust deposition in the surrounding area. Although fugitive dust deposition is not a health issue, excess dust deposition is considered a nuisance as it can increase the soiling of surfaces, such as parked cars or the exterior of buildings.

The State of Washington does not have any quantitative standards pertaining to dust deposition. However, Section 9.11 of PSCAA Regulations states that "It shall be unlawful for any person to cause or allow the emission of any air contaminant in sufficient quantities and of such characteristics and duration as is, or is likely to be, injurious to human health, plant or animal life, or property, or which unreasonably interferes with enjoyment of life and property." Members of the public can contact PSCAA if they feel the project is interfering with the use and enjoyment of their property due to a dust deposition issue. The Agency will respond to complaints and potentially issue a Notice of Violation to the facility if the concern is determined to be valid. In that event the facility will likely have to pay a fine and provide assurances to PSCAA that measures to resolve the dust problem have been implemented and impacts will not continue. In the event of repeated violations, PSCAA may levy an enforcement action against the facility. This scenario could result in a shutdown of the facility, criminal penalties for the operators and firm requirements for changes at the facility.

3.1.2 Greenhouse Gas Emissions

When a Greenhouse Gas (GHG) emissions inventory is prepared for a facility or other entity, associated GHG emissions are separated into three categories, or "scopes":

- Scope 1 GHG emissions are direct emissions from sources that are owned or controlled by the facility, such as on-site fossil fuel combustion and industrial processes;

- Scope 2 GHG emissions are indirect emissions from the generation of electricity, heat or steam purchased by the facility from a utility provider; and

- Scope 3 GHG emissions are all indirect emissions linked to facility operations and production that are not included in Scope 2.

The GHGs emitted by the loaders and dozer are classified as Scope 1 emissions. GHGs emitted by off-site sources that generate electricity used by the conveyor drives and water pumps are Scope 2 emissions. Because the facility's annual production and operating time will not change, Scope 3 emissions are not expected to change as a result of the project.

Annual Scope 1 emissions were estimated using CO_2-equivalent (CO_2e) emission factors, expected annual operating hours for the South parcel, and the estimated fuel usage for each piece of equipment. The loaders and dozer fuel consumption ranges were estimated using hourly fuel consumption rates from tables found in the 29th edition of Caterpillar's performance handbook.[6&7]

CalPortland estimates that the South Parcel will be operated 2,080 hours per year and is expected to be the area of highest production at the facility. Total Scope 1 GHG emissions are expected to be 1,497 metric tons per year (mtpy) of CO_2e. It should be noted that the expansion of mining into the South Parcel will not require the addition of new equipment to the site but will instead redirect use of existing equipment into the expansion area. In this way, the overall annual hours of operation of the dozer and loaders are not expected to increase over current active mining operations. In this way, the emission calculations can be considered a very conservative estimation of the GHG emissions due to the South Parcel Expansion Project. The calculations are summarized below.

Table 2. Scope 1 Estimated Greenhouse Gas Emissions (mtpy CO_2e)

Equipment	Annual Operation (hr/yr)	Maximum Fuel Use (gal/hr)[3]	Emission Factor (lb CO_2e/gal)	Annual Scope 1 GHG Emissions (mtpy CO_2e)[1&2]
Caterpillar 992K Loader (2)	2,080	26	22.58	1,090
Caterpillar D10T Dozer	2,080	19.4	22.58	407
Total Annual GHG Emissions				1,497

Notes:
[1] Calculated using default emission factors from 40 CFR Part 98 Subpart C Tables C-1 and C-2 and assuming two loaders each operate 2,080 hours per year.
[2] Calculated using global warming potentials from 40 CFR Part 98 Subpart A Table A-1.
[3] Calculated using fuel consumption range on page 21-18 of, pages 25-9 and 25-39 of edition 46, the equipment is estimated to be used at medium load on average.

[6] Caterpillar Performance Handbook: Edition 29, Prepared by Caterpillar: http://nees.ucsd.edu/facilities/docs/Performance_Handbook_416C.pdf
[7] Caterpillar Performance Handbook: Edition 48, Prepared by Caterpillar: https://wheelercat.com/wp-content/uploads/2018/07/SEBD0351_ED48.pdf

Scope 2 emissions were estimated using CO_2e emission factors, expected annual South Parcel operating hours, and the quantity of electricity required to operate the conveyor belt and water pumps.

The facility purchases electricity from Puget Sound Energy (PSE). The Total Firm & Total Non-Firm Contracts, Purchases, and PSE Generated Electricity from Table 7 (Detailed Emissions Calculations) of PSE's 2020 Greenhouse Inventory document were combined to calculate a supplier-specific emission factor of 874 pounds of CO_2e per megawatt-hour (CO_2e/MWh). [8] This emission factor was combined with the estimated annual megawatt (MW) usage for conveyor drive motors and water pumps to be used in the South Phase to calculate annual Scope 2 GHG emissions.

The conveyor belt currently operated in the North Parcel of the facility is approximately 1,200 feet (ft) long and requires drive motors that total approximately 400 HP. A similar conveyor belt would be used in the South Parcel, so it is assumed that electric drive motors totaling 400 HP will be needed for every 1,200 ft of conveyor belt length. The South Parcel is expected to require approximately 1,200 feet of conveyors when operations begin, and approximately 5,000 feet of conveyors when operations are at their maximum expected extent (i.e., driver motors totaling approximately 1,667 HP). It was assumed that the conveyor belts will be operated the same number of hours per year as the loaders (i.e., 2,080) because they will be operated jointly with the loaders.

There are expected to be a total of approximately 50 water pumps used at the South Parcel to intercept water at the edge of the pit, and each pump will be driven by a 10 HP electric motor. While all 50 pump motors will typically not be operated simultaneously, we assumed continuous operation of all 50 pumps throughout the year (i.e., 8,760 hours per year) as a worst-case GHG emission scenario.

The water pumps will be operated as needed and continuous operation is not anticipated. To provide a conservative estimate of potential emissions attributable to the pumps, the GHG emissions summarized in the table below assume that all 50 pumps will be operated continuously throughout the year (i.e., 8,760 hr/yr); actual emissions are expected to be less than the values shown. Total Scope 2 emissions attributable to planned operations at the South Parcel are expected to range from 2,034 to 3,062 mtpy of CO_2e as the extent of the conveyor system increases from an initial 1,200 ft to a maximum of 5,000 ft.

Table 3. Scope 2 Estimated Greenhouse Gas Emissions (mtpy CO_2e)

Operating Scenario	Equipment	Annual Operation (hr/yr)	Annual Power Consumption (MW/yr)[2]	Annual Scope 2 GHG Emissions (mtpy CO_2e)[1]
Initial Extent	1,200 ft Conveyor System	2,080	832	325
	50 Water Pumps	8,760	4,380	1,709
	Total		**5,212**	**2,034**

[8] 2020 Greenhouse Inventory, prepared by Puget Sound Energy and published online in June 2021: https://www.pse.com/-/media/PDFs/GHG_Inventory_2020.pdf

Maximum Extent	5,000 ft Conveyor System	2,080	3,467	1,353
	50 Water Pumps	8,760	4,380	1,709
	Total		**7,847**	**3,062**

Notes:
[1] Calculated using a 2020 PSE-specific emission factor of 873.9 lb/MWh.
[2] A 1 horsepower (HP) motor is assumed to use 0.001 megawatt-hour (MWh) of electricity.

Adding the worst-case potential Scope 1 and Scope 2 emissions at the maximum extent of mining results in overall annual GHG emissions of 4,559 mtpy of CO_2e.

There are no well-established nor well-recognized thresholds for determining whether GHG emission rates from a project would be considered significant, although there are reporting thresholds established by the USEPA and by Ecology for stationary sources. Furthermore, GHG emission rates are reported by Ecology for the State of Washington, by USEPA for the United States, and by the World Resources Institute (and others) for the entire globe. The large-scale (United States and global) emission inventories are relevant since the impacts due to GHG emissions are considered to be global in scale.

Even these maximum potential worst-case GHG emissions from the proposed sources are less than half of the reporting thresholds identified by Washington State (10,000 mtpy CO_2e) and federal agencies (25,000 mtpy CO_2e). The three-year average GHG emissions (2013 to 2015) for all sources in Washington State was 97.4 million mtpy CO_2e. The GHG emissions from the proposed project would represent a very small percentage of the total state-wide inventory.

3.2 Construction Impacts

Construction related to the project will include site preparation activities such as logging and clearing, topsoil removal, and construction of perimeter berms using diesel-powered, heavy equipment (e.g., dozers and loaders). During construction, fugitive dust from site preparation may temporarily cause a localized ambient concentration increase of particulate matter (PM_{10} and $PM_{2.5}$). In addition, heavy machinery will emit diesel engine exhaust pollutants that could slightly degrade local air quality in the immediate vicinity of the activity. However, these emissions will be temporary and localized and are expected to be minimal in comparison to regional emissions considering the limited amount of this equipment.

In addition to emissions from diesel-powered equipment, logging of the site in preparation of mining may result in GHG emissions due to the removal of the trees. The extent of the GHG emissions will ultimately depend on the final use of the logs. For example, use of the trees to produce wood products used in construction would result in the storage of some of the GHG emissions. Regardless of the ultimate use of the trees, GHG emissions resulting from the logging of the site would be minimal in comparison with other local sources, such as truck and vehicular traffic.

4. MITIGATION

By virtue of the process, gravel extraction releases fugitive dust. Because of the local climate, much of the material excavated as part of this proposal would be wet much of the year, thereby reducing the potential for fugitive dust emissions. Regardless, the existing mine and the expansion due to the proposal is subject to local and federal air pollution regulations that require precautions to minimize impacts on air quality. PSCAA, the local air pollution agency with jurisdiction over this area, regulates sources of fugitive dust under Section 9.15 of PSCAA Regulations. Section 9.15(c) states that reasonable precautions must be employed to prevent visible fugitive particulate material from becoming airborne. Reasonable precautions include, but are not limited to:

- The use of control equipment, enclosures, and wet (or chemical) suppression techniques, as practical, and curtailment during high winds;
- Surfacing roadways and parking areas with asphalt, concrete, or gravel;
- Treating temporary, low-traffic areas (e.g., construction sites) with water or chemical stabilizers, reducing vehicle speeds, constructing pavement or rip rap exit aprons, and cleaning vehicle undercarriages before they exit to prevent the track-out of mud or dirt onto paved public roadways; or
- Covering or wetting truck loads or allowing adequate freeboard to prevent the escape of dust-bearing materials

Although not specifically identified as mitigation with regards to GHG emissions, CalPortland is the only industrial company in the United States that has reduced energy consumption and been recognized by EPA as an Energy Star Partner for 17 consecutive years. Specific actions taken at the overall Pioneer Aggregates operation that reduce energy consumption and associated greenhouse gas emissions include the following:

- Converting incandescent lighting systems to LED and implementing motion-activated lighting,
- Regenerating electricity from the conveyor belt leading downhill to the barge loadout facility, and
- Participating in PSE's Schedule 258 electricity energy efficiency program.

5. CONCLUSION

With the appropriate application of some or all the mitigation measures described above and consistent use of best management practices, no significant air quality impacts are expected from the South Parcel Expansion Project.

Appendix D

Stormwater Management Report

STORMWATER MANAGEMENT REPORT

South Parcel Project

Prepared for: CalPortland

Project No. 040001-016-02 • February 23, 2021

Aspect CONSULTING

earth + water

STORMWATER MANAGEMENT REPORT

South Parcel Project

Prepared for: CalPortland

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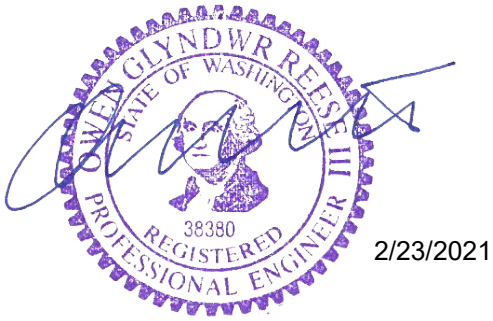
Aspect Consulting, LLC





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Contents

Acronyms ..... **iv**

1 Project Overview **1**

2 Summary of Minimum Requirements **2**

2.1 Minimum Requirement #1 – Preparation of Stormwater Site Plan 2

2.2 Minimum Requirement #2 – Construction Stormwater Pollution Prevention Plan 2

2.3 Minimum Requirement #3 – Source Control of Pollution 2

2.4 Minimum Requirement #4 – Preservation of Natural Drainage Systems and Outfalls 2

2.5 Minimum Requirement #5 – On-site Stormwater Management 3

2.6 Minimum Requirement #6 – Runoff Treatment 3

2.7 Minimum Requirement #7 – Flow Control 3

2.8 Minimum Requirement #8 – Wetlands Protection 3

2.9 Minimum Requirement #9 – Operation and Maintenance 4

3 Existing Site Conditions **5**

3.1 Site Geology 5

3.1.1 Surficial Soils 6

3.2 Groundwater Conditions 6

3.2.1 Sensitive Areas 6

3.2.2 Wetlands 6

3.2.3 Stream 7

3.2.4 Steep Slopes 7

3.3 Site Hydrology 7

4 Developed Site Conditions **9**

4.1 Dewatering Plan 9

4.2 Mine Phasing 10

4.3 Developed Site Hydrology 11

4.3.1 Basins 11

4.3.2 Land Types 11

4.3.3 Incorporating Groundwater Inflow 12

4.3.4 Peak Flows 13

5 Proposed Drainage System **14**

5.1 Water Quality Facilities 14

5.2 Constructed Mitigation Wetland 15
5.3 Infiltration Studies 15
5.4 Conveyance 16
5.5 Dewatering System Flows and Discharges 16
5.5.1 Groundwater Discharges to Stormwater System 16
6 Off-site Analysis 18
6.1 Spills and Discharges of Priority Pollutants 18
6.2 Discharges to Groundwater Recharge Zones 18
7 Special Reports and Studies 19
8 Other Permits 20
9 References 21
10 Limitations 23

List of Tables

1 Land Types by Basin in Acres 11
2 15-Minute Peak Flows in cfs 13
3 Water Quality Design Volumes 14
4 Wet Pond Dimensions 14
5 Infiltration Pond Dimensions 16
6 Groundwater Discharges to Infiltration Pond E in cfs 17

List of Figures

1 Existing Conditions
2 Generalized Geologic Cross Section
3 Proposed Conditions
4 Stormwater Model Input
5 Monthly Variation in Groundwater Inflows

List of Appendices

A Construction Stormwater Pollution Prevention Plan
B South Parcel Monitoring Plan
C Hydrologic Calculations
D Stormwater Design Calculations

Acronyms

Aspect	Aspect Consulting, LLC
BMP	best management practice
cf	cubic feet
cfs	cubic feet per second
DMC	City of DuPont Municipal Code
DNR	Washington State Department of Natural Resources
Ecology	Washington State Department of Ecology
ft/day	feet per day
H:V	horizontal to vertical
NCRS	Natural Resources Conservation Service
NGVD 29	National Geodetic Vertical Datum of 1929
NPDES	National Pollution Discharge Elimination System
O&M	operation and maintenance
PGHS	pollution-generating hard surfaces
PGPS	pollution-generating pervious surfaces
SCS	Soil Conservation Service
sf	square feet
SWMMWW	Stormwater Management Manual for Western Washington
SWPPP	stormwater pollution prevention plan
WWHM2012	Western Washington Hydrology Model 2012

1 Project Overview

The Pioneer Aggregates South Parcel Project (hereinafter referred to as the "project") is an expansion of the existing mine operated by Glacier Northwest, Inc., doing business as CalPortland, in DuPont, Washington. The project includes horizontal expansion of mining into approximately 188 acres previously undisturbed by mining, and vertical expansion of approximately 125 acres where re-mining will deepen a portion of the existing mine. The project would extend mining at the current rate for approximately 14 additional years. This document describes the proposed stormwater management system for the project.

CalPortland is currently permitted to extract sand and gravel from a 497-acre area that includes the original mine permitted in 1997 (355 acres) and the North Parcel Expansion (142 acres), permitted in 2014. Activities on the existing site include extraction of sand and gravel, aggregate processing, concrete manufacture, and loading for transportation by barge and truck. Mining began in 1997, and the current mine has an estimated remaining life of 6 to 10 years. Mining is currently limited to 10 feet above groundwater.

The project would expand the mine area by 175 acres and allow deeper mining within portions of the existing mine. No changes are proposed to the processing area. The mine expansion would also include:

- Creation of a mitigation berm along a portion of the southern boundary to reduce noise and visual impacts.
- Creation of a wetland in the existing mine to mitigate for impacts to the Kettle Wetland.

Groundwater is present at shallow depths in the expansion area and the portion of the existing mine underlain by the Olympia beds (a lower permeability geologic unit below the glacial sand and gravels being mined). Mining in these areas requires constructing a temporary dewatering system consisting of a series of wells to draw down groundwater and allow mining to advance along the eastern perimeter of the expansion area. After removing the overlying sand and gravel, a drainage swale would be constructed in the underlying low permeability soils to intercept groundwater seepage and discharge it to a new mitigation wetland to be constructed on the bottom of the existing mine. Overflow from the mitigation wetland would flow to a new infiltration facility complete in the Steilacoom gravels on the bottom of the existing mine. Infiltrated water will join the sea level aquifer and ultimately flow into Puget Sound.

This report describes the proposed stormwater management system at completion of mining. These facilities would be constructed as mining advances and would also be used as the primary components of temporary stormwater management.

2 Summary of Minimum Requirements

The minimum requirements for stormwater management for new development and redevelopment are established in Chapters 22.01.200 and 22.01.090 of the City of DuPont Municipal Code (DMC), which collectively adopt the minimum requirements of the 2012 Washington State Department of Ecology's (Ecology) Stormwater Management Manual for Western Washington, as amended in 2014 (2014 SWMMWW; Ecology, 2014a) and as further amended by Appendix 1 of the National Pollution Discharge Elimination System (NPDES) Phase II general permit (Ecology, 2014b), which specifically addresses minimum requirements. This section describes how the proposed project complies with the nine minimum requirements identified in Appendix 1 of the Phase II NPDES permit.

As the project would disturb more than 7,000 square feet and would convert greater than 2.5 acres of native vegetation, all nine minimum requirements apply.

2.1 Minimum Requirement #1 – Preparation of Stormwater Site Plan

CalPortland will prepare a Stormwater Site Plan in accordance with Section 4.1 of Appendix 1 of the Phase II NPDES permit.

2.2 Minimum Requirement #2 – Construction Stormwater Pollution Prevention Plan

A Construction Stormwater Pollution Prevention Plan has been developed and is included as Appendix A. Much of the site will drain internally. Erosion and sediment control for the internally draining areas will generally be governed by the Sand and Gravel NPDES General Permit and the Reclamation Plan.

2.3 Minimum Requirement #3 – Source Control of Pollution

Source control best management practices (BMPs) will be implemented to prevent contamination of surface or ground waters.

2.4 Minimum Requirement #4 – Preservation of Natural Drainage Systems and Outfalls

The natural drainage pattern would be preserved with site development. Precipitation falling on the project site would be collected and infiltrated. From there it would join the sea-level aquifer and flow through subsurface to Puget Sound, as it does currently. There are no outfalls or other discharges of stormwater to surface water.

2.5 Minimum Requirement #5 – On-site Stormwater Management

All stormwater falling within the closed depression of the mine will be infiltrated, preserving the natural drainage pattern and retaining runoff on-site. The specific on-site stormwater management BMPs identified in List #2 of Section 4.5 of Appendix 1 of the Phase II NPDES permit are generally not applicable to the project as no hard surfaces will be created. Soil quality and depth will be managed in accordance with a Washington State Department of Natural Resources (DNR)-approved Reclamation Plan.

2.6 Minimum Requirement #6 – Runoff Treatment

Runoff treatment is required for sites that exceed minimum thresholds for pollution-generating pervious or hard surface areas as stated in Section 4.6 of Appendix 1 of the Phase II NPDES permit.

The proposed project exceeds the thresholds requiring treatment for pollution-generating surfaces. The type of treatment required is Basic Treatment as the project discharges to ground and the groundwater flows to a marine water. The site does not require Oil Control as the heavy vehicle and traffic loading does not meet the threshold for a "high-use" site.

Runoff treatment BMPs (two-celled wet ponds) are included upstream of proposed infiltration facilities. Treatment facility types were selected based on guidance in the 2014 SWMMWW. The facilities were sized to treat 91 percent of site runoff using the Western Washington Hydrology Model 2012 (WWHM2012).

2.7 Minimum Requirement #7 – Flow Control

Section 4.7 of Appendix 1 of the Phase II NPDES permit requires all projects that do not discharge to a flow control-exempt surface water to provide flow control to reduce the impacts of stormwater runoff. The proposed project meets this requirement by draining internally to infiltration ponds. Thus, the proposed surface flow leaving the site would be 0 cubic feet per second (cfs) for all storms; with sufficient infiltration capacity to infiltrate 100 percent of runoff simulated with WWHM2012.

2.8 Minimum Requirement #8 – Wetlands Protection

Additional water quality and flow control protections are required for stormwater discharges to wetlands. No stormwater will be discharged to any natural wetlands. Once reclaimed, stormwater from the eastern slope of the proposed mine expansion will be collected along with groundwater inflows and drain to a mitigation wetland to be constructed on the floor of the existing mine. There are no pollution generating hard surfaces (PGHS) or pervious surfaces (PGPS) within the drainage area tributary to the wetland.

2.9 Minimum Requirement #9 – Operation and Maintenance

An operation and maintenance (O&M) manual, consistent with Volume V of the 2014 SWMMWW will be provided for the proposed stormwater facilities and BMPs.

3 Existing Site Conditions

This section describes the existing site conditions within the active mine site and proposed project area. The existing site features and adjacent streams and wetlands are shown on Figure 1.

3.1 Site Geology

The geologic unit being mined is the Quaternary Vashon recessional outwash, predominantly comprised of sand and gravel. The first detailed study of the outwash sequence in the mine was conducted by CalPortland in 1988 and 1989 to evaluate the resource (Lonestar Northwest, 1989). At that time, borings were drilled through the sand and gravel and into the underlying silts on approximately 500-foot centers. Numerous subsequent studies were conducted for the specific area being proposed for mining in these plans, beginning largely in 1999 (CH2M Hill, 2000 and 2003; Aspect, 2004 and 2005a).

The sand and gravel outwash includes two generalized units in the area of the mine: the Steilacoom gravel, and an older Vashon outwash unit. The Steilacoom gravel is a highly permeable flood deposit that occurs at ground surface throughout the Sequalitchew Creek basin. Steilacoom gravel is the deposit that is currently being mined by CalPortland. It is estimated to be roughly 40 to 50 feet thick in the eastern expansion area.

Below the Steilacoom gravel is an older outwash deposit indicated by greater density, more silty layers, and lower hydraulic conductivity. This lower section of sand and gravel occurs in the eastern expansion area (Figure 2). It is approximately 30 to 40 feet thick.

Underlying the sand and gravel outwash are the Olympia Beds—a glacially overridden sequence of nonglacial, low-permeability silts and sands. This unit has been called the Kitsap Formation in geologic reports older than 1999 (Troost, 1999). The Olympia Beds occur at an elevation ranging from approximately 90 to 140 feet[1] in the planned mining area. This unit is estimated to be at least 40 feet thick in the project area and to occur to an elevation of 50 feet or lower (URS, Inc. and Pioneer Technologies Corporation, 2003).

Figure 2 presents a hydrogeologic cross section through the existing mine and the proposed expansion area. Depositional processes of the Steilacoom gravel eroded away the western end of the Olympia Beds and older outwash creating a discontinuity between the existing mine and the expansion area. In the eastern expansion area, the Olympia Beds hold groundwater elevations high by its relatively low permeability compared to the Steilacoom gravel to the west. The absence of Olympia Beds to the west creates a groundwater fall into the existing mine area. In this area, the

[1] All elevations presented in this report reference the National Geodetic Vertical Datum of 1929 (NGVD 29).

groundwater levels drop by over 100 feet in less than 500 feet (gradient between 0.1 and 0.2 feet/feet).

Appendix B provides more detailed descriptions of the expansion area geology and groundwater conditions.

3.1.1 Surficial Soils

According to the Natural Resource Conservation Service (NRCS) 2004 soil study for Pierce County, two surficial soil types are present in the planned mine area: Alderwood sandy gravelly loam and Spanaway sandy gravelly loam (NRCS, 2004). Both are typical of outwash gravels. The extent of these soils is shown on Figure 1. Both soils allow rapid infiltration of stormwater and their easy drainage encourages the establishment of plant communities that tolerate dry conditions.

3.2 Groundwater Conditions

Groundwater occurs at an average depth of approximately 10 to 15 feet below ground surface within the Steilacoom gravel. Groundwater levels fluctuate annually with precipitation and precipitation readily infiltrates the area soils. In the expansion area, groundwater levels are typically 7 feet higher in the winter/spring months than in summer/fall, ranging from approximately 197 to 190 feet elevation.

The aquifer is differentiated into an upper zone in the Steilacoom gravel, and a lower zone in the older outwash. The upper aquifer zone is more permeable with an estimated average hydraulic conductivity of 850 feet per day (ft/day). The lower zone is estimated to have an average hydraulic conductivity of 31 ft/day.

Four pumping tests were conducted in the aquifers beneath the site, with monitoring in both the upper and lower zones. Wells TW-1, TW-2, TW-3, and TW-4 (see Figure 1) were located and tested around the eastern boundary of the proposed expansion area. The 1- to 3-day tests provide good information on expected groundwater conditions during mining. These data, together with groundwater flow modeling and area-wide hydrology monitoring (Aspect, 2004, 2005b, 2007, and 2017b) have been used evaluate the groundwater system, and groundwater control during mining. The South Parcel Monitoring Plan (Appendix B) provides additional information on the predicted groundwater conditions during and following mining.

3.2.1 Sensitive Areas

Sensitive areas are present within the project site and would be impacted by the proposal. The following sections describe the wetlands, stream, and steep-slope sensitive areas present on-site and summarize any project activities within them.

3.2.2 Wetlands

One wetland, known as the Kettle wetland, is present within the proposed project area. It was delineated by Anchor QEA and is more thoroughly described and evaluated in their Kettle Wetland Delineation Report (Anchor QEA, 2020a).

The Kettle wetland is 1.78 acres of Category III wetland located near the eastern boundary of the existing lease area (Figure 1). The Kettle wetland would be dewatered shortly after the dewatering system is brought on line and subsequently removed by

mining. The dewatering and subsequent removal would be mitigated via the construction of a mitigation wetland within the existing mine.

3.2.3 Stream

Sequalitchew Creek forms the southern boundary of the project area. In accordance with DMC 25.105.070 (4)(a), a 100-foot buffer measured from the stream bank is maintained along the stream corridor throughout the project area.

3.2.4 Steep Slopes

Steep slopes (greater than 40 percent) are present along the Sequalitchew Creek ravine and western slope facing Puget Sound. The boundary of steep slope areas was defined using ArcGIS and light detection and ranging (LiDAR) topographic data (which provides better resolution than aerial mapping in areas of dense vegetation).

In accordance with DMC 25.105.070(2), the project Geotechnical Report (Aspect, 2020) recommends maintaining at least a 50-foot buffer from the top of steep slopes. Consistent with the 2012 Settlement Agreement, the project includes a 100-foot buffer along the top of the slope along the Sequalitchew Creek ravine. The 100-foot buffer provides ample protection for steep slopes.

3.3 Site Hydrology

The existing site hydrology is dominated by evapotranspiration and infiltration. Surface soils are coarse, so precipitation falling on the site infiltrates and either is ultimately transpired by vegetation or flows in the subsurface to Puget Sound or to a lesser extent to Sequalitchew Creek (e.g., through the seeps in the ravine, such as the Seep wetland located near the proposed confluence).

The expansion area is generally flat and vegetated, with some cleared areas and gravel roads. Conifer forest, dominated by Douglas fir, covers 90 percent of the expansion area. A smaller clearing, approximately 13 acres in size in the northern portion of the expansion area, was once considered a prairie-type habitat, but is now dominated by Scot's broom. Surficial soils, shown on Figure 1, are classified by the NRCS Soil Survey (2004) as Spanaway gravelly sandy loam, which are characterized as "deep somewhat excessively drained soils formed in glacial outwash."

The Kettle wetland is the only surface water body within the existing mine or expansion area. The Kettle wetland is hydrologically connected to the Vashon aquifer. The Kettle wetland receives water primarily from groundwater inflows, but also from direct precipitation and any runoff generated within the kettle that surrounds it. The Kettle wetland does not have a surface discharge.

The active mine forms a closed depression so all stormwater generated within the mine either infiltrates or evaporates. Exposed soils within the existing mine consist of bare sand and gravel side slopes, where active mining is occurring, and compacted roads and equipment operating areas. Within the reclaimed portions of the mine the side slopes have been covered with topsoil and revegetated, and fine soil resulting from gravel washing (i.e., belt press fines) has been placed on the mine bottom. There have been no

water quality or flooding problems associated with stormwater management within the active mine. There are no surface water discharges from the mine.

Several industrial warehouses, including Industrial Place and the Amazon Fulfillment Center, are located east of the project. These warehouses manage stormwater through infiltration, preceded by water quality treatment. There is no off-site run-on to the proposed project site.

Existing site stormwater conditions were not analyzed with a hydrologic model because there is no runoff currently occurring. As stormwater management for the mine will largely use infiltration, hydrologic model results for the existing condition are not important for correctly designing the water quality treatment and infiltration facilities.

4 Developed Site Conditions

The project would allow for the extraction of approximately 25 million cubic yards of sand and gravel from the expansion area and newly dewatered areas of the existing mine. Postmining conditions are shown on Figure 3. The project includes multiple two-cell stormwater treatment ponds and infiltration basins. The project also includes the following additional elements:

- A constructed wetland to mitigate impacts to the Kettle wetland. Groundwater emanating from the toe of the eastern mine slope of the South Parcel will be collected and conveyed to the wetland to be constructed within the existing mine.
- A berm along the southern boundary to mitigate noise and visual impacts.
- Grading for two future roads descending into the mine from the southwest corner. The road beds would be graded, but would not be paved as a component of this project.

4.1 Dewatering Plan

Dewatering will be required for control of groundwater during mining as outlined in the South Parcel Monitoring Plan (Monitoring Plan; Aspect, 2017a).

Mining of the South Parcel will proceed slowly from the north to the south over a period of 5 to 8 years, extracting gravel to create a broad trough along the eastern property boundary. Wells will be installed and pumped in advance of mining to intercept groundwater and dry out the gravels for mining. The purpose of mining a trough is to minimize the amount of time that active dewatering by pumping wells is required. Once mining of each section of trough is completed, the adjacent wells can be turned off, allowing groundwater to passively seep from the stable mine slope and flow by gravity to an infiltration facility on floor of the existing mine. After mining the trough along the perimeter, gravel will be extracted from the interior area.

The dewatering plan consists of four steps:

Step 1 – Initial Pumping Test. The initial step is a 60-day pumping test that is completely reversible (i.e., no gravel will be extracted during the test). The results of that test will be analyzed and evaluated, and plans adjusted as necessary prior to commencing the next phase.

Step 2 – Preparation for Mining/Dewatering Test. The second step involves installing and pumping additional dewatering wells to lower water levels in the first mine segment in preparation for mining. This step would last about 6 months and functions as a greatly expanded pumping test. As with the first step, it is also completely reversible.

Step 3 – Active Dewatering during Mining. This step involves mining the trough described above. Additional dewatering wells will be installed and pumped as mining

progresses. Mining would begin at the location farthest from the Edmond Marsh and Sequalitchew Creek and proceed slowly south. Completing the trough would require 5 to 8 years depending on market conditions and the success in meeting predicted groundwater levels. The potential impact on groundwater levels builds slowly over time as wells are added and mining progresses south. This allows ample opportunity to monitor and adapt to the conditions observed before mining proceeds into each dewatered segment.

Step 4 – Cessation of Active Dewatering. The final step begins when mining of the trough is complete and the last dewatering well is turned off. Groundwater, no longer intercepted by wells, would form seeps at the toe of the eastern mine slope. It would flow by gravity through newly created wetlands and a vegetated swale to an infiltration pond located at the bottom of the existing mine. Groundwater discharge from the toe of the slope would continue in perpetuity. Once this step has begun, further mining activities in the interior of the South Parcel would not affect groundwater.

4.2 Mine Phasing

Mining activity has been divided into four segments, each consisting of two to four sequence areas. Sequence areas generally represent 1 to 2 years of mining, but the actual rate of mining will vary based on market conditions unforeseeable at this time. The mining sequence is shown on Sheet C3 of the Conditional Use Permit plan set.

Segment 1. Mining would begin from the bottom of the existing conveyor in the northeast corner of the existing permit area. Mining in Segment 1 involves excavating a deep, relatively narrow trough going south along the eastern property boundary. The trough would have a bottom width of about 200 feet, allowing room for a conveyor with access roads on each side, and toe ditches to convey stormwater and any intercepted groundwater.

The trough would begin in the existing mine area and would proceed to advance to the southeast, parallel to the conveyor, until reaching the eastern boundary of the expansion area. Mining would then turn to the south, advancing the trough along lease boundary for approximately 2,500 feet. From there, the trough would turn to the southwest and would be advanced about 2,000 feet and widened out

Segment 1 would be graded to drain to the north to a new water quality treatment pond and infiltration pond (Pond C) located in the existing mine.

Segment 2. Mining in Segment 2 would proceed to the northwest, ultimately connecting to the existing mine excavation. As the last sequence of Segment 2, mining would return to excavate the benches in the southeast corner of the expansion area.

Segments 3 and 4. Segments 3 and 4 involve extracting material from the center of the expansion area and existing mine. Mining would start at the southern portion of the trench and proceed west toward the existing mine. On reaching the existing mine, mining would start again from the trench in the next Segment to the north. The conveyor would be retracted as mining proceeds to the north.

4.3 Developed Site Hydrology

Site hydrology for developed conditions was evaluated using guidance provided in the 2014 SWMMWW. The WWHM2012 was used for sizing of the infiltration and water quality facilities per Ecology standards. Model input and out for WWHM2012 is included in Appendix C.

4.3.1 Basins

The site was divided into five drainage basins, labeled C, D, E1, E2, and E3[2]. These drainage basins were based on the proposed topography (Figure 4). A brief description of drainage patterns of each basin follows.

Basins C and D drain internally to infiltration ponds located in the existing mine and include about 390 acres of the existing mine and expansion area. When mining is completed, each basin will include mine side slopes, large areas of rolling terrain where sand and gravel will be excavated exposing the lower-permeability Olympia Beds, and a relatively flat area at elevation 25 to 50 feet in the bottom of the existing mine.

Basins E1, E2 and E3 consists of 92.6 acres of the mine side slopes and mitigation wetland which drain to the ditches designed to capture and convey groundwater emanating from the toe of the mined slope once active dewatering has ceased. Basin E1 consists of the slopes on the southern and southwestern corner of the mine as well as the mitigation wetland itself. Basin E1 drains to the mitigation wetland, then eventually infiltration pond E. . Basin E2 includes the western slopes that will drain to the ditch that conveys outflow from the wetland to the infiltration pond; it also includes infiltration pond E. Basin E3 consists of the eastern slopes that drain to the groundwater capture trench running along the toe of those slopes.

4.3.2 Land Types

Each basin was subdivided into smaller areas based on soil types, vegetative cover, and slope (Figure 4). The total areas calculated for each resulting land classification are presented in Table 1.

Table 1. Land Types by Basin in Acres

	Till Lawn			Outwash Lawn				Imperv.	
Basin	Flat	Mod.	Steep	Flat	Mod.	Steep	Wetland	Steep	Total
C	57.5	49.3	20.7	19.2	0.0	14.4	0.0	1.0	162.1
D	11.9	144.1	26.3	4.0	41.5	0.0	0.0	0.0	227.8
E1	2.2	0.0	0.0	0.0	0.0	34.1	4.3	0.0	40.6
E2	10.5	0.0	0.0	3.5	0.0	20.1	0.0	0.0	34.2
E3	0.0	0.0	0.0	0.0	0.0	17.9	0.0	0.0	17.9
Total	82.1	193.5	47.0	26.6	41.5	86.5	4.3	1.0	482.5

[2] Basins A and B are part of the North Parcel Mine Expansion (Aspect, 2012).

After the final phase of mining is complete, the developed site will be primarily composed of two types of pervious soils:

- Advance outwash and/or Steilacoom gravel deposits, which were modeled as outwash (Soil Conservation Service [SCS] soil type A/B), and
- Olympia Beds, which will be still covered by about 10 feet of gravel left in place after mining, but were conservatively modeled as till (SCS soil type C).

WWHM2012 uses three slope classifications: flat (0 to 5 percent slope), moderate (5 to 15 percent slope) and steep (greater than 15 percent slope). Vegetation categories are lawn, pasture, or forest, of which lawn generates the most runoff and is typically used to represent developed landscapes even if actual plantings will eventually more closely resemble a pasture or forest. As such, lawn was used as the vegetation for all land uses in the model.

The WWHM2012 categories were applied to different areas of the mine as follows:

- Till Lawn – Used for the Olympia Beds (even though overlain by 10 feet of gravel), areas of the existing mine where belt press fines have been placed (assumed to be 75 percent of the mine floor west of the edge of the Olympia Beds), and the mitigation berm.
- Outwash Lawn – Surfaces comprised of advance outwash and/or Steilacoom gravel, including mine side slopes, and the terraces in the southwest corner of the South Parcel. Twenty-five percent of the mine floor west of the edge of the Olympia Beds was assumed to be outwash lawn.
- Impervious – The surface of the compacted gravel access road in Basin C.

4.3.3 Incorporating Groundwater Inflow

Groundwater discharges were added to the WWHM2012 model for Basin E to ensure the infiltration pond has adequate capacity to infiltrate captured groundwater in the long-term.

A three-dimensional groundwater model was used to predict groundwater discharge at the toe of the mined slope after the cessation of active dewatering (i.e., in Step 4). The model results are documented in the Groundwater Model Update (Aspect, 2017b).

Groundwater discharge at the toe of the mine slope will vary from year to year and month to month. The maximum, average, and minimum groundwater discharges predicted by the model over the 12-year period simulated are shown on Figure 5. The maximum predicted groundwater discharge was 13.7 cfs, occurring in November, and the minimum was 4 cfs.

For design of infiltration pond E, groundwater inflow was conservatively assumed to be the maximum predicted by the model for each month (i.e., the blue line shown on Figure 5). A time series of the maximum monthly values was created and added as an inflow to the infiltration pond in WWHM2012. The maximum monthly values were used for all years in WWHM2012, regardless of the precipitation occurring in that year.

4.3.4 Peak Flows

Model-predicted peak flows for each basin are shown in Table 2. These flows represent the inflow to the infiltration ponds. The 15-minute time-step peak flows for the 100-year event ranged from 14.1 cfs for Basin E to 68.9 cfs for Basin C (Table 2).

Table 2. 15-Minute Peak Flows in cfs

Basin	Return Interval		
	2-year	25-year	100-year
C	7.2	31.8	55.9
D	9.5	42.8	75.7
E	14.2	16.3	17.1

5 Proposed Drainage System

This section describes the permanent drainage system that would be constructed as mining advances and would continue to operate after completion of mining and dewatering. The permanent system consists of water quality treatment facilities, infiltration ponds, and a network of open ditches to convey stormwater.

5.1 Water Quality Facilities

There are two water quality treatment facilities proposed for the project. The infiltration ponds in Basins C and D are preceded by two-cell wet ponds for solids settlement.

The volume of the water quality design storm for each basin was calculated using WWHM2012 (Table 3). Each water quality wet pond was designed to hold the BMP water quality volume determined by the model.

Table 3. Water Quality Design Volumes

Basin	Volume of Water Quality Storm in cf	Type of Settling Pond	Size Factor	Volume Required in cf
C	264,845	Basic Wet Pond	1	264,845
D	372,438	Basic Wet Pond	1	372,438

Notes: cf = cubic feet

The resulting wet-pond designs are summarized in Table 4. The ponds range in depth from 6 to 7 feet deep and each have 3:1 horizontal to vertical (H:V) side slopes. Two-celled ponds were designed to provide 30 percent of required storage in the first cell. Pond geometry was shaped to provide a flow path length to width ratio at least 3:1 at mid-depth. Each pond is equipped with 1 foot of freeboard and the upstream cell of each two-cell facility is designed to hold 1 foot of silt. The first cell of each wet pond would be lined with a compacted till layer a minimum 18 inches thick and compacted to 95 percent to retain water at all times, improving wet-pond function. The second cell would be unlined to promote infiltration.

Table 4. Wet Pond Dimensions

Pond	Cell	Depth in feet	Volume Provided in cf	Volume Required in cf
C	1	6	79,704	79,453
	2	7	187,614	185,391
D	1	6	111,816	111,731
	2	7	263,739	260,707

Notes: cf = cubic feet

5.2 Constructed Mitigation Wetland

As described in Section 3.2.1, above, the 1.78-acre Kettle wetland will be dewatered and ultimately removed by the proposed mining activities. To mitigate these wetland impacts, a constructed mitigation wetland is included in the proposed drainage system.

Groundwater discharges from the southern and southeastern mine slope and stormwater runoff from Basin E1 will provide the water source for the mitigation wetland. The groundwater source will provide a continuous inflow to the wetland throughout the year. Upon the completion of mining and revegetation, Basin E1 would not contain any PGPS and thus does not require water quality treatment.

5.3 Infiltration Studies

The three proposed infiltration ponds (C, D and E) will receive runoff from approximately 162, 228, and 93 acres, respectively. The ponds would be located on native outwash soils on the floor of the existing mine, as shown on Figure 3. These locations were evaluated and found suitable for the proposed facilities.

The infiltration ponds were designed to infiltrate all stormwater and groundwater generated within the mine. Key dimensions of the infiltration ponds are summarized in Table 5. The ponds were assumed to be rectangular with 3H:1V slopes, and a total depth of 6 feet (5 feet of active depth with 1 foot of freeboard).

The infiltration properties of soils in the pond areas were estimated using the methodology provided in Volume III, Chapter 3.3.6, Section 3 of the 2014 SWMMWW. This methodology relates infiltration rates to the grain-size characteristics of the soil. Grain-size information was obtained from CalPortland's gridded borings at the location and depth closest to the proposed pond locations (Lonestar Northwest, 1989). Data from the two borings closest to each infiltration pond, in the 168- to 188-foot depth range (which corresponds to the soils below the bottom of the infiltration ponds) were used to estimate infiltration rates. Conservative correction factors of CF_v = 0.33, CF_t = 0.40, and CF_m = 0.9 were applied.

The long-term infiltration rates corresponding with these grain-size results are 8.2, 8.1, and 8.2 inches per hour for Ponds C, D, and E, respectively. Calculations for the estimation of infiltration rates are presented in Appendix D.

The 'size infiltration pond' function in WWHM2012 was then used to determine the appropriate size of the infiltration pond, with preliminary dimensions being based on the amount of storage needed to fit the design volume simultaneously, and reducing it to account for infiltration, evaporation, and design storm hydrograph (Table 5). Infiltration Pond E also received groundwater inputs, as described above.

Table 5. Infiltration Pond Dimensions

Pond	Depth in feet (without freeboard)	Bottom Area in sf	Top Area at Max Water Level in sf	Side Slopes
C	5	50,762	66,748	3H:1V
D	5	37,655	68,755	3H:1V
E	6	57,807	82,120	3H:1V

Notes: sf = square feet

5.4 Conveyance

The conveyance system will consist of a network of open ditches that collect and route stormwater to the water quality facilities described above. In places where the slope is less than 2.5 percent, the ditches would be vegetated. Steeper ditches would require lining with cobbles for slopes up to 5 percent, or rip rap for steeper. The conveyance system was designed to convey the 25-year peak flow.

5.5 Dewatering System Flows and Discharges

The proposed dewatering system consists of two lines of wells located east and west of Segment 1 of mine excavation (Sheet C3 of Construction Plan Set). Groundwater pumped from these wells would be discharged to an infiltration pond on the floor of the existing mine.

The dewatering system would be constructed in phases ahead of the advancing mine excavation along the new creek corridor. Three phases are planned with each phase adding new pumping wells. As mining advances beyond the dewatering wells, the wells will be turned off, allowing groundwater to naturally discharge at the toe of the mined slope. The groundwater discharges will be collected in ditches and ponds and conveyed with the stormwater system into Pond E in the existing mine.

5.5.1 Groundwater Discharges to Stormwater System

Discharges to the infiltration ponds constructed for the stormwater system would include dewatering water from the wells located along the northern (DW-1 through DW-5) and west side of the Segment 1 mining area, and groundwater inflows to the base of the mine as mine sequences are completed and dewatering wells are turned off. Dewatering modeling results (Appendix A) indicate permanent discharges to the stormwater system, ultimately reaching Pond E, would reach a potential maximum of 13.7 cfs (Table 6).

Dewatering model results were incorporated into the WWHM2012 model by building a 15-minute time-step time-series flow file with the maximum monthly average groundwater inflow (in cfs) for each month. This time series uses the maximum average flow to produce a conservatively sized pond. The time series was inputted into infiltration Pond E along with stormwater runoff from watershed E, and the pond was sized based on those two inputs.

Table 6. Groundwater Discharges to Infiltration Pond E in cfs

	Dewatering Step	Average Annual Pumping Rate	Average Wet Season Pumping Rate	Groundwater Inflow to Base of Mine
1	Initial Pumping Test	3.6	5.5	-
2	Preparation for Mining/Expanded Pumping Test	5.2	8.8	-
3	Active Dewatering during Mining	6.9	12.2	-
4	Cessation of Active Dewatering	-	-	6.6 - 13.7

Notes: cfs = cubic feet per second

Dewatering discharges would be conveyed to internal infiltration Pond E through a pipeline system. The pipeline would parallel the well alignment, starting along the expansion area lease boundary and running north, then curving in and downslope near the existing access road from the processing plant.

6 Off-site Analysis

A qualitative downstream analysis was conducted in accordance with Option Guidance #2 of the 2014 SWMMWW.

Relevant and available information on the study area was reviewed, including boring logs from on-site resource evaluation, WRIA 14 basin planning efforts, DNR Forest Practices Activity Map, wetland inventories, and groundwater studies from adjacent sites (Fort Lewis Landfill 5). The Kettle wetland is the only surface water body present on the site. No streams or drainage channels were identified on the project site on the DNR Forest Practice Activity Map for the area. There were no existing drainage problems identified.

The off-site analysis indicated that there would be no potential impacts from the proposed stormwater management approach of infiltrating all stormwater within the closed depression of the proposed mine.

6.1 Spills and Discharges of Priority Pollutants

Mining equipment primarily would operate within the closed depression of the mine, which reduces the potential for discharges to surface water. A stormwater pollution prevention plan (SWPPP) has been developed for mine as a component of complying with the Sand and Gravel General NPDES permit. The SWPPP BMPs for mobile fueling, vehicle and equipment maintenance, and spill prevention and response. However, due to the internally draining nature of the project, discharges to surface water are not expected.

6.2 Discharges to Groundwater Recharge Zones

The infiltration ponds would discharge to the unconfined aquifer that in turn flows to Puget Sound. The stormwater discharges would be treated to remove suspended sediments prior to discharge. As infiltrated stormwater is treated and vehicle activity is generally limited to a few pieces of equipment, there is little risk of contamination of the shallow aquifer. There are no water supply wells downgradient of the site, so the proposed activities will not affect local drinking water supplies.

7 Special Reports and Studies

The following special reports and studies have been prepared as a component of the South Parcel Mine Expansion:

- Groundwater Model Update (Aspect, 2017b)
- Geotechnical Report (Aspect, 2020)
- Kettle Wetland Delineation Report (Anchor QEA, 2020a)
- Critical Areas Report (Anchor QEA, 2020b)

8 Other Permits

This section provides a list of other permits and approvals required for the project that would include conditions that affect the drainage plan. Those permits and approvals are:

- Sand and Gravel General NPDES Permit, issued by Ecology.
- Surface Mine Reclamation Permit, issued by DNR.

9 References

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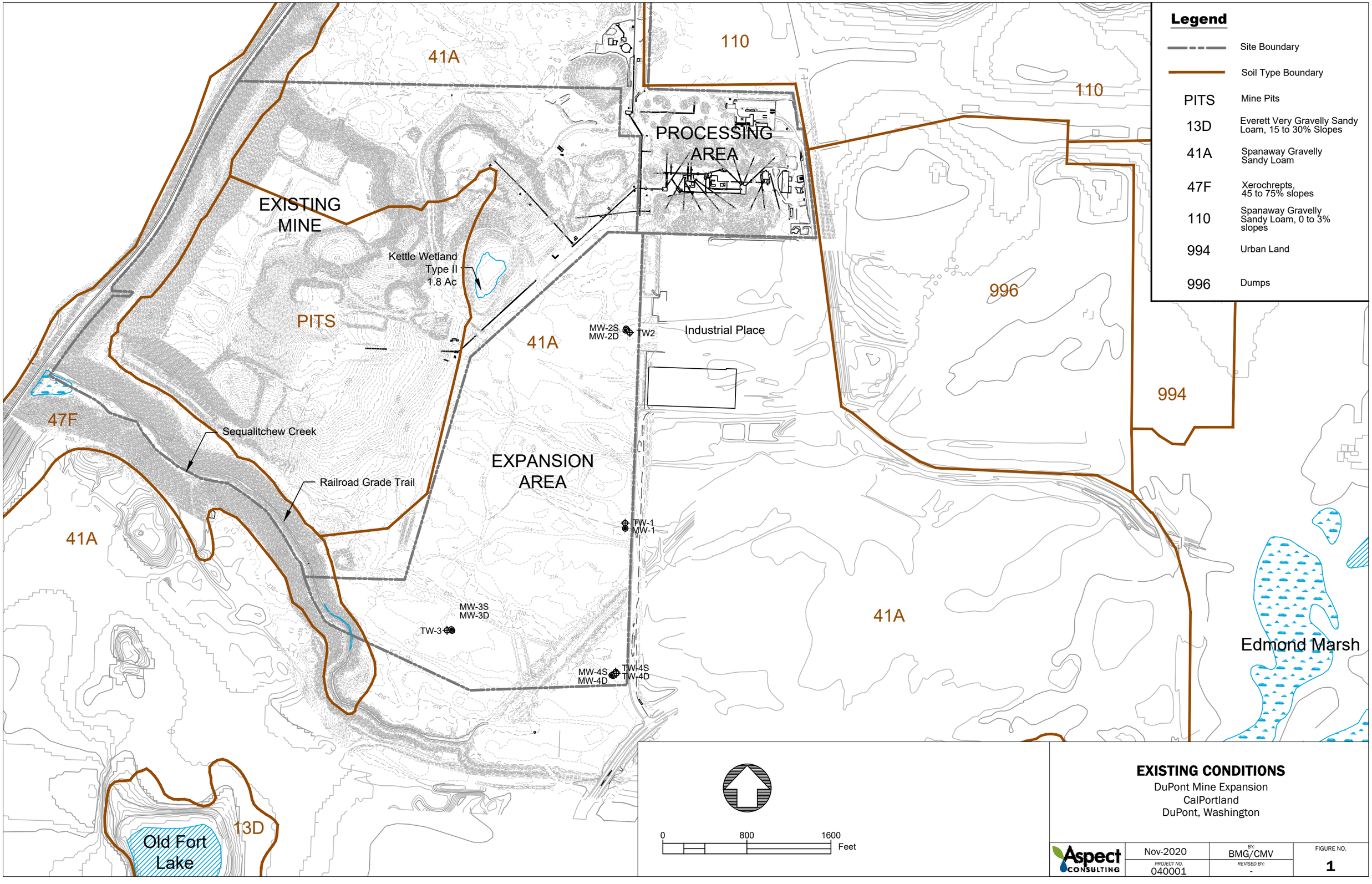
Washington State, Department of Ecology (Ecology), 2014b, Western Washington Phase II Municipal Stormwater Permit, Appendix 1 – Minimum Technical Requirements for New Development and Redevelopment. Accessed at: https://ecology.wa.gov/DOE/files/7a/7a6940d4-db41-4e00-85fe-7d0497102dfd.pdf. Modification Date: January 16, 2014.

10 Limitations

Work for this project was performed and this report prepared in accordance with generally accepted professional practices for the nature and conditions of work completed in the same or similar localities, at the time the work was performed. It is intended for the exclusive use of CalPortland for specific application to the referenced property. This report does not represent a legal opinion. No other warranty, expressed or implied, is made.

FIGURES



EXISTING CONDITIONS

DuPont Mine Expansion
CalPortland
DuPont, Washington

Aspect CONSULTING	Nov-2020	BY: BMG/CMV	FIGURE NO. 1
	PROJECT NO. 040001	REVISED BY: -	

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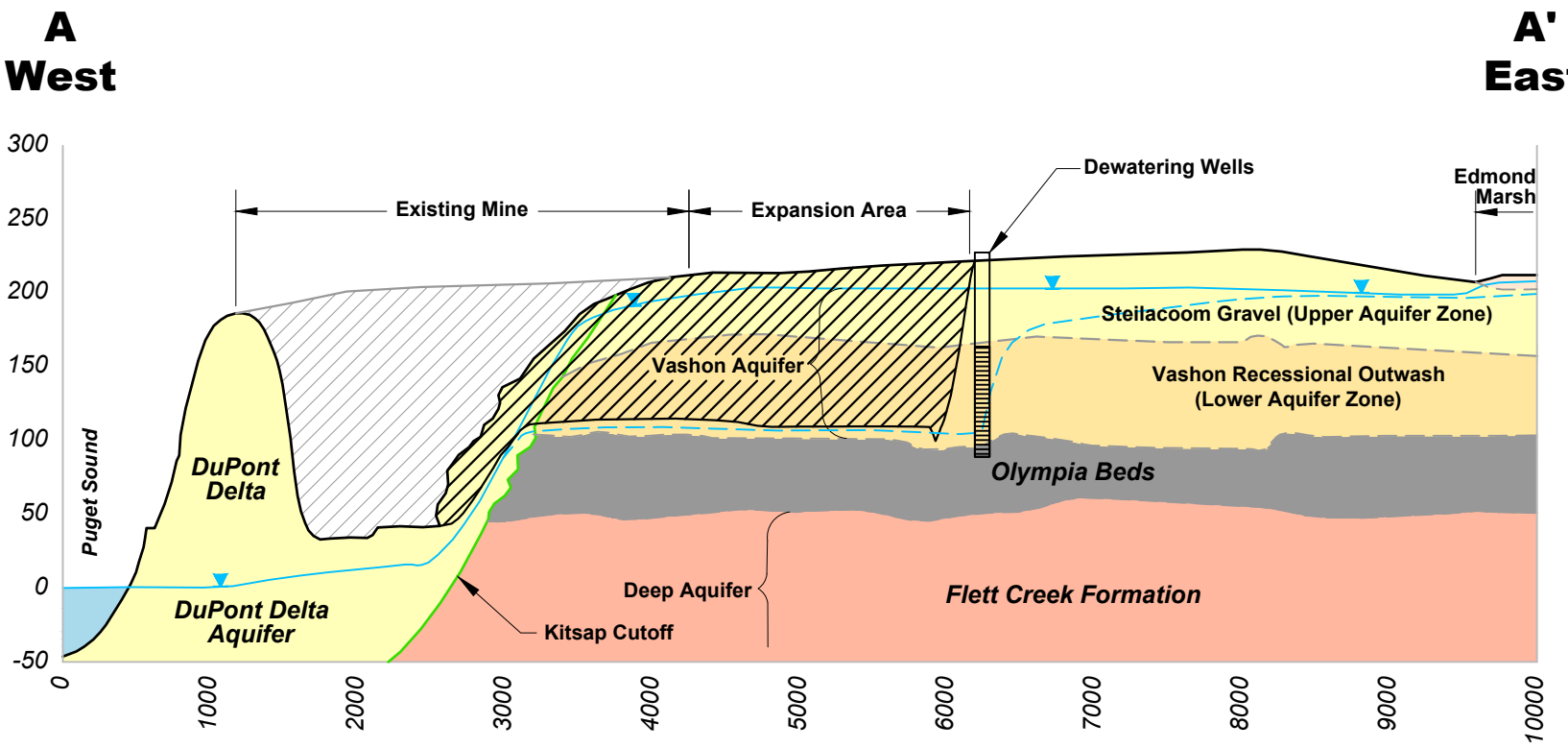

Note: Cross-Section from CH2M Hill, 2003, Figures 1-2 and 1-3.

Legend

- Existing Water Table
- Future Water Table
- Area to be Mined

0 125 250 Feet

0 1250 2500 Feet

Horizontal Scale: 1" = 1250'
Vertical Scale: 1" = 125'
Vertical Exaggeration 10x

GENERALIZED GEOLOGIC CROSS-SECTION

DuPont Mine Expansion
CalPortland
DuPont, Washington

Aspect Consulting	Nov-2020	BY: BMG/CMV	FIGURE NO. 2
	PROJECT NO. 040001	REVISED BY: -	

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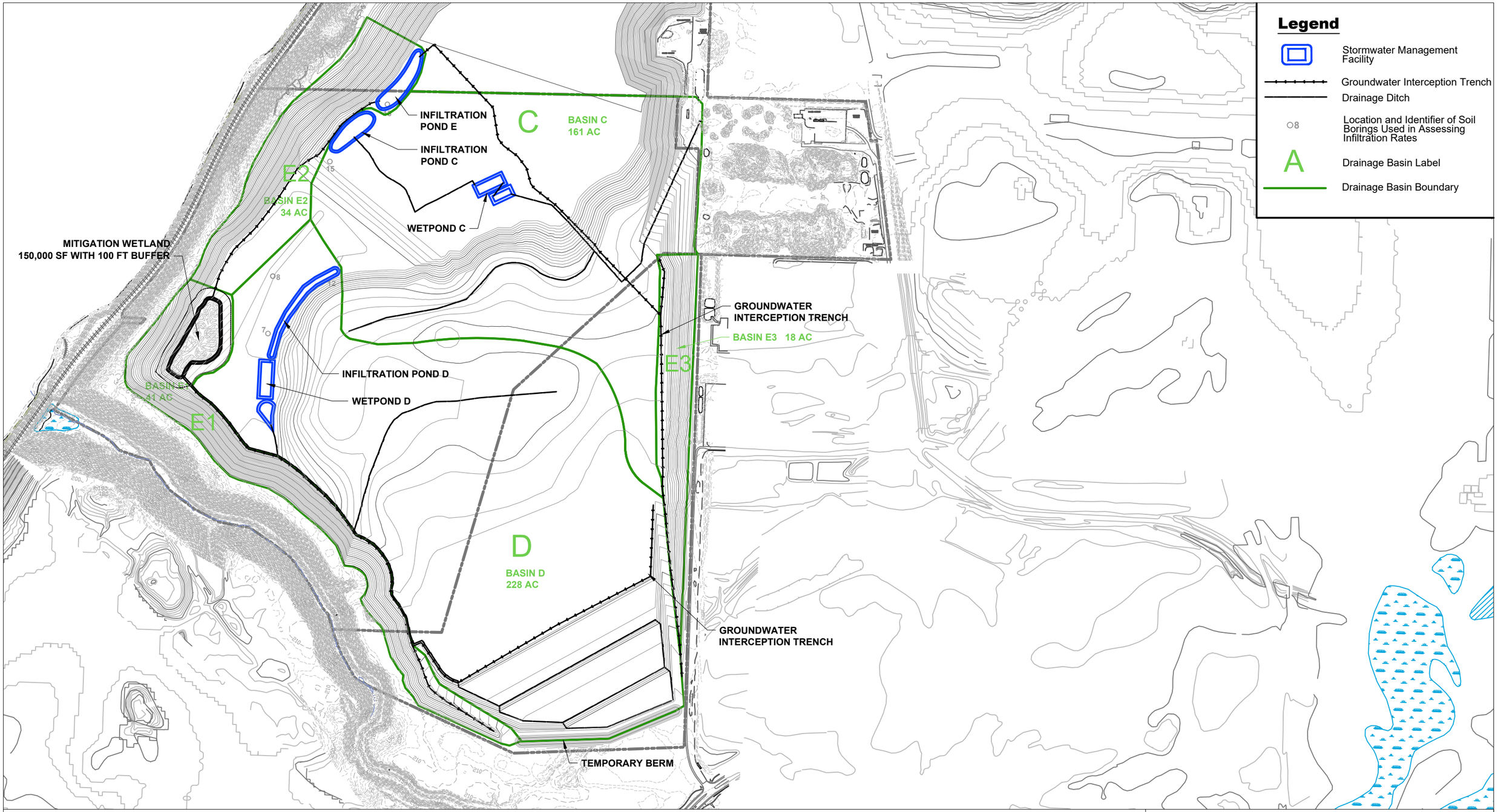

PROPOSED CONDITIONS

CalPortland
Dupont, Washington

Aspect CONSULTING	Nov-2020	BY: BMG/CMV	FIGURE NO. 3
	PROJECT NO. 040001	REVISED BY: -	

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Legend

- OUTWASH LAWN
- 25% OUTWASH LAWN 75% TILL LAWN
- TILL LAWN
- IMPERVIOUS
- WETLAND
- SITE BOUNDARY

0 800 1600 Feet

STORMWATER MODEL INPUT

DuPont Mine Expansion
CalPortland
DuPont, Washington

Aspect CONSULTING	Nov-2020	BY: BMG/CMV	FIGURE NO. 4
	PROJECT NO. 040001	REVISED BY: -	

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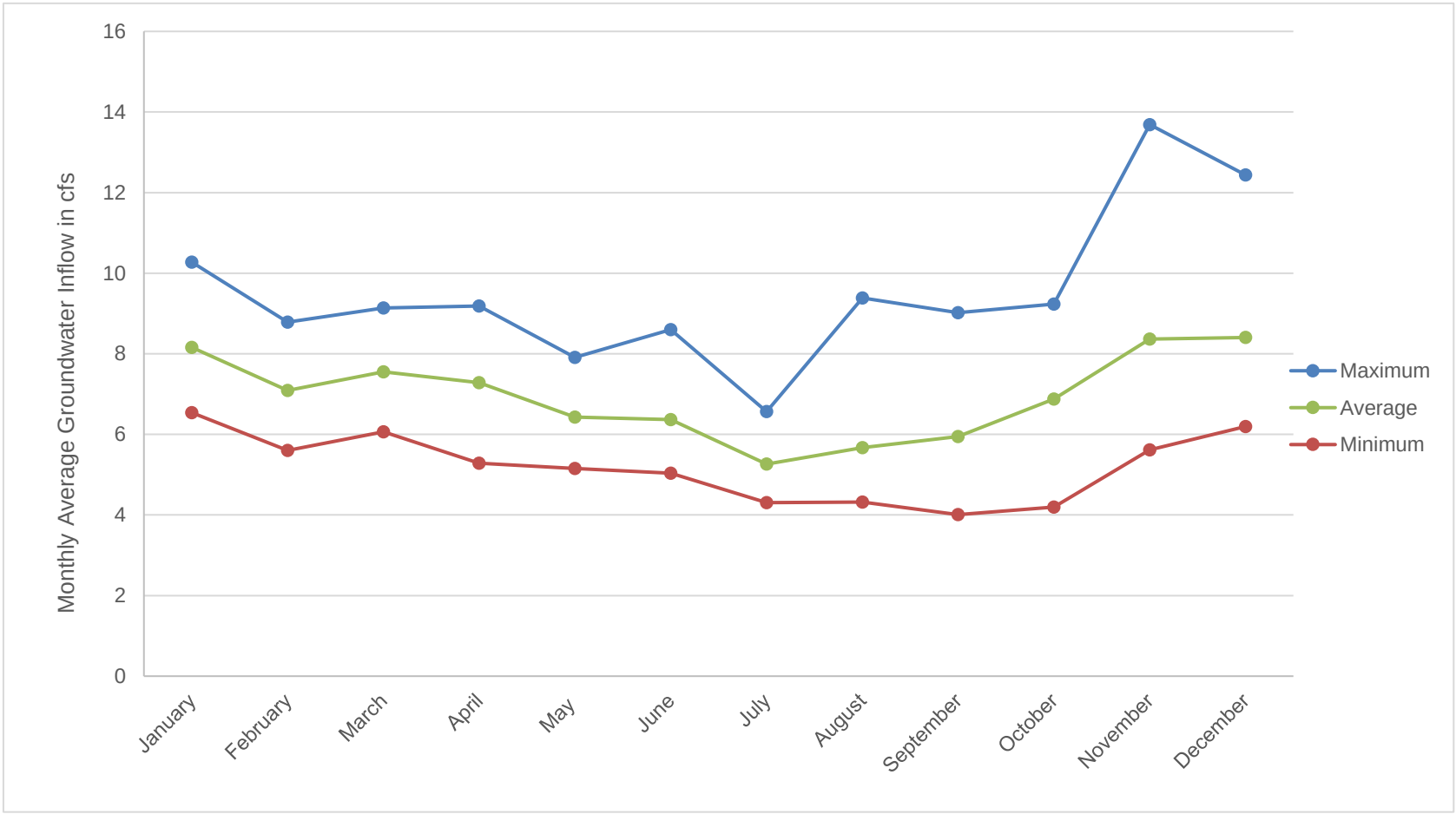

Figure 5
Monthly Variation in Groundwater Inflows
Preliminary Stormwater Management Report
DuPont WA

Aspect Consulting
02/23/2021
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APPENDIX A

Construction Stormwater Pollution Prevention Plan

CONSTRUCTION STORMWATER POLLUTION PREVENTION PLAN

Pioneer Aggregates South Parcel Project

Prepared for: CalPortland

Project No. 040001-016 • February 23, 2021

Aspect CONSULTING

earth + water

CONSTRUCTION STORMWATER POLLUTION PREVENTION PLAN

Pioneer Aggregates South Parcel Project

Prepared for: CalPortland

Project No. 040001-016 • February 23, 2021

Aspect Consulting, LLC



02/23/2021

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Contents

Introduction **1**

Minimum Requirements **2**

Element #1: Preserve Vegetation/Mark Clearing Limits 2

Element #2: Establish Construction Entrance 2

Element #3: Control Flow Rates 3

Element #4: Install Sediment Controls 3

Element #5: Stabilize Soils 4

Element #6: Protect Slopes 4

Element #7: Protect Drain Inlets 5

Element #8: Stabilize Channels and Outfalls 5

Element #9: Control Pollutants 6

Element #10: Control Dewatering 7

Element #11: Maintain BMPs 7

Element #12: Manage the Project 8

Financial Liability 8

ESC Measures **9**

Construction Sequence **10**

References **11**

Limitations **12**

Introduction

This document describes the Construction Stormwater Pollution Prevention Plan (CSWPPP) for CalPortland's Pioneer Aggregates South Parcel Project (hereafter referred to as the project) in DuPont, Washington. The project includes a 188-acre expansion of the existing mine.

Throughout the project, the following basic principles will form the core of the approach to preventing erosion at the site:

- Design the project to drain internally.
- Emphasize erosion control rather than sediment control.
- Minimize the extent and duration of area exposed.
- Keep runoff velocities low by encouraging infiltration where possible.
- Retain sediment on the site.
- Thoroughly monitor the site and maintain erosion and sediment control (ESC) measures.

The site will drain internally, eliminating the risk of off-site sediment delivery from erosion. ESC measures will be governed by the Sand and Gravel NPDES Permit requirements and Reclamation Plan.

Minimum Requirements

City of DuPont Municipal Code 22.01.200 requires that all projects comply with the *2012 Stormwater Management Manual for Western Washington* as Amended in December 2014 (2014 SMMWW; Ecology, 2014). Minimum Requirement #2 states that all projects disturbing 7,000 square feet or more prepare a Construction Stormwater Pollution Prevention Plan (SWPPP). The SWPPP contains 15 erosion and sediment control element requirements. The requirements are described individually below, with the code requirement in italic bullets followed by a description of how that requirement has been addressed in the proposed project. The summary of code requirements is omitted for elements that are not applicable.

Element #1: Preserve Vegetation/Mark Clearing Limits

- *Before beginning land disturbing activities, including clearing and grading, clearly mark all clearing limits, sensitive areas and their buffers, and trees that are to be preserved within the construction area.*
- *Retain the duff layer, native top soil, and natural vegetation in an undisturbed state to the maximum degree practical.*

Clearing limits for the mine will be marked with frequent and brightly colored flagging or posts. Given the size of the site, use of continuous clearing limit fencing would be economically and environmentally wasteful. The topsoil layer will be temporarily removed to facilitate mining, but those soils will be stockpiled on-site and used in mine reclamation in accordance with a Surface Mine Reclamation Permit from the Washington State Department of Natural Resources (DNR).

Element #2: Establish Construction Entrance

- *Limit construction vehicle access and exit to one route, if possible.*
- *Stabilize access points with a pad of quarry spalls, crushed rock, or other equivalent Best Management Plans (BMPs), to minimize tracking sediment onto roads.*
- *Locate wheel wash or tire baths on site, if the stabilized construction entrance is not effective in preventing tracking sediment onto roads.*
- *If sediment is tracked off site, clean the affected roadway thoroughly at the end of each day, or more frequently as necessary (for example, during wet weather). Remove sediment from roads by shoveling, sweeping, or pick up and transport the sediment to a controlled sediment disposal area.*
- *Conduct street washing only after sediment is removed in accordance with the above bullet.*

- *Control street wash wastewater by pumping back on site or otherwise preventing it from discharging into systems tributary to waters of the State.*

All equipment and trucks, if leaving the property, will use the existing wheel wash in the Processing Area. No new construction entrances will be created.

Element #3: Control Flow Rates

- *Protect properties and waterways downstream of development sites from erosion and the associated discharge of turbid waters due to increases in the velocity and peak volumetric flow rate of stormwater runoff from the project site, as required by local plan approval authority.*
- *Where necessary to comply with the bullet above, construct stormwater retention or detention facilities as one of the first steps in grading. Assure that detention facilities function properly before constructing site improvements (e.g. impervious surfaces).*
- *If permanent infiltration ponds are used for flow control during construction, protect these facilities from siltation during the construction phase.*

The proposed site drains internally into the mine depression and, therefore, poses little risk of discharging sediment past project boundaries. Construction of infiltration ponds will be sequenced to avoid siltation from active mining.

Element #4: Install Sediment Controls

- *Construct sediment control BMPs (sediment ponds, traps, filters, etc.) as one of the first steps in grading. These BMPs shall be functional before other land disturbing activities take place.*
- *Minimize sediment discharges from the site. The design, installation and maintenance of erosion and sediment controls must address factors such as the amount, frequency, intensity and duration of precipitation, the nature of resulting stormwater runoff, and soil characteristics, including the range of soil particle sizes expected to be present on the site.*
- *Direct stormwater runoff from disturbed areas through a sediment pond or other appropriate sediment removal BMP, before the runoff leaves a construction site or before discharge to an infiltration facility. Runoff from fully stabilized areas may be discharged without a sediment removal BMP, but must meet the flow control performance standard in Element #3, bullet #1.*
- *Locate BMPs intended to trap sediment on site in a manner to avoid interference with the movement of juvenile salmonids attempting to enter off-channel areas or drainages.*
- *Provide and maintain natural buffers around surface waters, direct stormwater to vegetated areas to increase sediment removal, and maximize stormwater infiltration, unless infeasible.*

- *Where feasible, design outlet structures that withdraw impounded stormwater from the surface to avoid discharging sediment that is still suspended lower in the water column.*

The proposed site drains internally and, therefore, poses little risk of discharging sediment from the construction site. All permanent infiltration ponds are preceded by water quality treatment BMPs to prevent clogging or reduction in long-term infiltration performance.

Element #5: Stabilize Soils

- *Stabilize exposed and unworked soils by application of effective BMPs that prevent erosion. Applicable BMPs include, but are not limited to: temporary and permanent seeding, sodding, mulching, plastic covering, erosion control fabrics and matting, soil application of polyacrylamide (PAM), the early application of gravel base early on areas to be paved, and dust control.*
- *Control stormwater volume and velocity within the site to minimize soil erosion.*
- *Control stormwater discharges, including both peak flow rates and total stormwater volume, to minimize erosion at outlets and to minimize downstream channel and stream bank erosion.*
- *Soils must not remain exposed and unworked for more than the time periods set forth below to prevent erosion.*
  - *During the dry season (May 1 – Sept. 30): 7 days.*
  - *During the wet season (October 1 – April 30): 2 days.*
- *Stabilize soils at the end of the shift before a holiday or weekend if needed based on the weather forecast.*
- *Stabilize soil stockpiles from erosion, protect with sediment trapping measures, and where possible, be located away from storm drain inlets, waterways, and drainage channels.*
- *Minimize the amount of soil exposed during construction activity.*
- *Minimize the disturbance of steep slopes.*
- *Minimize soil compaction and, unless infeasible, preserve topsoil.*

As the mine is internally draining, CalPortland proposes to comply with Element 5 by implementing the erosion control and reclamation requirements of their DNR Surface Mine Reclamation Permit.

Element #6: Protect Slopes

- *Design and construct cut-and-fill slopes in a manner to minimize erosion. Applicable practices include, but are not limited to, reducing continuous length of slope with terracing and diversions, reducing slope steepness, and roughening slope surfaces (for example, track walking).*

- *Divert off-site stormwater (run-on) or ground water away from slopes and disturbed areas with interceptor dikes, pipes, and/or swales. Off-site stormwater should be managed separately from stormwater generated on the site.*
- *At the top of slopes, collect drainage in pipe slope drains or protected channels to prevent erosion.*
    - *Temporary pipe slope drains must handle the peak volumetric flow rate calculated using a 10-minute time step from a Type 1A, 10-year, 24-hour frequency storm for the developed condition. Alternatively, the 10-year, 1-hour flow rate predicted by an approved continuous runoff model, increased by a factor of 1.6, may be used. The hydrologic analysis must use the existing land cover condition for predicting flow rates from tributary areas outside the project limits. For tributary areas on the project site, the analysis must use the temporary or permanent project land cover condition, whichever will produce the highest flow rates. If using the Western Washington Hydrology Model (WWHM) to predict flows, bare soil areas should be modeled as "landscaped" area.*
- *Place excavated material on the uphill side of trenches, consistent with safety and space considerations.*
- *Place check dams at regular intervals within constructed channels that are cut down a slope.*

Mine cut slopes will be constructed by cutting to final grade, followed by topsoil, surface roughening, and reclamation planting according to established reclamation practices currently used in the existing mine. CalPortland's mining technique leaves a series of ridges on the slope that helps prevent erosion prior to reclamation, by encouraging infiltration on the mine slopes.

Element #7: Protect Drain Inlets

Not applicable, no storm drain inlets are proposed.

Element #8: Stabilize Channels and Outfalls

- *Design, construct, and stabilize all on-site conveyance channels to prevent erosion from the following expected peak flows:*
    - *Channels must handle the peak volumetric flow rate calculated using a 10-minute time step from a Type 1A, 10-year, 24-hour frequency storm for the developed condition. Alternatively, the 10-year, 1-hour flow rate indicated by an approved continuous runoff model, increased by a factor of 1.6, may be used. The hydrologic analysis must use the existing land cover condition for predicting flow rates from tributary areas outside the project limits. For tributary areas on the project site, the analysis must use the temporary or permanent project land cover condition, whichever will produce the highest flow rates. If using the Western Washington Hydrology Model (WWHM) to predict flows, bare soil areas should be modeled as "landscaped area.*

- *Provide stabilization, including armoring material, adequate to prevent erosion of outlets, adjacent streambanks, slopes, and downstream reaches at the outlets of all conveyance systems.*

No temporary conveyance channels are proposed in areas with the potential to discharge off-site. CalPortland requests that the sizing and armoring requirements not apply within the internally draining portions of the mine. Current erosion control and mine reclamation practices within the existing mine have prevented erosion without requiring the use of armored drainage channels.

Element #9: Control Pollutants

- *Design, install, implement and maintain effective pollution prevention measures to minimize the discharge of pollutants.*
- *Handle and dispose of all pollutants, including waste materials and demolition debris that occur on-site in a manner that does not cause contamination of stormwater.*
- *Provide cover, containment, and protection from vandalism for all chemicals, liquid products, petroleum products, and other materials that have the potential to pose a threat to human health or the environment. On-site fueling tanks must include secondary containment. Secondary containment means placing tanks or containers within an impervious structure capable of containing 110% of the volume contained in the largest tank within the containment structure. Double-walled tanks do not require additional secondary containment.*
- *Conduct maintenance, fueling, and repair of heavy equipment and vehicles using spill prevention and control measures. Clean contaminated surfaces immediately following any spill incident.*
- *Discharge wheel wash or tire bath wastewater to a separate on-site treatment system that prevents discharge to surface water, such as closed loop recirculation or upland land application, or to the sanitary sewer, with local sewer district approval.*

CalPortland manages other potential pollutants at the existing mine under the requirements of the Sand and Gravel General Permit. The site is managed under a SWPPP that includes BMPs for mobile fueling, vehicle maintenance, and the loading, unloading, storage, and containment for potential pollutants. The SWPPP also includes a Spill Control Plan.

With the proposed project, CalPortland would continue to manage potential pollutants using the existing established BMPs. No new potential pollutant sources would be created.

Element #10: Control Dewatering

- *Discharge foundation, vault, and trench dewatering water, which have characteristics similar to stormwater runoff at the site, into a controlled conveyance system before discharge to a sediment trap or sediment pond.*
- *Discharge clean, non-turbid de-watering water, such as well-point ground water, to systems tributary to, or directly into surface waters of the State, as specified in Element #8, provided the de-watering flow does not cause erosion or flooding of receiving waters or interfere with the operation of the system. Do not route clean dewatering water through stormwater sediment ponds. Note that "surface waters of the State" may exist on a construction site as well as off site; for example, a creek running through a site.*
- *Handle highly turbid or contaminated dewatering water separately from stormwater.*
- *Other treatment or disposal options may include:*
    1) *Infiltration.*
    2) *Transport off-site in a vehicle, such as a vacuum flush truck, for legal disposal in a manner that does not pollute state waters.*
    3) *Ecology-approved on-site chemical treatment or other suitable treatment technologies.*
    4) *Sanitary or combined sewer discharge with local sewer district approval, if there is no other option.*
    5) *Use of a sedimentation bag with outfall to a ditch or swale for small volumes of localized dewatering.*

Dewatering is a significant component of the proposed project. CalPortland intends to manage dewatering via the Groundwater Model Update (Aspect, 2017). This comprehensive plan includes a cyclical process of dewatering, disposal, and monitoring that requires design modifications should the requirements not be met. Further, all dewatering discharge will be disposed of internally into an infiltration basin that will return the water to the deep aquifer than flows to the Puget Sound. No dewatering water will flow off-site.

Element #11: Maintain BMPs

- *Maintain and repair all temporary and permanent erosion and sediment control BMPs as needed to assure continued performance of their intended function in accordance with BMP specifications.*
- *Remove all temporary erosion and sediment control BMPs within 30 days after achieving final site stabilization or after the temporary BMPs are no longer needed.*

Maintenance would be performed according to the requirements of Ecology's 2014 SMMWW. Most of the ESC BMPs included in this plan are components of final site stabilization and would remain in place. However, if any Temporary Erosion and Sediment Control (TESC) measures are installed, they will be removed when no longer necessary.

Element #12: Manage the Project

- *Phase development projects to the maximum degree practicable and take into account seasonal work limits.*
- *Inspection and monitoring – Inspect, maintain, and repair all BMPs as needed to assure continued performance of their intended function. Conduct site inspections and monitoring in accordance with the Construction Stormwater General Permit or local plan approval authority.*
- *Maintaining an updated construction SWPPP – Maintain, update, and implement the SWPPP in accordance with the Construction Stormwater General Permit.*

CalPortland will manage the proposed mining project in compliance with Element #12, the Sand and Gravel General Permit, and DNR Surface Mine Reclamation Permit. Routine inspections and maintenance of the SWPPP would be performed as required by the Sand and Gravel General Permit.

Financial Liability

Per City of Dupont Municipal Code 22.01.295:

> *Performance bonding, or other appropriate financial instruments shall be required as determined necessary by the City to ensure compliance with these standards.*

Under the Washington State Surface Mining Act, CalPortland is required to obtain a Reclamation Permit and provide the DNR sufficient performance security to reclaim the permitted mine. Because DNR will hold the performance security and exclusive authority to regulate reclamation under Chapter 78.44 Revised Code of Washington (RCW), CalPortland respectfully requests that the City of DuPont waive their performance bond requirement for the area covered by the Surface Mine Reclamation Permit.

ESC Measures

The mine area will be graded to drain internally to three infiltration facilities located on the floor of the mine. Two of the infiltration facilities would be preceded by water quality treatment to remove suspended sediments, enhancing long-term performance of the infiltration ponds. The third infiltration facility has no Pollution Generating Pervious or impervious surfaces draining to it.

ESC in the internally draining areas is generally governed by the Sand and Gravel NPDES Permit, and the Reclamation Plan, which establishes the plan for permanently stabilizing the site for the postmining condition. As portions of the site are mined, slopes will be stabilized and replanted using methods and practices prescribed in the Reclamation Plan approved by DNR.

Construction Sequence

Because this project includes ongoing operation and removal of materials, the CSWPPP is flexible to allow for adjustments in operation. In addition, a phased approach will be adopted. Some erosion control measures apply regardless of the phase of the project, while other measures are specific to certain phases as described in the previous section.

The following describes the general sequence of project actions as they pertain to erosion control measures.

1. Initial site preparation of the Expansion Area (clearing and removal of overburden).
2. Excavation of Sequence Areas 1–4.
    a. Grade and plant slopes as mining progresses.
    b. Clear and grub next mine area concurrently with mining.
3. Continued excavation of overburden, mining, and sequential reclamation of remaining phases of the mine development (Segments 1, 2, 3, and 4).
4. Removal of equipment from mine area and conveyor route.
5. Final stabilization of site.

References

Aspect Consulting, LLC (Aspect), 2017, Groundwater Model Update, DuPont Mine South Parcel Expansion Area, Prepared for CalPortland, June 29, 2017.

Washington State Department of Ecology (Ecology), 2014, Stormwater Management Manual for Western Washington. Publication No. 04-10-076. Water Quality Program, Washington State Department of Ecology, Olympia, WA.

Limitations

Work for this project was performed and this report prepared in accordance with generally accepted professional practices for the nature and conditions of work completed in the same or similar localities, at the time the work was performed. It is intended for the exclusive use of CalPortland for specific application to the referenced property. This report does not represent a legal opinion. No other warranty, expressed or implied, is made.

APPENDIX B

South Parcel Monitoring Plan

SOUTH PARCEL MONITORING PLAN

DuPont Mine South Parcel Expansion Area

Project No. 040001-014-02 • November 22, 2017

CONFIDENTIAL
This document is confidential, and is intended for the sole use of CalPortland and the Environmental Caucus (and their designated attorneys and consultants) for the purpose of effectuating the provisions of the 2012 Settlement Agreement. Any distribution of this document to any other party, or use of this document for any other purpose, is prohibited.

Aspect CONSULTING

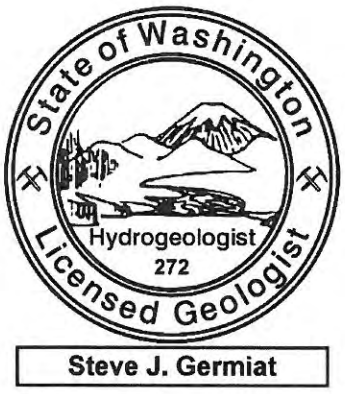
earth + water

SOUTH PARCEL MONITORING PLAN

DuPont Mine South Parcel Expansion Area

Project No. 040001-014-02 • November 22, 2017

Aspect Consulting, LLC





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Contents

Contents ..... **i**

1 Introduction **1**

2 Goals and Objectives **3**

3 Dewatering Plan Overview **4**

3.1 Four Steps of Dewatering Plan 5

3.2 Dewatering Well Construction 6

3.3 Predicted Effects of Dewatering on Groundwater Levels 6

4 Adaptive Management **9**

4.1 Process of Adaptive Management 9

4.2 Key Adaptive Management Commitments 10

4.2.1 Anticipated Schedule 10

4.2.2 Routine Reporting 14

4.2.3 Comparison of Groundwater Levels with Performance Thresholds 11

4.2.4 Notifications and Project Status Updates 12

4.2.5 Limitations on Mining 15

4.2.6 Meet and Confer Process 16

4.3 Detailed Adaptive Management Plan 17

4.3.1 Step 1 – Initial Pumping Test 17

4.3.2 Step 2 – Preparation for Mining/ Dewatering Test 20

4.3.3 Step 3 – Active Dewatering during Mining 24

4.3.4 Step 4 – Cessation of Active Dewatering 27

5 Relationship to Adaptive Management Process for Sequalitchew Creek Restoration Plan **29**

6 References **32**

7 Limitations **33**

List of Tables

1 Summary of Reporting by Dewatering Step *(in text)*

2 Frequency of Comparison to Performance Thresholds *(in text)*

3 Summary of Notifications by Dewatering Step *(in text)*

4 Performance Thresholds for Step 1 – Initial Pumping Test

5 Potential Response Actions during Step 1 – Initial Pumping Test *(in text)*

6 Performance Thresholds for Step 2 – Preparation for Mining/ Dewatering Test

7 Potential Response Actions during Step 2 – Preparation for Mining/ Dewatering Test *(in text)*

8 Performance Thresholds for Step 3 – Active Dewatering during Mining

9 Potential Response Actions during Step 3 – Active Dewatering during Mining *(in text)*

10 Performance Thresholds for Step 4 – Cessation of Active Dewatering

List of Figures

1 Project Area Map

2 Timeline of Dewatering Steps

3 Dewatering Plan

4 Monitoring Locations

5 Post-Mining Drawdown Contours

6 Predicted Changes and Ranges in Groundwater Levels

7 Adaptive Management Process

8 Timeline of Adaptive Management for South Parcel Mining

9 Adaptive Management Process During Step 1 – Initial Dewatering Test

10 Adaptive Management Process During Step 2 – Preparation for Mining/ Dewatering Test

11 Adaptive Management Process During Step 3 – Active Dewatering and Mining

12 Adaptive Management Process During Step 4 – Cessation of Active Dewatering

13 Anticipated Timeline of Mining and Restoration Activities

List of Appendices

A Performance Thresholds: Predicted Changes and Ranges in Groundwater Levels

B Sampling and Analysis Plan

1 Introduction

This document presents the Monitoring Plan for dewatering of the South Parcel of CalPortland's DuPont Mine. The South Parcel is a 177-acre property located southeast of the existing mine, shown on Figure 1. CalPortland proposes to expand the existing mine by extracting sand and gravel from the South Parcel. Groundwater saturates the lower level of gravels that are proposed for extraction. For mining to occur, these gravels of the South Parcel would need to be dewatered by installing a series of pumping wells to capture groundwater. The dewatering activity would affect groundwater levels in the surrounding area.

In 2011, CalPortland, the City of DuPont, Washington State Department of Ecology (Ecology), and a group of seven environmental organizations collectively known as the Environmental Caucus entered into a Settlement Agreement to define the conditions under which mining of the South Parcel could occur. The Settlement Agreement requires the development and permitting of a Restoration Plan for the Sequalitchew Creek watershed. It also requires the development of a Monitoring Plan for ensuring that changes in groundwater levels resulting from dewatering are within expected (and agreed-upon) limits.

Section 7.3 of the 2011 Settlement Agreement specifies that the Monitoring Plan will *"…include a series of monitoring actions to allow a comparison of predicted and actual changes in groundwater draw-down levels, and a process for the Parties to meet and confer if groundwater monitoring results do not meet the criteria provided in the Monitoring Plan."* This document was developed to meet that requirement.

The aim of the Restoration Plan is to increase available habitat for aquatic species through the restoration and enhancement of creek flow from Sequalitchew Lake to the Puget Sound. The Restoration Plan includes the following restoration actions, among others: comprehensive beaver management to restore flow from Sequalitchew Lake to West Edmond Marsh, improvements to the outlet of Sequalitchew Lake to reduce barriers to flow down the creek system, rehabilitating fish passage through the DuPont Railroad Trail by replacing a section of trail that is built on fill with a pedestrian bridge, culvert evaluation and replacement, and habitat restoration in Sequalitchew Creek downstream of Edmond Marsh. Implementing these actions will involve changes to marsh water levels and increases in Sequalitchew Creek flows.

The Restoration Plan actions are intended to occur concurrently with South Parcel mining activities. Under the terms of the Settlement Agreement, mining of the South Parcel cannot commence until all necessary permits for the Restoration Plan have been obtained. The Restoration Plan will include a monitoring component aimed at measuring the success of restoration actions and adaptively responding if goals are not met.

As specified in the Settlement Agreement, this Monitoring Plan focuses on observing and responding to changes in groundwater levels. Marsh water levels and streamflows will

also be monitored (as required by Section 7.2 of the Settlement Agreement), but they are not the focus of the adaptive management actions identified in the Monitoring Plan.

This Monitoring Plan consists of three components:

1) The main text, which outlines the framework for monitoring and decision making at a conceptual level.

2) A set of figures illustrating the performance thresholds for each month at each well in each dewatering step (Appendix A).

3) A sampling and analysis plan (SAP; Appendix B), which provides the specific details of monitoring, such as identification of monitoring locations, parameters, and frequency, as well as monitoring methods.

The parties acknowledge that the Monitoring Plan may be updated or amended by mutual agreement of the parties.

2 Goals and Objectives

This Monitoring Plan strives to monitor and respond to maintain groundwater at or above predicted levels beneath the marshes and Sequalitchew Creek, and manage groundwater to maintain conditions conducive to safe and efficient mining in the South Parcel.

Articulating the specific goals, objectives, and performance thresholds of a plan provides clarity in measuring the success of the actions taken and guidance for managing unanticipated circumstances. Goals are the overarching principles behind the Monitoring Plan. Objectives identify specific, measurable elements that are undertaken to meet the goal(s) of a project. They provide more detail on how the goals will be achieved, and criteria for determining when their achievement has occurred.

For each objective, a performance threshold is identified to measure success in meeting that objective. Failure to meet the performance threshold will trigger the adaptive management process and require iterative additional actions until it is met. If monitoring indicates that a performance threshold is not being met, additional action will be necessary and the adaptive management process (described in Section 4) will be used iteratively to identify and implement actions intended to improve conditions until the performance threshold has been met.

The goals, objectives, and thresholds of the Monitoring Plan are:

Goal 1. Maintain groundwater at or above predicted levels beneath Edmond Marsh and Sequalitchew Creek.

> **Objective 1A**. Groundwater levels at monitoring wells near Edmond Marsh and Sequalitchew Creek are at or above predicted levels.
>
> **Performance Threshold**: Monthly groundwater level measurements are at or above target levels established for each step of the dewatering process at each well and for each month of the year, based on statistical analysis of groundwater model predictions over a range of historical climate conditions. Initial target levels are included in Tables 4, 6, 8, and 10.

Goal 2. Maintain groundwater conditions conducive to safe and efficient mining and processing of the South Parcel aggregates.

> **Objective 2A**. Moisture content of mined aggregate is at appropriately low levels for safe and efficient mining and processing.

3 Dewatering Plan Overview

The entire mining process will take many years and is designed to proceed slowly from areas of least potential impact toward areas of increasing potential impact, allowing time and opportunity to confirm predictions and adaptively manage the mining and dewatering effort before irreversible changes occur.

Mining of the South Parcel will proceed slowly from the north to the south over a period of 5 to 8 years, extracting gravel to create a broad trough along the eastern property boundary. Wells will be installed and pumped in advance of mining to intercept groundwater and dry out the gravels for mining. The purpose of mining a trough is to minimize the amount of time that active dewatering by pumping wells is required. Once mining of each section of trough is completed, the adjacent wells can be turned off, allowing groundwater to passively seep from the stable mine slope and flow by gravity to an infiltration facility on floor of the existing mine. After mining the trough along the perimeter, gravel will be extracted from the interior area.

The following section describes four steps of the dewatering plan, but it is important to recognize that these steps occur on very different time scales. Figure 2 provides an overview of the timeline for the four steps of dewatering, assuming that mining proceeds rapidly during the period of active dewatering (Step 3).

The initial step is a 60-day pumping test that is completely reversible (i.e., no gravel will be extracted during the test). The results of that test will be analyzed and evaluated, and plans adjusted as necessary prior to commencing the next phase.

The second step involves installing and pumping additional dewatering wells to lower water levels in the first mine segment in preparation for mining. This step would last about six months and functions as a greatly expanded pumping test. As with the first step, it is also completely reversible.

The third step—active dewatering during mining—involves mining the trough described above. Additional dewatering wells will be installed and pumped as mining progresses. Mining will begin at the location farthest from the Edmond Marsh and Sequalitchew Creek and proceed slowly south. Completing the trough would require 5 to 8 years depending on market conditions and the success in meeting predicted groundwater levels. The potential impact on groundwater levels builds slowly over time as wells are added and mining progresses south. This allows ample opportunity to monitor and adapt to the conditions observed before mining proceeds into each dewatered segment.

The final step—passive dewatering—begins when mining of the trough described above is complete and the last dewatering well is turned off. Passive dewatering represents the groundwater condition that will continue in perpetuity. Groundwater, no longer intercepted by wells, would form seeps at the toe of the eastern mine slope. It would flow by gravity through newly created wetlands and a vegetated swale to an infiltration pond located at the bottom of the existing mine. Once this step has begun, further mining activities in the interior of the South Parcel would not affect groundwater.

Additional detail about each of these steps is described in the following section.

3.1 Four Steps of Dewatering Plan

The dewatering necessary to accomplish the mine expansion will occur in four steps as outlined below to address the needs of the mining operations and to provide an opportunity for adaptive management, as described in Section 4. Figure 3 depicts locations of the wells planned for installation in each step. All water generated during dewatering will be infiltrated within the footprint of the current mine, west of the expansion area. Infiltrated water will travel vertically into the ground to the aquifer then flow westward and discharge as seeps to Puget Sound

Step 1. Initial Pumping Test: The first step is a 10-well pumping test, conducted for a minimum of 60 days, to validate model predictions of dewatering effectiveness in the local vicinity of the test wells and make any necessary changes to the model parameters and/or plans for subsequent dewatering and mining activities. The 10 wells will be located in the northeastern portion of the South Parcel as shown on Figure 3. Monitoring will be conducted throughout the test in the pumping wells and existing monitoring wells. The combined pumping rate during Step 1 is predicted to be approximately 3.5 cubic feet per second (cfs) on average, and up to approximately 5 cfs if pumping during the wet season. The model predicts that groundwater level changes will stabilize within approximately 60 days of the start of pumping. No mining will occur in the South Parcel during this step. Step 1 could occur at any time prior to mining; it is not anticipated that all permits for mining would need to be obtained before Step 1 could occur.

Step 2. Preparation for Mining/ Dewatering Test: Following completion of the initial pumping test, the next step of the dewatering plan involves expanding the dewatering well network along the eastern edge of the mine area with two purposes: 1) to evaluate model predictions across a wider extent (making any necessary changes to model parameters and/or to subsequent dewatering/mining activities); and 2) to dewater gravels for the first segment of mining. No mining will occur in the South Parcel before this step is completed.

During Step 2, an expected 14 additional dewatering wells will be installed along the South Parcel mine boundary, including wells located interior to the mine, as shown on Figure 3. The dewatering wells will be arranged in two lines on either side of the initial mine trough, including 19 boundary wells and 5 interior wells. Two additional monitoring wells will also be installed to measure drawdown within the mine interior. Step 2 is expected to last for up to 6 months,with the first two months being a second pumping test again lasting a minimum of 60 days, followed by an estimated four additional months of pumping to dry gravels in the Segment 1A in preparation for mining. The results from the first 60 days would be used to evaluate the model; this evaluation would occur concurrently with the continued dewatering in preparation for mining. The predicted total system pumping rate of approximately 5.1 cfs on average and up to approximately 8 cfs during the wet season.

Since a key component of Step 2 is preparation of the site for mining, pumping during Step 2 would only occur once mining and restoration permits have been obtained.

Step 3. Active Dewatering during Mining: Step 3 is active dewatering as mining begins to form a broad trough in the northeastern corner of the site. Over the next 5 to 8 years,

mining will then proceed from north to south along eastern boundary of site. Step 3 dewatering is predicted to use 66 dewatering wells arranged in two lines on either side of the initial mine trough, with 54 boundary wells and 12 inner wells, as shown on Figure 3. The wells are installed and pumped ahead of the trough's southern progression; as mining of an area is completed, wells along that portion of the trough are shut off, allowing groundwater to begin seeping from the newly mined slope. Groundwater seeping into the mine will be collected in a vegetated swale and conveyed to the infiltration pond located at the bottom of the existing mine.

If all 66 dewatering wells were operating, the combined pumping rate is predicted to be approximately 6.8 cfs on average and up to approximately 11 cfs during the wet season. However, it is unlikely that all dewatering wells would need to be operated at any one time as wells will be phased off as mining progresses.

Step 4. Cessation of Active Dewatering: During Step 4, pumping from the dewatering well network will cease, and the post-mining groundwater flow condition will be established consistent with reclamation objectives. Once all dewatering wells are off, mining above the water table will continue in the interior of the South Parcel. Groundwater will flow from the toe of the newly mined slope on the eastern boundary of the property and be collected and conveyed to an infiltration pond in the bottom of the existing mine, from where it will continue its westward flow, ultimately entering Puget Sound. Groundwater levels will increase slightly following the cessation of active dewatering as they adjust to long-term equilibrium with the new spring locations that will form along the toe of the mined slope. Step 4 lasts through mining of the remaining interior areas and through the post-mining period.

3.2 Dewatering Well Construction

The dewatering wells are designed to accommodate large drawdowns (up to 70 feet), and operate under a wide range of flow rates against a wide range of heads. All dewatering wells will be screened to the depth of the Olympia Beds, with nominal 10-foot sumps installed into the top of the Olympia Beds. Expected well depths will range from about 75 to 115 feet to accommodate the variation in aquifer thickness (between ground surface and the Olympia Beds contact) and the 10-foot sump into the Olympia Beds. The dewatering wells will be screened across the lower zone and a portion of the upper aquifer zone (generally 40- to 50-foot screen lengths). Continuous slot, v-wire wrapped stainless-steel well screens will be used for maximum dewatering efficiency (low head loss). Anticipated well flows range from approximately 400 gallons per minute (gpm) initially to an average of approximately 50 to 200 gpm to maintain drawdown once storage is depleted.

3.3 Predicted Effects of Dewatering on Groundwater Levels

The effects of the four-step dewatering plan on groundwater levels have been evaluated using a numerical, three-dimensional, groundwater model developed specifically for the project (DuPont model). The model is transient, meaning that it simulates changes in groundwater levels over time, and runs on a monthly time step for a roughly 12-year period from March 2004 to December 2015 that includes wet and dry climate conditions.

This allows the model to be used to analyze the effects of the proposed dewatering plan over a range of weather conditions.

The model was developed using data from 2004 to 2010 and calibrated to observed water levels at 19 wells. The calibrated model achieved a "good fit" with a mean residual (difference between predicted and observed) of 1.7 feet or about 6 percent of the difference in minimum and maximum groundwater levels at the calibration targets. The model was validated over 2004 to 2015 (after a change in the precipitation data source) and the validation statistics were similar to the calibration with a mean residual of 1.87 feet providing confidence in its use to simulate groundwater conditions. Additional detail on groundwater model development, calibration, validation and predictive results is available in the Groundwater Model Update (Aspect, 2017).

The DuPont model was used to predict changes in groundwater conditions during the four sequential steps of proposed dewatering and mining activity in the South Parcel. These predictive runs used the same weather and boundary conditions as model calibration with the only change being the addition of pumping wells and changes in surface topography with mining. Dewatering Steps 1, 2, and 3 simulated 10, 24, and 66 active dewatering wells, respectively. Step 4 simulated the post-mining condition with pumping terminated and groundwater passively discharging at the toe of the newly mined slope.

Results of the predictive models are discussed below by dewatering step, in terms of predicted changes in groundwater levels. Baseline groundwater levels are sensitive to seasonal and longer-term precipitation patterns, and the model indicates that groundwater levels during the four dewatering steps will likewise remain sensitive to precipitation patterns. Monitoring well locations are shown on Figure 4.

In Step 1, the changes in groundwater levels are most evident at the monitoring wells closest to the pumping test (CHMW-2S and CHMW-2D). The maximum groundwater level change at CHMW-2D is predicted to be approximately 9 feet, whereas minimal groundwater level change (less than 0.5 foot) is predicted at monitoring wells in Edmond Marsh (MW-EM-1D and MW-EM-2D).

During Step 2, the maximum change in groundwater level is approximately 45 feet and would occur at CHMW-2D located on the northeastern edge of the South Parcel and within the dewatering well network. The maximum groundwater level changes in the closest monitoring wells in Edmond Marsh (MW-EM-1D and MW-EM-2D) are predicted to be approximately 1.3 feet and 0.2 feet, respectively.

During Step 3, maximum groundwater level changes of up to about 60 feet are predicted at wells within the mine area. The maximum groundwater level changes at MW-EM-1D and MW-EM-2D (Edmond Marsh) are predicted to be approximately 5.2 feet and 0.4 feet, respectively. The groundwater levels during Step 3 are predicted to be approximately 10 to 20 feet above the Olympia Beds along the mine trough.

During Step 4, following cessation of active pumping, the maximum change in groundwater levels along the eastern slope of the mine ranges from about 14 to 49 feet. The maximum groundwater level changes at the closest Edmond Marsh Wells (MW-EM-1D and MW-EM-2D) are predicted to be approximately 5.0 feet and 0.4 feet,

respectively. A map of the predicted contours of groundwater drawdown after cessation of active pumping is shown on Figure 5. Solid drawdown contours on Figure 5 indicate areas of greater certainty closer to the monitoring well network and model calibration targets, dashed drawdown contours indicate areas of lesser certainty.

The groundwater model was used to develop performance thresholds for each well in each month during each dewatering step. The thresholds are based on the predicted range in water levels under seasonal and annual variation in climate. The performance thresholds were established at the lower 95th-percentile confidence interval for the predicted water levels.

As an example, Figure 6 provides the range of model predictions (groundwater elevation, and change from baseline water levels) over varying climate conditions for well CHMW-2D, located near the proposed location of the pumping test. The vertical lines in Figure 6 indicate the lower end of the predicted range. The bottom of the vertical line is the performance threshold. The performance threshold will change by well, by month (to account for annual seasonal patterns), and by dewatering steps. Similar figures have been prepared for each monitoring well and are presented in Appendix A.

4 Adaptive Management

This Monitoring Plan implements adaptive management to observe and respond to changes in groundwater levels occurring during mining of the South Parcel. This section first introduces the fundamental steps of effective adaptive management, then establishes key commitments by CalPortland to be met throughout the adaptive management process, and then walks through the detailed adaptive management plan, including the groundwater performance thresholds, for each dewatering step.

4.1 Process of Adaptive Management

Adaptive management has been described as "*a systematic process for continually improving management policies and practices by learning from the outcomes of operational programs"* (Nyberg, 1999). Adaptive management typically consists of a monitoring system to identify changes in the environment coupled with a response system to adjust the activities in response to monitoring results. The adaptive management system proposed for implementation on this project was developed as a combination of the systems proposed by Ralph and Poole (2003) and Nyberg (1999). It consists of five key sequential elements, as illustrated on Figure 7:

A. **Assess:** Information is compiled from monitoring data, geologic investigations, groundwater modeling, and other available sources. The compiled information is used to identify issues, refine objectives, and screen potential alternative approaches. Predictions of the potential effects of the action on groundwater levels are developed.

B. **Design:** Based on the results of the assessment stage, design of the proposed action proceeds. Design will result in a specific plan of action, and supporting evaluations to ensure that the anticipated results are consistent with the identified objectives, the Monitoring Plan, and prior environmental assessments. Predictions of groundwater levels are refined as the design evolves. Analyses conducted during the design stage could result in an iterative process of assessment and design. Any required permitting is also included in the design stage.

C. **Implement and Monitor:** The approved plan is put into action, concurrently with monitoring focused on key indicators tied to the identified objectives. Monitoring data indicating conditions worse than forecasted are acted on rapidly, moving into the evaluation and adjustment stages.

D. **Evaluate:** Monitoring data are evaluated relative to the objectives and forecasted results developed in the assessment and design stages. Differences between forecasts and results are identified and the causes for those differences investigated.

E. **Adjust:** Information learned in previous steps is used to adjust the actions, if necessary. The Monitoring Plan provides an initial identification of potential adjustments in each dewatering step, but additional adjustments could be developed to fit specific situations.

The adaptive management process is iterative and would repeat until the mining project is completed. If an adjustment is identified, the process would begin again from the assessment and design stages, followed by implementation of the adjustment and associated monitoring, then evaluation and further response (if necessary). If an adjustment is not necessary, then the process still repeats. In this case, the assessment and design stages would largely rely on the previously approved plans, but there is still potential for more minor refinements based on the information learned.

Throughout the adaptive management process, status updates, monitoring data, and final reports will be shared with the Environmental Caucus. Should groundwater levels not meet the performance thresholds established in this plan, then CalPortland would notify the Environmental Caucus and plan and implement adjustments. If adjustments are unsuccessful in meeting predicted groundwater levels, CalPortland and the Environmental Caucus would initiate a technical review conference and, if necessary, meet and confer to share information and determine the appropriate additional steps.

4.2 Key Adaptive Management Commitments

This section establishes the commitments related to key components of adaptive management. First, an overview of the anticipated schedule for the four dewatering steps is presented. Then the commitments to the frequency that groundwater levels will be compared with the performance thresholds is established, followed by a summary of the notifications that will be provided if certain events occur (such as starting to pump new wells, or measurements of groundwater levels that are below performance thresholds). The next section summarizes the reports that will be provide throughout the process, ranging from relatively simple progress updates to detailed reports on the pumping tests. Then several overall limitations on advancement of mining and dewatering are established. Finally, the meet and confer process for resolving disputes is defined.

Additional detail about the adaptive management process as it applies to each dewatering Step is presented in Section 4.3.

4.2.1 Anticipated Schedule

Mining of the South Parcel will occur over many years, and the anticipated project schedule has been designed to include sufficient time for the adaptive management process to succeed in meeting performance thresholds before mining or dewatering advances. An overview of the anticipated schedule is presented on Figure 8; additional schedule detail is presented in the detailed adaptive management plan for each Step presented in Section 4.3.

Mining and dewatering activities would not begin until a series of conditions identified in Section 4.3 of the 2011 Settlement Agreement have been met. Those conditions include: 1) environmental review (SEPA) has been completed; 2) permits for the Restoration Plan have been issued [including the required authorizations and approvals from Joint Base Lewis-McChord (JBLM) for restoration activities on JBLM property], and applicable appeal periods have expired (except for federal permits); and 3) all necessary permits and approvals for South Parcel mining have been obtained. This paragraph is intended as a summary only; to the extent that it is inconsistent with the Settlement Agreement, the Settlement Agreement shall govern.

Step 1 is anticipated to require a year to complete from initial planning through reporting and discussion of the results and any resulting adjustments to the dewatering plan. Planning and well installation for Step 2 would overlap with completion of the reporting and review components of Step 1. Once Step 1 has been completed, the pumping test component of Step 2 would begin.

Step 2 is anticipated to require 6 months of active pumping—the first 2 months would be a larger-scale pumping test, and dewatering would continue over the subsequent 4 months in preparation for the start of mining. Reporting and review of results would be performed while dewatering continues.

Step 3 would only commence when groundwater levels are above the performance thresholds and water levels are at appropriately low levels for safe and efficient mining and processing. If groundwater levels meet performance thresholds, Step 2 would flow into Step 3 and the start of mining. Otherwise, Step 2 may require a longer period to perform the necessary adjustments to achieve sufficient dewatering for mining while maintaining groundwater levels consistent with the performance thresholds and prior environmental analyses, or update the environmental analyses, if necessary.

Mining would proceed south over a period of multiple years. The actual rate of mining depends on market demand. CalPortland expects that mining the first four segments (1A through 1D) would take 4 to 8 years and has committed (see Section 4.2.5) to completing those four segments in no less than 3 years total, or a minimum of 9 months for each segment. Figure 8 shows the timeline for mining of the South Parcel in the unlikely event that mining were to progress at this accelerated pace and the first four segments were to be completed in three years.

Step 4 will begin after active dewatering ceases. Depending on market demand for aggregate products, mining of the remainder of the South Parcel is expected to occur over 5 to 8 years after cessation of active dewatering.

4.2.2 Comparison of Groundwater Levels with Performance Thresholds

Success of the dewatering plan is evaluated by comparing groundwater levels with the performance thresholds.

A summary of the monitoring events where comparisons with the predicted ranges will be performed is provided in Table 1. The frequency of these comparisons will vary over time with more frequent evaluations at the start of each dewatering step or when changes to dewatering are made. If any of these monitoring results indicate groundwater levels are not above the performance thresholds, CalPortland will notify the Environmental Caucus according to the timelines described in Section 4.2.3, which vary by dewatering Step, and begin the adjustment process.

Table 1. Frequency of Comparison to Performance Thresholds

Dewatering Step	Frequency of Comparison
Step 1 – Initial Pumping Test	Changing frequency during test: hourly -> daily -> weekly
Step 2 – Preparation for Mining/ Dewatering Test	Changing frequency during first 2 months/ pumping test: daily -> weekly, then Weekly at key wells, Twice monthly at all others
Step 3 – Active Dewatering during Mining	For 3 months when new wells start pumping: weekly at key wells and twice monthly at all others, then Monthly.
Step 4 – Cessation of Active Dewatering	Monthly

Note: Key wells are the monitoring wells in the South Parcel (CHMW-1 through 4) and the closest marsh monitoring stations (EM-1 and -2), including both shallow and deep wells at those locations.

4.2.3 Notifications

Notifications are intended to alert the Environmental Caucus to the occurrence of an event. Routine reporting, including project status updates, data summaries, pumping test analyses, are described in the next section (Section 4.2.4).

CalPortland will inform the designated representative of the Environmental Caucus of each of the following types of events:

1) At the start of each dewatering step;

2) Major milestones within each step (such as addition of new pumping wells);

3) Upon collection of monitoring data indicating actual groundwater levels are lower than the performance thresholds; and

4) Implementation of response actions.

The Environmental Caucus will provide timely notice of any changes in its attorney, consultant, or designated representative or their contact information.

Notification points in each of the dewatering steps are summarized in Table 2, except for routine reporting milestones (which are summarized in Table 3). Notifications will be provided in writing by email, letter, or memorandum/report, as appropriate for the nature of the notification. It is anticipated that most notifications will be provided by email.

Groundwater monitoring data (including raw data) would be provided within 2 days of any notification that monitoring results are below performance thresholds.

Table 2. Summary of Notifications by Dewatering Step

Dewatering Step	Events Triggering Notification of Environmental Caucus	Timeline for Notification
Step 1 – Initial Pumping Test	Updates to pumping test plan	Within 3 days of updating plan
	Installation of pumping test wells	1 week prior to start of drilling
	Start of pumping test	1 week prior to start of pumping
	Monitoring results below performance thresholds	Within 24 hours of measurement
	Any adjustments implemented during pumping test	Within 24 hours of change
	End of pumping test	Within 24 hours
Step 2 – Preparation for Mining/ Dewatering Test	Updates to dewatering plan based on Step 1 results	Within 3 days of updating plan
	Installation of Step 2 dewatering wells	1 week prior to start of drilling
	Start of dewatering	1 week prior to start of pumping
	Monitoring results below performance thresholds	Within 48 hours of measurement
	Any adjustments implemented during dewatering	Within 24 hours of change
Step 3 – Active Dewatering during Mining	Commencement of mining in the South Parcel	1 month prior to start of mining
	Initiation of pumping at new wells	1 week prior to start of pumping
	Monitoring results below performance thresholds	Within 3 days of measurement
	Any adjustments implemented during dewatering	Within 3 days of change
	Cessation of active dewatering	Within 1 week of ceasing dewatering
Step 4 – Cessation of Active Dewatering	Monitoring results below predicted values	Within 3 days of measurement
	Completion of mining in South Parcel	Within 1 month of completion

The timeline for notification that monitoring results are below performance thresholds increases from 24 hours in Step 1 to 48 hours in Step 2 to 3 days in Steps 3 and 4 for four reasons:

1) the rate of change in groundwater levels will slow as mining progresses;

2) confidence increases over time as the number of wells pumping and set of successful groundwater measurements grows (mining and dewatering only advance when performance thresholds are met; see Section 4.2.5 for the specific limitations);

3) new wells begin pumping substantially in advance of mining both in time and space and dewatering proceeds from farthest away towards the creek and

marshes, which allows for the marginal impact of adding new wells to be reversible, even in during Step 3; and

4) Gravel would continue to be mined, but the volume that could be mined during the notification period is nominal compared with the volume of each mine segment, which are expected to require 1.5 to 2 years of mining to complete.

4.2.4 Routine Reporting

CalPortland will routinely share information about mining, dewatering, and the adaptive management process with the Environmental Caucus to achieve a variety of purposes, including sharing and interpreting monitoring data, documenting actions taken during a dewatering step, providing updated model predictions and analysis, and response actions, if necessary.

The specific reports required during each step of dewatering are summarized in Table 3. Additional detail about the individual reports and their role in the adaptive management process is presented in the Detailed Adaptive Management Plan in Section 4.3.

Table 3. Summary of Reporting by Dewatering Step

Dewatering Step	Reports	Minimum Frequency of Reporting
Step 1 – Initial Pumping Test	Pumping Test Design	One time
	Pumping Test Progress	Weekly during test
	Pumping Test Results	One time
Step 2 – Preparation for Mining/ Dewatering Test	Dewatering Plan for Step 2, if revised.	One time
	Pumping Test Progress	Weekly for first 2 months
	Pumping Test Results	One time – 4 months after start of Step 2
	Dewatering Summary Memos	Monthly
Step 3 – Active Dewatering during Mining	Dewatering Plan, Mining Plan, or SAP, if revised.	One time
	Dewatering Summary Memos,	Monthly for 3 months after each new set of dewatering wells, then quarterly
Step 4 – Cessation of Active Dewatering	Dewatering Summary Memos for first year	Quarterly for 2 years, then annually

The purpose and contents of each report are outlined below:

- Pumping Test Design/Dewatering Plans will provide the plan for performing the pumping tests and/or dewatering. These plans will include the proposed well pumping and observation well locations, depths, well construction, drilling methods, data collection, and timelines.

- Pumping Test Progress will provide a status update during the pumping test including an overview of progress toward completing the test, identifying which wells are pumping and pumping rates, locations and frequency of monitoring, any changes to the pumping test plan, and notes on how the test is proceeding.

- Pumping Test Results will present a detailed reporting of the execution of the pumping test, a summary of the data collected, including figures showing groundwater levels and pumping rates over time, comparisons of groundwater levels with performance thresholds, data analysis and results (estimates of key hydrogeologic parameters), and a comparison between model predictions and pumping test results for the purpose of model evaluation and validation.

- Dewatering Summary Memos will provide a summary of mining and dewatering progress, including information on any new wells installed, initiation of pumping at new wells, overview of wells that are pumping and pumping rates, cessation of pumping at wells, areas of active mining, and reclamation activities.

Reports will be prepared by a third-party consultant to be selected and paid for by CalPortland. The reports will be distributed to the Environmental Caucus electronically in protected documents, with hard copies available on request. Raw monitoring data will be provided with any groundwater measurement below a performance threshold, or when requested by the Environmental Caucus.

4.2.5 Limitations on Mining

In order to establish bounds on the pace and advancement of mining that will allow time for the adaptive management process to succeed, CalPortland commits to the following limitations on mining and dewatering activities in the South Parcel:

1) Mining associated with active dewatering (i.e., mining of the trough along the eastern boundary of the South Parcel; Figure 3) will last at least 3 years.

2) The mine trough has been divided into four segments (1A to 1D; Figure 3). Mining of each segment will last at least 9 months.

3) Mining will not advance into the next segment, unless groundwater levels meet performance thresholds.

4) Dewatering activity will not intensify through commencing pumping at new wells or increasing pumping rates at existing wells (except for normal seasonal changes in pumping rates), unless groundwater levels meet performance thresholds.

These limitations do not apply to operations of the existing mine and processing area, or extraction of gravel from areas west of the Olympia Bed truncation within the existing mine or North Parcel as these areas do not require dewatering.

4.2.6 Meet and Confer Process

Section 7.3 of the Settlement Agreement states that the Monitoring Plan will include a "process for the Parties to meet and confer if the groundwater levels do not meet the criteria provided in the Monitoring Plan." The process described below involves two steps for the parties (CalPortland and the Environmental Caucus) to follow with respect to groundwater information and data obtained during the monitoring process. The first step is for the parties' technical consultants to engage in one or more technical review conferences. If necessary, the second step would involve one or more meetings between the parties' designated representatives to discuss any differences of opinion or interpretation that the technical consultants are unable to resolve. Each of these two steps is discussed further below. This two-step process may be invoked at any time, including but not limited to the various specific points in the adaptive management process identified in Section 4.3 below.

Technical Review Conferences. The Environmental Caucus may initiate a request for a technical review conference of the parties' technical consultants at any time to discuss any questions or concerns it might have about any aspect of the groundwater monitoring data. The conferences may be in person or via conference call or other communications technology, and there may be multiple conferences to discuss any issues identified by the Environmental Caucus. The technical consultants would work in good faith during these review conferences to resolve any differences in interpretation of the groundwater monitoring data.

Party Representative Discussions. If the good-faith efforts of the technical consultants are unable to resolve any differences of opinion regarding the interpretation of the groundwater data, including but not limited to what the data shows regarding groundwater levels, either CalPortland or the Environmental Caucus may request a meeting of the parties' designated representatives or principals by providing notice to the other party of the desire to meet, and a brief explanation of the reasons for the request.

Once noticed is provided, CalPortland and the Environmental Caucus would work collaboratively to agree on a meeting format, date, time, and place to be held within 30 days of the request to hold a Technical Review Conference or a Party Representative Discussion. Meetings may be in person or via conference call or other communications technology, and there may be multiple meetings. This paragraph is intended to generally describe, but not constrain, the ways that the parties may choose to meet. Based on the issue raised, CalPortland would prepare and provide appropriate information summarizing the issue and current status of mining and dewatering activities, sharing related monitoring data (including raw data, if requested), and identifying potential responses.

Representatives of CalPortland and the Environmental Caucus will confer during the meeting on the most appropriate response with the goal of reaching consensus. If consensus cannot be reached, the parties would enter mediation, making good-faith efforts to hold a meeting with a mutually agreed-upon mediator within 45 days of the initiation of any request to the other party for mediation.

4.3 Detailed Adaptive Management Plan

This section is the core of the Monitoring Plan. It walks through each step of the dewatering plan providing conceptual details about how the stages of adaptive management would apply to that step. Specifically, this section establishes the objectives, provides an overview of monitoring activities, outlines an approximate schedule, summarizes the approach for data evaluation, and provides initial identification of potential response actions for each step of the dewatering plan.

Specific details of the monitoring activities (e.g., monitoring locations, frequency, and methods) are provided in the SAP in Appendix B.

Although the stages of adaptive management are presented sequentially in each step, it is important to recognize that the adaptive management process will be implemented iteratively within the step, particularly for Steps 2 and 3. For example, evaluation will be conducted each time monitoring data is collected, and that evaluation could trigger adjustment and looping back through the process during the same dewatering step. Alternately, if the monitoring data consistently indicate that performance thresholds are being met, the adaptive management process for a step could be completed without requiring iteration or adjustments.

4.3.1 Step 1 – Initial Pumping Test

Step 1 is envisioned as a 10-well pumping test, conducted for a minimum of 60 days, to validate model predictions of dewatering effectiveness in the local vicinity of the test wells, and make any necessary changes to the model parameters and/or to plans for subsequent dewatering and mining activities. No mining will occur in the South Parcel during Step 1.

The adaptive management process in Step 1 is illustrated on Figure 9.

A. Assess

The assessment stage for Step 1 will include compilation of existing monitoring data, geologic information, results from prior pumping tests conducted by CH2M Hill (2000), and the latest groundwater modeling simulations of the Step 1 pumping test. Monitoring data will continue to be collected and will be incorporated into the assessment for the pumping test.

Two initial objectives have been identified for the Step 1 pumping test:

1) Evaluate model predictions near the test wells.

2) Test dewatering design for meeting mining needs (i.e., achieving necessary drawdown), collecting information to refine the dewatering design, such as the number, screening, and spacing of wells.

B. Design

Based on the information collected during the assessment phase, CalPortland, and its consultants, will prepare a detailed plan for the pumping test. The plan will identify the number and location of pumping and observation wells, well drilling and construction, pumping rates, duration, monitoring locations, equipment, and frequency, etc.

The pumping test plan will be provided to the Environmental Caucus.

C. Implement and Monitor

CalPortland will install the pumping wells and any new observation wells, and conduct the pumping test. The minimum duration of pumping during the test will be 60 days.

Monitoring would consist of two components: 1) high-frequency automated monitoring at wells that are expected to be affected by the pumping test and at sensitive receptors, and 2) continuation of routine manual monitoring at other groundwater and surface water locations.

High-frequency monitoring using pressure transducers would be performed in observation wells near the pumping test location (CHMW-2D, -2S, and MW-D-3), and at wells located nearest to Sequalitchew Creek and West Edmond Marsh (CHMW-3S &-3D and MW-EM-1D). Typically, the frequency of data collection is programmed to vary throughout a pumping test with rapid data collection at the start tapering to less frequent as groundwater levels near stabilization.

Routine monitoring would continue to occur at the normal monitoring locations, including wetland, stream, and groundwater locations outside the area of influence of the pumping test. The streamflow monitoring stations are continuously recording. Manual measurements will be used at the wetland and groundwater locations not near the pumping test.

The Environmental Caucus will be notified of the installation of wells and the start and end of the pumping test. CalPortland will also provide weekly summaries of pumping test progress, and notification (within 24 hours) of any monitoring results below the performance thresholds. Routine reporting is summarized in Table 3 and notifications are outlined in Table 2.

D. Evaluate

Data will be screened as they are collected to determine if immediate action is required. In such an event, the Environmental Caucus would be notified within 24 hours, and the project would move immediately to the adjustment stage.

As monitoring data are collected, they also will be evaluated to see if the test is well-designed and the monitoring network is effective. If necessary, the project may enter the adjustment step to improve the pumping test to collect better information.

Once representative monitoring results are being collected, they will be screened against performance thresholds in Table 4 for the appropriate well and month. The performance thresholds were established at the lower 95th-percentile confidence interval for the predicted water levels [see Section 3.3 and the Groundwater Model Update (Aspect, 2017)]. The frequency of screening will vary during the test beginning with hourly at the start and reducing to daily then weekly as the test progresses, as outlined in Table 1.

If the monitoring results indicate that groundwater levels near the marshes are lower than the performance thresholds, CalPortland would develop and implement appropriate adjustments during the pumping test.

If monitoring results indicate groundwater levels are lower than the performance thresholds in wells that are not near the marshes or other sensitive receptors (i.e., monitoring wells on the South Parcel), then the test would be completed as planned. These results would be evaluated and any anticipated adjustments for future steps identified.

Even if the observations made during the test are above the performance thresholds, they still may provide valuable information for refining the model, mine plan, and Monitoring Plan. Those observations will be considered during assessment and design for Step 2.

The evaluation will also include comparison of climate and water level conditions prior to the test with the range of conditions experienced during the model calibration and validation period.

E. Adjust

Adjustments during the pumping test could occur for two reasons:

1) The monitoring data indicate that data collected are not sufficient to achieve the objectives of the test; or

2) The monitoring data indicate that groundwater levels are below the performance thresholds.

Potential adjustments consist of modifying or terminating the pumping test, and are listed in Table 5. Since no mining below the pre-project groundwater elevation would occur during this dewatering step, any change in groundwater could be reversed by turning the dewatering wells off.

Table 5. Potential Response Actions during Step 1 – Initial Pumping Test

Modify pumping test:
Changing pumping rates
Changing the number of pumping wells
Changing the duration of pumping
Changing monitoring locations including installing new wells
Performing additional testing
Cease pumping test.

CalPortland will notify the Environmental Caucus of any adjustments to the pumping test within 24 hours of the change.

Reporting and Discussion

At the conclusion of the Step 1 pumping test, whether completed as planned, adjusted, or terminated, CalPortland will prepare an interpretative report documenting the pumping test, summarizing the monitoring data, comparing monitoring results with prior model predictions, and making recommendations for the assessment and design phases of the next step.

The report will be provided to the Environmental Caucus, with a 3-month period for review and discussion of the results. CalPortland commits to meeting with the Caucus as often as necessary during the review period to facilitate open communications and timely review. Should the Environmental Caucus and CalPortland have different interpretations

of the dewatering test results, either party may request technical review conferences of the parties' technical consultants, followed by, if necessary, meetings of the parties' representatives, as described in Section 4.2.6 above.

Anticipated Schedule
The schedule for Step 1, in the context of the overall mining schedule, is illustrated in Figure 8. It is expected to require about a year to complete Step 1, with the following anticipated schedule:

- Planning the Pumping Test 1 month
- Installing and Developing Wells 2–3 months
- Performing the Pumping Test 2 months
- Evaluating Results and Reporting 2 months
- Model Updates (if necessary) 2–3 months
- Review by and discussion with Environmental Caucus 3 months

Incorporation of the results into the design of future steps could require additional time.

4.3.2 Step 2 – Preparation for Mining/ Dewatering Test

In Step 2, additional dewatering wells will be installed and will be pumped for several months to draw down groundwater until the gravel in the first mine segment of the South Parcel is dry enough to mine. If monitoring results are above performance thresholds during Step 2, the intent is to continue dewatering from those wells and transition smoothly into Step 3 – Active Dewatering during Mining. Step 3 would only commence when groundwater levels are above the performance thresholds.

The dewatering activity will also serve as a greatly expanded pumping test, the effects of which are completely reversible. The information collected in the first 60 days is most valuable as a pumping test, so evaluation and reporting on the test will focus on this period. The pumping test portion of Step 2 will occur for a minimum of 60 days.

The adaptive management plan for Step 2 is illustrated on Figure 10.

A. Assess
The planning for Step 2 will incorporate the results of Step 1, including any updates to the groundwater model, this Monitoring Plan, or mine plan resulting from Step 1.

In the assessment phase for Step 2, the results of the pumping test in Step 1 will be compared with the groundwater model. If they agree, then design would move forward as planned. If there are notable differences, the groundwater model would be evaluated and potentially modified.

The first level of model evaluation and modification would consist of updating the model to reflect the specific conditions of the Step 1 test (well locations, well construction, pumping rates, antecedent weather conditions, etc.) and developing a set of model predictions specific to the actual test conditions. These updates only modify the scenario for Step 1 and would not require recalibration of the model.

If the predictions from the updated model are notably inconsistent with the results of the pumping test, then the model parameters would be modified and calibrated to the observed data. Then, the full suite of predictive scenarios would be evaluated and compared with the groundwater levels included in the environmental analyses and permitting. If within the contemplated range, the project would move forward to the design phase with the revised model. If not, additional environmental analysis may be necessary.

The initially identified objectives for Step 2 are:

1) Evaluate whether groundwater levels at monitoring wells are above the performance thresholds; and,

2) Confirm that groundwater levels are low enough within the material to be mined to allow for safe and efficient mining and processing.

B. Design

Based on the results of the assessment step, the dewatering plan for Step 2 and the associated monitoring will be designed by CalPortland. Updates to the design will be simulated with the groundwater model and compared with prior environmental analyses as described above. If the model was updated in Step 1 or the assessment stage of Step 2, the predictive results from the updated model will be used to establish new performance thresholds.

Updates to the design and predictions of its impacts on groundwater will be provided to the Environmental Caucus.

C. Implement and Monitor

The additional dewatering wells for Step 2 will be installed and begin pumping. Pumped water will be discharged to an infiltration facility on the floor of existing mine. Pumping will occur for a minimum of 60 days to complete the dewatering test plus an estimated four additional months to dry gravels in Segment 1A sufficiently for mining.

Monitoring would consist of weekly monitoring at the key wells on the South Parcel in the portions of Edmond Marsh closest to the mine (key wells are defined in Table 1) and twice monthly monitoring at the other well, staff gage, and flow monitoring stations. Stations with continuously recording instrumentation, such as the flow monitoring stations, will be downloaded during these visits. Pressure transducers would also be installed to allow for continuous monitoring in key monitoring wells. Manual measurements will be collected from the other locations, such as staff gages and more distant wells.

The Environmental Caucus will be notified of the installation of wells and the start of dewatering. CalPortland will also provide weekly summaries of dewatering progress during the first two months, then monthly summaries. CalPortland will notify the Environmental Caucus (within 24 hours) of any monitoring results below the performance thresholds. Routine reporting is summarized in Table 3 and notifications are outlined in Table 2.

D. Evaluate

The evaluation stage in Step 2 is very similar to the evaluation stage of Step 1, as both actions are essentially pumping tests at different spatial scales.

Data will be screened as they are collected to determine if immediate action is required. In such an event, the Environmental Caucus would be notified and the project would move immediately to the adjustment stage.

Monitoring results will be screened against the performance thresholds in Table 6 for the appropriate well and month. The performance thresholds were established at the lower 95th-percentile confidence interval for the predicted water levels [see Section 3.3 and the Groundwater Model Update (Aspect, 2017)]. If the monitoring results indicate that groundwater levels are lower than the performance thresholds, CalPortland will develop and implement appropriate adjustments.

Even if the groundwater levels are above the performance thresholds, they still may provide valuable information for refining the model, mine plan, and/or this Monitoring Plan. Those observations will be considered during assessment and design for the next dewatering step.

The evaluation will also consider the effect of conditions occurring at the time of monitoring (such as climate conditions, development, and Restoration Plan activities) with the range of conditions experienced during the model calibration and validation period, and include that information in the interpretation of results.

E. Adjust

Adjustment during the pumping test could occur for two reasons:

1) The monitoring data indicate that dewatering could cause groundwater drawdown beyond that previously contemplated and permitted; or

2) The monitoring data indicate that groundwater levels are not sufficiently low within the mine to allow for safe and efficient mining and processing in Step 3.

The first case would trigger rapid development and implementation of adjustments by CalPortland. If adjustments are not feasible or are exhausted without success, CalPortland would request to initiate the technical review conference of the parties' technical consultants, followed by, if necessary, meetings of the parties' representatives, as described in Section 4.2.6. The Environmental Caucus may also initiate this process.

In the second case, CalPortland would refine the dewatering plan while pumping continues. Potential adjustments include modifying or terminating the pumping test, and are listed in additional detail in Table 7. The list of adjustments provided in Table 7 is not intended to limit the range of potential responses.

CalPortland will notify the Environmental Caucus of any adjustments within 24 hours of the change.

Step 2 is completely reversible as no mining below the pre-project groundwater elevation would occur. Any change in groundwater could be reversed by ceasing to pump from the dewatering wells.

Table 7. Potential Response Actions during Step 2 – Preparation for Mining/Dewatering Test

Revise monitoring (change frequency of monitoring, or monitoring locations).
Install additional monitoring locations.
Change pumping rates.
Change pumping locations (adding or decommissioning) wells.
Modify the duration of pumping.
Cease dewatering.

Reporting and Discussion

In addition to the dewatering summaries described above, an interpretative report will be prepared in the third month of pumping for Step 2. The report will summarize the pumping-test portion of Step 2 by summarizing the first 2 months of data, comparing monitoring results with prior model predictions, documenting any response actions taken, and making recommendations for the assessment and design phases of the next step.

The report will be provided to the Environmental Caucus, with a 2-month period for review and discussion of the results. CalPortland commits to making its technical consultant available to meet with the Caucus's technical consultant as often as necessary during the review period to facilitate open communications and timely review. Should the parties' technical consultants be unable to resolve any difference in opinion in interpreting the dewatering test results, either party may request a meeting of the parties' designated representatives, as described in Section 4.2.6 above.

Anticipated Schedule

Step 2 is expected to require a about a year to complete, though the planning and well installation stages may overlap with the later reporting and discussions related to Step 1. The schedule for Step 2 and relationship with the Step 1 pumping test are shown on Figure 8. The anticipated schedule for key elements of Step 2, assuming performance thresholds are met, is:

Planning the Dewatering	2 months	
Installing and Developing Wells	2–3 months	
Performing the Pumping Test	2 months	
Evaluating Results and Reporting	2 month	Simultaneously: Continue Dewatering in Preparation for Mining
Update Model (if necessary)	1 month	
Review by and discussion with EC	2 months	4 months

If groundwater levels meet performance thresholds, Step 2 would flow into Step 3 and the start of mining. Otherwise, Step 2 may require a longer period to perform the

necessary adjustments to achieve sufficient dewatering for mining while maintaining groundwater levels consistent with the performance thresholds and prior environmental analyses, or update the environmental analyses, if necessary.

Step 3 would only commence when groundwater levels are above the performance thresholds and water levels are at appropriately low levels for safe and efficient mining and processing.

4.3.3 Step 3 – Active Dewatering during Mining

During Step 3, mining will begin in the northeastern portion of the South Parcel and proceed south to mine a trough along the eastern boundary. Additional dewatering wells will be installed and pumped to dewater gravel in subsequent mine segments in the South Parcel. CalPortland would not start pumping additional dewatering wells until groundwater levels are at or above performance thresholds.

As mining is completed, reclamation of the eastern mined slope will begin. Pumping wells adjacent to mine segments that are under reclamation will be turned off incrementally to allow natural springs to form at the toe of the mined slope and vegetation to become established.

Steps 3 and 4 are different from the first two steps in that changes to groundwater in these steps are not as easily reversed. As such, the adaptive management plan is focused on identifying when adjustments are necessary.

The adaptive management plan for Step 3 is iterative, and activities would loop continuously through the adaptive management stages throughout implementation of Step 3. The adaptive management plan for Step 3 is illustrated on Figure 11.

A. Assess

The planning for Step 3 will begin prior to the completion of Step 2 to allow for a potentially smooth transition, if performance thresholds are being met. The planning stage will incorporate previously collected monitoring data as well as any updates to the groundwater model, monitoring plan, or dewatering and mining plans.

If monitoring data from prior steps meet the performance thresholds, the planning for Step 3 is expected to move forward in accordance with the mine plan.

Differences between monitoring results and predictions would result in re-evaluation of the groundwater model. The re-evaluation would first simulate the specific conditions of Step 2, then more broadly update the model if predictions still do not match observations. If significant model updates are required, the full suite of scenarios would be simulated and results compared with the prior environmental analyses and permitting. Only if model results are within the predicted range may the project move forward to the design phase with the revised model.

The initially identified objectives for Step 3 are:

1) Evaluate whether groundwater levels at monitoring wells are above the performance thresholds for the appropriate month; and

2) Confirm that groundwater levels are low enough within the material to be mined to allow for safe and efficient mining and processing.

B. Design

Based on the results of the prior steps and assessment for Step 3, the dewatering plan, mining plan, and the associated monitoring will be updated by CalPortland, if necessary. Updates to the design will be simulated with the groundwater model and compared with the performance thresholds. Updated documents will be provided to the Environmental Caucus.

C. Implement and Monitor

Mining will begin at the northern edge of the South Parcel in the area dewatered in Step 2. As mining progresses, additional dewatering wells will be installed to the south of the current wells and begin pumping. As mining is completed in an area, the nearby wells will be turned off, allowing groundwater to emerge from springs from the toe of the completed slope. Both pumped groundwater and spring flow will be conveyed to an infiltration pond installed on the floor of the existing mine.

Monitoring would continue at all normal well, wetland, and streamflow monitoring stations. Streamflow and select well monitoring stations would have continuous recording instruments installed. Other locations would use manual measurements.

The frequency of monitoring would vary during Step 3. In the 3 months after the start of pumping for each new group of monitoring wells, monitoring would be weekly at key wells (defined in Table 1) and twice monthly monitoring at the other well, staff gage, and flow monitoring stations. After that, monitoring will be performed monthly.

D. Evaluate

As with prior steps, monitoring results will be screened against performance thresholds for Step 3 (Table 8) for the appropriate well and month. The performance thresholds were established at the lower 95th-percentile confidence interval for the predicted water levels [see Section 3.3 and the Groundwater Model Update (Aspect, 2017)]. If the model was previously updated, performance thresholds based on predictive results from the updated model will be used for the comparison. The evaluation will also consider the effect of conditions occurring at the time of monitoring (such as climate conditions, development, and Restoration Plan activities) with the range of conditions experienced during the baseline period.

If the monitoring results indicate that groundwater levels are lower than the performance thresholds, CalPortland would evaluate and implement appropriate adjustments.

Although the primary focus is on changes in groundwater levels, streamflow and surface water monitoring results will also be reviewed. By this point in the project, streamflow and surface water monitoring results will be affected by Restoration Plan activities, which are likely to have a larger effect than mining on the surface water bodies. The Restoration Plan will incorporate its own adaptive management process.

E. Adjust

Step 3 involves mining below the current aquifer level. As such, it is more difficult to reverse than prior steps; however, mining is designed to begin away from the marshes

and Sequalitchew Creek and proceed southward toward them over a period of years. This will slowly change water levels beneath the marshes and creek and allow time for response actions should the monitoring data and evaluations indicate they are necessary.

If groundwater levels are below the performance thresholds, CalPortland would develop and implement adjustments. Unlike in the prior steps, re-examination of the groundwater model is not a first element of evaluating potential response actions in Step 3.

Either party may initiate a request for a technical review conference and, if necessary, meetings of the parties' representatives, as described under Section 4.2.6 above. If adjustments are not feasible or are exhausted without meeting performance thresholds, CalPortland would initiate the process to discuss alternative approaches and next steps.

Selection of potential response actions is shown in Table 9. The suite of appropriate response actions will change over time as mining progresses. For example, early in Step 3 there is more flexibility to alter the mine plan. As mining progresses further south, the ability for alterations to the mine plan to produce a meaningful change in groundwater levels is reduced.

Table 9. Potential Response Actions during Step 3 – Active Dewatering during Mining

Revise mine phasing to allow time for additional monitoring, analyses, testing, and planning.
Revise dewatering plan (number of wells, spacing, alignment, pumping duration).
Revise mining plan to change depth or extent of mining.
Install partial slurry cutoff wall.
Provide additional mitigation.
Cease dewatering and mining.

Reporting and Discussion

During Step 3, CalPortland will prepare summary memos providing comparison of observed groundwater levels over the past 3 months with model predictions, as well as an update on dewatering and mining status, and any response actions taken. The summary memos will be prepared monthly for 3 months after each new set of dewatering wells begins pumping, then quarterly. The memos will be provided to the Environmental Caucus.

Anticipated Schedule

Mining would proceed south over a period of years. Completion of Step 3 is expected to take 4 to 8 years. The mining schedule is, in part, driven by the market demand for aggregate. CalPortland has committed to complete Step 3 in no less than 3 years, or a minimum of 9 months per each of the first four segments (1A to 1D). The minimum timeline for completion of Step 3 is illustrated in Figure 8.

4.3.4 Step 4 – Cessation of Active Dewatering

This final step of dewatering commences once mining and reclamation advances to the point that the last dewatering wells installed in Step 3 have been turned off. At that point, groundwater will emerge from springs along the length of the toe of the mined (and reclaimed) slope along the eastern and a portion of the southern mine boundaries. Step 3 is expected to transition smoothly into Step 4, given the multiple-year duration of Step 3 and that ceasing to pump the dewatering wells will result in lower environmental impact.

Several steps of the adaptive management process (i.e., assess and design) are not as relevant in Step 4, because it is a largely passive step with respect to the effects on groundwater levels. Mining and reclamation activities will continue within the South Parcel, but those activities would no longer influence groundwater levels.

As such, this discussion focuses on ongoing monitoring, data evaluation, and potential response actions. The adaptive management plan for Step 4 is illustrated on Figure 12.

C. Monitoring

Monthly monitoring would continue for the duration of mining at the normal well, wetland, and streamflow monitoring stations. Continuous instrumentation will be maintained at streamflow monitoring stations. Staff gage and well monitoring locations will be manually measured.

D. Evaluate

Monitoring results would continue to be screened relative to the performance thresholds shown in Table 10, or as refined from the most recent groundwater model. The performance thresholds were established at the lower 95th-percentile confidence interval for the predicted water levels [see Section 3.3 and the Groundwater Model Update (Aspect, 2017)]. It is unlikely that events will result in short-term changes in groundwater levels in Step 4. Therefore, the evaluation will focus on longer-term comparisons with model predictions and observations of changes in the marshes and Sequalitchew Creek.

E. Adjust

If groundwater levels persist lower than the performance thresholds, CalPortland and the Environmental Caucus would hold one or more technical review conferences of the parties' technical consultants and, if necessary, meetings of the parties' representatives (as described in Section 4.2.6). to discuss and select appropriate adjustments. Either party may initiate this process.

Reporting

Quarterly summary memos will be prepared for the first year after cessation of dewatering. Annual reports will be prepared for the remaining duration of mining of the South Parcel.

Anticipated Schedule

Step 4 will begin after active dewatering ceases. Depending on market demand for aggregate products, mining of the remainder of the South Parcel is expected to occur over 5 to 8 years after cessation of active dewatering. Active adaptive management during Step 4 would cease when the following conditions are met:

- Mining of the South Parcel is complete, and

- Measured groundwater levels have been met performance thresholds for at least 3 consecutive years.

5 Relationship of Adaptive Management Process to Sequalitchew Creek Restoration Plan

Mining of the South Parcel and the restoration of Sequalitchew Creek are separate, but interacting, projects. Each project has its own adaptive management process tailored to achieving the goals and objectives of that project. The interaction between the two adaptive management processes is three-fold: 1) project schedules that encourage restoration in advance of the potential impacts from mining; 2) development of performance thresholds for mining that support restoration based on prior technical studies, including the cumulative effects analysis prepared in 2016 (Aspect and Anchor, 2016); and 3) coordinated monitoring and open sharing of information.

Project Schedules. The mining and restoration projects have been designed to facilitate restoration occurring in advance of the potential impacts from mining. This relationship between the project schedules is founded in key elements of the settlement agreement:

1) The mining project cannot begin until all permits for restoration have been obtained and the required authorizations or approvals from JBLM needed to implement the restoration elements on JBLM have been obtained.

2) The first actions of the mining project are pumping and dewatering tests (i.e., Steps 1 and 2) and are expected to take about 1.5 to 2 years to complete and no less than 9 months[1], as described in Section 4.2.1. The effects of Steps 1 and 2 on groundwater are completely reversible.

3) The first South Parcel mining segment is located furthest from the wetlands and Sequalitchew Creek. Mining and dewatering proceed slowly toward the Creek over a period of not less than 3 years, and more likely 4 to 8 years.

4) There are no schedule constraints or limits imposed on the pace of restoration activities.

The Restoration Plan schedule is anticipated to begin with the elements that immediately restore flow through the system—specifically, beaver management and improvements at the outlet of Sequalitchew Lake. The actions will be followed by improvements that enhance flows (e.g., connections from Hamer Marsh) and make it easier to maintain flows (e.g., installation of the Railroad Trail bridge and sealing\restoration of the losing reach). Finally, habitat restoration, through culvert replacements and enhancement of wetland and stream habitats, is the final component of the Restoration Plan.

Although a detailed schedule has not been developed for implementation of the Restoration Plan, it is anticipated restoration activities will begin immediately shortly after Restoration Plan permits are obtained and it should require no more than 6 years to complete construction and implementation of all elements of the Restoration Plan. The

[1] Minimum durations for the pumping test and review and discussion stages of Steps 1 and 2 are established in Section 4.3. The specified timeframes add up to a minimum duration of 9 months, however this duration is unrealistically short as it does not include time for other key steps, like well installation or report writing.

flow restoration actions should be completed within two years from the start of the project, and followed by flow maintenance and enhancement, which may require 3 years to complete, but could overlap with the flow restoration actions. Finally, construction of habitat restoration improvements could be completed within 3 years and could overlap or dovetail with the related flow maintenance and enhancement elements.

A timeline relating the anticipated schedules for restoration and mining is presented on Figure 13. Restoration activities should be successful in restoring flows to Sequalitchew Creek within the first 2 years. During this time, the mining project would complete the second pumping test (Step 2) and, if groundwater levels meet performance thresholds and mining progresses at the fastest allowable pace, mine Segment 1A and advance into Segment 1B. The anticipated increase in flow is much greater than the potential impact from the mining project, and the full benefit in flow quantity may be achieved in these first 2 years; whereas the impact from mining is minimal at first and increases slowly over time. The impact from mining is expected to peak during mining of Segment 1C, when the greatest number of wells are pumping[2].

Even if mining is proceeding rapidly, CalPortland has committed that mining of Segment 1 would not be completed in less than 3 years, with each segment lasting at least 9 months. At this pace, the peak impact from mining could be expected around 2 to 3 years after the start of restoration. Even if delayed, the flow restoration action should have occurred by this time and only a fraction of flow restoration is necessary to offset the impacts from mining.

Performance Thresholds that are Supportive of Restoration. The cumulative effects analysis (Aspect and Anchor, 2016) found that the changes in the marshes would be dominated by the Restoration Project (which requires lowering marsh water levels to achieve flow from Sequalitchew Lake to the ravine), rather than increased infiltration resulting from lower groundwater levels. The marshes would have significantly more water flowing through them than under current conditions, resulting in consistent water levels year-round at the target levels established in the Restoration Plan, except for some periods in the driest years.

The cumulative effects analysis also concluded that the predominant cumulative effect on Sequalitchew Creek would be an increase in annual average flows by approximately 10 cfs, with abundant year-round flow most of the time. By comparison, the stream flow reductions from mining is expected to be less than 1 cfs, and only apparent during limited periods in atypical summers.

The anticipated benefits to streamflow from restoration are much larger than the potential impacts from mining. As a result, the success of the restoration project is not expected to be particularly sensitive to the groundwater levels resulting from mining. Monitoring during mining will ensure that groundwater levels remain within the expected range that will support the anticipated increases in stream flow from the restoration project. If

[2] To be conservative, the potential impacts of mining described in the cumulative effects analysis (Aspect and Anchor, 2016) were based on all wells pumping at the same time. In practice, this condition is unlikely to occur as initial wells would be phased off as mining progresses.

groundwater levels are not maintained within the expected range, corrective actions will be implemented in accordance with the adaptive management plan for mining.

Coordinated Monitoring and Information Sharing. To facilitate the coordinated collection and exchange of information, the two projects share an integrated SAP (Appendix B). The SAP outlines the collection of information on groundwater levels, surface water levels, streamflow, and surface water quality to support both plans. Each plan also outlines how information will be shared so that plan implementers have the data necessary to make informed management decisions.

6 References

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Ralph, S. C., and G. C. Poole, 2003, Putting monitoring first: designing accountable ecosystem restoration and management plans, D. R. Montgomery, S. Bolton, and D. B. Booth, editor, Restoration of Puget Sound Rivers, University of Washington Press, Seattle, pp 188.

7 Limitations

Work for this project was performed for CalPortland (Client), and this report was prepared in accordance with generally accepted professional practices for the nature and conditions of work completed in the same or similar localities, at the time the work was performed. This report does not represent a legal opinion. No other warranty, expressed or implied, is made.

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TABLES

Table 4 - Performance Thresholds for Step 1 - Initial Dewatering Test

Project No. 040001-014-02, South Parcel, DuPont, Washington

Well	Performance Threshold = Groundwater Elevation in Feet (NGVD 29)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
MW-EM-1S	203.6	202.4	202.9	202.2	202.3	201.4	200.4	200.4	199.5	199.5	202.1	202.9
MW-EM-1D	204.6	203.4	203.9	203.2	203.3	202.5	201.5	201.5	200.7	200.7	203.1	203.9
MW-EM-2S	210.6	210.3	210.4	210.3	210.2	210.0	209.7	209.6	209.3	209.5	210.2	210.4
MW-EM-2D	210.8	210.4	210.6	210.5	210.4	210.2	209.8	209.7	209.4	209.6	210.4	210.5
MW-EM-3	212.1	211.9	211.8	211.9	212.0	211.6	211.4	210.8	210.2	210.3	211.5	211.9
MW-SRC-2	213.2	212.4	212.7	212.6	212.8	212.0	211.4	210.2	209.6	210.5	212.3	212.7
MW-BM-1	218.0	217.0	216.6	217.4	217.3	216.6	216.1	213.1	213.3	214.2	216.8	217.4
MW-HM-1	214.2	213.5	213.3	213.8	213.6	212.7	211.8	211.2	210.6	211.1	213.1	213.6
MW-PL-1	200.8	200.1	200.4	200.1	200.0	199.4	198.6	198.7	198.0	197.7	199.6	200.2
CHMW-1	191.3	189.9	190.4	189.6	189.7	189.0	188.1	188.0	187.4	187.5	190.0	190.7
CHMW-2S	184.6	183.3	183.7	183.0	183.0	182.5	181.7	181.6	181.2	181.4	183.5	184.0
CHMW-2D	183.4	181.8	182.4	181.4	181.5	180.8	179.8	179.7	179.3	179.4	182.1	182.7
CHMW-3S	193.3	191.7	192.4	191.3	191.5	190.6	189.6	189.5	188.7	188.8	191.7	192.6
CHMW-3D	193.2	191.5	192.2	191.1	191.3	190.4	189.2	189.1	188.3	188.4	191.5	192.5
CHMW-4S	196.1	194.7	195.3	194.4	194.6	193.7	192.7	192.6	191.9	191.9	194.6	195.5
CHMW-4D	194.3	192.9	193.5	192.6	192.7	191.9	190.9	190.8	190.1	190.1	192.8	193.6
MW-D-3	196.5	195.3	195.7	195.0	195.1	194.6	193.9	193.7	193.3	193.5	195.6	195.9
MW-93-MFS-C5-3	192.3	191.2	191.7	191.0	191.0	190.5	190.0	189.9	189.5	189.8	191.6	191.7

Table 6 - Performance Thresholds for Step 2 - Preparation for Mining/Expanded Dewatering Test

Project No. 040001-014-02, South Parcel, DuPont, Washington

Well	Performance Threshold = Groundwater Elevation in Feet (NGVD 29)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
MW-EM-1S	202.3	201.1	201.6	200.9	201.1	200.1	199.1	199.2	198.4	198.3	200.8	201.5
MW-EM-1D	203.4	202.3	202.8	202.2	202.3	201.4	200.5	200.5	199.7	199.7	202.0	202.7
MW-EM-2S	210.6	210.2	210.3	210.2	210.1	210.0	209.6	209.5	209.2	209.4	210.1	210.3
MW-EM-2D	210.8	210.4	210.5	210.4	210.3	210.1	209.7	209.6	209.3	209.5	210.3	210.5
MW-EM-3	212.1	211.9	211.8	211.9	212.0	211.6	211.4	210.8	210.2	210.3	211.5	211.9
MW-SRC-2	213.2	212.4	212.6	212.6	212.8	212.0	211.4	210.2	209.5	210.5	212.0	212.7
MW-BM-1	218.0	217.0	216.5	217.3	217.2	216.6	216.1	213.0	213.3	214.1	216.8	217.3
MW-HM-1	214.2	213.4	213.3	213.8	213.6	212.7	211.8	211.2	210.5	211.1	213.0	213.6
MW-PL-1	200.4	199.7	200.1	199.8	199.8	199.1	198.2	198.4	197.7	197.4	199.2	199.8
CHMW-1	187.0	185.7	186.3	185.5	185.6	184.9	184.0	184.0	183.3	183.4	185.8	186.4
CHMW-2S	143.8	141.4	142.2	141.0	141.0	140.1	139.1	138.9	138.3	138.6	141.8	142.9
CHMW-2D	142.5	141.0	141.6	140.7	140.7	140.0	139.1	138.9	138.3	138.5	141.2	141.9
CHMW-3S	190.6	189.0	189.8	188.8	189.0	188.1	187.0	187.0	186.2	186.2	189.0	189.8
CHMW-3D	190.2	188.6	189.4	188.3	188.5	187.5	186.3	186.3	185.4	185.3	188.4	189.3
CHMW-4S	193.7	192.3	193.0	192.1	192.3	191.4	190.4	190.4	189.6	189.6	192.2	193.0
CHMW-4D	191.8	190.5	191.2	190.3	190.5	189.6	188.6	188.6	187.8	187.8	190.4	191.1
MW-D-3	193.7	192.5	193.0	192.3	192.3	191.9	191.2	191.1	190.7	190.9	192.9	193.4
MW-93-MFS-C5-3	190.8	189.8	190.3	189.6	189.6	189.1	188.7	188.5	188.2	188.5	190.2	190.5

Table 8 - Performance Thresholds for Step 3 - Active Dewatering during Mining

Project No. 040001-014-02, South Parcel, DuPont, Washington

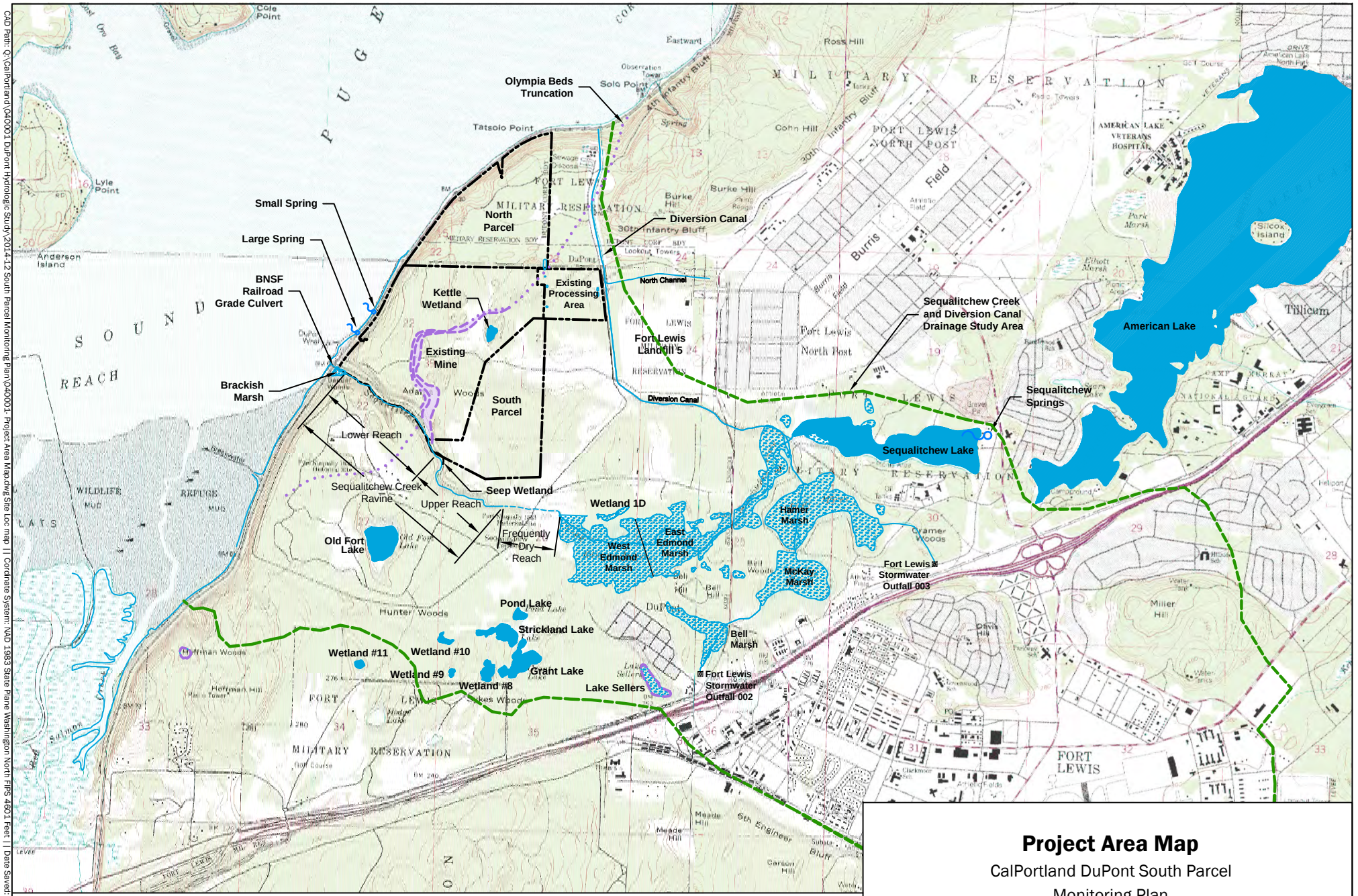
Well	Performance Threshold = Groundwater Elevation in Feet (NGVD 29)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
MW-EM-1S	197.5	196.4	196.9	196.4	196.5	195.6	194.7	194.8	194.1	194.1	196.1	196.8
MW-EM-1D	199.4	198.4	198.9	198.3	198.4	197.6	196.8	196.9	196.2	196.2	198.1	198.7
MW-EM-2S	210.3	210.0	210.1	209.9	209.9	209.7	209.4	209.3	209.0	209.2	209.9	210.0
MW-EM-2D	210.5	210.1	210.3	210.1	210.0	209.8	209.5	209.4	209.1	209.3	210.0	210.2
MW-EM-3	212.1	211.9	211.8	211.9	212.0	211.6	211.4	210.8	210.2	210.3	211.5	211.8
MW-SRC-2	213.2	212.4	212.7	212.6	212.8	212.0	211.4	210.2	209.5	210.5	212.0	212.7
MW-BM-1	217.8	216.8	216.4	217.2	217.1	216.4	215.9	212.8	213.1	213.9	216.7	217.2
MW-HM-1	214.2	213.4	213.3	213.8	213.6	212.7	211.8	211.2	210.4	211.1	213.0	213.6
MW-PL-1	199.4	198.7	199.0	198.8	198.7	198.0	197.1	197.3	196.6	196.2	198.1	198.8
CHMW-1	129.8	129.1	129.4	128.9	128.9	128.5	127.8	127.8	127.3	127.4	129.2	129.5
CHMW-2S	136.0	134.5	135.0	134.1	134.1	133.5	132.9	132.8	132.3	132.5	134.9	135.5
CHMW-2D	135.9	134.7	135.1	134.3	134.2	133.7	133.1	132.9	132.4	132.6	134.9	135.5
CHMW-3S	131.1	128.4	130.3	128.9	129.2	127.9	126.6	127.0	126.2	126.3	129.0	130.2
CHMW-3D	128.3	127.4	127.9	127.6	127.6	126.8	125.8	126.1	125.4	125.1	127.0	127.6
CHMW-4S	181.0	179.7	180.4	179.6	179.7	178.8	177.7	177.8	176.9	176.9	179.5	180.3
CHMW-4D	178.5	177.3	178.0	177.1	177.3	176.4	175.3	175.4	174.5	174.4	177.1	177.8
MW-D-3	189.9	188.6	189.1	188.4	188.4	187.9	187.4	187.3	186.9	187.3	189.1	189.6
MW-93-MFS-C5-3	189.5	188.5	189.0	188.4	188.3	187.9	187.5	187.4	187.2	187.5	189.0	189.3

Table 10 - Performance Thresholds for Step 4 - Cessation of Active Dewatering

Project No. 040001-014-02, South Parcel, DuPont, Washington

Well	Performance Threshold = Groundwater Elevation in Feet (NGVD 29)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
MW-EM-1S	198.1	197.0	197.6	197.0	197.1	196.2	195.4	195.3	194.8	194.7	196.8	197.4
MW-EM-1D	199.9	198.9	199.4	198.8	199.0	198.2	197.3	197.3	196.7	196.7	198.7	199.3
MW-EM-2S	210.3	210.0	210.1	210.0	209.9	209.7	209.4	209.3	209.0	209.2	209.9	210.1
MW-EM-2D	210.5	210.2	210.3	210.1	210.1	209.9	209.5	209.4	209.1	209.3	210.1	210.2
MW-EM-3	212.1	211.9	211.8	211.9	212.0	211.6	211.4	210.8	210.2	210.3	211.5	211.8
MW-SRC-2	213.2	212.4	212.7	212.6	212.8	212.0	211.4	209.9	209.4	210.4	212.0	212.7
MW-BM-1	217.9	216.9	216.4	217.2	217.1	216.5	216.0	212.3	213.0	213.8	216.7	217.2
MW-HM-1	214.2	213.4	213.3	213.8	213.6	212.7	211.8	211.0	210.3	211.1	213.0	213.6
MW-PL-1	199.5	198.8	199.2	198.9	198.9	198.2	197.3	197.5	196.8	196.4	198.2	198.9
CHMW-1	163.2	162.7	162.9	162.7	162.6	162.4	162.1	162.1	161.8	162.0	162.9	163.1
CHMW-2S	169.3	165.0	168.1	163.2	162.8	158.9	157.1	157.2	156.2	156.9	167.9	168.8
CHMW-2D	160.3	158.5	159.2	158.1	157.9	156.9	155.4	155.5	154.6	155.2	159.1	159.8
CHMW-3S	140.4	140.2	140.3	140.2	140.2	140.0	139.7	139.7	139.5	139.7	140.3	140.3
CHMW-3D	141.9	141.6	141.8	141.6	141.6	141.4	141.1	141.1	140.9	141.0	141.6	141.8
CHMW-4S	183.0	181.9	182.5	181.8	181.9	181.3	180.5	180.5	179.9	180.0	181.9	182.4
CHMW-4D	181.0	180.0	180.6	179.9	180.0	179.4	178.7	178.7	178.2	178.2	180.0	180.5
MW-D-3	191.4	190.2	190.7	190.0	189.9	189.5	188.9	188.8	188.5	188.9	190.7	191.1
MW-93-MFS-C5-3	190.1	189.1	189.5	188.9	188.8	188.4	187.9	187.9	187.6	188.0	189.6	189.9

FIGURES



Project Area Map

CalPortland DuPont South Parcel
Monitoring Plan
DuPont, Washington

Aspect CONSULTING	DEC-2014	BY: OGR/SCC	FIGURE NO. 1
	PROJECT NO. 040001-014	REVISED BY: -	

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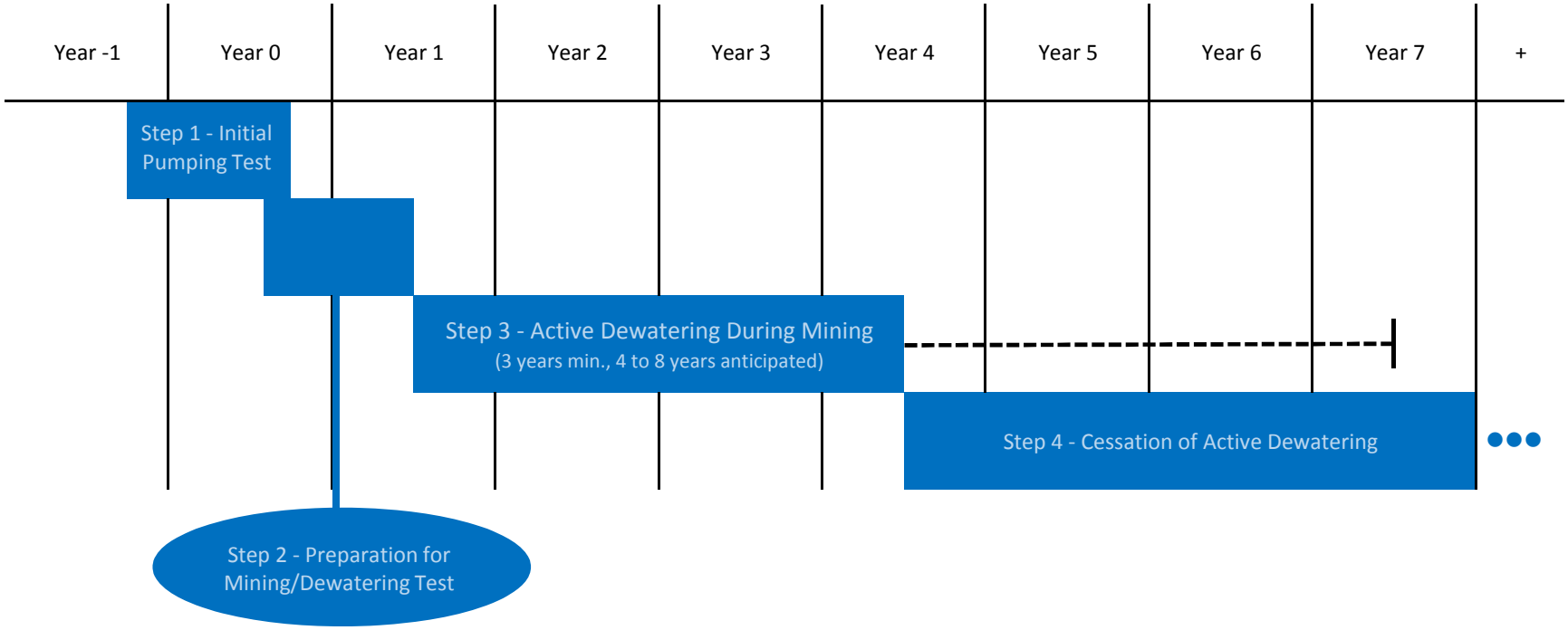
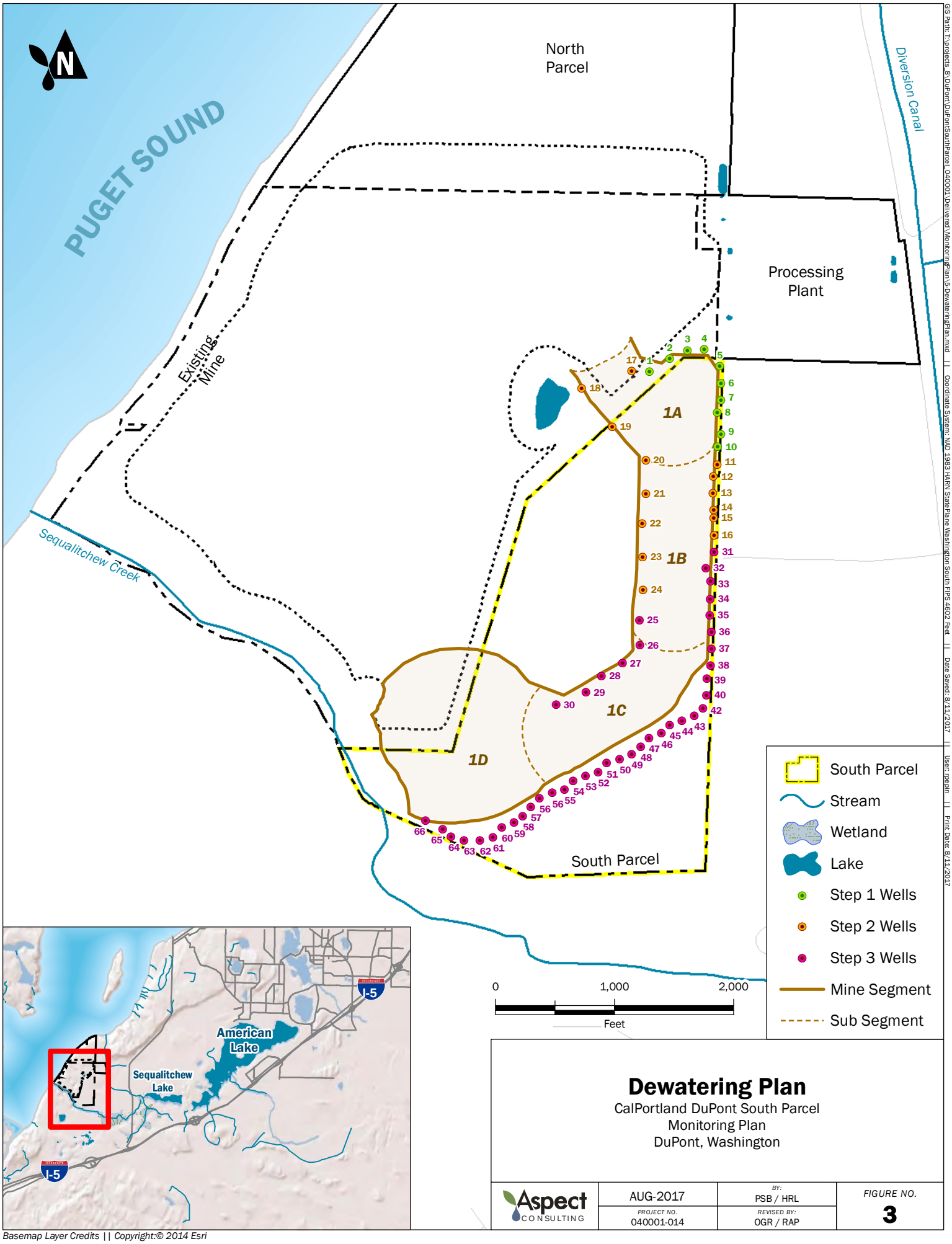


Notes:

1) Year 1 begins with the start of pumping in Step 2.

2) Timeline for Step 3 is based on CalPortland's commitment to a minimum duration of 3 years. The dashed line indicates the anticipated duration (6 years).

Figure 2
Timeline of Dewatering Steps
South Parcel Monitoring Plan
DuPont, Washington



Dewatering Plan

CalPortland DuPont South Parcel
Monitoring Plan
DuPont, Washington

Aspect CONSULTING	AUG-2017	BY: PSB / HRL	FIGURE NO. 3
	PROJECT NO. 040001-014	REVISED BY: OGR / RAP	

Basemap Layer Credits || Copyright:© 2014 Esri

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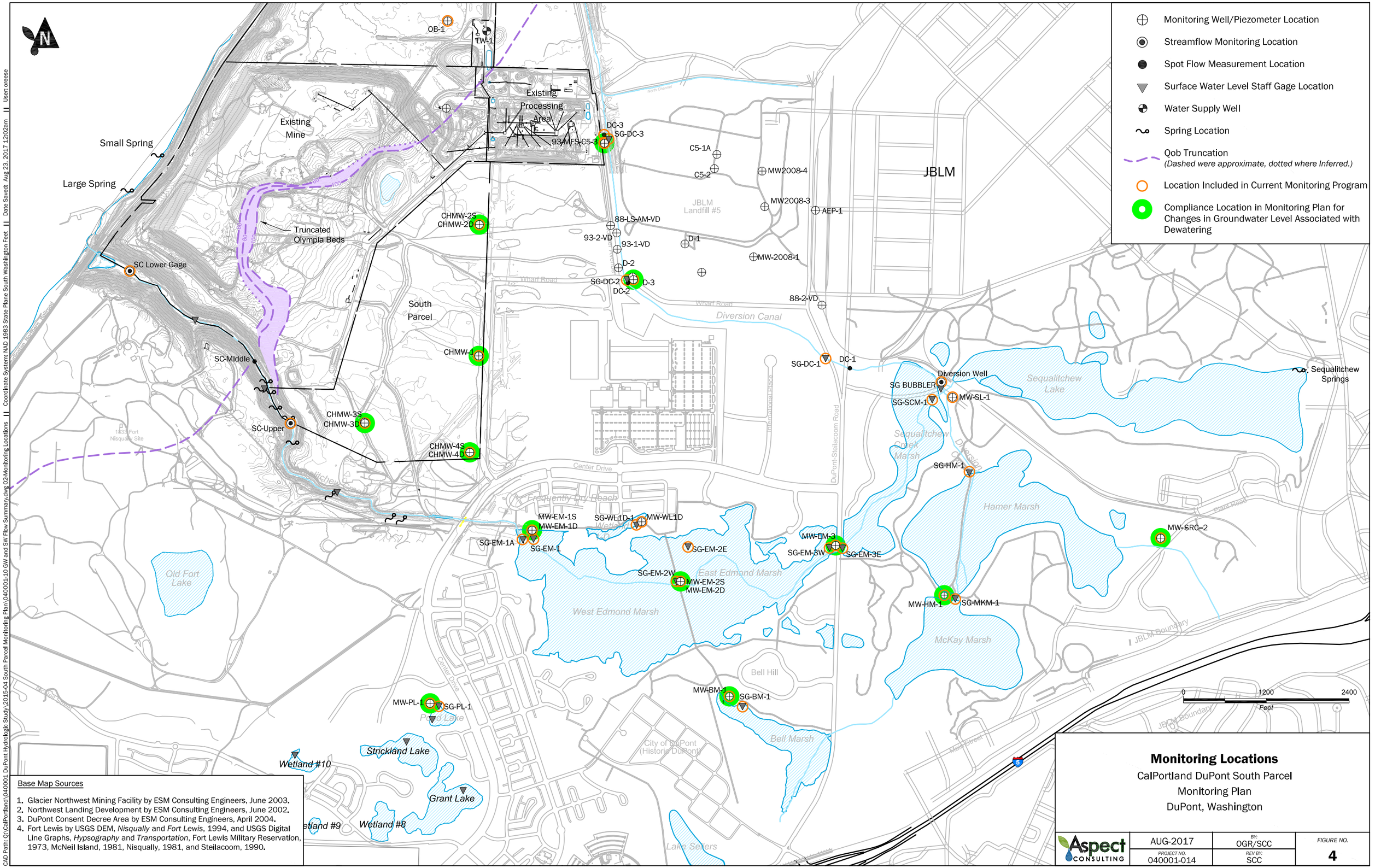

Base Map Sources

1. Glacier Northwest Mining Facility by ESM Consulting Engineers, June 2003.
2. Northwest Landing Development by ESM Consulting Engineers, June 2002.
3. DuPont Consent Decree Area by ESM Consulting Engineers, April 2004.
4. Fort Lewis by USGS DEM, *Nisqually* and *Fort Lewis*, 1994, and USGS Digital Line Graphs, *Hypsography* and *Transportation*, Fort Lewis Military Reservation, 1973, McNeil Island, 1981, Nisqually, 1981, and Steilacoom, 1990.

Monitoring Locations

CalPortland DuPont South Parcel
Monitoring Plan
DuPont, Washington

Aspect Consulting	AUG-2017	BY: OGR/SCC	FIGURE NO. 4
	PROJECT NO. 040001-014	REV BY: SCC	

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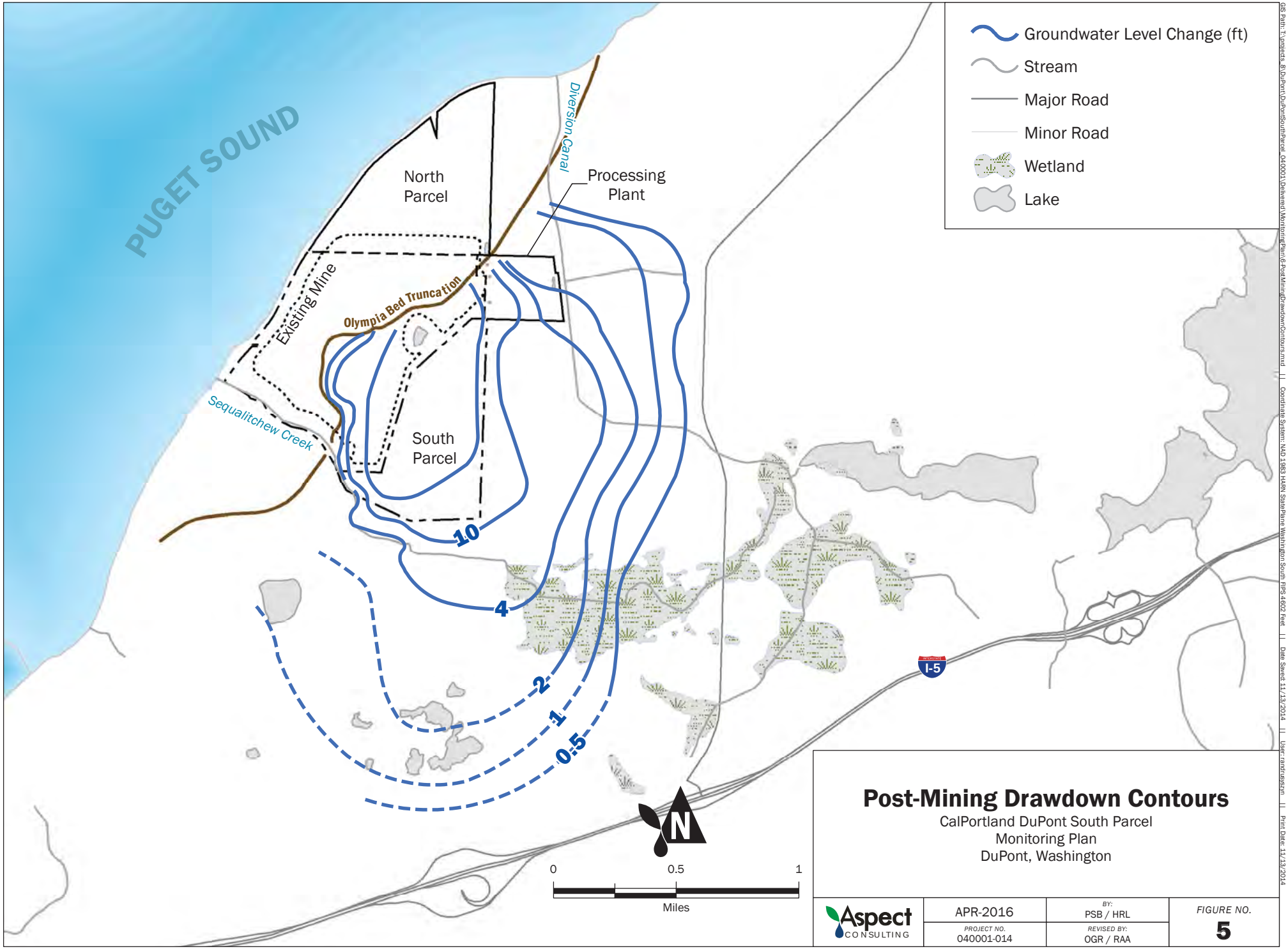

Post-Mining Drawdown Contours

CalPortland DuPont South Parcel
Monitoring Plan
DuPont, Washington

Aspect CONSULTING	APR-2016	BY: PSB / HRL	FIGURE NO. 5
	PROJECT NO. 040001-014	REVISED BY: OGR / RAA	

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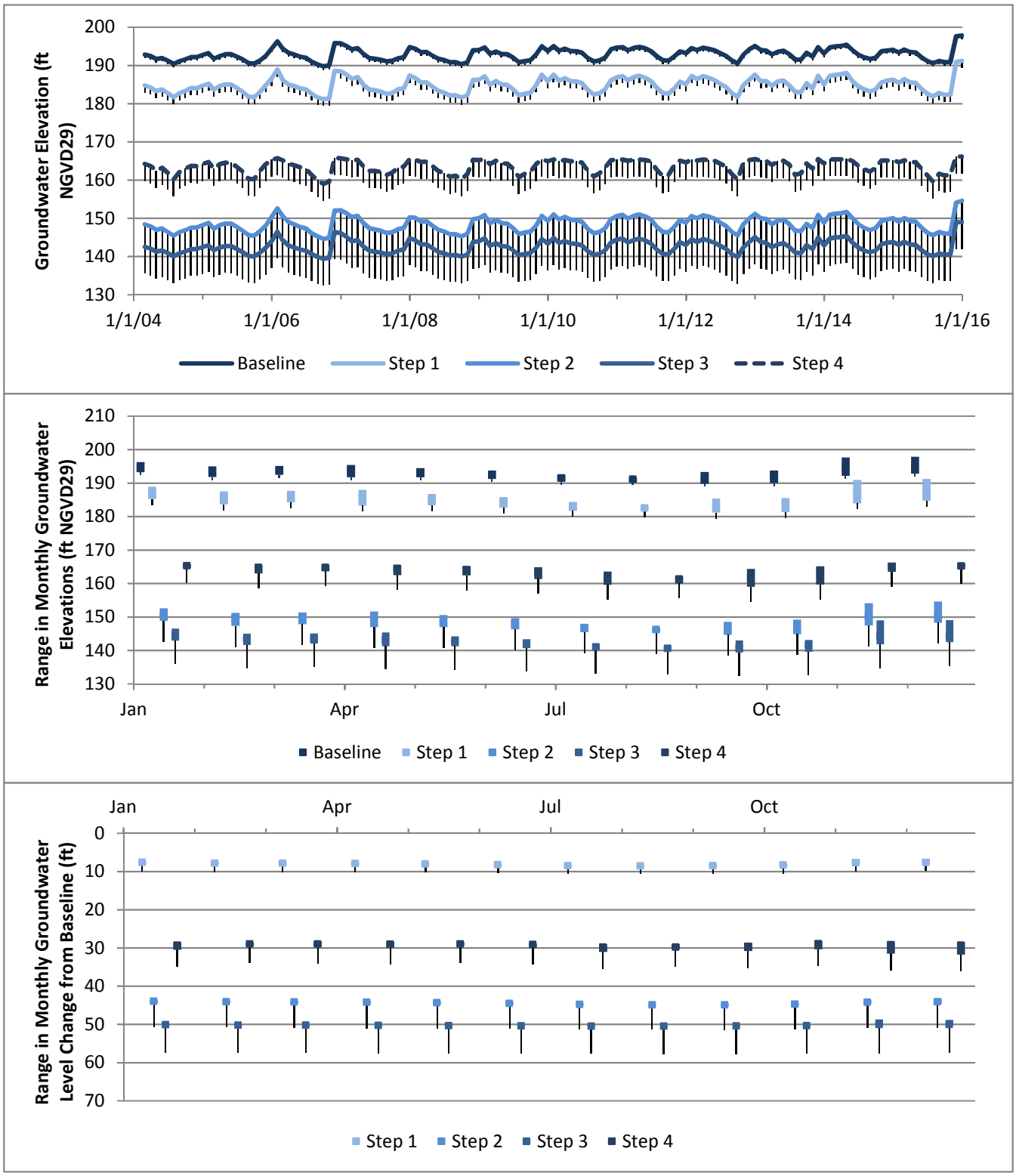
CHMW-2D



Aspect Consulting, LLC
03/20/2017
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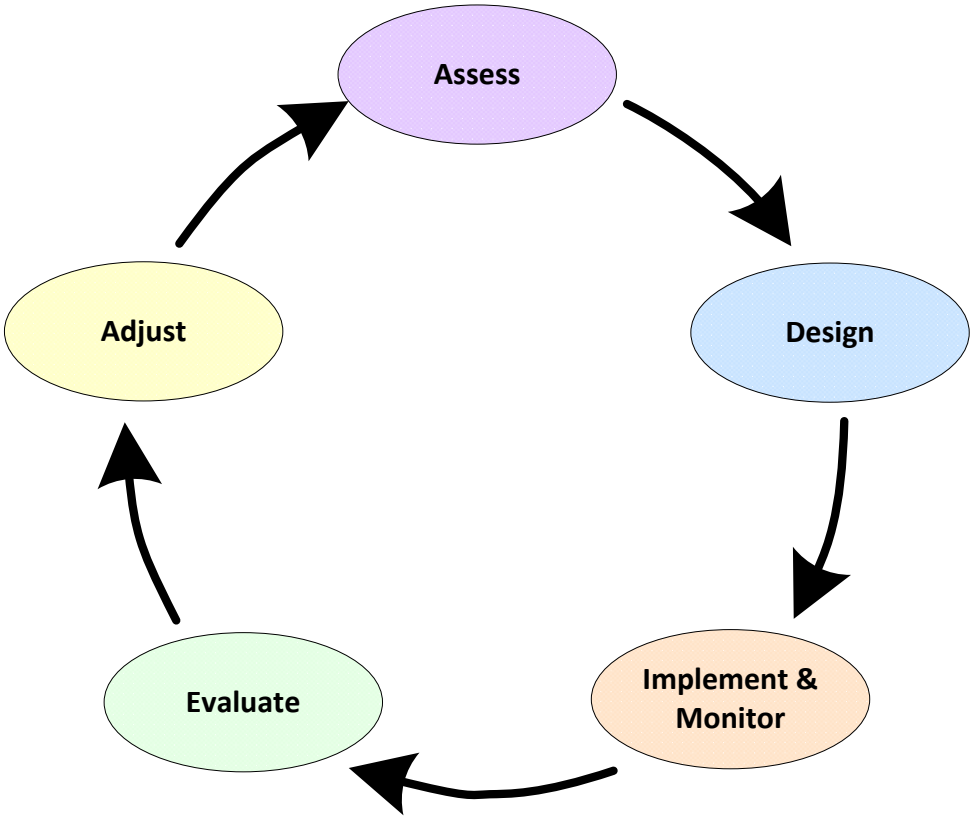
Figure 6
Predicted Changes and Ranges in Groundwater Levels



Adaptive Management Process

CalPortland DuPont South Parcel
Monitoring Plan
DuPont, WA

Aspect CONSULTING	APR-2016	BY: OGR	FIGURE NO. 7
	PROJECT NO. 040001-014	REV BY: ---	

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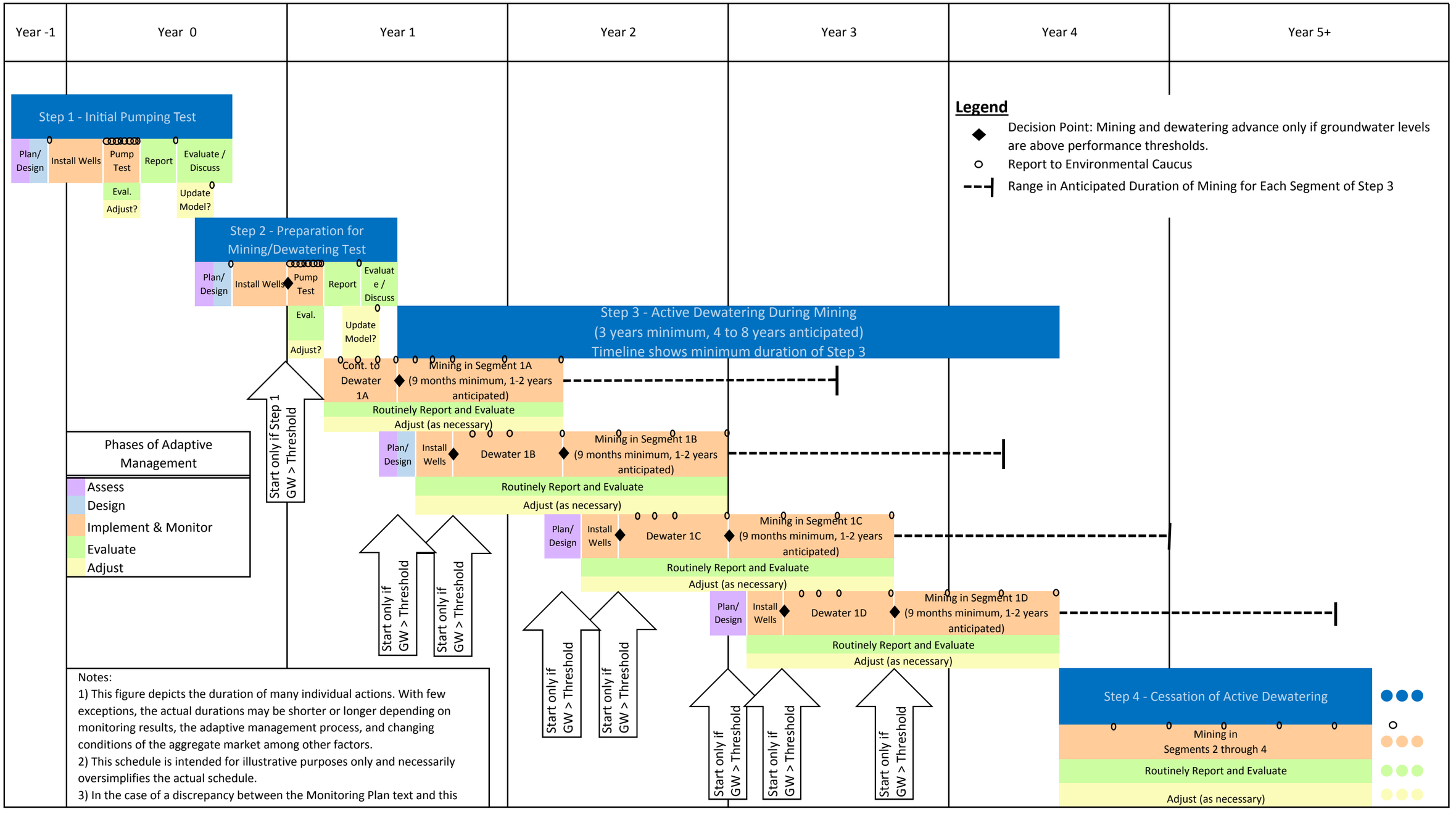
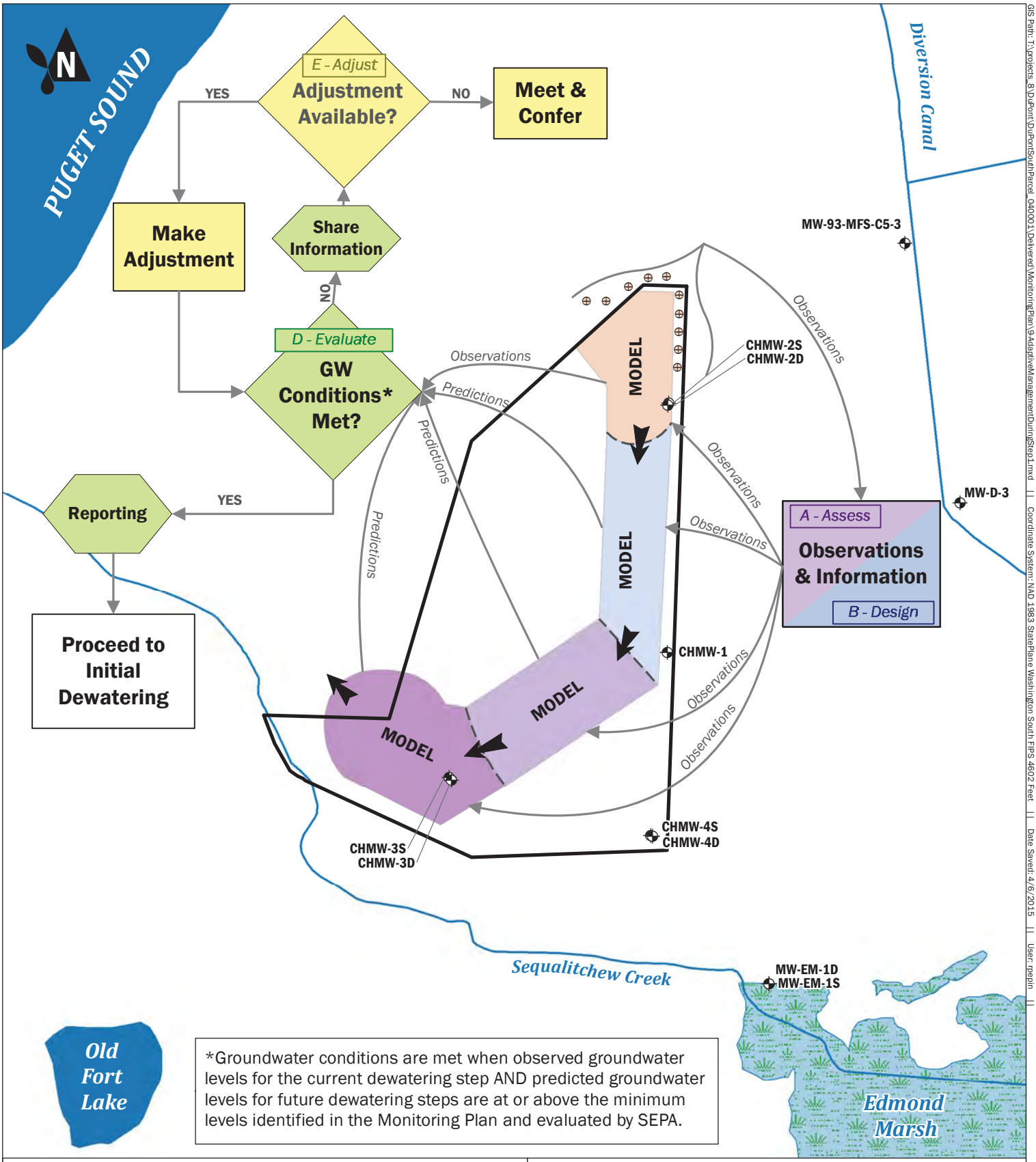


Figure 8
Timeline of Adaptive Management for South Parcel Mining



Adaptive Management Process During Step 1 - Initial Dewatering Test

CalPortland DuPont South Parcel
Monitoring Plan
DuPont, Washington

Aspect CONSULTING	APR-2016	BY: OGR / RAP	FIGURE NO. 9
	PROJECT NO. 040001-014	REVISED BY: ---	

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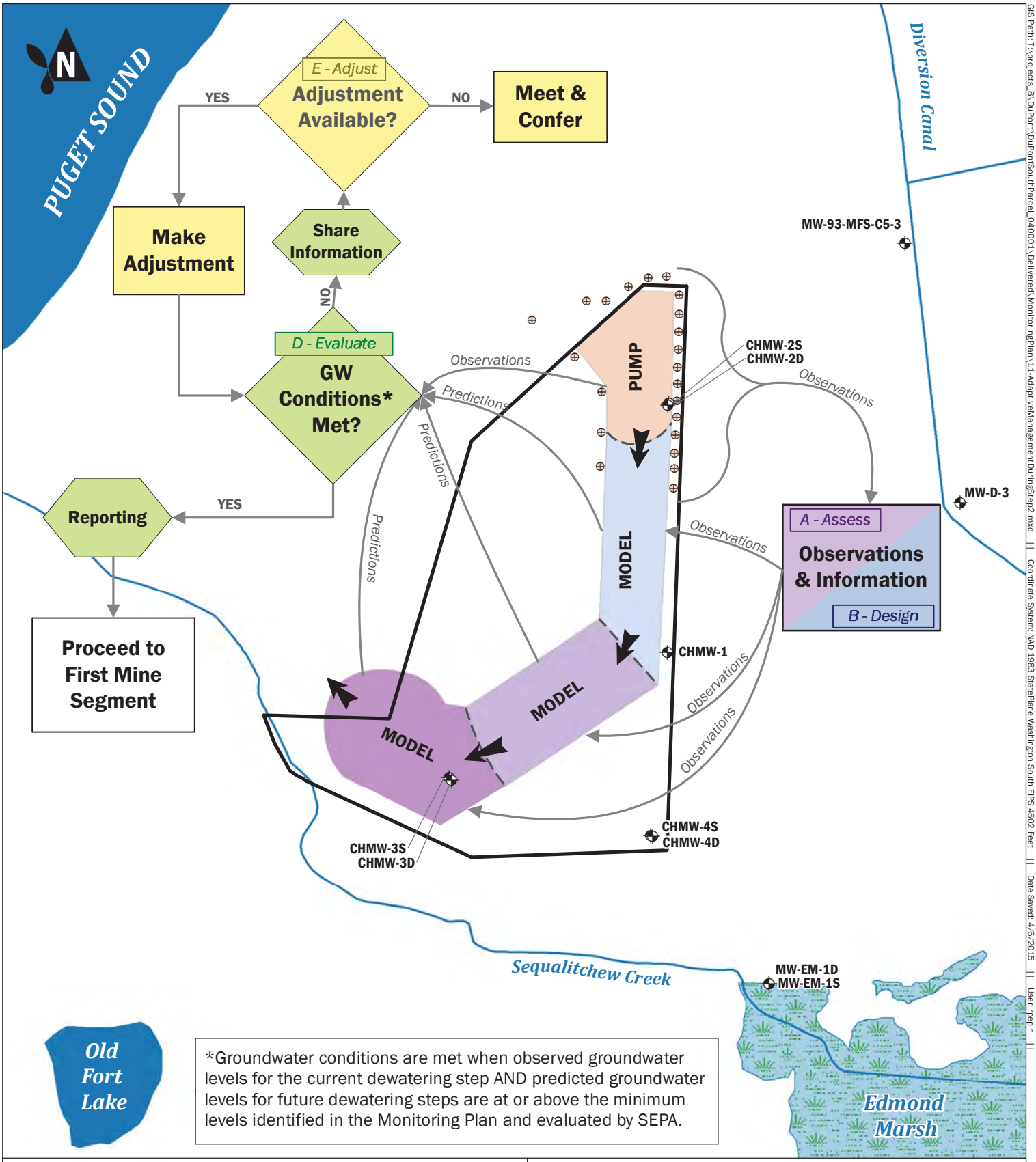

Adaptive Management Process During Step 2 - Preparation for Mining/ Dewatering Test

CalPortland DuPont South Parcel
Monitoring Plan
DuPont, Washington

Aspect CONSULTING	APR-2016	BY: OGR / RAP	FIGURE NO. 10
	PROJECT NO. 040001-014	REVISED BY: ---	

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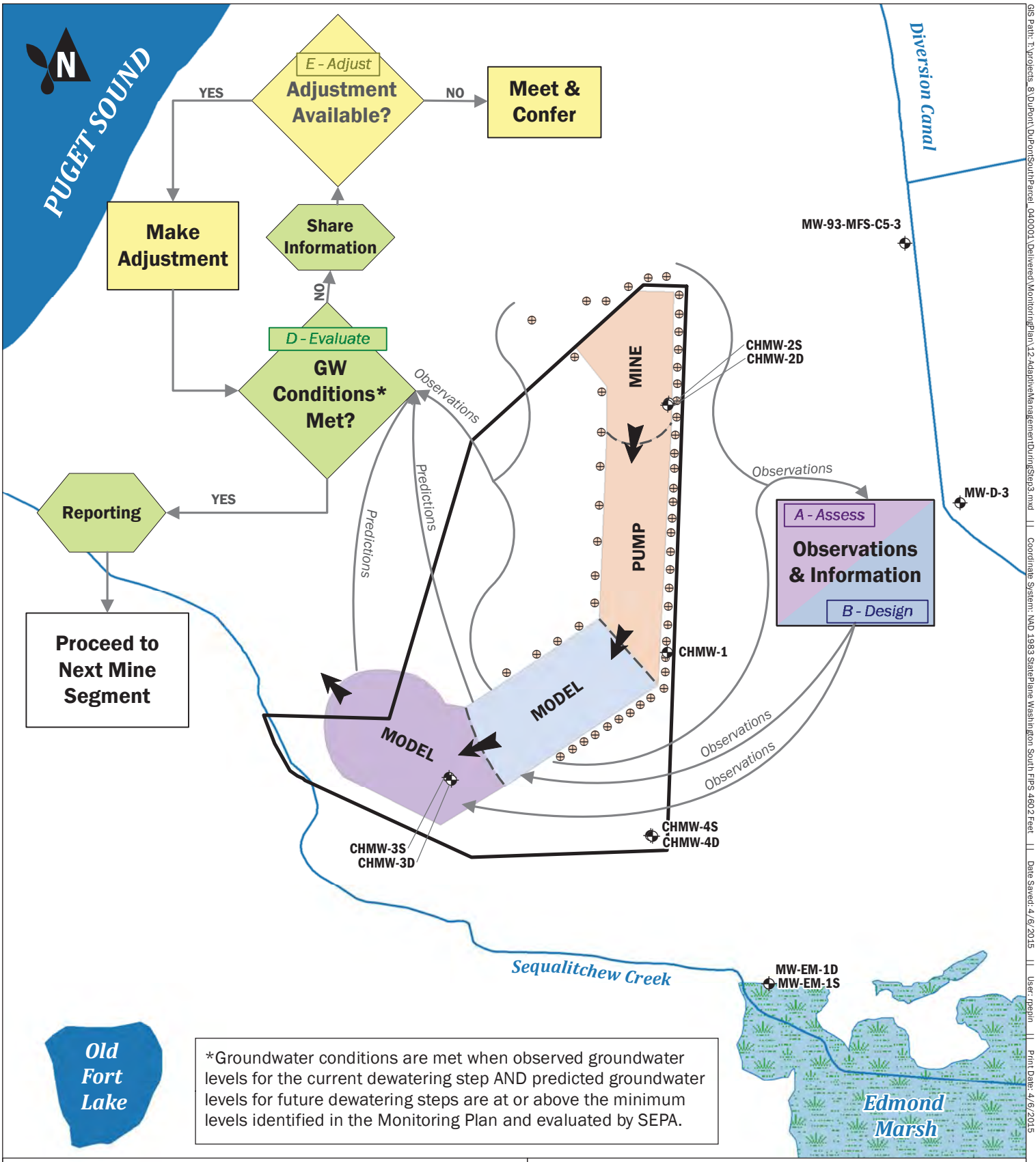

Adaptive Management Process During Step 3 - Active Dewatering and Mining

CalPortland DuPont South Parcel
Monitoring Plan
DuPont, Washington

Aspect CONSULTING	APR-2016	BY: OGR / RAP	FIGURE NO. 11
	PROJECT NO. 040001-014	REVISED BY: ---	

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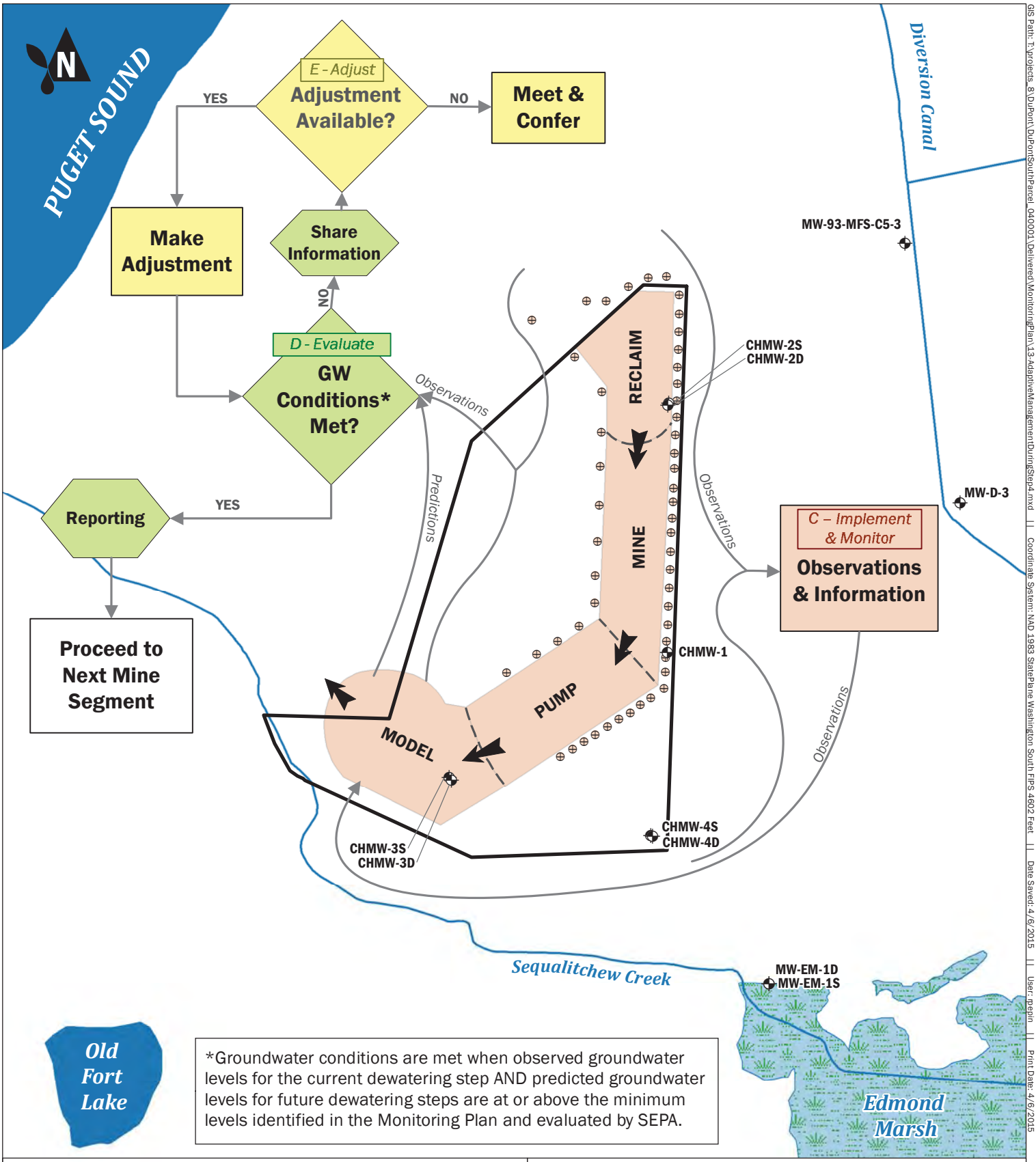


*Groundwater conditions are met when observed groundwater levels for the current dewatering step AND predicted groundwater levels for future dewatering steps are at or above the minimum levels identified in the Monitoring Plan and evaluated by SEPA.

Monitoring Well
Dewatering Well
Wetland
Lake

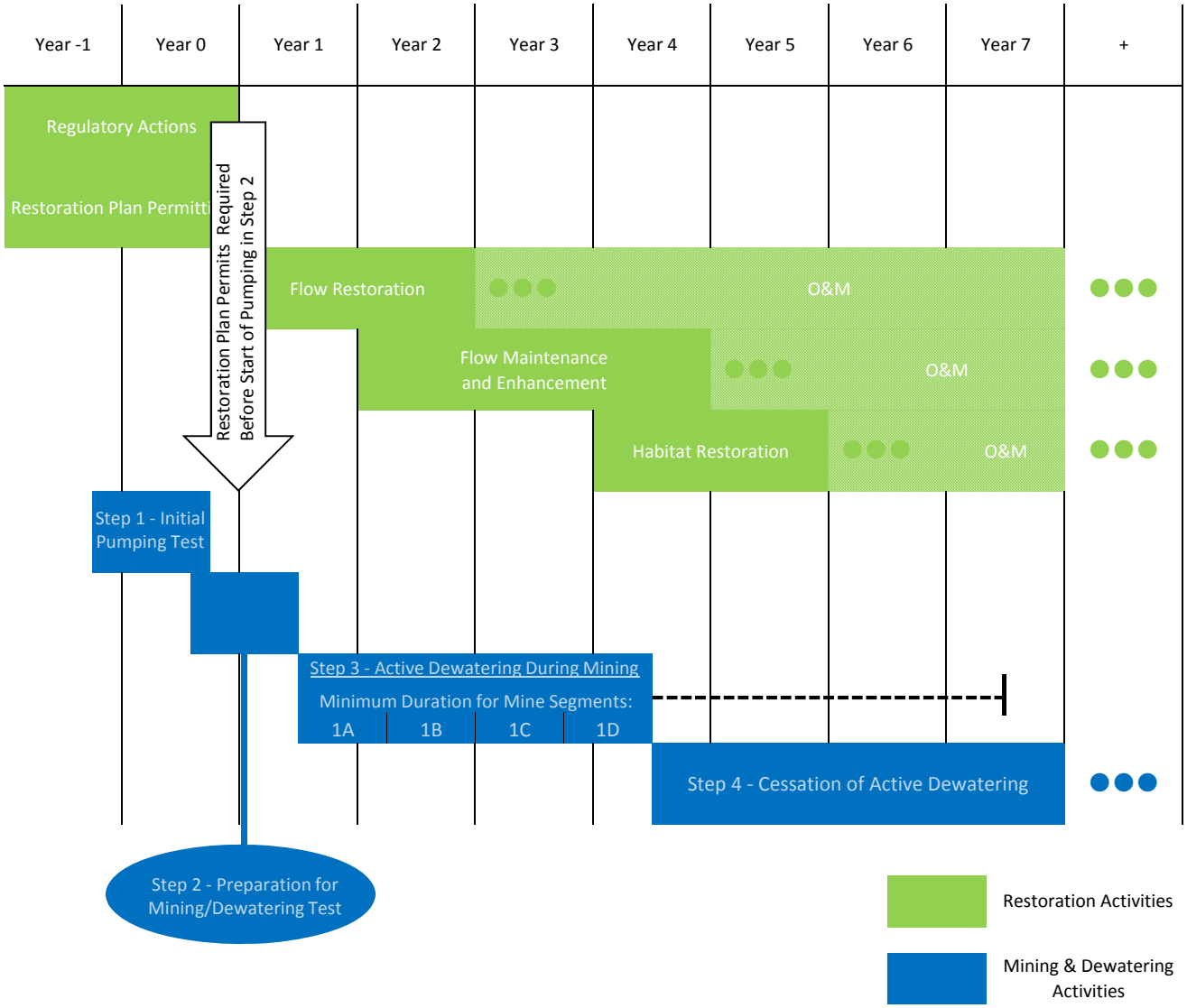
0 1,000 2,000
Feet

Adaptive Management Process During Step 4 - Cessation of Active Dewatering

CalPortland DuPont South Parcel
Monitoring Plan
DuPont, Washington

Aspect CONSULTING	APR-2016	BY: OGR / RAP	FIGURE NO. 12
	PROJECT NO. 040001-014	REVISED BY: ---	

GIS Path: T:\projects_8\DuPont\DuPontSouthParcel_040001\Delivered\MonitoringPlan\13-AdaptiveManagementDuringStep4.mxd || Coordinate System: NAD 1983 StatePlane Washington South FIPS 4602 Feet || Date Saved: 4/6/2015 || User: rpeplin || Print Date: 4/6/2015

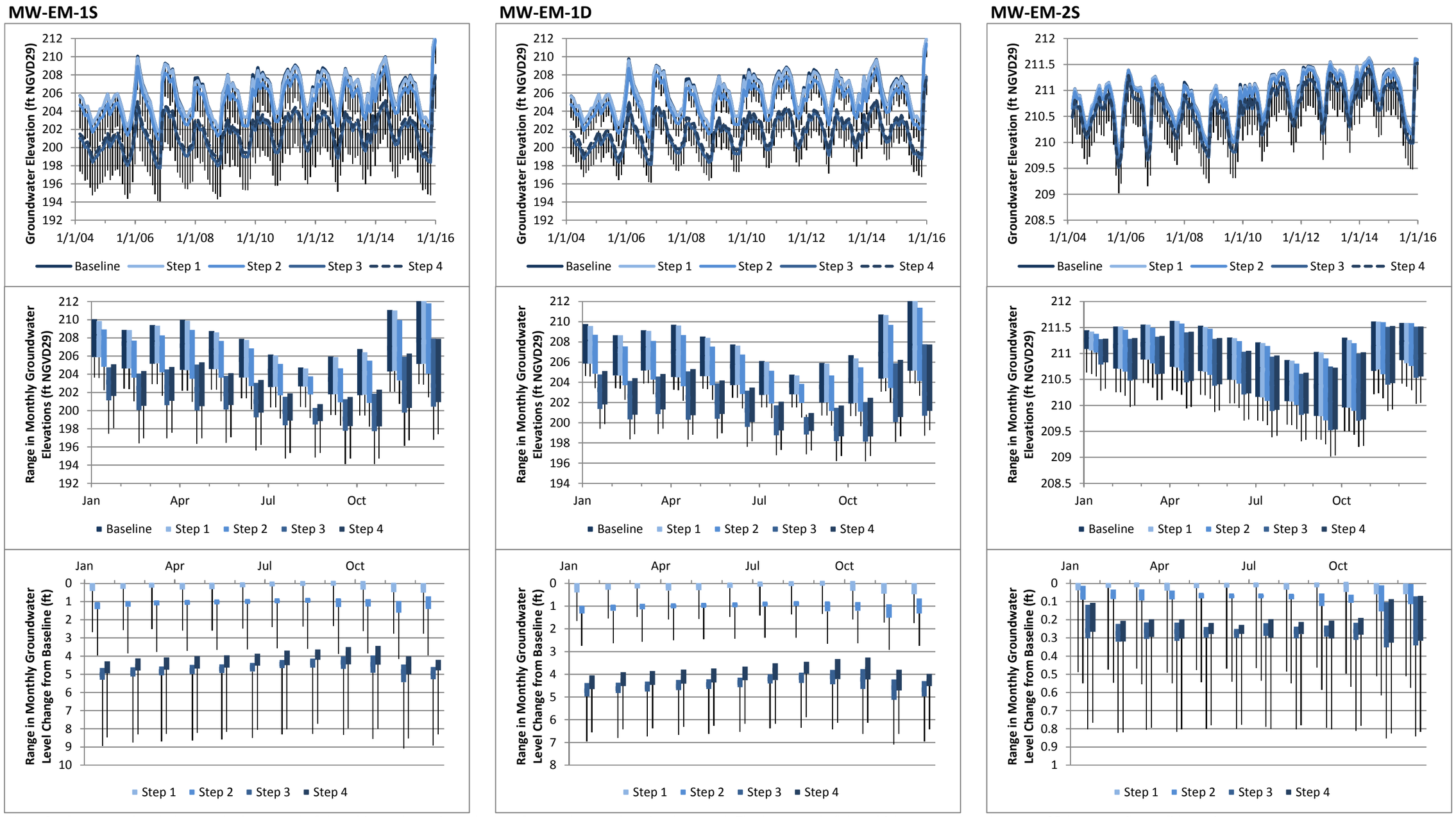


Notes:
1) Year 1 begins with the start of pumping in Step 2.
2) Mining timeline shown is based on the minimum duration of each mine segment in Step 3.
3) This figure depicts the duration of many individual actions. With few exceptions, the actual durations may be shorter or longer

Figure 13
Anticipated Timeline of Mining and Restoration Activities

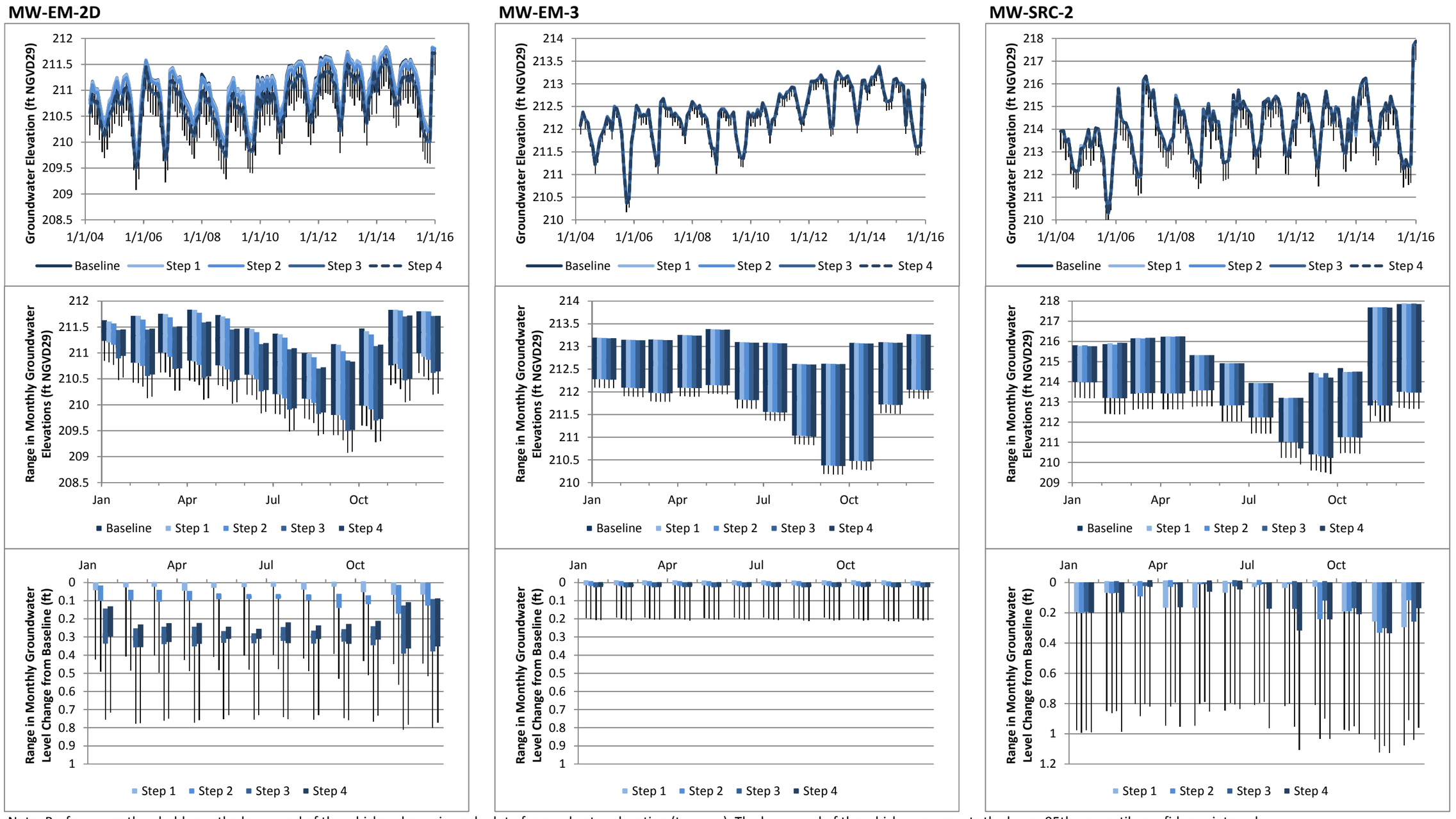
APPENDIX A

Performance Thresholds: Predicted Changes and Ranges in Groundwater Levels



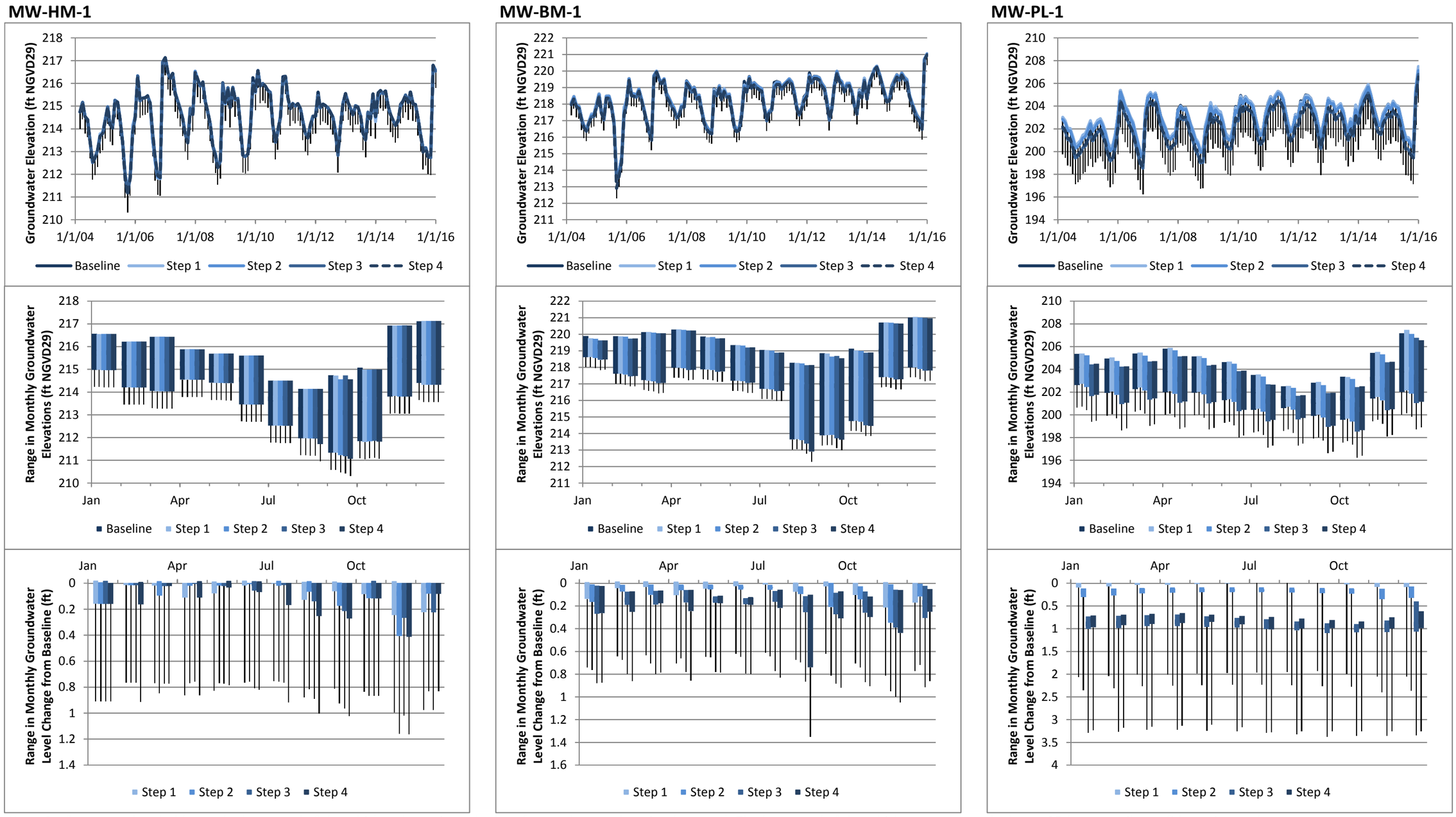
Note: Performance thresholds are the lower end of the whisker shown in each plot of groundwater elevation (top row). The lower end of the whisker represents the lower 95th-percentile confidence interval.

Figure A-1
Predicted Changes and Ranges in Groundwater Levels
Monitoring Plan



Note: Performance thresholds are the lower end of the whisker shown in each plot of groundwater elevation (top row). The lower end of the whisker represents the lower 95th-percentile confidence interval.

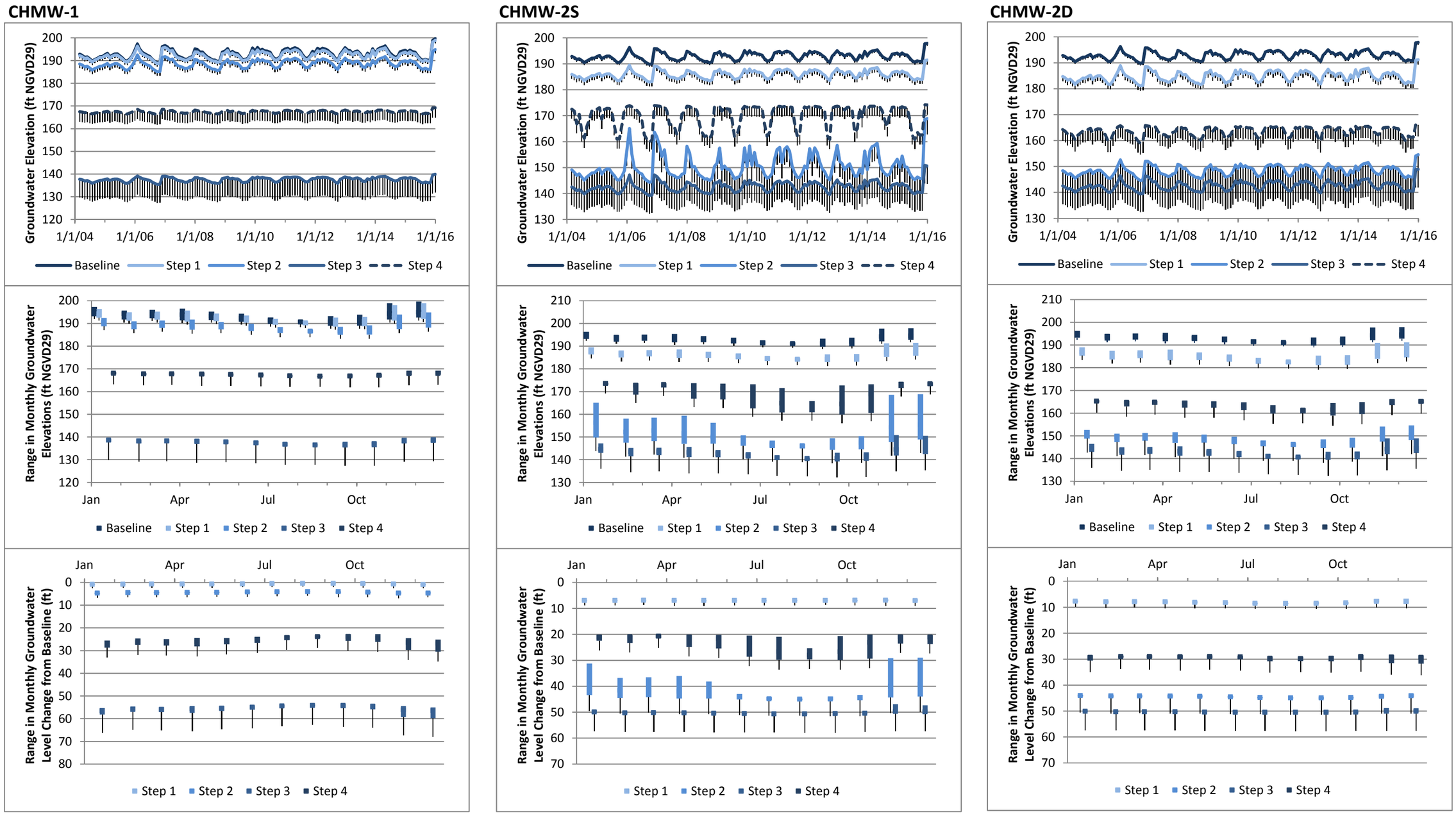
Figure A-1
Predicted Changes and Ranges in Groundwater Levels
Monitoring Plan



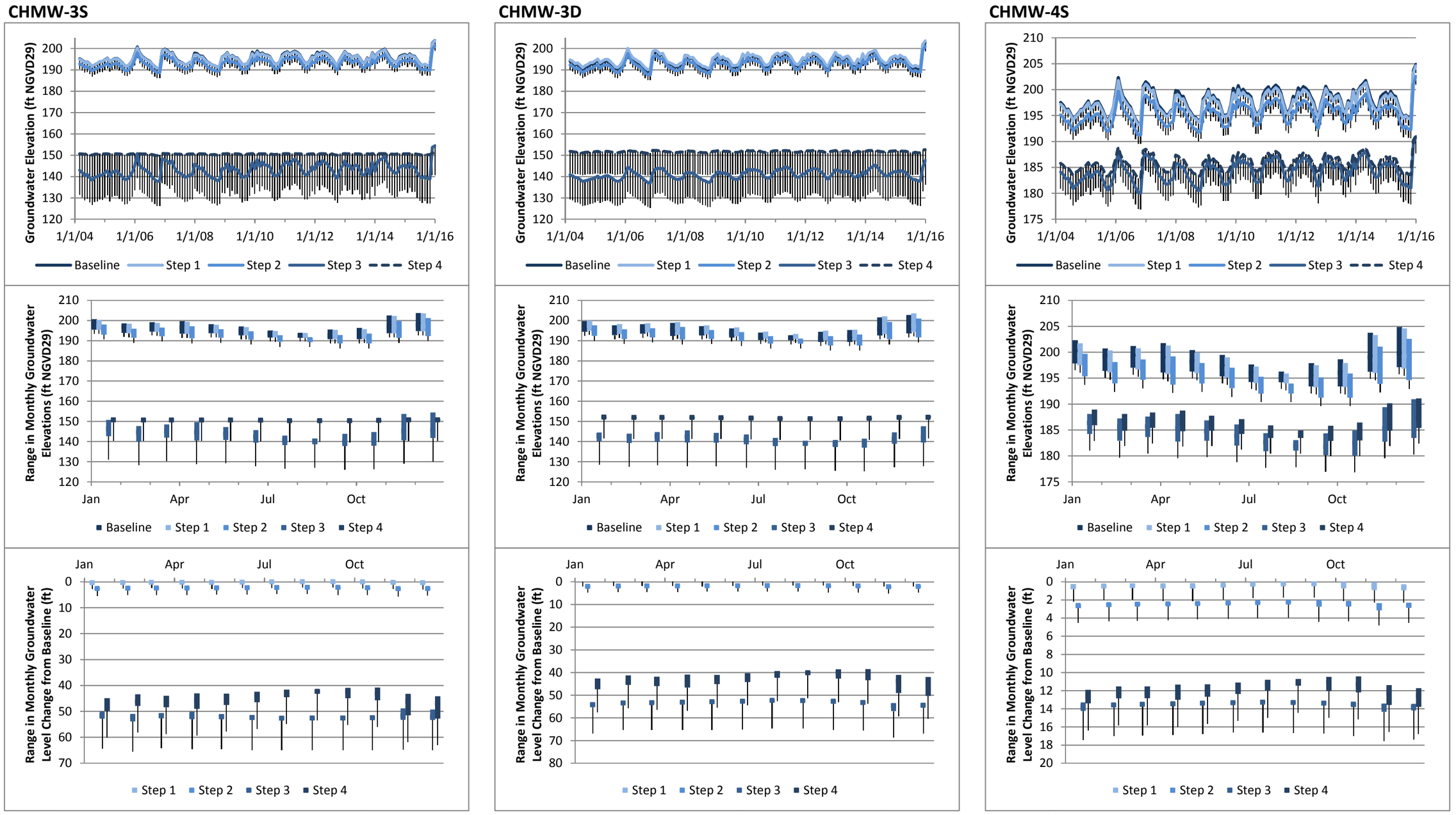
Note: Performance thresholds are the lower end of the whisker shown in each plot of groundwater elevation (top row). The lower end of the whisker represents the lower 95th-percentile confidence interval.

Figure A-1
Predicted Changes and Ranges in Groundwater Levels
Monitoring Plan

DRAFT



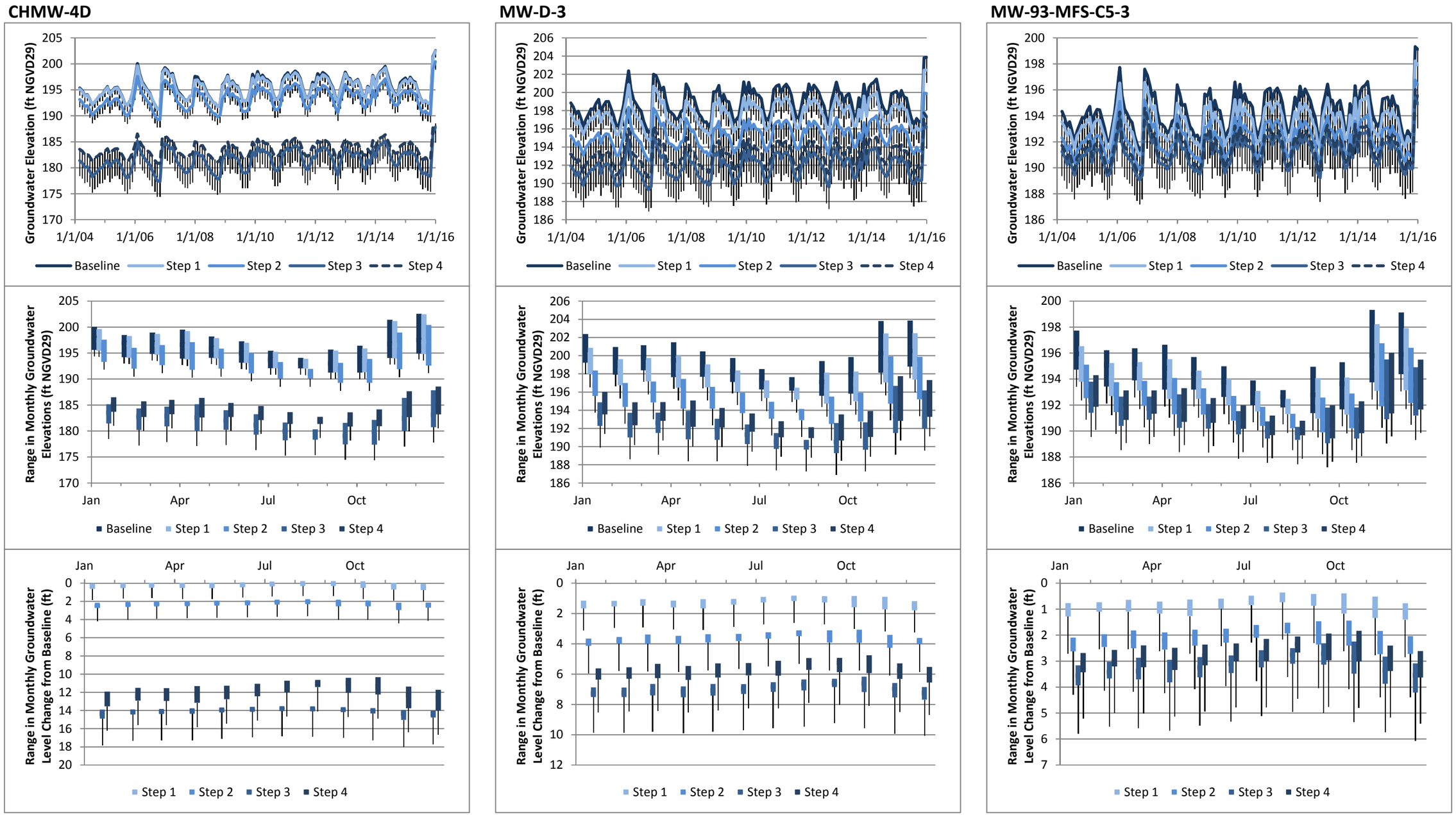
Note: Performance thresholds are the lower end of the whisker shown in each plot of groundwater elevation (top row). The lower end of the whisker represents the lower 95th-percentile confidence interval.



Note: Performance thresholds are the lower end of the whisker shown in each plot of groundwater elevation (top row). The lower end of the whisker represents the lower 95th-percentile confidence interval.

Figure A-1
Predicted Changes and Ranges in Groundwater Levels
Monitoring Plan

DRAFT



Note: Performance thresholds are the lower end of the whisker shown in each plot of groundwater elevation (top row). The lower end of the whisker represents the lower 95th-percentile confidence interval.

Figure A-1
Predicted Changes and Ranges in Groundwater Levels
Monitoring Plan

APPENDIX B

Sampling and Analysis Plan

Contents – Appendix B

A.1. Introduction 3

A.2. Background 3

A.2.1. Baseline Monitoring Program 3

A.2.1.1. Groundwater Level Monitoring 4

A.2.2. Surface Water Monitoring 4

A.2.2.1. Water Levels 4

A.2.2.2. Water Quality 5

A.2.2.3. Streamflow 5

A.2.2.4. Habitat Monitoring 6

Wetland Habitat 6

Stream Habitat 6

A.3. Roles and Responsibilities 7

A.4. Monitoring Approach 7

A.4.1. Groundwater levels 8

A.4.2. Surface water levels 9

A.4.3. Streamflow 9

A.4.4. Surface Water Quality 10

A.4.5. Habitat 12

A.4.6. Precipitation 13

A.5. Monitoring Procedures 13

A.5.1. Routine Station Inspections 14

A.5.2. Groundwater levels 14

A.5.3. Surface water levels 15

A.5.4. Streamflow 15

A.5.4.1. Weir-Discharge Equations 15

A.5.4.2. Stage-Discharge Rating Curve 15

A.5.5. Surface water quality 16

A.5.5.1. Equipment maintenance 17

A.5.5.2. Qualitative Observations 18

A.5.6. Habitat 19

A.5.6.1. Wetland Habitat 19

A.5.6.2. Stream Habitat 19

A.5.7. Precipitation 20

A.6. Quality Control 20

A.6.1. Field 20

A.6.2. Laboratory 21

A.7. Data Management 22
A.7.1. Hydrologic Data Collection 22
A.7.2. Hydrologic Database Structure 22
A.7.3. Database Inputs 23
A.7.3.1. Existing Data 23
A.7.3.2. New Data 23
A.7.3.3. Back-up Precipitation Data 24
A.7.4. Database Outputs 24
A.7.5. QA/QC Protocol 25
A.7.5.1. Data Collection 25
A.7.5.2. Data Entry 25
A.7.5.3. Data Reporting 25
A.7.6. Data Archival (EIM) 25
A.8. Special Studies 26
A.9. References 27

List of Tables

1 Summary of Baseline Monitoring Program
2 Monitoring Team Roles and Responsibilities *(in text)*
3 Relationship of Proposed Monitoring to Adaptive Management Thresholds
4 Water Quality Grab Sample Parameters and Methods *(in text)*
5 Field Monitoring Equipment Decontamination and Calibration Procedures *(in text)*
6 Stream Habitat Monitoring Parameters and Methods *(in text)*
7 Additional Habitat Observations *(in text)*

List of Figures

1 Monitoring Locations

List of Attachments

A Well Logs
B Field Data Forms

Sampling and Analysis Plan

A.1. Introduction

This document presents the Sampling and Analysis Plan (SAP) to collect the information necessary to support the adaptive management processes of the South Parcel Monitoring Plan and the Restoration Plan for the Sequalitchew Creek Watershed. This SAP is intended to direct collection, processing, and reporting of data by a single, reliable, and consistent source that will be used to inform both adaptive management plans.

A.2. Background

A.2.1. Baseline Monitoring Program

A baseline monitoring program of surface water and groundwater within the Sequalitchew Creek basin is currently conducted by CalPortland as a component of mine planning. The monitoring program generally consists of measuring water levels and flows on a monthly basis at multiple locations in Sequalitchew Creek and its related marshes. The hydrologic monitoring program has four basic elements:

- Groundwater elevation monitoring;
- Surface water elevation monitoring;
- Surface water streamflow monitoring; and
- Surface water quality monitoring (e.g., temperature, dissolved oxygen, and turbidity).

The monitoring program is summarized in Table 1, and monitoring locations are shown on Figure 1.

The baseline monitoring program began in 1999, then expanded significantly in 2003. Monitoring data has previously been presented in four reports (Aspect, 2004a, 2004b; Aspect and Anchor, 2007; and Appendix B of Anchor QEA and Aspect, 2010). The 2004 reports describe the surface water and groundwater systems of the Sequalitchew Creek basin and summarize the monitoring data collected through 2004. The 2007 report presents monitoring data collected in 2005 and 2006. The 2010 report provides summary hydrographs of streamflow and marsh levels, illustrating the data available at that time.

A.2.1.1. Groundwater Level Monitoring

In the baseline monitoring program, groundwater levels are monitored monthly at a network of 20 wells located throughout the watershed, including within the mine area, marshes, and upland areas:

- North Parcel mine area: OB-1
- South Parcel mine area: CHMW-1, CHMW-2S and -2D, CHMW-3S and -3D, and CHMW-4S and -4D
- Marshes and Lakes:
    - Edmond Marsh: MW-EM-1S and -1D, MW-EM-2S and -2D, and EM-3
    - Hamer and McKay Marshes: MW-HM-1
    - Sequalitchew Lake: MW-SL-1
    - Pond Lake: MW-PL-1
- Upland areas: D-3 (near Landfill #5) and SRC-MW-2 (east of Hamer Marsh)

Water levels are measured manually by measuring the depth to water from the top of the well casing. The top-of-casing elevation of each well has been surveyed relative to the National Geodetic Vertical Datum of 1929 (NGVD 29) to allow for calculation of groundwater elevations. Well logs for the existing monitoring wells are provided in Attachment A.

A.2.2. Surface Water Monitoring

A.2.2.1. Water Levels

The baseline monitoring program includes monthly measurement of surface water elevations at 15 locations in the Sequalitchew Creek watershed (Figure 1).

In many locations, staff gages are located close to monitoring wells to allow for coupled observations of surface water and groundwater levels. The following staff gages are included in the baseline monitoring program:

- Bell Marsh: SG-BM-1
- McKay Marsh: SG-MKM-1
- Hamer Marsh: SG-HM-1
- Sequalitchew Creek Marsh: SG-SCM-1 and SG-EM-3E
- East Edmond Marsh: SG-EM-3W and SG-EM-2E
- West Edmond Marsh: SG-EM-1/1A and SG-EM-2W
- Wetland 1D: SG-WL1D-1
- Pond Lake: SG-PL-1

- Diversion Canal: SG-DC-1, SG-DC-2, and SG-DC-3

The typical staff gage installed on this project is an enamel plate capable of measuring water levels in 0.01-foot increments over a 3.33-foot range. The staff gages at the west end of West Edmond Marsh (SG-EM-1/1A) are paired, with SG-EM-1 located near well MW- EM-1 and used to measure higher water levels in winter and SG-EM-1A located in a low spot behind the beaver dam at the outlet and used for measuring lower water levels in summer.

In addition, surface water levels are measured as a component of the three continuous flow monitoring stations described in Section A.2.2.3.

A.2.2.2. Water Quality

Beginning in 2009, surface water quality has been monitored monthly at three locations: the Diversion Weir, the outlet of Hamer Marsh, and the mid-ravine gage on Sequalitchew Creek. Monthly monitoring consists of field measurements of temperature, dissolved oxygen, specific conductance, oxidation reduction potential, and turbidity with a YSI Pro Plus and a Hach Turbidimeter. Several samples have been collected for laboratory analysis for select metals (iron, copper, and zinc) and total petroleum hydrocarbons.

A.2.2.3. Streamflow

The baseline streamflow monitoring program consists of continuous measurements at three stations, periodic measurements at three stations, and visual observations at five locations. The specific locations monitored are:

- Continuous streamflow monitoring at the Diversion Weir, and mid-ravine[1] and lower-ravine stations in Sequalitchew Creek.
- Periodic streamflow measurements at three locations in the Diversion Canal (SG-DC-1, SG-DC-2, SG-DC-3); and
- Visual estimates of flow at five locations:
    - Culvert from Hamer Marsh to Edmond Marsh,
    - Culvert from Sequalitchew Creek Marsh to Diversion Canal
    - Ditch at Plant Road flowing to Hamer Marsh,
    - Sequalitchew Creek at footbridge downstream of W. Edmond Marsh, and
    - Sequalitchew Creek under Center Drive.

Measurements of streamflow are made using the conventional current-meter method as described by the U.S. Geological Survey (USGS, 1982). Stream velocities are measured and discharges are calculated using a SonTek Flowtracker.

Discharge measurements are initially made at various stream stages to determine a relationship between stage and discharge. Discharge measurements are then made at

[1] The mid-ravine station was formerly known as the Upper gage or SC-Upper.

periodic intervals to verify the stage-discharge relationship or to define any change in the relationship caused by changes in channel geometry and/or channel roughness.

Rating curves, which relate water depth to flow in the channel, have been developed for each flow monitoring location based on a number of manual flow measurements collected over a range of different flows. These rating curves are used to convert observed water depths (stage) to flows.

Stream stage at each station is measured using a 4230 Bubble Flow Meter manufactured by Teledyne ISCO and powered by a 12-volt deep-cycle lead-acid battery. The meter uses an internal air compressor to force a metered amount of air through a bubble line submerged in the flow channel. The water level above the bubble line orifice is determined by measuring the pressure needed to force air bubbles out of the line. An internal data logger records the water level as bubbler pressure at 15-minute intervals. The water level is converted to a stage height by correlating the meter readings to manual measurements taken during monthly site visits from a staff gage that is installed at each station. The equipment for the stations is serviced once a month by replacing the batteries and downloading the data to a portable computer.

Flow over the Diversion Weir is monitored by continuously monitoring stage using an ISCO 4230 and calculating discharge with a standard weir equation for a fully contracted rectangular weir from the United States Bureau of Reclamation's (USBR) Water Measurement Manual (USBR, 2001). The weir equation is presented in Section A.5.4.1.

A.2.2.4. Habitat Monitoring

Wetland Habitat

Wetland monitoring conducted to date has been focused on documenting baseline (pre-project) conditions of three key variables in habitats: topography, hydrology, and vegetation. Major changes to the boundary of Edmond Marsh have been analyzed from high-resolution aerial photos, and compared to field-collected data. Twelve vegetation monitoring transects are located throughout the Sequalitchew Creek basin: in Edmond Marsh, Sequalitchew Creek Ravine, Wetland 1D, Pond Lake, and Brackish Marsh. Overall, patterns in species presence detected during the monitoring in the period from 2004–2015 have been documented by Anchor QEA (2016).

Stream Habitat

Anchor Environmental (Anchor; now Anchor QEA) has previously evaluated stream habitat in Sequalitchew Creek using toe-width and stage-discharge analysis methods as a component of the Fish Habitat Benefit Evaluation for Sequalitchew Creek (Anchor, 2004). Additional information on the methodology and background can be found in that document.

The **Toe-Width Method** applies information on active channel width to estimate the optimal flows (maximum habitat) for salmon spawning and rearing. Within Reach 2 and 3, transects were established in areas with fairly uniform depth over a gravel/cobble substrate (5 transects and 4 transects, respectively). Since Reach 1 was located in the estuary, no toe-width transects were established. Additional transects were established to represent riffle habitat in all three reaches.

The **Stage-Discharge Analysis** provides a more detailed evaluation of how habitat availability changes with incremental increases in flow by linking data on the physical relationship between water surface elevation (stage), velocity, and discharge with the biological habitat preferences of spawning and rearing salmon. Stage-discharge relationships in lower Sequalitchew Creek were developed at numerous transects that were selected to be representative of habitat conditions in the study area.

A.3. Roles and Responsibilities

The roles and responsibilities of all key members of the monitoring team are shown in Table 2 below. The monitoring team may be comprised of one or more qualified consulting firms, governmental agencies (e.g., USGS or Ecology), or nongovernmental organizations.

Table 2. Monitoring Team Roles and Responsibilities

Position	Roles and Responsibilities
Project Manager—Monitoring Team	Responsible for oversight of monitoring personnel, coordinating project tasks defined in the Consultant scope of work, tracking project progress and schedule relative to budget, and manage staff to complete project activities.
Principal-in-Charge—Monitoring Team	Responsible for oversight to project team to ensure that QC procedures are followed and project data quality objectives (DQOs) are being met. Oversight of development of project SAP, field audits, and project reports.
Data QC/Reporting Lead—Monitoring Team	Responsible for developing SAP, standard operating procedures (SOPs), and data QA/QC procedures for project. Responsible for managing project database, completing data QC on all project data, and reporting for individual events and the overall project.
Technology Lead—Hydrology/Water Quality	Responsible for the design of each monitoring station. Provide oversight for installation of each station's monitoring system. Provide oversight for monitoring station maintenance and lead equipment troubleshooting activities.
Data Collection Lead—Hydrology/Water Quality	Manages and oversees monitoring and maintenance activities that are completed in the field for hydrology and water quality data collection.
Data Collection Lead—Habitat	Manages and oversees habitat monitoring activities.

A.4. Monitoring Approach

The monitoring conducted under this SAP will collect data necessary to assess whether activities associated with the South Parcel expansion and restoration of Sequalitchew Creek are achieving the objectives of the South Parcel Monitoring Plan and the Restoration Plan for the Sequalitchew Creek Watershed. The monitoring approach is targeted at the specific performance and aspirational thresholds identified in those plans.

The monitoring program includes six components that will be implemented at key locations within the watershed: groundwater level, surface water level, stream flow, surface water quality, habitat, and precipitation monitoring. Each of these components are described below. A cross walk between specific SAP elements and the objectives of the Monitoring Plan and Restoration Plan is provided in Table 3.

In addition to the main monitoring activities, stand-alone special studies will be implemented to address specific concerns of the mine expansion and watershed restoration. These special studies will be developed further as mining and restoration planning progresses, but are described generally in Section A.8.

A.4.1. Groundwater levels

Groundwater levels will be monitored primarily for comparison with the performance thresholds of the South Parcel Monitoring Plan.

Groundwater level monitoring will use the existing network of monitoring wells (described in Section A.2.1 and shown in Figure 1) and new dewatering wells and monitoring wells that will be installed specifically for this project. Water level monitoring will include a combination of spot measurements in active dewatering wells and adjacent temporary monitoring wells, continuous monitoring at key monitoring wells adjacent to the active dewatering area and beneath West Edmond Marsh, and routine monthly or semimonthly monitoring at other wells in the network.

As described in the Monitoring Plan, active dewatering of the South Parcel will occur in three sequential steps, involving progressively more dewatering wells, from 10 wells during Step 1, up to 66 wells during Step 3. Water levels will be measured periodically in the active dewatering wells, in new observation wells located adjacent to the active dewatering wells, and in several long-term monitoring wells installed in the interior of the South Parcel. Water level monitoring at these wells will be used to assess performance of the dewatering operation and, once mining operations commence in the South Parcel, will indicate if the moisture content of the mined aggregate is at appropriately low levels for safe, efficient mining and processing.

Outside of the South Parcel, groundwater level monitoring will consist of a combination of continuous monitoring and monthly or semimonthly manual measurements. During all Dewatering Steps, water levels will be monitored continuously in key wells located along the eastern boundary of the South parcel and in the western portion of Edmond Marsh. Specifically, the following key wells will be monitored continuously: CHMW-1, CHMW-2S and -2D, CHMW-3S and -3D, CHMW-4S and -4D. MW-EM-1S and -1D and MW-EM-2S and -2D. Water levels at all other groundwater monitoring wells will be measured monthly, except during Dewatering Step 2, when twice monthly measurements will occur, and Dewatering Step 3 when twice monthly measurements will occur for 3 months once new dewatering wells start pumping.

Monitoring wells are generally one- or two-inch-diameter PVC casings protected with a locking steel surface monument. Well depths vary from 5 feet for shallow piezometers to 85 feet for wells penetrating the Vashon Outwash gravels. Monitoring well logs are provided in Attachment A.

Continuous groundwater level monitoring will be conducted using a submersible pressure transducer connected to an aboveground data logger housed in a weather-resistant enclosure. Instruments will measure and record water level at 15-minute intervals. Data loggers will be downloaded by field staff at least weekly during Dewatering Steps 1 through 3 and once each month during Step 4.

A.4.2. Surface water levels

Surface water level monitoring data will primarily be used to compare the effects of restoration efforts with the performance and aspirational thresholds specified in the Restoration Plan. Surface water monitoring will occur at 12 stations as shown on Figure 1 and listed in Table 3 (station IDs have a "SG" prefix).

Continuous surface water monitoring will occur at SG-EM-1/1A and SG-EM-2E. Continuous water level data will be useful for assessing the water level response to precipitation. Water level will be measured manually once per month at the other stations; except during Dewatering Step 2, when twice-monthly measurements will occur. More frequent spot measurements will be made during specific restoration activities, such as the installation and adjustment of flexible levelers at beaver dams. New staff gage locations may be installed and added to the monitoring program as necessary to support adaptive management of the flexible levelers.

Surface water level monitoring at the seven locations in Sequalitchew Marsh, East Edmond Marsh, and West Edmond Marsh will provide feedback for efforts to increase westward flows in Sequalitchew Creek. Surface water level monitoring at SG-HM-1 in Hamer Marsh, in concert with groundwater level measurements at MW-HM-1 and MW-EM-3, will assess the increase in subsurface flow from Hamer Marsh to East Edmond Marsh following installation of the weir at Hamer Marsh outlet.

All surface water level monitoring stations are currently equipped with staff gages; either Stevens Style A or C porcelain-enameled iron plate. Style A gages are 3.33 feet long and 4 inches wide with graduated marks every 0.02 feet. Style C gages are also 3.33 feet long and are 2.5 inches wide with graduated marks every 0.01 foot. Water levels are measured to the nearest 0.01 foot. Water level is converted to surface water elevation by subtracting the staff gage height from the surveyed top-of-staff gage elevation and then adding the measured staff gage water level. At SG-EM-1 and SG-EM-2W, continuous water level monitoring will be conducted using a pressure transducer housed in a PVC stilling well that is mounted adjacent to the staff gage. The pressure transducer will be connected to the data logger used for continuous groundwater monitoring at the adjacent groundwater monitoring wells (MW-EM-1D for SG-EM-1/1A and MW-EM-2D for SG-EM-2W).

A.4.3. Streamflow

Streamflow monitoring will include:

- Continuous streamflow monitoring at five locations: the three existing streamflow monitoring stations (i.e., the Diversion Weir, and mid-ravine and lower stations in Sequalitchew Creek) and two new gaging stations on Sequalitchew Creek at the Lake Outlet and at Center Drive.

- Visual observations at the culvert from Hamer Marsh to Edmond Marsh.

At each continuous gaging station, water level will be measured and recorded every 15 minutes using a pressure transducer housed in a PVC stilling well and connected to a data logger that is housed in a weatherproof enclosure. Each continuous stream flow gaging station will include a Stevens Style A or C porcelain-enameled iron-plate staff gage, as described previous for the water level monitoring sites. Water level measured by the pressure transducer will be calibrated to the staff gage at the site. Field staff will service and download the data loggers at least monthly.

At the Diversion Weir, flow will be calculated using a standard discharge equation for a fully contracted rectangular weir as described above in Section A.5.4.1. At the other four gaging stations, stage-discharge or rating curves will need to be developed and maintained to calculate flow. Rating curves will be developed and maintained consistent with industry standard practices, as is currently done.

Flow through the culvert from Hamer Marsh to Edmond Marsh will be visually estimated monthly. Additional locations for visual flow estimates may be added at any time to respond to conditions observed in the field or adaptive management needs.

Following installation of the weir at the outlet of Hamer Marsh, outflow from Hamer Marsh to the Diversion Canal will be determined using the appropriate weir equation, based on water level observations at SG-HM-1, whose staff gage elevation relative the top of the weir will be established.

Continuous flow data from the Diversion Weir will be used to assess achievement of the Restoration Plan performance threshold to reduce flow to the Diversion Canal.

Continuous flow data from the Sequalitchew Lake Outlet and Center Drive gages will be used to assess achievement of the performance standard to match flows at those two locations.

Flow data at Center Drive, Upper Sequalitchew Creek, and Lower Sequalitchew Creek gages will be used to assess achievement of the performance standard to eliminate flow losses in the ravine.

Spot flow measurements at the Hamer Marsh Weir, at the culvert between Hamer Marsh and East Edmond Marsh, and in the ditch under Plant Road to Hamer Marsh, in concert with surface and shallow groundwater monitoring in and around Hamer Marsh, will be used to assess efforts to increase surface and groundwater flow from Hamer Marsh into East Edmond Marsh.

Going forward, the sampling program will no longer collect spot flow measurements in the Diversion Canal, since those data are not relevant to the objectives of the South Parcel Monitoring Plan or the Restoration Plan.

A.4.4. Surface Water Quality

The evaluation of habitat suitability will include monitoring water quality conditions in the watershed restoration area. In particular, stream temperature is predicted to increase in summer as a result of the restoration and mining projects for two reasons: 1) water

temperatures in Sequalitchew Lake are warmer than the groundwater discharge that currently provides the flow in Sequalitchew Creek during summer, and 2) dewatering for mining will reduce the groundwater discharge. Prior monitoring indicates that Sequalitchew Lake temperatures can reach up to 21°C in summer, whereas Sequalitchew Creek is currently 12 to 13°C. This condition is largely natural resulting from solar radiation on the lake surface. However, it also represents the primary tradeoff of restoration—greatly increased flow and reconnection to the natural water source in exchange for higher temperatures in summer.

The water quality monitoring program has been designed to monitor for unintended consequences, primarily focused on temperature, resulting from the restoration and mining projects. Stream temperatures will be monitored continuously at the five locations in the Sequalitchew Creek watershed where flow is measured (Sequalitchew Lake Outlet, Diversion Weir, Center Drive, and mid-ravine and lower ravine Sequalitchew Creek stations), as well as at the continuous water level monitoring stations in East Edmond Marsh (SG-EM-1 and SG-EM-2). The pressure transducers used to monitor water levels will be equipped with temperature sensors and will record water temperature every 15 minutes. The monitoring data will allow for developing temperature profiles along Sequalitchew Creek from headwaters to near the mouth.

These monitoring data will inform the adaptive management components of the Restoration Plan. The Restoration Plan includes several restoration elements that either include specific components that would reduce temperatures, or include flexible elements that could be implemented adaptively in response to monitoring data that indicate unanticipated effects on stream temperature. Specifically, the following elements of the Restoration Plan have components related to temperature, beyond those aimed at increasing flow through the system:

> G – Losing Reach—restoration of riparian vegetation in the losing reach will benefit stream temperature through shading.
>
> J – Ravine Habitat—this element is intended to adapt to habitat conditions that emerge once flow is restored in the ravine. Envisioned as being used to enhance stream structure through large woody debris placement, it could also be used to address temperature issues by creating pools as refugia or shading through riparian plantings.

In addition to temperature, water quality monitoring will include periodic *in-situ* monitoring of temperature, dissolved oxygen, and turbidity at select surface water level monitoring locations.

Periodic *in-situ* water quality measurements of temperature, dissolved oxygen, and turbidity will be collected using portable water quality meters. Measurements will occur monthly, except during Dewatering Step 2, when measurements will be taken twice each month. These water quality data, used in conjunction with measurements of physical habitat characteristics, will inform the assessment of habitat conditions relative to performance thresholds in the Restoration Plan.

A special study of Hamer Marsh water quality will be developed and implemented separately as described in Section A.8.

A.4.5. Habitat

A.4.5.1. Wetland Habitat

The most important effect of the combined mining and restoration projects would be the restoration of a surface water and wetland community connection between the ravine and Edmond Marsh. Data collection discussed in this section is focused on detecting changes to vegetation and habitat structure. This will be used in conjunction with the collection of hydrology data (see section A.5.2) and topography to understand the effects of the project. Hydrology (water surface elevation) data will be used to further understand habitat changes:

- Changes in water surface elevations, particularly in East Edmond Marsh;
- Changes in the magnitude of seasonal fluctuation in water surface elevations;
- Changes in the location and amount of open-water habitat, specifically any loss of open-water habitat in East Edmond Marsh, or greater persistence (later in the growing season) of open water habitats in West Edmond Marsh; and
- The establishment of a surface water and wetland community connection between the ravine and Edmond Marsh.

The baseline wetland habitat monitoring approach (see Section A.2.2.4) will continue to be used to identify patterns in plant species presence, hydrology, and topography under changing conditions along these established transects for comparison and analysis with post-project conditions. New transects will be established between Edmond Marsh and Lower Sequalitchew Creek. Baseline data was not collected in this reach due to the lack of flow and wetland or riparian vegetation during the baseline period.

A.4.5.2. Stream Habitat

Stream habitat will be monitored by measuring physical habitat characteristics at consistent locations over time. Habitat monitoring stations will be established as cross sections of Sequalitchew Creek spaced 100 feet apart for 1,500 feet upstream of the BNSF culvert, then 200 feet apart upstream to the east end of Edmond Marsh. This will provide additional resolution in the area likely to be used for spawning by Chum.

At each section, the following physical parameters will be monitored: flow depth, velocity, substrate size and cover. Cross sections will be monitored in years 0, 1, 2, 3, 5, and 10 commencing prior to construction of the first Restoration Plan element.

Observations of fish presence and active erosion will be noted during the cross-section surveys. Surveys of large woody material will be conducted in years 5 and 10.

A.4.6. Precipitation

Precipitation will be continuously monitored with a tipping bucket rain gage to be located on or near the South Parcel (e.g., City Hall, Pioneer Middle School, or Chloe Clark Elementary). An on-site, program-operated rain gage will likely provide a more complete data set that is of known quality and will better represent precipitation occurring within the watershed than would data from the McMillin Reservoir rain gage, which has been used for prior monitoring efforts.

A continuous precipitation record will provide a context for evaluating short-term changes in surface water and shallow groundwater levels, stream flows, and water quality conditions monitored within the watershed in response to storm events. Observed seasonal precipitation patterns will be used in the analysis of seasonal groundwater and surface water levels, stream flows, and water quality conditions.

The rain gage will be installed at the top of a 1.5-inch-diameter steel pole, approximately 10 feet above the ground surface. The rain gage will be wired to a data logger that will record and totalize rainfall on a 15-minute interval. The data logger will be housed in a durable, weatherproof steel enclosure.

The rain gage will be maintained per manufacturer's recommendations (see Section A.5.7 for methods). The rain gage will be capable of measuring only liquid precipitation (i.e., rainfall or melted snow); it will not be a heated rain gage capable of melting snow. Alternate rain data from the McMillin Reservoir rain gage or PRISM estimates of gridded precipitation for the project area will be used should the project rain gage malfunction.

A.5. Monitoring Procedures

This section provides specific procedural guidelines regarding routine field measurement and maintenance activities pursuant to the monitoring objectives detailed in the previous section.

Campbell Scientific (CSI) pressure transducers and data loggers will be employed at groundwater, surface water, streamflow monitoring stations, which continually measure level and water temperature. A project rain gage will be installed at one of the central monitoring stations, and be recorded by the station data logger. Equipment specifications and installation guidelines for continual monitoring stations includes the following:

- Parameter data (e.g., level, temperature, precipitation) will be recorded at a minimum of 15-minute intervals.
- Transducers selected for each station will be designed with a PSI range and cable length that is appropriate for the range of water levels expected in the observation well or surface water environment.
- Transducer sensor diaphragms will be vented to the atmosphere; eliminating corrections regarding barometric pressure compensation.
- Groundwater pressure transducers will be suspended from a fixed reference point in each monitoring well, at a point below the lowest expected water level. Suspending

the transducer prevents corrosion/interference of benthic sediment, or level discrepancies/drift due to settling.

- Surface water pressure transducers will be installed at a fixed point within a PVC stilling well, adjacent to the station staff plate.
- All level and flow rate measurements will be reported in decimal-feet and cubic feet per second (cfs), respectively.

Water levels measurements at stations recording continuous data will be maintained within a 0.02-foot tolerance. If the difference between the level measured during site inspections and the data logger recorded level is greater than ± 0.02 feet, field personnel will calibrate the data logger recorded level during routine site inspections. Differences in level, as well as calibration points, will be recorded on field sheets. Level drift observed from either the pressure transducer, or movement of the suspension cable, will be corrected by linear interpolation within the project dataset.

A.5.1. Routine Station Inspections

Routine site inspections will occur at least monthly while the project is actively collecting water quality, level, and/or flow data. Field staff will complete a field data collection form, or electronic equivalent, when conducting station inspections (see example in Attachment B). During monthly inspections, all equipment will be maintained per manufacturer recommendation, and include the following tasks:

- Download data logger module records;
- Maintain station grounds for clear and safe access;
- Clean and maintain enclosures, sensors, and monitoring equipment;
- Change/charge station batteries; and
- Calibrate/verify the accuracy, precision, and operation of sampling and monitoring equipment.

All observed and recorded field measurements, as detailed below, will be updated within the project database following routine inspection activities.

A.5.2. Groundwater levels

Groundwater levels are measured in monitoring well stations using a 150- or 300-foot electronic water level indicator. Depth to water is measured from a black mark on the top of the well casing and recorded to the nearest 0.01 foot. The depth to water is converted to a groundwater elevation by subtracting the depth to water from the surveyed top of casing elevations. Groundwater level measurements will be conducted and recorded on field sheets, or electronic equivalents, during each routine site inspection.

The well casings are accessed by unlocking and removing the lids on the steel stick-up-style monuments protecting each well. MW-C5-3 is maintained by JBLM. A key to unlock MW-C5-3 is obtained from JBLM during each site visit.

A.5.3. Surface water levels

Surface water levels are visually observed/measured during routine site inspections from staff plate gages; measured to the nearest 0.01 foot. Water levels will be converted to surface water elevation by subtracting the staff gage height from the surveyed top-of-staff gage elevation and then adding the measured staff gage water level.

A.5.4. Streamflow

Streamflow monitoring for this project will be performed by continuously observing the water level in the stream and calculating flow using one of two methods: a standardized weir-discharge equation or a stage-discharge rating curve.

Stream water levels will be visually observed/measured during routine site inspections from staff plate gages. CSI pressure transducers at continuous-record streamflow stations will be calibrated to the correspond station staff-gage level. Spot level measurements and observations at all other stations will be recorded during routine inspections. All level measurements will be used to calculate and update discharge flow volumes from each station.

A.5.4.1. Weir-Discharge Equations

Streamflow at the Diversion Weir is calculated using a standard discharge equation for a fully contracted rectangular weir from the USBR's Water Measurement Manual (USBR, 2001). The equation relates discharge (Q) to the length of the weir (l) and depth (d) of water over the weir as follows:

$$Q = 3.33*(l - 0.2*d)*d^{(3/2)}$$

It is imperative to maintain flow through weirs free from debris and obstructions, to ensure accurate level/flow measurements. Weir discharge equations will be incorporated into the project database, to ensure precision when field personnel transcribe field observations and measurements.

A.5.4.2. Stage-Discharge Rating Curve

Open-channel streamflow monitoring stations require the development of flow rating curves, which relate observed water depths (i.e., stage) to flow volumes. Rating curves will be developed for each flow monitoring location based on manual flow measurements collected over a range of different flows.

Measurements of streamflow (in cubic feet per second [cfs]) will be made using the conventional current-meter method as described by the USGS (1982). Stream velocities will be measured and discharges are calculated using a SonTek Flowtracker, or other similar velocity meter.

In accordance with the USGS current-meter method, observations of width, depth, and velocity will be made at approximately 10 to 15 intervals in a cross section by wading the stream. The average velocity of each subsection will be taken at 0.6 of the depth below the water surface. That velocity represents the average velocity for that stream subsection, whose cross-section area will be calculated from the corresponding width and

depth measurements. A streamflow measurement is the sum of the flow in each subsection.

The recorded discharge measurements are plotted against corresponding stage heights. The stage-discharge rating (i.e., regression equation) is determined by plotting a best-fit line through a series of stage-discharge points.

Rating curves will be developed at streamflow monitoring stations during a minimum of three (3) different flow event regimes, including flows covering the low-, mid-, and high ranges of the depths expected in each channel. To measure flows at these ranges, field personnel will collect flow measurements during various intensity storm events, as well as baseflow conditions. For existing stations, the rating curves developed during baseline monitoring will be used initially.

Rating curves are evaluated by comparing sets of flow event measurements to determine if the average rating curve for each event graphs similarly on a stage-discharge plot. A change in curve shape or shift in location indicates a change in channel geomorphology and a new rating curve is developed and updated, as necessary. Manual streamflow measurements are made at periodic intervals to verify the rating curve and evaluate if there has been any change in the stage-discharge relationship caused by changes in channel geometry and/or channel roughness. Rating curves were previously developed and reported for the mid-ravine and lower Sequalitchew Creek stations (Aspect and Anchor, 2007), and have continued to evolve since. The rating curves from these stations will be evaluated against new flow-discharge measurements, to ensure updated and accurate rating curves are used.

A.5.5. Surface water quality

Surface water quality parameters, including temperature, dissolved oxygen, pH, and turbidity will be monitored at all surface water stations. Water quality parameters are measured with a YSI Pro Plus multiparameter meter and a Hach Turbidimeter or equivalent instruments.

Surface water temperature will be continually logged by integrated CSI pressure transducer temperature sensors or equivalent equipment (e.g., Onset Hobo/Tidbit© temperature loggers). Temperature sensors will have a minimum accuracy/precision range of +/- 0.2°C. Temperature sensors will be calibrated and maintained in accordance with Ecology's (2015) Standard Operating Procedure (SOP) for Continuous Temperature Monitoring of Fresh Water Rivers and Streams (EAP080). Deployment techniques for temperature sensors/loggers will follow guidance and from Ecology's SOP; however, may vary slightly based on alternative equipment specifications.

Table 4 summarizes the water quality parameters and standard methods that will be employed for the surface water quality monitoring objectives of this project.

Table 4. Water Quality Grab Sample Parameters and Methods

Sample Type	Field Collection Containers	Parameter	Holding Time	Method	Lab Sample Container	Preservative
Continuous	*In-situ* stream or surface water station	Temperature	N/A	Continually logged via CSI pressure transducer, or equivalent	*In situ* (n/a)	*In situ* (n/a)
Grab	1-liter poly	pH	15 minutes	EPA 150.1 via YSI	*In situ* (n/a)	*In situ* (n/a)
		Dissolved Oxygen	15 minutes	EPA 150.2 via YSI	*In situ* (n/a)	*In situ* (n/a)
		Turbidity	15 minutes	EPA 180.1 via YSI	*In situ* (n/a)	*In situ* (n/a)

Manual grab samples will be collected by directly filling sample bottles from the monitoring discharge point, using a “clean hands” approach. The principle of the “clean hands” technique is that field personnel wear appropriate noncontaminating, disposable, powderless gloves during the entire grab sample collection procedure; changing gloves frequently with each change in task.

In-situ measurements with the YSI multiparameter meter may be conducted by directly submerging the sensors into surface waters, so long as there is no interference from bottom sediments or debris.

A.5.5.1. Equipment maintenance

Monitoring equipment will be inspected and serviced as recommended by the manufacturer, or at least once preceding the deployment of temporary monitoring station setups. Generally, equipment maintenance includes: inspection, testing, calibration, and replacement of worn or missing components. Table 5 summarizes the water quality field equipment specifications for this project, including: parameters, decontamination, and calibration procedures.

Table 5. Field Monitoring Equipment Decontamination and Calibration Procedures

Equipment	Parameters	Decontamination Procedure	Calibration Procedures
YSI water quality multimeter, or equivalent	pH; dissolved oxygen	Rinse sensors thoroughly with DI water as needed Store sensors in KCl solution between uses.	Perform the following prior to each site inspection: • Three-point calibration of pH (4,7,10) • Dissolved oxygen using barometric pressure and/or saturation method
HACH Turbidimeter, or equivalent	Turbidity	Rinse sample vials thoroughly with DI water as needed.	Perform reference calibration before every sample period, in accordance with manufacturer specifications.
Continually logged via CSI pressure transducer, or equivalent	Temperature	Gently clean temperature loggers with a soft cloth or soft-bristled brush to remove any biofouling or sediment.	Record ten reference *in-situ* measurements using NIST field thermometer. Compare the mean absolute value of the NIST thermometer measurements against the continuous temperature logger for the same time period; ensure the mean difference isn't greater than 0.2°C.

A.5.5.2. Qualitative Observations

In addition to the quantitative observations of water quality described above, surface water stations will be qualitatively inspected for the following, where applicable:

- Channel conditions, including the presence/absence of beaver dams, downed trees, streambed composition, vegetation, and particularly fast or slow flow velocities.
- Water color, floating oil and grease, floating debris/scum, and materials that may be toxic or harmful to human or other life.

A.5.6. Habitat

Habitat data are collected for two purposes: 1) stream cross sections are measured for comparison with the performance and aspirational thresholds of Goal 2 of the Restoration Plan, and 2) wetland and additional stream habitat measurements are collected to understand the linkages between stream restoration activities and effects on habitat. The wetland and additional stream habitat measurements could inform decisions to employ additional adaptive management strategies or modify existing strategies to limit impacts and/or increase benefits. The supplemental data would not be applicable to the evaluation of performance or aspirational thresholds.

A.5.6.1. Wetland Habitat

Wetland habitat will be measured using established transects with surveyed topography that has been related to surface water monitoring stations. The protocols for point intercept methods for determination of the vegetation community will generally follow Heady et al., 1959. Vegetation data will be collected annually at the end of the growing season (September or October, typically). A tape measure will be strung between fixed points (T-stakes or rebar, typically) and all vegetation species present at each given interval (1-foot or 2-foot, depending on transect length) will be recorded along with the distance from the start of the transect for correlation to surveyed ground surface elevation and surface water elevation data collected throughout the growing season.

A.5.6.2. Stream Habitat

Habitat monitoring stations will be established as cross sections and marked with driven rebar, or similar, in the field. Stations will be spaced 100 feet apart for 1,500 feet upstream of the BNSF culvert, and will be spaced 200 feet apart upstream to the east end of Edmond Marsh. At each section, the following data will be collected, at the frequency indicated in Table 6.

Table 6. Stream Habitat Monitoring Parameters and Methods

Parameter	Method	Precision/ units	Frequency
Depth	Measured every 2 feet within the wetted width of the section using a stadia rod.	0.1 foot	Years 0,1,2,3,5,10
Velocity	Measured at least every 2 feet within the wetted width of the section with a minimum of five measurements using a current velocity meter (Swoffer 2100 or similar).	0.1 feet per second (fps) for velocities between 0.5 and 25 fps	Years 0,1,2,3,5,10
Substrate size	D50 of randomly chosen substrate at least every 2 feet within the wetted width of the section with a minimum of 10 measurements.	1 mm	Years 0,1,2,3,5,10
Cover	Densiometer	Intersects	Years 0,1,2,3,5,10

Additional observations will be collected along the creek and referenced by distance upstream from the BNSF culvert (by station), as shown in Table 7.

Table 7. Additional Habitat Observations

Parameter	Method	Precision/ units	Frequency
Large Woody Material	Repeat existing survey based on methodology by Fox and Boulton (2007).	Count	Years 5, 10
Fish Presence	Visual identification	Species/ size (approx.)/ behavior	0,1,2,3,5,10
Active erosion	Visual identification	Photo documentation with scale	0,1,2,3,5,10

All data, except large woody material, will be collected once per indicated year in November or December when flows are between 100 and 200 percent of mean monthly average flow (or as predicted during years 1 and 2). Data on large woody material can be collected at any time of year.

All data will be presented in an annual monitoring report, including summarization and analysis of the data in terms of the quantity of usable and optimal habitat for Chum spawning and salmonid rearing. Trends over monitoring years will be included along with adaptive management considerations regarding the project performance or this sampling methodology.

A.5.7. Precipitation

For this project, a Hydrological Services Model TB3, or similar, tipping bucket rain gage will be installed at the designated site on the South Parcel. This instrument measures rainfall at 0.01-inch increments. The rain gauge will be connected to a CSI data logger, recording rainfall data at 15-minute intervals. The rain gage will be downloaded at least once each month. Field staff will inspect the rain gage monthly and service as needed. Rain gage calibration checks will occur using the method and at the frequency recommended by the manufacturer.

A.6. Quality Control

This section presents the quality control (QC) requirements for field and laboratory activities associated with this project.

A.6.1. Field

Field measurement equipment, dataloggers, and pressure transducers will be maintained and calibrated every month, at a minimum, to help ensure proper monitoring station operation. Preventative maintenance of the pressure transducers and water quality multimeters will be performed as specified by the manufacturer. The pressure transducers and sensors will be calibrated to the manufacturer's recommendations.

Original field records will be maintained in designated binders for all monitoring and field-related activities using project-specific forms, and guided by the procedures outlined in this SAP. Field documentation will include monthly inspection field sheets, maintenance/calibration logs, COC forms, and other required documentation. All entries in field notebooks will be written in pencil or waterproof ink. When errors are made,

project staff cross-out the error and enter the correct information. All corrections will be initialed and dated. Electronic equivalents of field forms may be used.

Field personnel will employ the following additional field-sample collection QC procedures, as needed:

- Collect grab water quality samples in certified contaminant-free or properly decontaminated containers.
- Use "clean hands/dirty hands" sampling techniques (that is, one team member performs "dirty tasks," while the other member performs "clean tasks," such as handling sample collection bottles).
- Hold samples on ice in coolers during retrieval and delivery to analytical laboratory.
- Deliver samples to analytical laboratory with proper chain of custody, and within holding times.

A.6.2. Laboratory

An accredited laboratory will be contracted to complete additional analyses, as needed, by the inclusion of special studies. Analytical test methods will be standardized and in accordance with procedures approved under 40 Code of Federal Regulations (CFR) §136. The minimum laboratory QA/QC requirements shall also include, but may not necessarily be limited to the following:

- Calibration of analytical laboratory instruments within acceptable limits.
- Periodic inspection, maintenance/servicing, and analysis of quality indicator samples, as necessary, to determine the accuracy and precision of procedures, instruments, and operators.
- Statistical procedures, such as control charts to monitor the precision and accuracy of the analytical data and to establish acceptance ranges and control limits. These data shall be maintained with project records and available upon request or during an audit.
- A continuous review of results to identify and correct problems originating with the instrument, the methodology or the analyst.
- Thorough documentation of the performance of systems, procedures, and operators.
- Certify that electronic data deliverables will exactly match all hard copy data.
- Provide notification of all nonconforming events and conditions, including missed holding times and delays in turnaround time, potentially impacting sample analysis.

A summary of laboratory QA/QC procedures will be requested in the final analytical report deliverables.

A.7. Data Management

This section describes the data management procedures to be used for ensuring access to consistently reliable data. The data management procedure includes 1) recording measurements in the field, 2) downloading data from storage devices in the field, and 3) transferring these data into project databases. There are two separate databases, one for hydrologic data and managed by the hydrology/water quality consultant, and a second for storing vegetation information from the wetland transects and quadrats in the marshes and creek, managed by the habitat consultant. This section defines the structure, inputs, outputs, and quality assurance(QA) and quality control (QC) procedures for the hydrologic database. These data management procedures closely follow those used for current and prior monitoring activities.

A.7.1. Hydrologic Data Collection

Field measurements/observations will be recorded in the field notebook. The field notebook will include the following data sheets: field visit data sheets, field equipment calibration sheets, and the equipment maintenance activity log. Custom field data sheets will be developed for the actual equipment installed. Examples of field data sheets are in Attachment B. Electronic equivalents of field forms may be developed and used.

The Data Collection Lead is responsible for updating and storing the field notebook. The field notebook will be photocopied monthly, and the copy stored at the Consultant's offices. Data loggers will be downloaded onto a project-designated field computer using applicable software and returned to the Consultant's office for transfer to the project database, as described below. Information from field notebook is transcribed into the project database manually. The project data files and database are stored on the Consultant's server, which is to be backed up for disaster recovery purposes at least once per week.

A.7.2. Hydrologic Database Structure

Hydrologic data are stored in an existing central Microsoft Access database created for the ongoing monitoring activities, and a set of specially formatted spreadsheets for ISCO datalogger data. The database will be used to assist with the analysis of groundwater and surface water conditions, and both consolidation and dissemination of information to other parties. The database provides a central storage area for ongoing data collected by Aspect Consulting, LLC and previous data sources, and allows data to be viewed in a uniform manner.

This database is structured such that, whenever possible, user input is validated using predefined formats and common terms making data input fast and simple, while ensuring that data can be accessed reliably through predefined queries. The data management tools in the database include:

- Task/field event setup for verifying completeness of data;
- Manual data entry;
- Querying and reporting tools; and

- Output of graphs and tabulated data.

Additional features designed to protect the integrity of the data and ensure smooth operation of the database include compact on close, tag data additions and modifications with date/time stamp and user id, and "*edit guard*" function that avoids inadvertent editing errors.

Due to the volume of ISCO bubbler data collected since 2004, it is currently managed as a set of Excel spreadsheets that combine to allow storage, correction, and graphing of the raw 15-minute stage data into final analysis and figures.

A.7.3. Database Inputs

Existing hydrologic data currently reside in the database. Data from planned monitoring described in this SAP will be routinely entered into the database as described below.

A.7.3.1. Existing Data

The following types of data were previously input for existing monitoring points:

- Survey coordinates and elevation data for staff gages and well top-of-casing elevations;
- Staff gage and well water level data;
- 15-minute continuous-record stream stage data;
- Stream stage-discharge rating equations for SC-Upper and SC-Lower;
- Standard weir equation for the Diversion Weir; and
- Spot flow measurements.

Existing water quality data is stored in an EQUIS database.

A.7.3.2. New Data

Data inputs from planned data collection include:

- Survey coordinates and elevation data for new staff gages (e.g., at SC-Center Drive gaging station and Sequalitchew Lake Outlet gaging station);
- New surface water staff gage measurements;
- Depth to groundwater measurements from wells;
- Monthly 15-minute stage-height data files for continuous flow and surface water monitoring stations;
- Monthly 15-minute groundwater level data files for continuous groundwater level monitoring stations;
- Monthly 15-minute precipitation data files from on-site rain gage;
- Water quality data;
- New manual streamflow flow measurements; and

- New stream stage-discharge rating equations, as necessary.

Staff gage, depth-to-groundwater, and spot water quality measurements are manually entered directly into the database using the manual data entry form following each field visit. The form includes fields for all monitoring data to help verify completeness.

Continuous stage height, groundwater level, temperature, and precipitation data files are loaded into the database and verified against manual measurements. Manual streamflow measurements and staff gage readings for the Sequalitchew Lake Outlet, SC-Center Drive, SC-Upper, and SC-Lower gaging stations are also entered into MS Excel to evaluate the appropriateness of the current rating curves for each station. When a new rating equation is necessary, it is entered manually into the database and applied to a specific date range for the station.

A.7.3.3. Back-up Precipitation Data

In the event the project rain gage malfunctions, precipitation data from the McMillin Reservoir weather station will be used to fill data gaps, as available. The McMillin Reservoir weather station is located about 20 miles northeast of the project area. This gage was selected as the most appropriate source of back-up precipitation data because it is the closest station with a lengthy period of record, and it receives similar monthly and annual precipitation amounts (Aspect, 2004a).

The precipitation data from McMillin Reservoir are collected as a part of the National Weather Service's (NWC) Cooperative Observer Program (COOP). Electronic files of daily precipitation can be downloaded from the COOP website and imported directly into the database using automated data import routines.

A.7.4. Database Outputs

Figures and tabulated data outputs are generated by an either automated output from the database, or generated via spreadsheet through Tableau. When new figures or tables are desired, water levels and flows are recalculated and printed from their appropriate software.

Water level elevations are calculated in the database, based on the supplied reference elevations for each point. The surveyed elevation of staff gages and monitoring wells is input in the database with a timestamp of when it was measured. Old water levels can be recalculated, based on resurveyed reference elevations when new ones become available.

Raw stage data from the continuous record stream gages is processed with the supplied stage-discharge ratings. Each station has a list of correlations that are applied over a specified time frame—typically for a given year or set of years. From the processed stage data, streamflow in either hourly or 15-minute data intervals is then averaged to mean daily flow for use in graphs and tables.

Precipitation data from the site rain gage is processed to calculate daily, monthly, and annual precipitation totals. Precipitation data at the appropriate time scale is exported to Excel for display on graphs and tables. The data export includes qualifiers indicating the quantity of missing data, if any.

Water quality data are stored and processed in the database. Continuous temperature data will be aggregated to calculate daily and monthly minimum and maximum temperatures as well as the 7-day average of daily maximum temperatures (7-DADMax), which has regulatory significance. Periodic water quality observations will also be output from the database.

A standard monthly report will be developed to assist with routine sharing of information during the mining and restoration projects. The report format will present a summary of observations for the prior month, and compare the observations with relevant performance and aspirational thresholds to determine if the adaptive management processes have been triggered.

A.7.5. QA/QC Protocol

QA/QC protocol for this project fall into three categories, based on which step of data collection and entry is taking place. Data QA/QC occurs during data collection in the field, data entry, and data reporting.

Key components of each QA/QC procedure are summarized below.

A.7.5.1. Data Collection

- The task/field event setup feature identifies all current monitoring points, and organizes them in the order that the data is typically collected on preprinted field forms. This feature helps ensure the completeness of data, especially in the event of field staff turnover.
- While measurements are being collected, the field staff quickly references the previous event's field form to verify the current measurement seems reasonable, and remeasures if necessary.

A.7.5.2. Data Entry

Manual data entry utilizes real-time data verification against defined valid values, acceptable data ranges, expected parameters, and standard data formats. Entries that fall outside these defined parameters will return an error message and reject the data.

A.7.5.3. Data Reporting

After each data entry event, data is reviewed in tabulated and graphical formats. This allows the user to readily identify data outliers and missing values. Data tables and figures will be inspected each month as a final step to verify the completeness and quality of monitoring data.

A.7.6. Data Archival (EIM)

To provide long-term data preservation by a neutral party, data collected under this SAP will be uploaded annually to Ecology's Environmental Information Management (EIM) database: http://www.ecy.wa.gov/eim/. Alternately, data collected by a governmental party with a similar, publicly accessible database (e.g., USGS's Nationwide Water Information System) may be stored in that database.

A.8. Special Studies

This SAP describes the routine monitoring approaches and methods for use in implementing the mining and restoration plans. Those plans also identify several special studies—notably the 60-day pumping test proposed as Step 1 of dewatering, and a study of water quality in Hamer Marsh to determine if it is adequate for improving the connection to Sequalitchew Creek. Specific plans will be developed for these studies, and others that may arise during implementation and adaptive management of the projects.

A.9. References

Anchor Environmental (Anchor), 2004, Fish Habitat Benefit Evaluation for Sequalitchew Creek, Pioneer Aggregates North Sequalitchew Creek Project, July 2004.

Aspect Consulting, LLC (Aspect), 2004a, Technical Memorandum: Surface Water and Groundwater System with Predictions on Effects to Wetland Hydrology Upstream of Proposed North Sequalitchew Creek, Prepared for Glacier Northwest, July 21, 2004.

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Washington State Department of Ecology (Ecology), 2015, Standard Operating Procedures for Continuous Temperature Monitoring of Fresh Water Rivers and Streams, EAP080, Version 2.0, Recertified: February 27, 2015.

V:\040001 DuPont South Parcel\Monitoring Plan\Final\Appendices\Sampling and Analysis Plan\Sampling and Analysis Plan_10042017.docx

TABLES

Table 1 - Summary of Baseline Monitoirng Program

Project No.: 040001-014-03, DuPont, Washington

Station ID	Summary of Monitoring					Description
	Surface Water	Streamflow	Water Quality	Groundwater Elevation		
				Shallow	Deep	
MW-BM-1				X		Bell Marsh - Monitoring Well
SG-BM-1	X					Bell Marsh - Stage Gage
SG-MKM-1	X					McKay Marsh - Stage Gage
MW-HM-1				X		Hamer Marsh - Monitoring Well
MW-SRC-2				X		Hamer Marsh - Monitoring Well
SG-HM-1	X		X			Hamer Marsh - Stage Gage
G-Diversion Weir	X	X	X			Diversion Canal - Continuous Stage Gage and Discharge Transect
SG-DC-1	X	X				Diversion Canal - Stage Gage and Discharge Transect
SG-DC-2	X	X				Diversion Canal - Stage Gage and Discharge Transect
SG-DC-3	X	X				Diversion Canal - Stage Gage and Discharge Transect
MW-D-3				X		Diversion Canal - Monitoring Well
IW-93-MFS-C5-3				X		Diversion Canal - Monitoring Well
MW-SL-1				X		Sequalitchew Lake Outlet - Monitoring Well
SG-SCM-1	X					Sequalitchew Creek Marsh - Stage Gage
SG-EM-3E	X					Edmond Marsh - Stage Gage
SG-EM-3W	X					Edmond Marsh - Stage Gage
MW-EM-3				X		Edmond Marsh - Monitoring Well
SG-EM-2E Island	X					Edmond Marsh - Stage Gage
G-EM-2W Culvert	X					Edmond Marsh - Stage Gage
MW-EM-2(D)					X	Edmond Marsh - Monitoring Well
MW-EM-2(S)				X		Edmond Marsh - Monitoring Well
SG-WL1D-1	X					Edmond Marsh - Stage Gage
MW-WL1D-1				X		Edmond Marsh - Monitoring Well
SG-EM-1	X					Edmond Marsh - Stage Gage
SG-EM-1A	X					Edmond Marsh - Stage Gage
MW-EM-1(D)					X	Edmond Marsh - Monitoring Well
MW-EM-1(S)				X		Edmond Marsh - Monitoring Well
MW-PL-1				X		Pond Lake - Monitoring Well
SG-PL-1	X					Pond Lake - Stage Gage
CHMW-1				X		Mine Area - Monitoring Well
CHMW-2-D					X	Mine Area - Monitoring Well
CHMW-2-S				X		Mine Area - Monitoring Well
CHMW-3-D					X	Mine Area - Monitoring Well
CHMW-3-S				X		Mine Area - Monitoring Well
CHMW-4-D					X	Mine Area - Monitoring Well
CHMW-4-S				X		Mine Area - Monitoring Well
OB-1				X		Mine Area - Monitoring Well
SG-SC-Lower		X				Sequalitchew Creek - Continous Stage Gage and Discharge Transect
SG-SC-Upper		X	X			Sequalitchew Creek - Continous Stage Gage and Discharge Transect

Table 3 - Relationship of Proposed Monitoring to Adaptive Management Thresholds

DRAFT

Project No. 040001-014-03, DuPont, Washington

Plan Objectives			Sampling and Analysis Plan Elements[1]				
			Precipitation	Groundwater Level			
			on-site rain gage	Dewatering Wells	Key Wells: CHMW-1, CHMW-2S&D, CHMW-3S&D, CHMW-4S&D, MW-EM-1S&D, MW-EM-2S&D	MW-BM-1, MW-HM-1, MW-D-3, MW-93-MFS-C5-3, MW-SRC-2, MW-SL-1, MW-EM-3, MW-WLD-1, MW-PL-1	Two new monitoring wells in mine interior
South Parcel Monitoring Plan Objectives	Step 1 - Initial Pumping Test	Groundwater levels at monitoring wells near Edmond Marsh and Sequalitchew Creek are at or above predicted, approved-upon levels.	continuous		continuous	monthly	
		Moisture content of mined aggregate is at appropriately low levels for safe and efficient mining and processing.	continuous	continuous			
	Step 2 - Prep for Mining/ Dewatering Test	Groundwater levels at monitoring wells near Edmond Marsh and Sequalitchew Creek are at or above predicted, approved-upon levels.	continuous		continuous	twice monthly	
		Moisture content of mined aggregate is at appropriately low levels for safe and efficient mining and processing.	continuous	continuous			as needed
	Step 3 - Active Dewatering During Mining	Groundwater levels at monitoring wells near Edmond Marsh and Sequalitchew Creek are at or above predicted, approved-upon levels.	continuous		continuous	twice monthly for 3 months after new dewatering wells are brought on line, then monthly	
		Moisture content of mined aggregate is at appropriately low levels for safe and efficient mining and processing.	continuous	as needed			as needed
	Step 4 - Cessation of Active Dewatering	Groundwater levels at monitoring wells near Edmond Marsh and Sequalitchew Creek are at or above predicted, approved-upon levels.	continuous		continuous	monthly	
		Moisture content of mined aggregate is at appropriately low levels for safe and efficient mining and processing.	continuous	as needed			as needed
Sequalitchew Creek Restoration Plan Objectives	After Elements B, C, and D,	Achieve year-round surface water flow in Sequalitchew Creek from Sequalitchew Lake to the mouth, as climate conditions allow.	continuous				
		Minimize the flow lost to the Diversion Canal.	continuous				
	After B, C, D, and G	Increase access to suitable spawning and rearing habitat in Sequalitchew Creek	continuous				

Notes:

1) additional monitoring locations may be added through adaptive management

* Continue routine monitoring of flow and surface water stations to aid in interpretation of groundwater measurements. Flow and surface water stations do not have Monitoring Plan performance thresholds.

Table 3 - Relationship of Proposed Monitoring to Adaptive Management Thresholds

Project No. 040001-014-03, DuPont, Washington

Plan Objectives			Sampling and Analysis Plan Elements*					
			Flow			Surface Water Level		
			Sequalitchew Lake Outlet	Diversion Weir	Sequalitchew Creek gages (Center Drive, mid-ravine, and SC-Lower)	West Edmond (SG-EM-1/1A and SG-EM-2W)	East Edmond and Sequalitchew Creek Marshes (SG-SCM-1, SG-EM-3E, SG-EM-3W, SG-EM-2E)	Hamer, McKay, and Bell Marshes (SG-HM-1, SG-MKM-1, SG-BM-1)
South Parcel Monitoring Plan Objectives	Step 1 - Initial Pumping Test	Groundwater levels at monitoring wells near Edmond Marsh and Sequalitchew Creek are at or above predicted, approved-upon levels.	* continue routine monitoring			* continue routine monitoring		
		Moisture content of mined aggregate is at appropriately low levels for safe and efficient mining and processing.						
	Step 2 - Prep for Mining/ Dewatering Test	Groundwater levels at monitoring wells near Edmond Marsh and Sequalitchew Creek are at or above predicted, approved-upon levels.	* continue routine monitoring			* continue routine monitoring, but at twice monthly frequency		
		Moisture content of mined aggregate is at appropriately low levels for safe and efficient mining and processing.						
	Step 3 - Active Dewatering During Mining	Groundwater levels at monitoring wells near Edmond Marsh and Sequalitchew Creek are at or above predicted, approved-upon levels.	* continue routine monitoring			* continue routine monitoring, but at twice monthly for first three months after new dewatering wells are brought on line, then monthly		
		Moisture content of mined aggregate is at appropriately low levels for safe and efficient mining and processing.						
	Step 4 - Cessation of Active Dewatering	Groundwater levels at monitoring wells near Edmond Marsh and Sequalitchew Creek are at or above predicted, approved-upon levels.	* continue routine monitoring			* continue routine monitoring		
		Moisture content of mined aggregate is at appropriately low levels for safe and efficient mining and processing.						
Sequalitchew Creek Restoration Plan Objectives	After Elements B, C, and D,	Achieve year-round surface water flow in Sequalitchew Creek from Sequalitchew Lake to the mouth, as climate conditions allow.	continuous		continuous	continuous	monthly	monthly
		Minimize the flow lost to the Diversion Canal.		continuous				
	After B, C, D, and G	Increase access to suitable spawning and rearing habitat in Sequalitchew Creek			continuous	continuous	monthly	

Notes:

1) additional monitoring locations may be added through adaptive management

* Continue routine monitoring of flow and surface water stations to aid in interpretation of groundwater measurements. Flow and surface water stations do not have Monitoring Plan performance thresholds.

Table 3 - Relationship of Proposed Monitoring to Adaptive Management Thresholds

Project No. 040001-014-03, DuPont, Washington

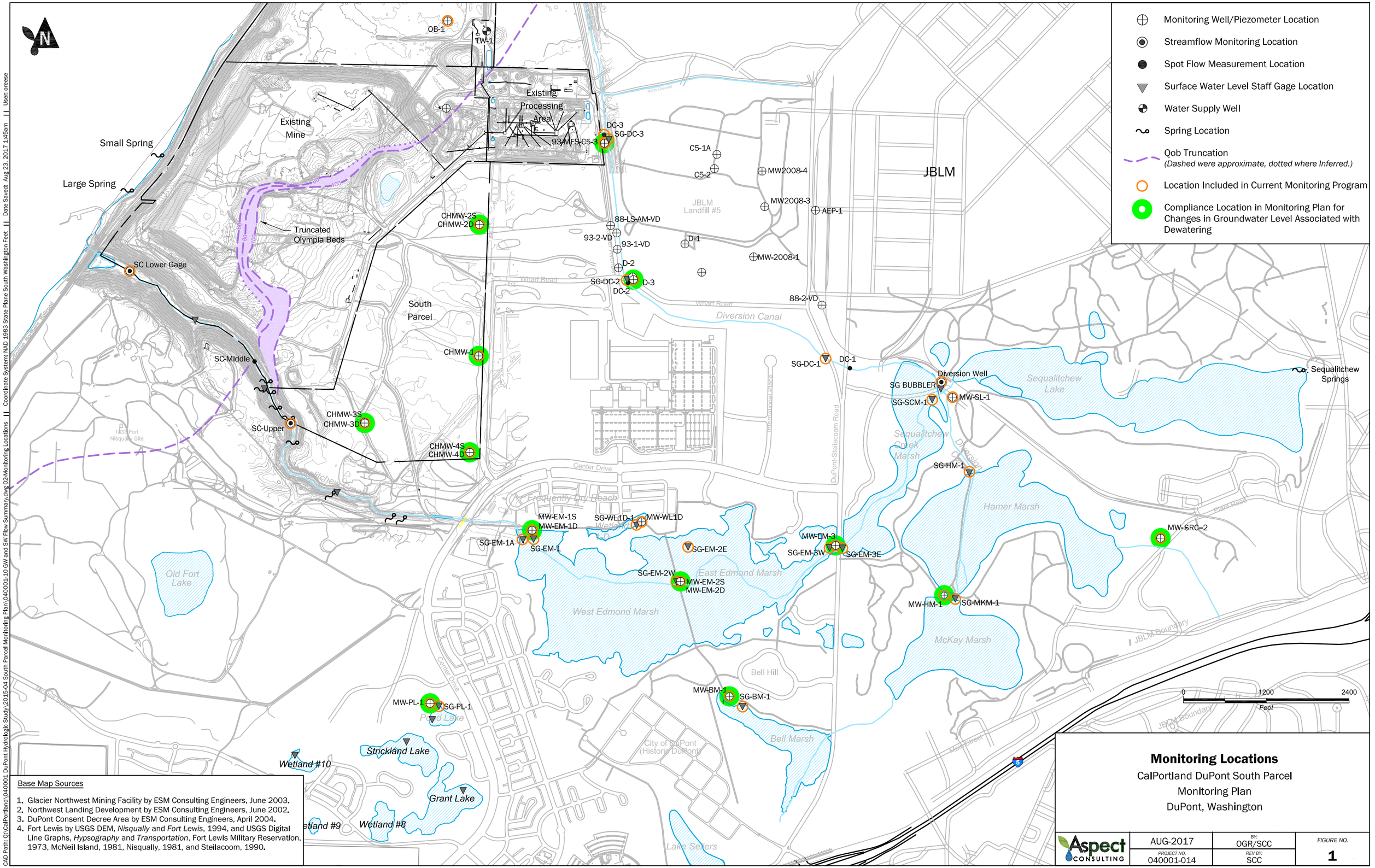
Plan Objectives			Sampling and Analysis Plan Elements*				
			Water Quality		Habitat		
			Temperature at SG-EM-1, SG-EM-2W, Diversion Weir, Sequalitchew Lake Outlet, SC-Center Drive, mid-ravine, SC-Lower	Water quality sampling for DO, turbidity, pH, Temperature at select surface water stations	Cross-section physical characteristics (depth, velocity, substrate,and cover)	Visual Observations (fish presence, active erosion)	Large Woody Material
South Parcel Monitoring Plan Objectives	Step 1 - Initial Pumping Test	Groundwater levels at monitoring wells near Edmond Marsh and Sequalitchew Creek are at or above predicted, approved-upon levels.					
		Moisture content of mined aggregate is at appropriately low levels for safe and efficient mining and processing.					
	Step 2 - Prep for Mining/ Dewatering Test	Groundwater levels at monitoring wells near Edmond Marsh and Sequalitchew Creek are at or above predicted, approved-upon levels.					
		Moisture content of mined aggregate is at appropriately low levels for safe and efficient mining and processing.					
	Step 3 - Active Dewatering During Mining	Groundwater levels at monitoring wells near Edmond Marsh and Sequalitchew Creek are at or above predicted, approved-upon levels.					
		Moisture content of mined aggregate is at appropriately low levels for safe and efficient mining and processing.					
	Step 4 - Cessation of Active Dewatering	Groundwater levels at monitoring wells near Edmond Marsh and Sequalitchew Creek are at or above predicted, approved-upon levels.					
		Moisture content of mined aggregate is at appropriately low levels for safe and efficient mining and processing.					
Sequalitchew Creek Restoration Plan Objectives	After Elements B, C, and D,	Achieve year-round surface water flow in Sequalitchew Creek from Sequalitchew Lake to the mouth, as climate conditions allow.					
		Minimize the flow lost to the Diversion Canal.					
	After B, C, D, and G	Increase access to suitable spawning and rearing habitat in Sequalitchew Creek	continuous	monthly	Years 0, 1, 2, 3, 5 and 10		Years 5 and 10

Notes:

1) additional monitoring locations may be added through adaptive management

* Continue routine monitoring of flow and surface water stations to aid in interpretation of groundwater measurements. Flow and surface water stations do not have Monitoring Plan performance thresholds.

FIGURE



Base Map Sources

1. Glacier Northwest Mining Facility by ESM Consulting Engineers, June 2003.
2. Northwest Landing Development by ESM Consulting Engineers, June 2002.
3. DuPont Consent Decree Area by ESM Consulting Engineers, April 2004.
4. Fort Lewis by USGS DEM, *Nisqually* and *Fort Lewis*, 1994, and USGS Digital Line Graphs, *Hypsography* and *Transportation*, Fort Lewis Military Reservation, 1973, McNeil Island, 1981, Nisqually, 1981, and Steilacoom, 1990.

Monitoring Locations

CalPortland DuPont South Parcel
Monitoring Plan
DuPont, Washington

Aspect Consulting	AUG-2017	BY: OGR/SCC	FIGURE NO. 1
	PROJECT NO. 040001-014	REV BY: SCC	

CAD Path: Q:\CalPortland\040001 DuPont Hydrologic Study\2015-04 South Parcel Monitoring Plan\040001-10 GW and SW Flow Summary.dwg 02-Monitoring Locations || Coordinate System: NAD 1983 State Plane South Washington Feet || Date Saved: Aug 23, 2017 1:45am || User: oreese

APPENDIX A

Boring Logs

14P1

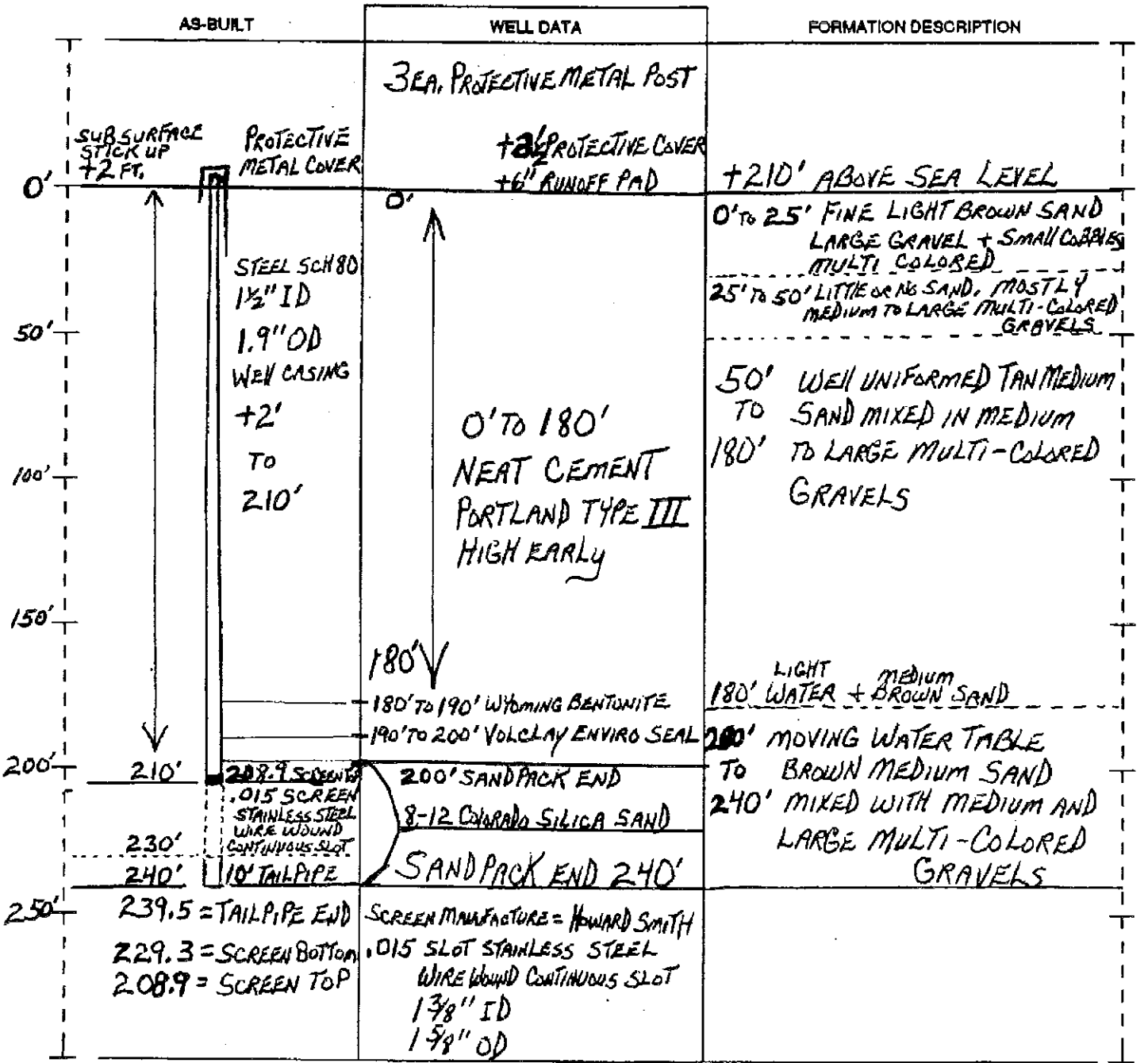
21 FEB 9

RESOURCE PROTECTION WELL REPORT

START CARD NO. 063977

PROJECT NAME: LONESTAR NW OBSERVATION WELL
WELL IDENTIFICATION NO. LONE STAR OB-1
DRILLING METHOD: REVERSE CIRCULATION ROTARY
DRILLER: DOUGLAS GRABOWSKI
FIRM: BECKER DRILLS INC.
SIGNATURE: William J. Flickey
CONSULTING FIRM: HART CROWSER
REPRESENTATIVE: TOM NOYES

COUNTY: PIERCE
LOCATION: SE¼ SW¼ Sec 14 Twn 19N R 1E
STREET ADDRESS OF WELL: NORTHWEST LANDING ANNEX DUPONT STEILACOOM ROAD DUPONT WASHINGTON
WATER LEVEL ELEVATION: 200 FT. STATIC
GROUND SURFACE ELEVATION: +210
INSTALLED: FEBRUARY 15, 1991
DEVELOPED:



SCALE: 1" = 50 FEET

PAGE 1 OF 1

ECY 050-12 (Rev. 11/89)

The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report

CH2MHILL

Well Number: CHMW-1

Sheet: 1 of 1

Client: Glacier NW
Project: N Sequalitchew Creek Aquifer Tests
Location: DuPont, Washington
Project Number: 151973.A2.AT

Driller: Hokkaido Drilling (Bill & Steve)
Drilling Method: Speedstar 15 Truck-Mounted Air Rotary
Sampling Method: Sand pump (water added)
Logged by: driller
Start/Finish Date: 9/23/99 - 9/24/99

Depth (ft)	Sample Info: Sample #	Sample Info: STP (6"-6"-6")	Soil Log	Soil Description	Depth / Elev	Well Drawing	Well Construction Notes
-5					5		
					217		Monument (not shown)-- Lockable 6" steel protective casing in concrete.
0				Ground Surface			
				Topsoil	2		
5				Sand and gravel with silt, dry, brown	210		
10							Casing - 2" sch 40 PVC pipe
15							
20					22		
				Brown silty gravel	190		
25					26		
				Brown gravel, like till	186		
30					33		
				Brown silt	179		
35				Light brown gravel, productive water-bearing zone			
40							
45							
50							
55					57		
				Dark brown gravel and sand. Note no "soupy sand" like in CHTW-1.	155		
60							Casing Seal - Hydrated medium bent
65							
70							
75					76		Filter pack - 10-20 CSSI sand
				Dark brown sand and gravel	136		Screen - 2" sch 40 PVC, 0.020-in slot
80					82		
				Gray-blue silty sand, sand and gravel.	130		
85					85		6" end cap
					127		

CH2MHILL

Well Number: CHMW-2(S)

Sheet: 1 of 1

Client: Glacier NW
Project: N Sequalitchew Creek Aquifer Tests
Location: DuPont, Washington
Project Number: 151973.A2.AT

Driller: Hokkaido Drilling (Daryl & Tom)
Drilling Method: Star 71 cable tool, 8" steel casing
Sampling Method: Sand pump (water added)
Logged by: driller
Start/Finish Date: 11/17/99 - 11/19/99

Depth (ft)	Sample Info: Sample #	Sample Info: STP (6"-6"-6")	Soil Log	Soil Description	Depth / Elev	Well Drawing	Well Construction Notes
-5					5 212		Monument (not shown)-- Lockable 6" steel protection casing in concrete.
0				Ground Surface Topsoil and gravel	3		
5				Brown silty sand and gravel	204		
10							Casing - 2" sch. 40 PVC pipe
15							Casing seal - Hydrated medium bentc
20					21		
25				Larger gravel and sand, slightly silty, very hard	186 26		
30				Brown silty sand, gravel Sandier with gravel	181		Sandy filterpack - 10-20 CSSI sand
35					36		
40				Clean sand and gravel, water	171		Screen - 2 centralizers, 2" sch 40 PV(0.020-inch slot width
45					43		6" end cap
50				End of Log	164		

CH2MHILL

Well Number: CHMW-2(D)

Sheet: 1 of 1

Client: Glacier NW
Project: N Sequalitchew Creek Aquifer Tests
Location: DuPont, Washington
Project Number: 151973.A2.AT

Driller: Hokkaido Drilling (Steve & Tom)
Drilling Method: Speedstar 15 & Star 71 Cable Tool
Sampling Method: Sand pump (water added)
Logged by: Driller
Start/Finish Date: 11/12/99 - 11/18/99

Depth (ft)	Sample Info: Sample #	Sample Info: STP (6"-6"-6")	Soil Log	Soil Description	Depth / Elev	Well Drawing	Well Construction Notes
-5					5 212		Monument (not shown): Lockable 6' steel protection casing in concrete
0				Ground Surface			
				Topsoil	4		
5				Brown silty gravel	203 9		
10				Brown gravel	198		Casing--2" sch 40 PVC pipe
15				Brown silty gravel, moist	15 192		
20					24		
25				Hard till, brown	[illegible]		
				Loose sand and gravel, water	181		
30							Casing Seal--Hydrated medium bentc
35				Brown till	35 172		
40							
45					48		
50				Loose sand and gravel, water	159		
55					58		
60				Brown silt bound sand and gravel, tight	149		
65					66		Screen - 2" sch 40 PVC, 0.020-in slot with centralizer
				no record	141		
70					73		6" end cap
75				End of Log	134		

CH2MHILL

Well Number: CHMW-3(D)

Sheet: 1 of 1

Client: Glacier NW
Project: N Sequalitchew Creek Aquifer Tests
Location: DuPont, Washington
Project Number: 151973.A2.AT

Driller: Hokkaido Drilling (Steve)
Drilling Method: Speedstar 15 Air Rotary Drill Rig
Sampling Method: Sand pump (water added)
Logged by: driller
Start/Finish Date: 11/4/99 - 11/5/99

Depth (ft)	Sample Info: Sample #	Sample Info: STP (6"-6"-6")	Soil Log	Soil Description	Depth / Elev	Well Drawing	Well Construction Notes
-5					5		Monument (not shown): Lockable 6" steel protective casing in concrete
					221		
0				Ground Surface			
				Brown topsoil	2		
5				Loose brown gravel	214		
10							Casing - 2" sch 40 PVC pipe
15					16		
				Brown silty sand and gravel	200		
20							
25					26		
				Brown silty sand and gravel (moist)	190		Casing seal - hydrated medium bento
30					31		
				Brown sand and gravel, dirty, water	185		
35							
40					41		
				Brown till	175		
45							
					48		
50				Sand and gravel, water	168		
					54		
55				Brown till	162		
				Silt, sand and gravel, brown, wet			
60							
					64		
65				Clean sand and gravel	152		
70							
							Filter pack - 10-20 CSSI sand
75							Screen - 2" sch 40 PVC, 0.020-in slot
80							
					85		6" end cap
85				End of Log	131		
90							

CH2MHILL

Well Number: CHMW-3(S)

Sheet: 1 of 1

Client: Glacier NW
Project: N Sequalitchew Creek Aquifer Tests
Location: DuPont, Washington
Project Number: 151973.A2.AT

Driller: Hokkaido Drilling (Steve)
Drilling Method: Speedstar 15 Air Rotary Drill Rig
Sampling Method: Sand pump (water added)
Logged by: driller
Start/Finish Date: 11/5/99

Depth (ft)	Sample Info: Sample #	Sample Info: STP (6"-6"-6")	Soil Log	Soil Description	Depth / Elev	Well Drawing	Well Construction Notes
-5					5 221		Monument (not shown): Lockable 6" steel protection casing in concrete
0				Ground Surface Brown topsoil	2		
				Loose gravel	214		
5							Casing - 2" sch 40 PVC pipe
10							
15					16		Casing seal - Hydrated medium bentc
				Silty brown sand and gravel	200		
20							
25					26		
				Moist silty brown sand and gravel	190		Filter pack - 10-30 CSSI sand
30					31		Screen - 2" sch 40 PVC, 0.020-in slot
				Clean sand and gravel, water	185		
35							
40					40		6" end cap
				End of Log	176		
45							

CH2MHILL

Well Number: CHMW-4(S)

Sheet: 1 of 1

Client: Glacier NW
Project: N Sequalitchew Creek Aquifer Tests
Location: DuPont, Washington
Project Number: 151973.A2.AT

Driller: Hokkaido Drilling (Steve)
Drilling Method: air rotary
Sampling Method: Sand pump (water added)
Logged by: driller
Start/Finish Date: 11/23/99

Depth (ft)	Sample Info: Sample #	Sample Info: STP (6"-6"-6")	Soil Log	Soil Description	Depth / Elev	Well Drawing	Well Construction Notes
-5					5 219		Monument (not shown): Lockable 6" steel protective casing
0				Ground Surface Topsoil with large gravel	3		
5				Brown silty sand and gravel	211		
10					11		Casing - 2" sch 40 pvc pipe w/ j-plug
				Brown silty sand and large boulders	203		
15					15		Casing seal - hydrated medium bento
				Sand and gravel with water	199 17		
				Brown silt with gravel	197		
20							
25							Filterpack - 10-20 CSSI sand
							Screen - 2" sch 40 pvc, 0.020-in slot v
30							
35							
					37		6" end cap
				End of Log	177		
40							

CH2MHILL

Well Number: CHMW-4(D)

Sheet: 1 of 1

Client: Glacier NW
Project: N Sequalitchew Creek Aquifer Tests
Location: DuPont, Washington
Project Number: 151973.A2.AT

Driller: Hokkaido Drilling (Steve)
Drilling Method: air rotary
Sampling Method: Sand pump (water added)
Logged by: diller
Start/Finish Date: 11/11/99

Depth (ft)	Sample info: Sample #	Sample info: STP (6"-6"-6")	Soil Log	Soil Description	Depth / Elev	Well Drawing	Well Construction Notes
-5					5 / 219		
0				Ground Surface			
				Topsoil	2		
5				Brown gravel	212		Monument: Lockable 6" steel protective casing in concrete
10							
15					15		
				Brown till	199		
20							
25							Casing - 2" sch 40 PVC pipe
30							
					34		
35				Sand, gravel, making water	180		Casing seal - hydrated medium bento
40							
45							
					48		
50				Brown till	166		
					53		
55				Sand, gravel, making water	161		
60							
65					66		
				Brownish orange silty gravel	148		
70				Sand, gravel, water			
75							Filter pack - 10-20 CSSI sand
							Screen - 2" sch 40 PVC, 0.020-in slot
80							
					85		6" end cap
85					129		

CH2MHILL

PROJECT NUMBER : 151973.A1.AT

WELL NUMBER : CHMW-1

WELL CONSTRUCTION/BORING LOG

PROJECT : **LONE STAR, DUPONT** LOCATION : **50' S. OF CHTW-1**

WATER LEVELS : **21'6 3/4" ATD**

DRILLING METHOD/EQUIPMENT : **SPEEDSTAR 15 TRUCK-MOUNTED AIR ROTARY**

START : **9/23/99** END : **9/24/99** LOGGER: **HOKKAIDO(BILL&STEVE)**

DEPTH BELOW SURFACE (FT)	CORE DESCRIPTION/COMMENTS
0	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.
	0-2FT Topsoil
	2-22FT Sand/gravel w/silt (dry,brown)
5	
10	
15	
20	
	22-26FT Brown silty gravel
25	
	26-33FT Brown gravel (like till)
30	

CH2MHILL

PROJECT NUMBER : 151973.A1.AT	WELL NUMBER : CHMW-1 SHEET 2 OF 3

WELL CONSTRUCTION/BORING LOG

PROJECT : **LONE STAR, DUPONT** LOCATION : **50' S. OF CHTW-1**

WATER LEVELS : **21'6 3/4" ATD**

DRILLING METHOD/EQUIPMENT : **SPEEDSTAR 15 TRUCK-MOUNTED AIR ROTARY**

START : **9/23/99** END : **9/24/99** LOGGER: **HOKKAIDO(BILL&STEVE)**

DEPTH BELOW SURFACE (FT)	CORE DESCRIPTION/COMMENTS
	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.
	33-35FT Brown silt
35	35-57FT Lt.brown gravel, productive water-bearing zone
40	
45	
50	
55	
	57-59FT Dk.brown gravel & sand NOTE: No "soupy sand" at 50' like in CHTW
60	

CH2MHILL

PROJECT NUMBER : 151973.A1.AT

WELL NUMBER : CHMW-1

WELL CONSTRUCTION/BORING LOG

PROJECT : **LONE STAR, DUPONT** LOCATION : **50' S. OF CHTW-1**

WATER LEVELS : **21'6 3/4" ATD**

DRILLING METHOD/EQUIPMENT : **SPEEDSTAR 15 TRUCK-MOUNTED AIR ROTARY**

START : **9/23/99** END : **9/24/99** LOGGER: **HOKKAIDO(BILL&STEVE)**

DEPTH BELOW SURFACE (FT)	CORE DESCRIPTION/COMMENTS
	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.
65	
70	
75	76-82FT Dk.brown sand & gravel
80	82-83FT Gray silty sand & gravel
85	83-85FT Blue sand & gravel
	WELL: STICKUP=2' (2"sch 40 pvc) SCREEN=75'-84.5' (2"sch 40 pvc, 20-slot) 6" endcap 84.5 -85 fbgs ANNULUS=15 bags 10-20 cost sand (50lb. ea) 52 bags med. bentonite chips (50lbs ea) MONUMENT=6" steel protective casing in concrete
0	

CH2MHILL

PROJECT NUMBER : 151973.A1.AT	WELL NUMBER : CHMW-2(S)
	SHEET 1 OF 2

WELL CONSTRUCTION/BORING LOG

TOC elev = 209.39 Stickup = 1.45
grd = 207.94

PROJECT : **LONE STAR, DUPONT** LOCATION : **50' N. OF TW-2(~15FT E.OF MW-2(D)**

WATER LEVELS :

DRILLING METHOD/EQUIPMENT: **STAR 71 CABLE TOOL, 8" STEEL CASING**

START : **11/17/99** END : **11/19/99** LOGGER: **HOKKAIDO(DARYL & TOM)**

DEPTH BELOW SURFACE (FT)	CORE DESCRIPTION/COMMENTS
0	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.
	0-3FT Topsoil & gravels
	3-21FT Brown silty sand and gravels
5	
10	
15	
20	
	21-26FT Larger gravels & sand slightly silty, very hard
25	
	26-27FT Brown silty sand & gravel
	27-28FT Sandier w/gravel (gravel smaller)
30	

CH2MHILL

PROJECT NUMBER : 151973.A1.AT	WELL NUMBER : CHMW-2(S) SHEET 2 OF 2

WELL CONSTRUCTION/BORING LOG

PROJECT : **LONE STAR, DUPONT** LOCATION : **50' N. OF TW-2(~15FT E.OF MW-2(D)**

WATER LEVELS :

DRILLING METHOD/EQUIPMENT: **STAR 71 CABLE TOOL, 8" STEEL CASING**

START : **11/17/99** END : **11/19/99** LOGGER: **HOKKAIDO(DARYL & TOM)**

DEPTH BELOW SURFACE (FT)	CORE DESCRIPTION/COMMENTS
	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.
35	36-43FT Clean sand & gravel w/H20 Total casing=46'-81/2" Well: Stickup=2' (2" sch 40 pvc) w/j-plug Screen=33'-421/2' bgs w/2 centralizers & 6' end (2"sch 40 pvc, 20-slot) Annulus=13 50-lb bags 10-20 cgsi sand 18 50-lb bags medium bentonite chips Monument= 6"steel protecting casing in concrete (7 bags)
40	
45	
50	
55	
60	

CH2MHILL

PROJECT NUMBER : 151973.A1.AT	WELL NUMBER : CHMW-2(D) SHEET 1 OF 3

WELL CONSTRUCTION/BORING LOG

TOC elev = 209 Stickup = 1.8 grd = 207.2

PROJECT : **LONE STAR, DUPONT** LOCATION : **50' N. OF TW-2**

WATER LEVELS :

DRILLING METHOD/EQUIPMENT: **SPEEDSTAR 15, 8" STEEL CASING(TO58") &STAR 71 CABLE TOOL, 8" CASING**

START : **11/12/99** END : **11/18/99** LOGGER: **HOKKAIDO(STEVE & TOM)**

DEPTH BELOW SURFACE (FT)	CORE DESCRIPTION/COMMENTS
0	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.
	0-4FT Dark brown topsoil
	4-9FT Brown silty gravel
5	
10	9-15FT Brown gravel
15	15-24FT Brown, silty gravel, moist
20	
25	24-26FT Hard till, brown
	26-35FT Loose sand & gravel H20
30	

CH2MHILL

PROJECT NUMBER : 151973.A1.AT	WELL NUMBER : CHMW-2(D) SHEET 2 OF 3

WELL CONSTRUCTION/BORING LOG

PROJECT : **LONE STAR, DUPONT** LOCATION : **50' N. OF TW-2**

WATER LEVELS :

DRILLING METHOD/EQUIPMENT: **SPEEDSTAR 15, 8" STEEL CASING(TO58") &STAR 71 CABLE TOOL, 8" CASING**

START : **11/12/99** END : **11/18/99** LOGGER: **HOKKAIDO(STEVE & TOM)**

DEPTH BELOW SURFACE (FT)	CORE DESCRIPTION/COMMENTS
	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.
35	35-48FT Brown till
40	
45	
50	48-58FT Loose sand & gravel H20
55	
60	58-66FT Brown tight Silt Bound sand & gravel

CH2MHILL

PROJECT NUMBER : 151973.A1.AT	WELL NUMBER : CHMW-2(D) SHEET 3 OF 3

WELL CONSTRUCTION/BORING LOG

PROJECT : **LONE STAR, DUPONT** LOCATION : **50' N. OF TW-2**

WATER LEVELS :

DRILLING METHOD/EQUIPMENT: **SPEEDSTAR 15, 8" STEEL CASING(TO58") &STAR 71 CABLE TOOL, 8" CASING**

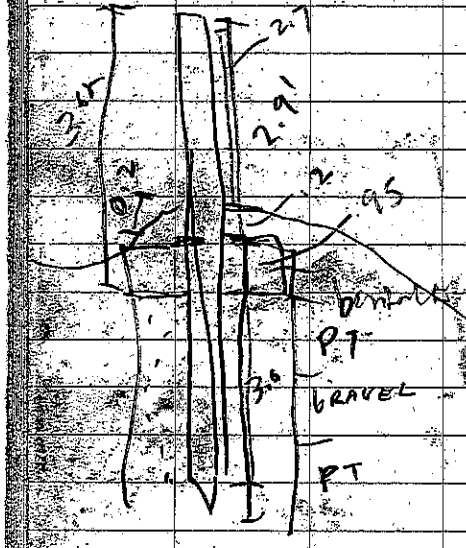
START : **11/12/99** END : **11/18/99** LOGGER: **HOKKAIDO(STEVE & TOM)**

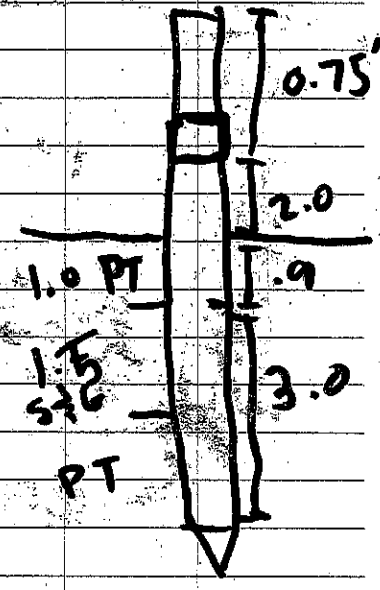
DEPTH BELOW SURFACE (FT)	CORE DESCRIPTION/COMMENTS
	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.
65	66-73FT NO RECORD
	Total Casing=72'-41/4"
	Well:
70	Stickup=2' (2"sch 40 pvc) w/j plug
	Screen= 63'-721/2' bgs (2" sch 40 pvc, 20-slot)
	w/centralizer 6"end cap 721/2-73 fbgs
	Annulus=13 50-lb bags 10-20 cssi sand
	34 50-lb bags medium bentonite chips
	Monument= 6" steel protectivecasing in concrete
75	
80	
85	
90	

CHMW- 4 (S) 18.42

4 (D) 20.81

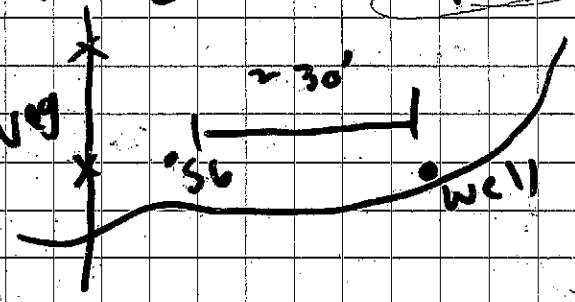
CHMW-1 19.40 14:21





Pond L. well 2.95

Pond L. SG 1.07



BM-MW-1 14.23' 12:30

BM-SG-1 2.53' 12:32

EM-1A 3.69' 12:40

Top 6.65'

SG EM1 dry Top 3.33

Aspect consulting
IN-DEPTH PERSPECTIVE

Geologic & Monitoring Well Construction Log

Project Number	Well Number	Sheet
040001	SL-1	1 of 1

Project Name: North Sequalichew Creek
Location: Fort Lewis, WA
Drilling Method: Hollow stem auger, 4" ID ; Holt Drilling
Sampling Method: 3" diameter D&M
Ground Elevation 214.94

Top of PVC Casing Elev. (ft mllw) 217.74
Depth to Water (ft BTC) 6.25
Start Date March 11, 2004
Finish Date March 11, 2004

Depth feet	Well Construction	Tests\Remarks	Blows/ 6"	Sample ID	Mtl. Graphic	Description
	5" diameter steel monument, 3' stickup; Concrete seal 0'-2'					Grass, duff
						FILL
						Gravel up to 1-1/2" diameter, to a depth of 8" below ground surface
			4 3 3	S-1		Medium stiff, moist to very moist, dark brown, gravelly SILT with SAND
		3/26/04 ▼				
5			3 3 4	S-2		•Very gravelly drilling, no recovery
			9 8 11	S-3		Medium dense, wet, gray, sandy GRAVEL; sand medium to coarse, gravel fine to coarse
			4 6 6	S-4		•Low recovery, trace gravel in sampler
			7 7 7	S-5		RECESSIONAL OUTWASH Medium dense, wet, gray, very gravelly SAND; sand predominantly coarse
10	Bentonite chips 2'-13'		7 7 9	S-6		Medium dense, wet, gray-brown, sandy GRAVEL; sand predominantly coarse
			6 7 12	S-7		
			11 10 9	S-8		•Trace silt
15	10/20 silica sand filter pack 13'-20'		10 7 7	S-9		•Trace silt
	20-slot screen 15'-20'; slip cap with SS screw 20'-20.3'		4 6 7	S-10		
20						Bottom of boring at 20 feet.

Sampler Type (ST):
- 3.25" OD D & M Split-Spoon Ring Sampler
- No Recovery
- 2" OD Split-Spoon Sampler

PID - Photoionization Detector
▼ Water Level (ATD)
▽ Static Water Level

Logged by: RRH
Approved by: LJH
Figure No. B - 2

SEQUALICHEW CREEK.GPJ July 20, 2004
MW_GEO1.G

Aspect consulting
IN-DEPTH PERSPECTIVE

Geologic & Monitoring Well Construction Log

Project Number	Well Number	Sheet
040001	HM-MW-1	1 of 1

Project Name: North Sequalitchew Creek
Location: DuPont, Washington
Drilling Method: Hollow Stem Auger - 4" ID ; Holt Drilling
Sampling Method: 3" Diameter D&M

Top of Casing Elev. (ft mllw): 221.06
Ground Surfave Elev. (ft): 217.75
Depth to Water (ft bgs): 5
Start Date: August 2, 2004
Finish Date: August 2, 2004

Depth feet	Well Construction	Tests\Remarks	Blows/ 6"	Sample ID	Mtl. Graphic	Description
1						Brown, slightly silty GRAVEL; gravel, predominantly coarse and cobbles (observed from drill action and cuttings) (GP)
2	5" diameter steel monument, cement seal 0'-4'					
3		18"/5"	3 27 30	2.5-4		Brown, moist, slightly silty to trace silt, sandy GRAVEL; sand medium to coarse; gravel fine to coarse, abundant cobbles, subangular to rounded (GW)
4						
5		8/2/04 ▼ 18"/8"	11 23 23	5-6.5		Brown to olive gray, wet, very sandy GRAVEL, trace silt; sand medium to coarse, predominantly medium; gravel fine to coarse with cobbles, subangular to subround; no apparent organization.
6	Bentonite Chips 4'-7.5'					
7						
8		18"/11"	19 22 24	7.5-9		Color change to olive gray; grades to medium to coarse sand and predominantly fine gravel; increase in silt (still trace silt), less cobbles.
9						
10		18"/6"	22 28 32	10-11.5		Olive gray to gray-green, wet, SAND; trace gravel; sand medium to coarse, occasional zones of fine to medium; gravel fine (SP-SW)
11	10/20 silica sand filter pack 7.5'-20.3'					
12						
13		18"/12"	21 30 35	12.5-14		Olive gray, wet, slightly silty, very sandy GRAVEL; gravel fine to coarse; with cobbles; sand predominantly medium to coarse (GW-GM)
14						
15	20-slot screen 10'-20'; slip cap with SS screw 20'-20.3'	18"/10"	21 31 44	15-16.5		Gray-green to olive gray, wet, SAND, trace gravel; sand predominantly medium to coarse; gravel fine (SW)
16						Olive gray, wet, very sandy GRAVEL, trace silt, sand medium to coarse, occasional fine, predominantly coarse; gravel fine to coarse (GW)
17						
18		18"/10"	26 50/6"	17.5-19		Gray-green, wet SAND; trace gravel; sand predominantly medium to coarse (SW)
19						Olive-gray, wet, very sandy GRAVEL, trace silt; gravel fine to coarse; sand predominantly medium to coarse (GW)
20		18"/11"	26 50/6"	20-21.5		Gray to olive gray, wet SAND; sand medium; homogenous (SP)
21						
22						Olive gray to gray, wet, sandy GRAVEL, trace silt; gravel fine to coarse; subrounded to rounded; sand medium to coarse, predominantly medium (GW)
23						Total depth = 20' drilled, 22.5' driven.
24						
25						
26						
27						
28						
29						

Sampler Type (ST):
- 3.25" OD D & M Split-Spoon Ring Sampler
- No Recovery
- 2" OD Split-Spoon Sampler

PID - Photoionization Detector
▼ Water Level (ATD)
▽ Static Water Level

Logged by: ILE
Approved by: LJH
Figure No. A-2

APPENDIX B

MW_GEOL S CRK.GPJ November 23, 2004

Aspect consulting
IN-DEPTH PERSPECTIVE

Geologic & Monitoring Well Construction Log

Project Number	Well Number	Sheet
040001	EM-3	1 of 1

Project Name: North Sequalichew Creek
Location: Fort Lewis, WA
Drilling Method: Hollow stem auger, 4" ID ; Holt Drilling
Sampling Method: 3" diameter D&M
Ground Elevation 214.63

Top of PVC Casing Elev. (ft mllw) 217.38
Depth to Water (ft BTC) 4.96
Start Date March 11, 2004
Finish Date March 11, 2004

Depth feet	Well Construction	Tests\Remarks	Blows/ 6"	Sample ID	Mtl. Graphic	Description
	5" diameter steel monument, 3' stickup; Concrete seal 0'-2'					Sod and dark brown organic soil
						FILL
		3/26/04 ▼				Gravel, some cobbles at 0.5'
			3 7 10	S-1		Medium dense, moist, dark brown, sandy GRAVEL with SILT and ORGANICS, trace wood
			3 6 8	S-2		Medium dense, wet, gray SAND and GRAVEL
5			6 2 1	S-3		MARSH DEPOSITS
		K Test K = 1x10^{-6} cm/s	1 1 9	S-4		Soft, wet, brown, slightly fibrous PEAT, trace gravel
			8 12 14	S-5		Medium dense, wet, brown, sandy GRAVEL to GRAVEL, trace silt
10	Bentonite chips 2'-13'		2 6 6	S-6		RECESSIONAL OUTWASH
			7 8 13	S-7		Medium dense, wet, gray SAND, trace gravel; sand fine to medium; 1/4" silt seam
			1 12 25	S-8		No recovery, coarse gravel in shoe of sampler
15			16 17 16	S-9		Dense, wet, brown, gravelly SAND to sandy GRAVEL
	10/20 silica sand filter pack 13'-20'		11 16 32	S-10		Dense, wet, sandy GRAVEL
	20-slot screen 15'-20'; slip cap with SS screw 20'-20.3'		15 25 35	S-11		
20						Bottom of boring at 20 feet.

Sampler Type (ST):
- 3.25" OD D & M Split-Spoon Ring Sampler
- No Recovery
- 2" OD Split-Spoon Sampler

PID - Photoionization Detector
▼ Water Level (ATD)
▽ Static Water Level

Logged by: RRH
Approved by: LJH

Figure No. B - 1

SEQUALICHEW CREEK.GPJ 7/29/04

Aspect consulting
IN-DEPTH PERSPECTIVE

Geologic & Monitoring Well Construction Log

Project Number	Well Number	Sheet
040001	BM-MW-1	1 of 1

Project Name: North Sequalitchew Creek
Location: DuPont, Washington
Drilling Method: Hollow Stem Auger - 4" ID ; Holt Drilling
Sampling Method: 3" Diameter D&M

Top of Casing Elev. (ft mllw): 232.32
Ground Surfave Elev. (ft): 229.37
Depth to Water (ft bgs): 12.5
Start Date: August 3, 2004
Finish Date: August 3, 2004

Depth feet	Well Construction	Tests\Remarks	Blows/ 6"	Sample ID	Mtl. Graphic	Description
1	5" diameter steel monument, cement seal 0'-1.5'					Brown, dry, GRAVEL, trace silt; gravel fine to coarse, predominantly coarse; abundant cobbles, subrounded to rounded (GW)
2						
3						(Road fill)
4	Natural Fill 1.5'-5'					
5		18"/4"	11	5-6.5		Brown to tan, moist sandy GRAVEL, trace silt; gravel fine to coarse, subrounded to rounded; sand predominantly medium to coarse.
6			12			
7			10			
8		18"/12"	4	7.5-9		Brown to reddish brown, moist, slightly gravelly SAND, trace silt; sand fine to coarse, predominantly medium; gravel fine, subangular to rounded (SP)
9	Bentonite Chips 5'-12'		10			
10			16			
11		18"/5"	9	10-11.5		Occasional coarse gravel and grades medium to coarse sand.
12		8/3/04 ▼	15			
13		18"/6"	19			
	10/20 silica sand filter pack 12'-26.5'		8	12.5-14		Brown to red-brown, wet, gravelly SAND, trace silt; sand predominantly coarse; gravel fine to coarse, predominantly fine.
15		18"/10"	14			
16			15			
17			9	15-16.5		
18		18"/8"	10			Yellowish-green to brown, highly oxidized, wet, slightly to trace silt; sandy GRAVEL; gravel fine to coarse; sand predominantly coarse (GW-GM)
19			16			
20	20-slot screen 15'-25'; slip cap with SS screw 25'-25.3'	18"/12"	5	17.5-19		Yellow brown, highly oxidized, wet, slightly gravelly SAND, trace silt; sand medium to coarse, predominantly coarse; gravel predominantly fine (SP)
21			8			Grades to slightly silty and gravelly in shoe (SP-SM)
22			8			
23		18"/14"	9	20-21.5		Gray olive, wet, SAND; trace gravel; trace to no silt; sand predominantly medium to coarse (SP)
24			11			
25		18"/3"	13			Gray green, wet, slightly silty to trace silt, sandy GRAVEL; gravel fine to coarse, subrounded to rounded; sand medium to coarse. (GP-GM)
26			13	22.5-24		Gray green, wet, SAND; sand medium (SP)
27			25			
28			24			Gray olive, wet, sandy GRAVEL, trace silt; gravel fine to coarse, sand predominantly medium to coarse (GP)
29			28	25-26.5		Gray olive, wet, slightly silty sandy GRAVEL; gravel fine to coarse; sand medium to coarse (GP-GM)
			19			
			17			Total depth = 25' drilled; 26.5' driven.

Sampler Type (ST):
- 3.25" OD D & M Split-Spoon Ring Sampler
- No Recovery
- 2" OD Split-Spoon Sampler

PID - Photoionization Detector
▼ Water Level (ATD)
▽ Static Water Level

Logged by: ILE
Approved by: LJH
Figure No. A- 1

APPENDIX B

MW_GEOL S CRK_SEQ CRK.GPJ November 23, 2004

CH2MHILL

GS elev = 212.1'

PROJECT NUMBER: 151973.A4.WL BORING NUMBER: EM-2
Sheet: 1 of 3

SOIL BORING LOG

PROJECT: N. Sequalitchew Creek Wetland **LOCATION:** ~10' S. of Edmond Marsh Trail
ELEVATION: **DRILLING CONTRACTOR:** Cascade Drilling
DRILLING METHOD AND EQUIPMENT: CME 75 nodwell track rig, HSA, Dames & Moore, 140lb hammer
WATER LEVELS: See log **START:** 12/12/02 0934 **FINISH:** 12/12/02 1228 **LOGGER:** S. McGinnis

DEPTH BELOW GROUND SURFACE	WELL INSTALLATION	SAMPLE TYPE	SAMPLE RECOVERY (IN)	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION
0					Ground Surface	
		DM	12	2-5-5 (10)	SILTY SAND WITH ORGANICS (SM) Dark brown, moist, loose, fine grained sand, trace fine to medium round to subround gravel, est. 30-40% fines, 20% organics (TOPSOIL)	Two piezometers installed in separate monuments. EM-2(S) is the shallow piezometer, and EM-2(D) is the deep piezometer
		DM	6	5-6-6 (12)	SANDY SILTY GRAVEL (GM) Dark brown, moist to wet, medium dense, well graded round to subround gravel, est. 20% fines, 30-40% sand, trace organics (FILL)	3': Driller states in gravel and a little water
		DM	18	3-1-1 (2)	SILTY SAND WITH GRAVEL (SM) Light brown, moist, medium dense, fine to medium grained sand, fine to medium round to subround gravel, est. 15-20% gravel, 20% fines, trace organics (FILL)	
5		DM	18	6-16-18 (34)		5': Driller states drilling in gravel
					PEAT (PT) Dark brown, wet, very soft, fiberous	
					SANDY SILTY GRAVEL (GM) Gray, moist, medium dense, well graded round to subround gravel, fine to medium grained sand, est. 20% fines, 30% sand	8': Sampled, then loaded hole with water
		DM	12	18-21-15 (36)	SILTY SAND WITH GRAVEL (SM) Gray, wet, medium dense, fine to medium grained sand, fine to coarse round to subround gravel, est. 20-30% fines, 20-30% gravel, not compacted, soupy	
10						
		DM	12	18-22-18 (40)	GRAVELLY WELL GRADED SAND (SW) Gray, wet, medium dense, round to subround sand and gravel, fine to medium gravel, trace coarse gravel, est. <5% fines, 30-40% gravel	13': Driller states from 8-13' pretty sandy, not much gravel 14': Sampler wet
15						
		DM	10	44-50/6" (50/6")	GRAVELLY WELL GRADED SAND (SW) Gray, moist to wet, very dense, fine to coarse grained sand, fine round to subround gravel, est. 30-35% gravel	18': Top of sample was heave
20						

CH2MHILL

PROJECT NUMBER: 151973.A4.WL BORING NUMBER: EM-2
Sheet: 2 of 3

SOIL BORING LOG

PROJECT: N. Sequalitchew Creek Wetland **LOCATION:** ~10' S. of Edmond Marsh Trail
ELEVATION: **DRILLING CONTRACTOR:** Cascade Drilling
DRILLING METHOD AND EQUIPMENT: CME 75 nodwell track rig, HSA, Dames & Moore, 140lb hammer
WATER LEVELS: See log **START:** 12/12/02 0934 **FINISH:** 12/12/02 1228 **LOGGER:** S. McGinnis

DEPTH BELOW GROUND SURFACE	WELL INSTALLATION	SAMPLE TYPE	SAMPLE RECOVERY (IN)	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION
		DM	12	24-26-30 (56)	GRAVELLY WELL GRADED SAND (GW) Gray, moist to wet, medium dense, fine to coarse grained sand, fine to coarse round to subround gravel, est. 30-40% gravel	20.5': Heave in sampler
		DM	12	34-50/6" (50/6")	SANDY WELL GRADED GRAVEL (GW) Gray, moist to wet, very dense, well graded sand, round to subround gravel, est. 30-35% sand	
25		DM	12	23-36-50/6" (86/12")	SANDY WELL GRADED GRAVEL (GW) -Similar to above, gray, moist to wet, dense to very dense, well graded sand, est. 30-40% sand, becomes siltier toward bottom of sample, est. up to 10% silt toward bottom of sample	25.5': Driller drained water out of samples before opening split spoon. Driller loads hole with water, difficult to determine if samples are wet from drilling water or groundwater. All heave in sample from 25.5'. Resampled.
30		DM	12	32-40-50/6" (90/12")	GRAVELLY WELL GRADED SAND (SW) Gray, moist to wet, very dense, fine to coarse grained sand, fine round to subround gravel, "clean"-little to no fines	
		DM	12	36-44-50/6" (94/12")	GRAVELLY WELL GRADED SAND (SW) -Similar to above	
35		DM	2	44-50/3" (50/3")	WELL GRADED SAND (SW) Gray, moist to wet, very dense, fine to coarse round to subround sand	
		DM	6	36-50/6" (50/6")	SANDY WELL GRADED GRAVEL (GW) Gray, moist to wet, very dense, well graded sand, round to subround gravel, est. 30-40% sand, est. 5% silt	
40		DM	3	33-40-50/6" (90/12")	POORLY GRADED SAND WITH GRAVEL (SP) Gray, moist to wet, very dense, fine to medium grained sand, coarse round to subround gravel, est. 15-20% gravel	38': 3" of heave in sampler

CH2MHILL

PROJECT NUMBER: 151973.A4.WL BORING NUMBER: EM-2
Sheet: 3 of 3

SOIL BORING LOG

PROJECT: N. Sequalitchew Creek Wetland **LOCATION:** ~10' S. of Edmond Marsh Trail
ELEVATION: **DRILLING CONTRACTOR:** Cascade Drilling
DRILLING METHOD AND EQUIPMENT: CME 75 nodwell track rig, HSA, Dames & Moore, 140lb hammer
WATER LEVELS: See log **START:** 12/12/02 0934 **FINISH:** 12/12/02 1228 **LOGGER:** S. McGinnis

DEPTH BELOW GROUND SURFACE	WELL INSTALLATION	SAMPLE TYPE	SAMPLE RECOVERY (IN)	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION
		DM	10	16-38-50/6" (88/12")	**WELL GRAED SAND WITH GRAVEL (SW)** Gray, moist to wet, very dense, fine round to subround gravel, "clean", grades to **WELL GRADED SAND WITH SILT AND GRAVEL (SW-SM)** 42' Gray, moist to wet, very dense, fine round to subround gravel, est. 15% gravel, 10-15% silt	
		DM	12	18-28-30 (58)	**POORLY GRADED SAND (SP)** Gray, moist to wet, fine to medium grained sand, trace fine to coarse round to subround gravel, est. 5% or less gravel	
45		DM	12	29-36-42 (78)	**POORLY GRADED SAND (SP)** -Similar to above, some gravels have brown staining surrounding the gravel and within the fine grained sand, fine gravel	
Qvr		DM	12	36-50/6" (50/6")	**POORLY GRADED SAND WITH GRAVEL (SP)** Gray, moist, very dense, fine to medium grained sand, fine to coarse round to subround gravel, gravel was packed in "tight", trace dark organics?, pockets/lenses of fine sand at 48'	48': Driller states it felt more compacted Bottom of boring at 51.7' at 1228 on 12-12-02
50		DM	6	(100/6")	**SILTY WELL GRADED SAND WITH GRAVEL (SM)** Gray, moist to wet, very dense, some is compact where the sand is finer grained, est. 20-25% gravel	**Deep Piezometer Construction (EM-2(D))** +2.55-0' Steel riser, locking monument 0-2' Concrete 2-36' Quick grout 36-38' Bentonite chips 38-51.7' Lapis Lustre 2/12 silica sand 0-40' Blank pvc 40-50' 0.020 machine slot screen and cap
Qvt		SS	6	(100/8")	**SILTY SAND WITH GRAVEL (SM)** Gray, moist, very dense, fine grained sand, fine round to subround gravel, est. 20-25% gravel, compacted looking	
55					BOTTOM OF BORING	**Shallow Piezometer Construction (EM-2(S))** Drilled and installed in a separate monument about 3 feet east of deep well 0-1' Concrete and riser 1-2' Bentonite chips 2-5' Lapis Lustre 2/12 silica sand 0-2.5' Blank pvc 2.5-5' 0.020 machine slot screen and cap
60						

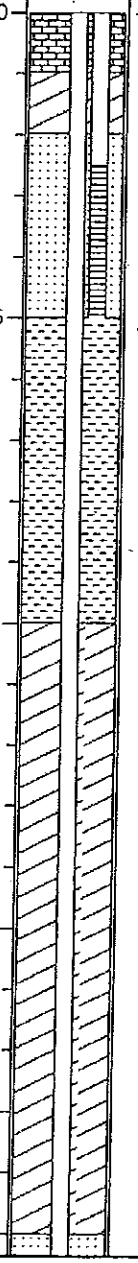
CH2MHILL

PROJECT NUMBER: 151973.A4.WL BORING NUMBER: EM-1
Sheet: 1 of 2

SOIL BORING LOG

GS elev = 207.3

PROJECT: N. Sequalitchew Creek Wetland **LOCATION:** ~100' S. of Edmond Marsh Trail
ELEVATION: **DRILLING CONTRACTOR:** Cascade Drilling
DRILLING METHOD AND EQUIPMENT: CME 75 nodwell track rig, HSA, Dames & Moore, 140lb hammer
WATER LEVELS: See log **START:** 12/11/02 1544 **FINISH:** 12/11/02 1620 **LOGGER:** S. McGinnis

DEPTH BELOW GROUND SURFACE	WELL INSTALLATION	SAMPLE TYPE	SAMPLE RECOVERY (IN)	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION
0					Ground Surface	Drilled down to 24 feet bgs before first sample. Two piezometers installed in one monument. EM-1(S) is the shallow piezometer, and EM-1(D) is the deep piezometer 4': Driller states in gravel and a little water 12': Sounded gravelley to 14' while drilling, rig stopped in gravel 14': Loaded hole with water 14-16': Gravelly, smoother drilling below 16' 17': Driller states cobbles about 4" in diameter, then smaller sized gravels below 17' 17-24': Smooth drilling, loaded hole with water
5						
10						
15						
20						

CH2MHILL

PROJECT NUMBER: 151973.A4.WL BORING NUMBER: EM-1
Sheet: 2 of 2

SOIL BORING LOG

PROJECT: N. Sequalitchew Creek Wetland LOCATION: ~100' S. of Edmond Marsh Trail
ELEVATION: DRILLING CONTRACTOR: Cascade Drilling
DRILLING METHOD AND EQUIPMENT: CME 75 nodwell track rig, HSA, Dames & Moore, 140lb hammer
WATER LEVELS: See log START: 12/11/02 1544 FINISH: 12/11/02 1620 LOGGER: S. McGinnis

DEPTH BELOW GROUND SURFACE	WELL INSTALLATION	SAMPLE TYPE	SAMPLE RECOVERY (IN)	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION
25		DM	12	16-20-25 (45)	POORLY GRADED SAND WITH GRAVEL (SP) Gray, wet, medium dense, fine to medium grained sand, fine to coarse round to subround gravel, est. 15-20% gravel	
		DM	0	39-50/4" (50/4")	POORLY GRADED SAND WITH GRAVEL (SP) -similar to above but fine to medium gravel	Bottom of boring at 33.5' at 1620 on 12/11/02.
30		DM	12	34-35-35 (70)	No recovery -Slough	Measured groundwater at 6.10' (EM-1(S)) and 7.47' (EM-1 (D)) below top of steel on 12/11/02
		DM	6	50/6" (50/6")	POORLY GRADED SAND WITH SILT AND GRAVEL (SP-SM) Gray, wet, very dense, fine to medium grained sand, fine to coarse gravel, gets siltier toward bottom of sample, grades to SILTY SAND WITH GRAVEL (SM) at 32' Gray, wet, very dense, fine to medium grained sand, fine to medium round to subround gravel, est. 10-20% silt, 20-25% gravel	Piezometer Construction (EM-1(S) and EM-1(D)) +3.65-0' Steel riser, locking monument 3.xx-2.5' Blank PVC (EM-1(S)) 3.xx-22' Blank PVC (EM-1(D)) 0-1' Concrete 1-2' Bentonite chips 2-5' Lapis Lustre 2/12 silica sand 2.5-5' 0.020 machine slot screen and cap (EM-1(S)) 5-10' Cuttings 10-20' Bentonite chips 20-33.5' Lapis Lustre 2/12 silica sand 22-32' 0.020 machine slot screen and cap (EM-1(D)) Note: Both piezometers are in one steel, riser monument
35					BOTTOM OF BORING	
40						

CH2MHILL

PROJECT NUMBER: 151973.A4.WL BORING NUMBER: EM-1A
Sheet: 1 of 5

SOIL BORING LOG

PROJECT: N. Sequalitchew Creek Wetland **LOCATION:** ~100' S. of Edmond Marsh Trail
ELEVATION: **DRILLING CONTRACTOR:** Cascade Drilling
DRILLING METHOD AND EQUIPMENT: CME 75 nodwell track rig, HSA, Dames & Moore, 140lb hammer
WATER LEVELS: See log **START:** 12/11/02 **FINISH:** 12/11/02 **LOGGER:** S. McGinnis

DEPTH BELOW GROUND SURFACE	WELL INSTALLATION	SAMPLE TYPE	SAMPLE RECOVERY (IN)	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION
0					Ground Surface	
		DM	18	1/12"-1/6" (2)	ORGANICS Dark brown, moist, very soft	
		DM	18	5-7-12 (19)	PEAT (PT) Dark brown, moist, very soft, fiberous	
		DM	8	43-40-40 (80)	SANDY SILTY GRAVEL (SM) Light brown, wet, loose, fine to coarse grained sand, coarse round to subround gravel	3': Driller states in gravel and a little water
5		DM	8	35-37-39 (76)	PEAT (PT) Dark brown, moist, very soft, fiberous, trace gravel mixed in	4.5': Sampler very wet, large gravel/small cobble jammed in shoe
					SANDY SILTY GRAVEL (GM) -Similar to above, light brown, wet, dense, fine to coarse grained sand, coarse round to subround gravel	6': Drilled in gravel from 4.5-6'.
					SILTY SAND WITH GRAVEL (SM) Gray, wet, dense, fine to coarse grained sand, fine to coarse round to subround gravel, trace round cobbles (TILL-LIKE)	
10		DM	10	28-35-39 (74)	SILTY GRAVEL WITH SAND (SM) Gray, wet, dense, fine to coarse gravel, fine to coarse grained sand, est. 30% silt, 20% sand (TILL-LIKE) In shoe: SANDY SILT (ML) Gray, moist, hard, fine to medium grained sand, est. 20-30% sand	
15		DM	12	42-35-38 (73) ?	SANDY WELL GRADED GRAVEL WITH SILT (GW-GM) Gray, wet, medium dense, fine to coarse round to subround gravel, fine to coarse sand, est. 30% sand, 10-15% fines	14': Sampler wet 17': Driller states not as much rock, large gravel 19': Water poured out of sampler 19.5': Measured groundwater through augers at 1406 on 12/11/02. Augers may be acting as a barrier.
20		DM	4	21-25-27 (52)		

CH2MHILL

PROJECT NUMBER: 151973.A4.WL **BORING NUMBER:** EM-1A
Sheet: 2 of 5

SOIL BORING LOG

PROJECT: N. Sequalitchew Creek Wetland **LOCATION:** ~100' S. of Edmond Marsh Trail
ELEVATION: **DRILLING CONTRACTOR:** Cascade Drilling
DRILLING METHOD AND EQUIPMENT: CME 75 nodwell track rig, HSA, Dames & Moore, 140lb hammer
WATER LEVELS: See log **START:** 12/11/02 **FINISH:** 12/11/02 **LOGGER:** S. McGinnis

DEPTH BELOW GROUND SURFACE	WELL INSTALLATION	SAMPLE TYPE	SAMPLE RECOVERY (IN)	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION
					GRAVELLY SAND (SW) Gray, wet, medium dense, fine to coarse grained sand, fine to coarse round to subround gravel, est. 30-40% gravel	
25		DM	10	42-33-30 (63)	**POORLY GRADED SAND WITH GRAVEL (SP** Gray, wet, medium dense, fine to medium grained sand, fine to coarse round to subround gravel, trace fine cobbles, est. 15-20% gravel	
30		DM	12	24-35-38 (73)	**WELL GRADED SAND WITH GRAVEL (SW)** Gray, wet, medium dense, fine to coarse grained sand, fine to medium round to subround gravel, trace fines, increased fines toward bottom of sampler, est. 20-30% gravel	
35		DM	6	50/6" (50/6")	**POORLY GRADED SAND WITH SILT AND GRAVEL TO SILTY SAND WITH GRAVEL (SP-SM/SM)** Gray, wet, very dense, fine to medium grained sand, fine to medium round to subround gravel, est. 10-20% fines, 20-25% gravel (TILL??)	34': Driller states back into a few cobbles
40		DM	4	50/4" (50/4")		

Qvt
Dof
d
Boring

CH2MHILL

PROJECT NUMBER: 151973.A4.WL BORING NUMBER: EM-1A
Sheet: 3 of 5

SOIL BORING LOG

PROJECT: N. Sequalitchew Creek Wetland **LOCATION:** ~100' S. of Edmond Marsh Trail
ELEVATION: **DRILLING CONTRACTOR:** Cascade Drilling
DRILLING METHOD AND EQUIPMENT: CME 75 nodwell track rig, HSA, Dames & Moore, 140lb hammer
WATER LEVELS: See log **START:** 12/11/02 **FINISH:** 12/11/02 **LOGGER:** S. McGinnis

DEPTH BELOW GROUND SURFACE	WELL INSTALLATION	SAMPLE TYPE	SAMPLE RECOVERY (IN)	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION
					POORLY GRADED SAND WITH SILT AND GRAVEL (SP-SM) Gray, wet, very dense, fine to medium grained sand, fine to coarse round to subround gravel, est. 10% fines, 10-15% gravel	
45		DM	4	50/5" (50/5")	POORLY GRADED SAND (SP) Gray, wet, very dense, fine to medium grained sand, trace fines	
50		DM	4	50/4" (50/4")	GRAVELLY WELL GRADED SAND WITH SILT (SW-SM) Gray, wet, very dense, fine to coarse round to subround gravel, est. 5-10% fines, 30-40% gravel	
55		DM	6	50/6" (50/6")	POORLY GRADED SAND (SP) Gray, wet, very dense, fine to medium grained sand	
60		DM	6	50/6" (50/6")		59': Driller states a little more gravel

CH2MHILL

PROJECT NUMBER: 151973.A4.WL BORING NUMBER: EM-1A
Sheet: 4 of 5

SOIL BORING LOG

PROJECT: N. Sequalitchew Creek Wetland **LOCATION:** ~100' S. of Edmond Marsh Trail
ELEVATION: **DRILLING CONTRACTOR:** Cascade Drilling
DRILLING METHOD AND EQUIPMENT: CME 75 nodwell track rig, HSA, Dames & Moore, 140lb hammer
WATER LEVELS: See log **START:** 12/11/02 **FINISH:** 12/11/02 **LOGGER:** S. McGinnis

DEPTH BELOW GROUND SURFACE	WELL INSTALLATION	SAMPLE TYPE	SAMPLE RECOVERY (IN)	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION
					POORLY GRADED SAND WITH SILT AND GRAVEL (SP-SM) Gray, wet, very dense, fine to medium grained sand, fine to medium round to subround gravel, est. 10-15% fines, 5-10% gravel	
65		DM	5	50/5" (50/5")	WELL GRADED SAND WITH GRAVEL TO WELL GRADED SAND WITH SILT AND GRAVEL (SW/SW-SM) Gray, wet, very dense, fine to coarse grained sand, fine to medium round to subround gravel, est. 5-10% fines, 20-30% gravel	
70		DM	5	50/5" (50/5")	POORLY GRADED SAND (SP) Gray, wet, very dense, medium to coarse grained round to subround sand, fine to medium round to subround gravel, est. <5% fines, 5-10% gravel	
75		DM	6	50/6" (50/6")	WELL GRADED SAND WITH GRAVEL TO WELL GRADED SAND WITH SILT AND GRAVEL (SW/SW-SM) Gray, wet, very dense, fine to coarse grained sand, fine round to subround gravel, est. 5-10% fines, 10-15% gravel	
80		DM	5	50/5" (50/5")		

CH2MHILL

PROJECT NUMBER: 151973.A4.WL BORING NUMBER: EM-1A
Sheet: 5 of 5

SOIL BORING LOG

PROJECT: N. Sequalitchew Creek Wetland LOCATION: ~100' S. of Edmond Marsh Trail
ELEVATION: DRILLING CONTRACTOR: Cascade Drilling
DRILLING METHOD AND EQUIPMENT: CME 75 nodwell track rig, HSA, Dames & Moore, 140lb hammer
WATER LEVELS: See log START: 12/11/02 FINISH: 12/11/02 LOGGER: S. McGinnis

DEPTH BELOW GROUND SURFACE	WELL INSTALLATION	SAMPLE TYPE	SAMPLE RECOVERY (IN)	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION
					POORLY GRADED SAND WITH SILT AND GRAVEL (SP-SM) Gray, wet, very dense, fine grained sand, fine to medium round to subround gravel, est. 10-15% fines, 20-30% gravel	
						83': Driller states into silts
85		DM	4	50/4" (50/4")	SILT (ML) Gray, moist to wet, hard	
90		DM	4	50/4" (50/4")	SILT (ML) -Similar to above, gray, moist to wet, hard, fine to medium sand seams	Bottom of boring at 89.3' at 1300 on 12/11/02.
					BOTTOM OF BORING	Driller states not much heave while drilling
						Backfilled boring with grout. Could not install piezometer in this boring. Had to move 3' north and redrill to the bottom of the piezometer installation.
95						
100						

RESOURCE PROTECTION WELL REPORT

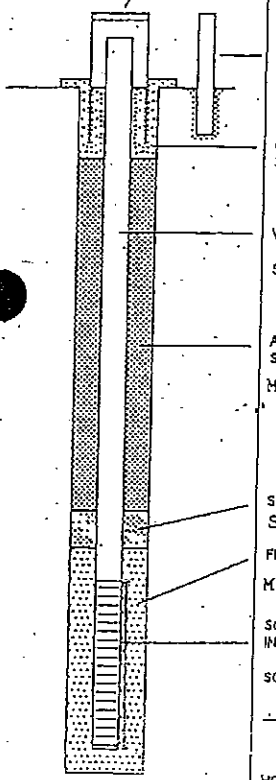
Close Demolition Waste Area - Ft. Lewis

START CARD NO. 17224

PROJECT NAME: Fort Lewis Public Works
WELL IDENTIFICATION NO. D-3
DRILLING METHOD: reverse circ. w/air
DRILLER: Charles E. Shorey, Jr.
FIRM: Layne Christensen Company
SIGNATURE:
CONSULTING FIRM: IMCO General Construction
REPRESENTATIVE: Roger Dudley

COUNTY: Pierce
LOCATION: ___ ¼ ___ ¼ SEC 26 TWN 19N R 1E
STREET ADDRESS OF WELL: Fort Lewis, WA 98433-9500
WATER LEVEL ELEVATION: 11' BGS
GROUND SURFACE ELEVATION: 216
DATE INSTALLED: 8-5-96
DATE DEVELOPED: 8-12-96, 8-14-96

AS-BUILT



OF BORING 24 FT.

WELL DATA

STEEL SURFACE MONUMENT
W/LOCK 3 FT. ABOVE G.L.
PROTECTIVE POSTS no
CONCRETE SURFACE SEAL 2' TO +4" FT.
WELL CASING 14 TO +3 FT.
SCHEDULE 80 TFJ PVC 2"
ANNULAR SEALANT 8 TO 2 FT.
Material: Cement
SEAL 10 TO 8 FT.
Silica sand 12'-10'
FILTER PACK 24 TO 12 FT.
Material: 10-20 sand
SCREEN INTERVAL 24 TO 14 FT.
SCHEDULE 80 TFJ PVC 2"
.02 FACTORY SLOTTED
HOLE DIAMETER
9 IN. 24 TO 0 FT.
___ IN ___ TO ___ FT.

FORMATION DESCRIPTION

0'-5' Coarse sand with medium gravel, brown in color

5'-10' Coarse to medium sand, with large and medium cobbles

10'-15' Fine silty sand, wet, light brown

11' Static water level

15'-20' Fine, dense sand with silt and uniform cobbles

20'-24' Fine silty sand, dense with uniform cobbles

WELL DEVELOPMENT DATA

8-12-96 Bailed 15 gallons from well to remove sediments
Temperature: 60 degrees F
pH: 6.0 Very silty, brown

8-14-96 Pumped 150 gallons from well to stabilize.
Temperature: 60 degrees F
pH; 6.0 Clear, no sediment

Layne Christensen Company
1401 E 26th Street - Tacoma WA 98421 (206) 572-4222 FAX (206) 572-4223

WELL COMPLETION REPORT

Project CELL 5, LFS, FT. LEWIS
Completion date 2/25/93
Contractor ANDREW WELL DRILLING SERVICE
Rig INGERSOLL RAND T-4W
Operator BOB DEWILD/MATT GILBERT
Inspector RICHARD SMITH
Depth 35.0 Datum GROUND SURFACE

HOLE DATA
Size: 6" in. to 35' ft.
____ in. to ____ ft.
____ in. to ____ ft.

CASING
Type 6" DIAMETER, 5' LONG STEEL SURFACE CASING
Mfr.
Ht. above gnd. surf. 3.0'
Drive shoe NO
Size: 6" in. to 3' AGS ft.
6" in. to 3' BGS ft.
____ in. to ____ ft.

SCREEN - 20' -30' (10') THREADED
Type PVC SCH 80 MONOFLEX 20 SLOT
Mfr. CAMPBELL
Composition PVC Dia. 2" ID

Fittings:	Length	Dia.
Riser	22.8'	2" ID
Tailpipe	0.2'	2" ID

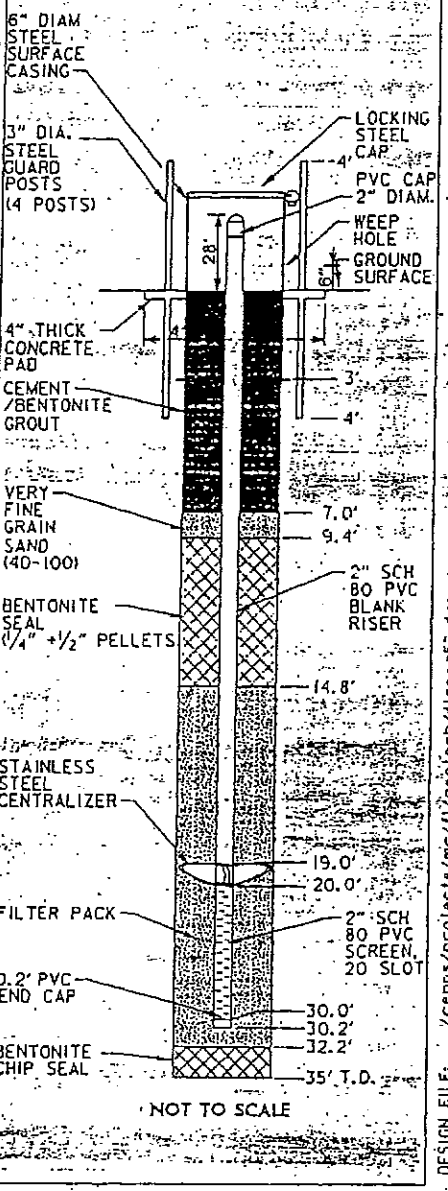
Centralizer- S.S. mounted on outside of PVC Riser 19' -20' BGS

FILTER
Source CSSI - ENVIRONMENTAL MEDIA
Composition SILICA SAND
Gradation 10-20
Inst. method POUR FROM SURFACE
Volume used 4 SACS (100 LB SAC)
Depth 14.8' to 32.2' ft.

GROUT
Composition CEMENT/BENT 5%/H20
Volume used 2-94 LBS BAGS CEMENT (12GAL)
Inst. method POUR DOWNHOLE W/BUCKET
Depth 0' to 7' ft.
____ to ____ ft.

REMARKS: BOTTOM PLUG BENT. CHIPS ½, 50 LB BAG
UPPER PLUG: BENT. PELLETS (⅜"), 2 - 50 LB
BUCKETS, VERY FINE SAND: ½ - 50 LB BAG.
FILLED CASING W/POTABLE WATER TO GROUND
SURFACE PRIOR TO INSTALLATION TO PREVENT
HEAVING AND AID IN PLACING BENT. PLUG.
GROUT RATIO: -1 SAC CEMENT (94 LBS)
6 GAL H20 - 5% BENT. BY WT

WELL DETAIL (AS BUILT)
93-MFS-C5-3



NOT TO SCALE

DESIGN FILE: /cenps/projects/mc/112geotech/11geoc53.dgn DATE AND TIME PLOTTED: 06-MAY-1993

DRILLING LOG	DIVISION NPO	INSTALLATION FORT LEWIS	SHEET 1 OF 1 SHEETS
1. PROJECT RCRA WELLS, CS, LF5		10. SIZE AND TYPE OF BIT 6" ODEX/6" ID TEMP CASING	
2. LOCATION (COORDINATES OR STATION) N 659,446.7 E 1,468,392.9		11. DATUM FOR ELEVATION SHOWN (TBM OR MSL) MSL	
3. DRILLING AGENCY ANDREW WELL DRILLING SERVICE		12. MANUFACTURER'S DESIGNATION OF DRILL INGERSOLL RAND T-4W	
4. HOLE NO. (AS SHOWN ON DRAWING TITLE AND FILE NUMBER) 93-WFS-CS-3		13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED 7; UNDISTURBED -0-	
5. NAME OF DRILLER BOB DEWILD, MATT GILBERT		14. TOTAL NUMBER CORE BOXES	
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.		15. ELEVATION GROUND WATER 195.5	
7. THICKNESS OF OVERBURDEN +35'		16. DATE HOLE STARTED 930CT24 COMPLETED 930CT24	
8. DEPTH DRILLED INTO ROCK -0-		17. ELEVATION TOP OF HOLE 216.9	
9. TOTAL DEPTH OF HOLE 35'		18. TOTAL CORE RECOVERY FOR BORING	
		19. NAME AND SIGNATURE OF INSPECTOR BILL GOSS	

ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (DESCRIPTION)	% CORE RECOV-ERY	BOX OR SAMPLE NO.	REMARKS (DRILLING TIME, WATER LOSS, DEPTH OF WEATHERING, ETC., IF SIGNIFICANT)
	0		GP; POORLY GRADED SANDY GRAVEL; UNCONSOLIDATED, DRY, BROWN		A	DRILLED W/6; ODEX, 6" DRILLING CONCURRENT W/CASING, BIT LEADS CASING BY 6"
	10				B	SAMPLES TAKEN FROM DISCHARGE AT 5' INTERVALS
					C	AIR MONITORING WITH CGI AND PID - NO DETECT
	20		SWL 21.4'		D	
195.5			GP; POORLY GRADED SANDY GRAVEL; UNCONSOLIDATED, WET, BROWN		E	
	30				F	
	35		T.D. 35'		G	

ENG FORM 1836 PREVIOUS EDITIONS ARE OBSOLETE. PROJECT RCRA WELLS, CS, LF5 HOLE NO. 93-WFS-CS-3

MAR 71
SEP 90 MODIFIED FOR CADD BY CEHQ

DRILLING LOG (Cont Sheet) | ELEVATION TOP OF HOLE 218.9 | Hole No. 93-MFS-CS-3

PROJECT RCRA WELLS, CS, LF5 | INSTALLATION FT LEWIS | SHEET 2 OF 4 SHEETS

ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (DESCRIPTION)	% CORE RECOVERY	BOX OR SAMPLE NO.	REMARKS (DRILLING TIME, WATER LOSS, DEPTH OF WEATHERING, ETC., IF SIGNIFICANT)
	10		GP: POORLY GRADED SANDY GRAVEL; UNCONSOLIDATED, SAND FINE - COARSE, ROUNDED GRAVEL TO 1", DRY, BROWN		B	SAMPLE B @ 10'
	11					AIR MONITORING 10-15' PID (-0.8) PPM CGI 20.8%, 0.0.0
	12					
	13					
	14					
	15		GP: POORLY GRADED SANDY GRAVEL; UNCONSOLIDATED, SAND FINE - COARSE, ROUNDED GRAVEL TO 1½" - DRY, TO SLT. MOIST, BROWN		C	SAMPLE C @ 15'
	16					AIR MONITORING 15'-17' PID (-0.8)PPM CGI 20.8.0.0.0 - 1 9:25 - 10:15 @ 17' WELD CASING
	17					AIR MONITORING 17'-20' PID (-0.4)PPM CGI 21.0.1.0.0
	18					
	19					
	20					

ENG FORM 1836-A PREVIOUS EDITIONS ARE OBSOLETE. SEP 80 MODIFIED FOR CADD BY CEMPS

PROJECT RCRA WELLS, CS, LF5 | HOLE NO. 93-MFS-CS-3

DRILLING LOG	DIVISION: NPD	INSTALLATION: FORT LEWIS	SHEET 1 OF 4 SHEETS
1. PROJECT: RCRA WELLS, C5, LF5		10. SIZE AND TYPE OF BIT: 6" ODEX/6" ID TEMP. CASING	
2. LOCATION (COORDINATES OR STATION): N 659,446.7 E 1,368,392.9		11. DATUM FOR ELEVATION SHOWN: MSL	
3. DRILLING AGENCY: ANDREW WELL DRILLING SERVICE		12. MANUFACTURER'S DESIGNATION OF DRILL: INGERSOLL RAND T-4W	
4. HOLE NO. (AS SHOWN ON DRAWING) TITLE AND FILE NUMBER: 93-WFS-C5-3		13. TOTAL NO. OF OVERBURDEN & BEDROCK SAMPLES TAKEN: DISTURBED 7; UNDISTURBED -0-	
5. NAME OF DRILLER: BOB DEWILD, MATT GILBERT		14. TOTAL NUMBER CORE BOXES	
6. DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.		15. ELEVATION GROUND WATER: 195.5	
7. THICKNESS OF OVERBURDEN: ±35'		16. DATE HOLE: STARTED 930CT24; COMPLETED 930CT24	
8. DEPTH DRILLED INTO ROCK: -0-		17. ELEVATION TOP OF HOLE: 218.9	
9. TOTAL DEPTH OF HOLE: 35'		18. TOTAL CORE RECOVERY FOR BORING: 1	
		19. NAME AND SIGNATURE OF INSPECTOR: BILL GOSS	

ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (DESCRIPTION)	% CORE RECOVERY	BOX OR SAMPLE NO.	REMARKS (DRILLING TIME, WATER LOSS, DEPTH OF WEATHERING, ETC., IF SIGNIFICANT)
	0		GP: POORLY GRADED SANDY GRAVEL; UNCONSOLIDATED. SAND FINE -COARSE ROUNDED GRAVEL TO 3". DRY. BROWN. OCCASIONAL COBBLE TO 6"			DRILLED W/6" ODEX, 6" CASING CONCURRENT W/DRILLING. BIT LEADS CASING BY 6" SAMPLES TAKEN FROM DISCHARGE LINE AT 5' INTERVALS AIR MONITORING W/PID & CGI AIR MONITORING @ 5' PID 1-0.4 PPM CGI 20,9,0,0,0
	5		GP: POORLY GRADED SANDY GRAVEL; UNCONSOLIDATED. SAND FINE - COARSE. ROUNDED GRAVEL TO 1". SLT. MOIST. BROWN		(1)	SAMPLE (1) @ 5'
	10					

ENG FORM 1836 PREVIOUS EDITIONS ARE OBSOLETE. SEP 90 MODIFIED FOR CADD BY CEMPR

PROJECT: RCRA WELLS, C5, LF5 HOLE NO. 93-WFS-C5-3

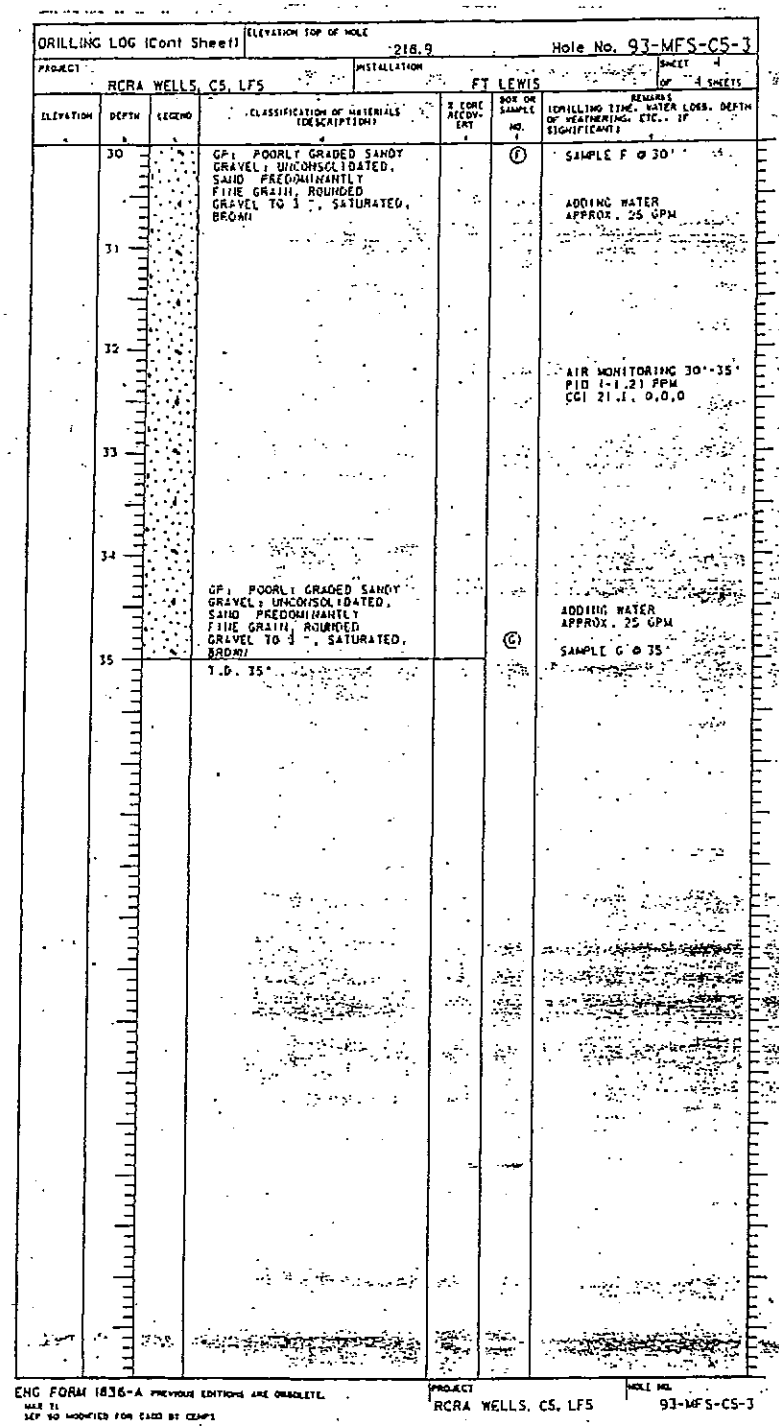
DRILLING LOG (Cont Sheet) | ELEVATION TOP OF HOLE 216.9 | Hole No. 93-MFS-C5-3

PROJECT: RCRA WELLS, C5, LF5 | INSTALLATION: FT LEWIS | SHEET 3 OF 4 SHEETS

ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (DESCRIPTION)	% CORE RECOVERY	BOX OR SAMPLE NO.	REMARKS (DRILLING TIME, WATER LOSS, DEPTH OF WEATHERING, ETC. - IF SIGNIFICANT)
	20		GP: POORLY GRADED SAND & GRAVEL; UNCONSOLIDATED, SAND FINE - COARSE, ROUNDED GRAVEL TO 1½", DRY, BROWN		(D)	SAMPLE D @ 20'
	21		@ 21' SAMPLE MOIST			AIR MONITORING 20'-25' PID (-0.4)PPM CGI 21, 1.0, 0
195.5			SWL 21.4			
	22					
	23					
	24					
	25		GP: POORLY GRADED SAND & GRAVEL; UNCONSOLIDATED, SAND FINE - COARSE, ROUNDED GRAVEL TO 1½", MOIST, BROWN		(E)	SAMPLE E @ 25'
						@ 25' ADD POTABLE WATER WHILE DRILLING APPROX. 2GPM
	26					FOOTEM LOSE FROZEN HOSE THAW HOSE & ADD WATER
	27					
	28					AIR MONITORING 25'-30' PID (-1.0) PPM CGI 21.0.0.0.1
	29		GP: AS ABOVE W/SAND PREDOMINANTLY FINE GRAIN			
	30					

ENG FORM 1836-A PREVIOUS EDITIONS ARE OBSOLETE. MAR 77 SEP 90 MODIFIED FOR CADD BY CEMPS

PROJECT: RCRA WELLS, C5, LF5 | HOLE NO. 93-MFS-C5-3



DRILLING LOG (Cont Sheet) | ELEVATION TOP OF HOLE 218.9 | Hole No. 93-MFS-CS-3

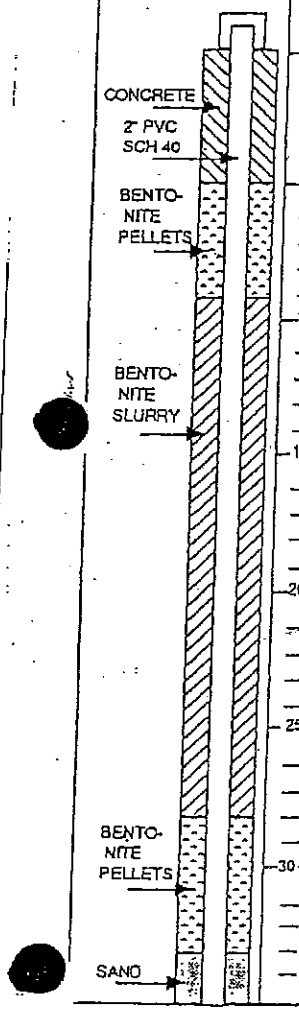
PROJECT: RCRA WELLS, CS, LF5 | INSTALLATION: FT LEWIS | SHEET 4 OF 4 SHEETS

ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (DESCRIPTION)	% CORE RECOVERY	BOX OR SAMPLE NO.	REMARKS (DRILLING TIME, WATER LOSS, DEPTH OF WEATHERING, ETC., IF SIGNIFICANT)
	30		GP: POORLY GRADED SANDY GRAVEL; UNCONSOLIDATED, SAND PREDOMINANTLY FINE GRAIN, ROUNDED GRAVEL TO 3", SATURATED, BROWN		(F)	SAMPLE F @ 30'
						ADDING WATER APPROX. 25 GPM
	31					
	32					AIR MONITORING 30'-35' PID (-1.2) PPM CGI 21.1, 0.0,0
	33					
	34					
			GP: POORLY GRADED SANDY GRAVEL; UNCONSOLIDATED, SAND PREDOMINANTLY FINE GRAIN, ROUNDED GRAVEL TO 3", SATURATED, BROWN			ADDING WATER APPROX. 25 GPM
	35		T.D. 35'		(G)	SAMPLE G @ 35'

ENG FORM 1836-A PREVIOUS EDITIONS ARE OBSOLETE. MAR 71 SEP 80 MODIFIED FOR USED BY CEMP1

PROJECT: RCRA WELLS, CS, LF5 | HOLE NO. 93-MFS-CS-3

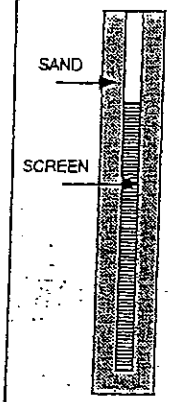
DRILLING LOG	PROJECT FT. LEWIS	PROJECT NUMBER 8820072A	SHEET 1 OF 2 SHEETS
LOCATION	LANDFILL #5	TOTAL NUMBER SAMPLES 0 (Sample Collected in Adjacent Hole)	
DRILLING AGENCY	HOLT	DEPTH TO WATER BELOW GRD SURFACE 22.06 FT	
HOLE NO.	88-2-VD	DATE HOLE STARTED 11/16/88	COMPLETED 11/17/88
NAME OF DRILLER	RANDY HOLT	ELEVATION AT REFERENCE POINT 220.03 FT	
TOTAL DEPTH OF HOLE	49.0 FT	SIGNATURE OF INSPECTOR	Warren Perkins William Deutsch



OPT (FT)	S T	B/FT	SAMP. NO.	% REC.	CLASSIFICATION OF MATERIALS (DESCRIPTION)	REMARKS Gals water added	
					Gravel with Sand		5
							5
					Yellow-gray, angular fragments	Bailed Material	5
							5
							5
							5
							5
					Yellow-gray, coarse sand with angular fragments, few 1-2" pebbles	Bailed Material	5
					Yellow-gray gravel with coarse sand fragments of some large cobbles to 5"	Bailed Material 11'10"	
					Yellow-gray gravel with some pebbles, not as many angular fragments	Bailed Material	5
					Yellow-gray pebbly gravel	Bailed Material	5
					Same as above, except more large angular fragments	Bailed Material	5
					As above, drilling harder at @ 18 ft similar to 88-1-SS	Bailed Material	
					Sandy gravel, yellow-gray, few 3-4" rock fragments; no pebbles	Vashon Recessional Gravel	5
						Bailed Material	5
					Sandy gravel, some silt, still hard drilling	Bailed Material	5
					As above		5
					Yellow-gray, sandy gravel, some silt; easier drilling	Water at 25' Bailed Material	5
					as above; drilling fairly hard	Bailed Material	2
					Yellow-gray, sandy gravel, angular fragments with some broken cobbles	Water bubbling into hole; drilling easier, able to drive casing ahead	
					Yellow-gray angular fragments	Vashon Till	7
					as above	Bailed sample; bailer full of water	7
					Sand/gravel, some silt	Hole making some water, not a lot	10
					as above	Hole making a little water	5

DRILLING LOG (Cont. Sheet) | HOLE NO. 88-2-VD

DIVISION | INSTALLATION FT. LEWIS | SHEET 2 OF 2 SHEETS



DPT (FT)	S T	B/FT	SAMP NO.	% REC.	CLASSIFICATION OF MATERIALS (DESCRIPTION)	REMARKS
						Water coming into
40					Well rounded coarse sand and gravel Some silt and crushed cobbles	hole in good quantity Vashon Advance Gravel Bailed sample
45					Slow drilling, large cobbles; cuttings all pulverized	Water at 28' below ground
					Heaving sand bottom 1 foot	
50					TOTAL DEPTH = 49 FT	

Woodward-Clyde Consultants

APPENDIX B

Field Data Sheets

DuPont Sampling and Analysis Plan

CalPortland -- Dupont, WA

Project Site/Location:	

Routine Station Maintenance			
Personnel:	Weather:	Arrival Date/Time:	
Station Battery Voltage:		Battery Changed? (Y/N -- New Voltage)	
Data Logger Desiccant OK? (Y/N)		Sensor(s) Cleaned & Secure? (Y/N)	
Flow Meter Desiccant OK? (Y/N)		Staff Plate Cleaned & Secure? (Y/N)	
Data Downloaded? (Y/N)		Rain Gage Cleaned & Secure? (Y/N)	
Water Level & Flow		**Water Quality Measurements & Observations (*In-Situ*)**	
Flow Meter Battery Voltage:		Data Logger Recorded Temp (°C) :	
Battery Changed? (Y/N -- New Voltage)		YSI Measured Temp (°C) :	
Date/time correct? (Y/N)		DO (mg/l) :	
Data Logger(s) Desiccant OK? (Y/N)		DO (% saturation) :	
Flow Meter Data Downloaded? (Y/N)		Salinity (ppt) :	
Staff Plate/Well Level (decimal-feet):		pH :	
Data Logger/Meter Recorded Level:		Turbidity (NTU) :	
Velocity (feet per second):		Water Color? (e.g., yellow, brown, grey)	
Flow Rate (CFS):		Floating Oil/Grease? (Y/N)	
Level Calibrated? (Y/N)		Floating Debris/Scum? (Y/N)	
Level Offset (Post-Calibration)		Potentially Harmful Materials? (Y/N)	
Level Offset (Post-Calibration)			

Notes, observations, and maintenance items for future visits. Include observations regarding channel/site conditions, such as: presence/absence of beaver dams; downed trees; streambed composition (e.g., embedded with sediment); vegetation; and particularly fast or slow flow velocities.

DuPont Sampling and Analysis Plan

CalPortland -- Dupont, WA

YSI Professional Handheld Multimeter Calibration Record	
CONDUCTIVITY and PH CALIBRATION*	DO CALIBRATION*
1. Press the Cal key. **2. Highlight the parameter you wish to calibrate and press enter. For Conductivity, a second menu will offer the option of calibrating Specific Conductance, Conductivity, or Salinity. Calibrating one automatically calibrates the other two. An additional sub-menu will require you to select the calibration units. For pH, auto-buffer recognition will determine which buffer the sensor is in and it will allow you to calibrate up to 6 points.** **3. Place the correct amount of calibration standard into a clean, dry or pre-rinsed container.** **4. Immerse the probe into the solution, making sure the sensor and thermistor are adequately immersed. Allow at least one minute for temperature to stabilize.** **5. For any of parameters, enter the calibration solution value by highlighting Calibration Value, pressing enter, and then using the alpha/numeric keypad to enter the known value. Once you have entered the value of the calibration standard, highlight <<<ENTER>>> and press enter.** **6. Wait for the readings to stabilize, highlight Accept Calibration and press enter to calibrate.** **7. For pH, continue with the next point by placing the probe in a second buffer and following the on-screen instructions or press Cal to complete the calibration.**	The Pro Plus offers four options for calibrating dissolved oxygen. The first is an air calibration method in % saturation. The second and third calibrates in mg/L or ppm to a solution with a known DO concentration (usually determined by a Winkler Titration). Calibration of any option (% or mg/L and ppm) will automatically calibrate the other. The fourth option is a zero calibration. If performing a zero calibration, you must perform a % or mg/L calibration following the zero calibration. For both ease of use and accuracy, YSI recommends performing the following 1-point DO % calibration: 1. Moisten the sponge in the cal/transport sleeve with a small amount of water and install it on the probe. The cal/transport sleeve ensures venting to the atmosphere. Disengage a thread or two to ensure atmospheric venting. Make sure the DO and temperature sensors are not immersed in the water. 2. Turn the instrument on. 3. Press the Cal key, highlight DO and press enter. 4. Highlight DO%, then press Enter. 5. Verify the barometric pressure and salinity displayed are accurate. Once DO and temperature are stable, highlight Accept Calibration and press enter.
*Additional calibration information can be found at: http://www.ysi.com/media/pdfs/605595-YSI-Pro-Plus-Quick-Start-Guide-RevB.pdf	

Date:	
Time:	
Staff:	

pH		
7	Initial	
	Calibration	
	Final	
4	Initial	
	Calibration	
	Final	
10	Initial	
	Calibration	
	Final	

Conductivity (Includes Salinity)		
Initial (µS/cm)	Calibration (µS/cm)	Final (µS/cm)

Dissolved Oxygen (1-Point DO Saturation Method)		
Initial (%)	Calibration (%)	Final (%)

APPENDIX C

Hydrologic Calculations

Western Washington Hydrology Model 2012

WWHM2012
PROJECT REPORT

Project Name: Basins C D
Site Name: Pioneer Aggregates
Site Address: Pioneer Avenue
City : DuPont
Report Date: 11/25/2020
Gage : 38 IN CENTRAL
Data Start : 10/01/1901
Data End : 09/30/2059
(adjusted) **Precip Scale:** 0.00
Version Date: 2019/09/13
Version : 4.2.17

Low Flow Threshold for POC 1 : 50 Percent of the 2 Year

High Flow Threshold for POC 1: 50 year

Low Flow Threshold for POC 2 : 50 Percent of the 2 Year

High Flow Threshold for POC 2: 50 year

PREDEVELOPED LAND USE

Name : Watershed C
Bypass: No

GroundWater: No

Pervious Land Use	acre
A B, Lawn, Flat	19.2
A B, Lawn, Steep	14.4
C, Lawn, Flat	57.5
C, Lawn, Mod	49.3
C, Lawn, Steep	20.7
Pervious Total	161.1

Impervious Land Use	acre
DRIVEWAYS MOD	1
Impervious Total	1
Basin Total	162.1

Element Flows To:

Surface	Interflow	Groundwater

Name : Watershed D
Bypass: No

GroundWater: No

Pervious Land Use	acre
A B, Lawn, Flat	4
A B, Lawn, Mod	41.5
C, Lawn, Flat	140
C, Lawn, Mod	15.9
C, Lawn, Steep	26.3
Pervious Total	227.7

Impervious Land Use	acre
Impervious Total	0
Basin Total	227.7

Element Flows To:

Surface	Interflow	Groundwater

MITIGATED LAND USE

Name : Basin C
Bypass: No

GroundWater: No

Pervious Land Use	acre
A B, Lawn, Flat	19.2
A B, Lawn, Steep	14.4
C, Lawn, Flat	57.5
C, Lawn, Mod	49.3
C, Lawn, Steep	20.7
Pervious Total	161.1

Impervious Land Use	acre
DRIVEWAYS MOD	1
Impervious Total	1
Basin Total	162.1

Element Flows To:

Surface	Interflow	Groundwater
Infilt Pond C	Infilt Pond C	

Name : Basin D
Bypass: No

GroundWater: No

Pervious Land Use	acre
A B, Lawn, Flat	4
A B, Lawn, Mod	41.5
C, Lawn, Flat	140
C, Lawn, Mod	15.9
C, Lawn, Steep	26.3
Pervious Total	227.7

Impervious Land Use	acre
Impervious Total	0
Basin Total	227.7

Element Flows To:

Surface	Interflow	Groundwater
Infilt Pond D	Infilt Pond D	

Name : Infilt Pond C
Bottom Length: 450.00 ft.
Bottom Width: 113.00 ft.
Depth: 6 ft.
Volume at riser head: 6.8406 acre-feet.
Infiltration On
Infiltration rate: 8.1
Infiltration safety factor: 1
Wetted surface area On
Total Volume Infiltrated (ac-ft.): 22322.842
Total Volume Through Riser (ac-ft.): 0
Total Volume Through Facility (ac-ft.): 22322.842
Percent Infiltrated: 100
Total Precip Applied to Facility: 0
Total Evap From Facility: 0
Side slope 1: 3 To 1
Side slope 2: 3 To 1
Side slope 3: 3 To 1
Side slope 4: 3 To 1
Discharge Structure

Riser Height: 5 ft.
Riser Diameter: 24 in.

Element Flows To:
Outlet 1 **Outlet 2**

Pond Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	1.167	0.000	0.000	0.000
0.0667	1.172	0.078	0.000	9.576
0.1333	1.177	0.156	0.000	9.618
0.2000	1.182	0.235	0.000	9.661
0.2667	1.188	0.314	0.000	9.703
0.3333	1.193	0.393	0.000	9.746
0.4000	1.198	0.473	0.000	9.788
0.4667	1.203	0.553	0.000	9.831
0.5333	1.208	0.633	0.000	9.874
0.6000	1.214	0.714	0.000	9.916
0.6667	1.219	0.795	0.000	9.959
0.7333	1.224	0.877	0.000	10.00
0.8000	1.229	0.958	0.000	10.04
0.8667	1.235	1.041	0.000	10.08
0.9333	1.240	1.123	0.000	10.13
1.0000	1.245	1.206	0.000	10.17
1.0667	1.251	1.289	0.000	10.21
1.1333	1.256	1.373	0.000	10.26
1.2000	1.261	1.457	0.000	10.30
1.2667	1.266	1.541	0.000	10.34
1.3333	1.272	1.626	0.000	10.39
1.4000	1.277	1.711	0.000	10.43
1.4667	1.282	1.796	0.000	10.47
1.5333	1.288	1.882	0.000	10.52
1.6000	1.293	1.968	0.000	10.56
1.6667	1.298	2.054	0.000	10.60
1.7333	1.304	2.141	0.000	10.65
1.8000	1.309	2.228	0.000	10.69
1.8667	1.315	2.316	0.000	10.74
1.9333	1.320	2.403	0.000	10.78
2.0000	1.325	2.492	0.000	10.82
2.0667	1.331	2.580	0.000	10.87
2.1333	1.336	2.669	0.000	10.91
2.2000	1.342	2.758	0.000	10.96
2.2667	1.347	2.848	0.000	11.00
2.3333	1.352	2.938	0.000	11.04
2.4000	1.358	3.028	0.000	11.09
2.4667	1.363	3.119	0.000	11.13
2.5333	1.369	3.210	0.000	11.18
2.6000	1.374	3.302	0.000	11.22
2.6667	1.380	3.393	0.000	11.27
2.7333	1.385	3.486	0.000	11.31
2.8000	1.391	3.578	0.000	11.36
2.8667	1.396	3.671	0.000	11.40
2.9333	1.401	3.764	0.000	11.45

3.0000	1.407	3.858	0.000	11.49
3.0667	1.412	3.952	0.000	11.54
3.1333	1.418	4.046	0.000	11.58
3.2000	1.424	4.141	0.000	11.63
3.2667	1.429	4.236	0.000	11.67
3.3333	1.435	4.332	0.000	11.72
3.4000	1.440	4.428	0.000	11.76
3.4667	1.446	4.524	0.000	11.81
3.5333	1.451	4.620	0.000	11.85
3.6000	1.457	4.717	0.000	11.90
3.6667	1.462	4.815	0.000	11.94
3.7333	1.468	4.912	0.000	11.99
3.8000	1.474	5.011	0.000	12.03
3.8667	1.479	5.109	0.000	12.08
3.9333	1.485	5.208	0.000	12.13
4.0000	1.490	5.307	0.000	12.17
4.0667	1.496	5.407	0.000	12.22
4.1333	1.502	5.507	0.000	12.26
4.2000	1.507	5.607	0.000	12.31
4.2667	1.513	5.708	0.000	12.36
4.3333	1.518	5.809	0.000	12.40
4.4000	1.524	5.910	0.000	12.45
4.4667	1.530	6.012	0.000	12.49
4.5333	1.535	6.114	0.000	12.54
4.6000	1.541	6.217	0.000	12.59
4.6667	1.547	6.320	0.000	12.63
4.7333	1.552	6.423	0.000	12.68
4.8000	1.558	6.527	0.000	12.73
4.8667	1.564	6.631	0.000	12.77
4.9333	1.570	6.735	0.000	12.82
5.0000	1.575	6.840	0.000	12.87
5.0667	1.581	6.945	0.365	12.91
5.1333	1.587	7.051	1.030	12.96
5.2000	1.593	7.157	1.886	13.01
5.2667	1.598	7.263	2.883	13.05
5.3333	1.604	7.370	3.979	13.10
5.4000	1.610	7.477	5.134	13.15
5.4667	1.616	7.585	6.307	13.19
5.5333	1.621	7.693	7.456	13.24
5.6000	1.627	7.801	8.540	13.29
5.6667	1.633	7.910	9.523	13.34
5.7333	1.639	8.019	10.37	13.38
5.8000	1.644	8.128	11.08	13.43
5.8667	1.650	8.238	11.65	13.48
5.9333	1.656	8.348	12.09	13.53
6.0000	1.662	8.459	12.46	13.57
6.0667	1.668	8.570	13.01	13.62

Name : Infilt Pond D
Bottom Length: 1000.00 ft.
Bottom Width: 37.70 ft.
Depth: 6 ft.
Volume at riser head: 6.1485 acre-feet.
Infiltration On
Infiltration rate: 8.2
Infiltration safety factor: 1

Wetted surface area On
Total Volume Infiltrated (ac-ft.): 31272.175
Total Volume Through Riser (ac-ft.): 1.011
Total Volume Through Facility (ac-ft.): 31273.186
Percent Infiltrated: 100
Total Precip Applied to Facility: 0
Total Evap From Facility: 0
Side slope 1: 3 To 1
Side slope 2: 3 To 1
Side slope 3: 3 To 1
Side slope 4: 3 To 1
Discharge Structure
Riser Height: 5 ft.
Riser Diameter: 24 in.

Element Flows To:
Outlet 1 **Outlet 2**

Pond Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.865	0.000	0.000	0.000
0.0667	0.875	0.058	0.000	7.234
0.1333	0.884	0.116	0.000	7.313
0.2000	0.894	0.176	0.000	7.392
0.2667	0.903	0.235	0.000	7.471
0.3333	0.913	0.296	0.000	7.550
0.4000	0.922	0.357	0.000	7.629
0.4667	0.932	0.419	0.000	7.709
0.5333	0.941	0.482	0.000	7.788
0.6000	0.951	0.545	0.000	7.867
0.6667	0.961	0.608	0.000	7.946
0.7333	0.970	0.673	0.000	8.026
0.8000	0.980	0.738	0.000	8.105
0.8667	0.990	0.803	0.000	8.185
0.9333	0.999	0.870	0.000	8.265
1.0000	1.009	0.937	0.000	8.344
1.0667	1.018	1.004	0.000	8.424
1.1333	1.028	1.073	0.000	8.504
1.2000	1.038	1.142	0.000	8.584
1.2667	1.047	1.211	0.000	8.664
1.3333	1.057	1.281	0.000	8.743
1.4000	1.067	1.352	0.000	8.824
1.4667	1.076	1.424	0.000	8.904
1.5333	1.086	1.496	0.000	8.984
1.6000	1.096	1.568	0.000	9.064
1.6667	1.106	1.642	0.000	9.144
1.7333	1.115	1.716	0.000	9.225
1.8000	1.125	1.791	0.000	9.305
1.8667	1.135	1.866	0.000	9.385
1.9333	1.144	1.942	0.000	9.466
2.0000	1.154	2.019	0.000	9.547
2.0667	1.164	2.096	0.000	9.627
2.1333	1.174	2.174	0.000	9.708

2.2000	1.183	2.252	0.000	9.789
2.2667	1.193	2.332	0.000	9.869
2.3333	1.203	2.412	0.000	9.950
2.4000	1.213	2.492	0.000	10.03
2.4667	1.223	2.573	0.000	10.11
2.5333	1.232	2.655	0.000	10.19
2.6000	1.242	2.738	0.000	10.27
2.6667	1.252	2.821	0.000	10.35
2.7333	1.262	2.905	0.000	10.43
2.8000	1.272	2.989	0.000	10.51
2.8667	1.282	3.074	0.000	10.60
2.9333	1.291	3.160	0.000	10.68
3.0000	1.301	3.247	0.000	10.76
3.0667	1.311	3.334	0.000	10.84
3.1333	1.321	3.421	0.000	10.92
3.2000	1.331	3.510	0.000	11.00
3.2667	1.341	3.599	0.000	11.09
3.3333	1.351	3.689	0.000	11.17
3.4000	1.361	3.779	0.000	11.25
3.4667	1.370	3.870	0.000	11.33
3.5333	1.380	3.962	0.000	11.41
3.6000	1.390	4.054	0.000	11.49
3.6667	1.400	4.147	0.000	11.58
3.7333	1.410	4.241	0.000	11.66
3.8000	1.420	4.335	0.000	11.74
3.8667	1.430	4.430	0.000	11.82
3.9333	1.440	4.526	0.000	11.91
4.0000	1.450	4.623	0.000	11.99
4.0667	1.460	4.720	0.000	12.07
4.1333	1.470	4.817	0.000	12.15
4.2000	1.480	4.916	0.000	12.24
4.2667	1.490	5.015	0.000	12.32
4.3333	1.500	5.114	0.000	12.40
4.4000	1.510	5.215	0.000	12.48
4.4667	1.520	5.316	0.000	12.57
4.5333	1.530	5.417	0.000	12.65
4.6000	1.540	5.520	0.000	12.73
4.6667	1.550	5.623	0.000	12.82
4.7333	1.560	5.727	0.000	12.90
4.8000	1.570	5.831	0.000	12.98
4.8667	1.580	5.936	0.000	13.06
4.9333	1.590	6.042	0.000	13.15
5.0000	1.600	6.148	0.000	13.23
5.0667	1.610	6.255	0.365	13.31
5.1333	1.621	6.363	1.030	13.40
5.2000	1.631	6.471	1.886	13.48
5.2667	1.641	6.580	2.883	13.57
5.3333	1.651	6.690	3.979	13.65
5.4000	1.661	6.800	5.134	13.73
5.4667	1.671	6.912	6.307	13.82
5.5333	1.681	7.023	7.456	13.90
5.6000	1.691	7.136	8.540	13.98
5.6667	1.702	7.249	9.523	14.07
5.7333	1.712	7.363	10.37	14.15
5.8000	1.722	7.477	11.08	14.24
5.8667	1.732	7.592	11.65	14.32
5.9333	1.742	7.708	12.09	14.40

6.0000	1.752	7.825	12.46	14.49
6.0667	1.763	7.942	13.01	14.57

ANALYSIS RESULTS

Stream Protection Duration

Predeveloped Landuse Totals for POC #1
Total Pervious Area:161.1
Total Impervious Area:1

Mitigated Landuse Totals for POC #1
Total Pervious Area:161.1
Total Impervious Area:1

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	Flow(cfs)
2 year	7.15659
5 year	14.082833
10 year	20.66757
25 year	31.840733
50 year	42.64107
100 year	55.940025

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	Flow(cfs)
2 year	0
5 year	0
10 year	0
25 year	0
50 year	0
100 year	0

Stream Protection Duration
Annual Peaks for Predeveloped and Mitigated. POC #1

Year	Predeveloped	Mitigated
1902	4.799	0.000
1903	3.466	0.000
1904	25.520	0.000
1905	4.233	0.000
1906	1.571	0.000
1907	12.609	0.000
1908	5.300	0.000
1909	6.989	0.000
1910	14.200	0.000
1911	9.354	0.000
1912	55.963	0.000
1913	6.386	0.000
1914	39.323	0.000

1915	3.687	0.000
1916	8.055	0.000
1917	2.298	0.000
1918	4.539	0.000
1919	4.129	0.000
1920	9.261	0.000
1921	6.609	0.000
1922	17.117	0.000
1923	7.087	0.000
1924	3.338	0.000
1925	3.459	0.000
1926	6.149	0.000
1927	3.354	0.000
1928	4.887	0.000
1929	12.189	0.000
1930	4.365	0.000
1931	4.843	0.000
1932	5.332	0.000
1933	6.063	0.000
1934	20.863	0.000
1935	4.242	0.000
1936	6.076	0.000
1937	15.127	0.000
1938	5.018	0.000
1939	1.735	0.000
1940	6.513	0.000
1941	2.472	0.000
1942	13.789	0.000
1943	6.739	0.000
1944	19.359	0.000
1945	5.697	0.000
1946	10.648	0.000
1947	2.796	0.000
1948	10.617	0.000
1949	10.733	0.000
1950	3.312	0.000
1951	3.177	0.000
1952	36.522	0.000
1953	28.551	0.000
1954	5.398	0.000
1955	3.533	0.000
1956	2.073	0.000
1957	5.164	0.000
1958	19.341	0.000
1959	16.116	0.000
1960	3.516	0.000
1961	22.333	0.000
1962	5.470	0.000
1963	3.069	0.000
1964	31.433	0.000
1965	11.702	0.000
1966	3.930	0.000
1967	14.803	0.000
1968	5.405	0.000
1969	5.852	0.000
1970	12.098	0.000
1971	12.768	0.000

1972	52.820	0.000
1973	12.265	0.000
1974	12.727	0.000
1975	29.304	0.000
1976	21.674	0.000
1977	2.415	0.000
1978	19.844	0.000
1979	7.557	0.000
1980	15.201	0.000
1981	5.582	0.000
1982	3.596	0.000
1983	10.771	0.000
1984	11.121	0.000
1985	19.657	0.000
1986	5.284	0.000
1987	16.103	0.000
1988	5.029	0.000
1989	5.135	0.000
1990	7.297	0.000
1991	14.980	0.000
1992	11.209	0.000
1993	7.477	0.000
1994	11.829	0.000
1995	3.511	0.000
1996	14.451	0.000
1997	5.092	0.000
1998	11.456	0.000
1999	2.804	0.000
2000	6.273	0.000
2001	3.865	0.000
2002	28.697	0.000
2003	7.538	0.000
2004	9.171	0.000
2005	34.781	0.000
2006	3.283	0.000
2007	8.778	0.000
2008	6.181	0.000
2009	4.071	0.000
2010	4.942	0.000
2011	2.348	0.000
2012	6.803	0.000
2013	9.504	0.000
2014	5.199	0.000
2015	27.596	0.000
2016	2.758	0.000
2017	7.909	0.000
2018	18.018	0.000
2019	26.979	0.000
2020	12.928	0.000
2021	10.302	0.000
2022	8.336	0.000
2023	7.925	0.000
2024	45.967	0.000
2025	4.846	0.000
2026	7.863	0.000
2027	4.910	0.000
2028	2.945	0.000

2029	6.624	0.000
2030	15.307	0.000
2031	3.288	0.000
2032	2.451	0.000
2033	3.070	0.000
2034	4.192	0.000
2035	15.150	0.000
2036	6.795	0.000
2037	2.789	0.000
2038	15.705	0.000
2039	2.081	0.000
2040	4.681	0.000
2041	5.905	0.000
2042	13.736	0.000
2043	9.643	0.000
2044	9.191	0.000
2045	4.659	0.000
2046	5.399	0.000
2047	4.288	0.000
2048	5.191	0.000
2049	7.317	0.000
2050	7.509	0.000
2051	18.257	0.000
2052	3.570	0.000
2053	5.536	0.000
2054	32.862	0.000
2055	4.357	0.000
2056	2.675	0.000
2057	4.042	0.000
2058	4.312	0.000
2059	19.759	0.000

Stream Protection Duration
Ranked Annual Peaks for Predeveloped and Mitigated. POC #1

Rank	Predeveloped	Mitigated
1	55.9628	0.0000
2	52.8202	0.0000
3	45.9668	0.0000
4	39.3227	0.0000
5	36.5224	0.0000
6	34.7813	0.0000
7	32.8623	0.0000
8	31.4326	0.0000
9	29.3037	0.0000
10	28.6966	0.0000
11	28.5509	0.0000
12	27.5956	0.0000
13	26.9794	0.0000
14	25.5195	0.0000
15	22.3329	0.0000
16	21.6736	0.0000
17	20.8633	0.0000
18	19.8441	0.0000
19	19.7590	0.0000
20	19.6570	0.0000
21	19.3587	0.0000

22	19.3413	0.0000
23	18.2573	0.0000
24	18.0179	0.0000
25	17.1166	0.0000
26	16.1156	0.0000
27	16.1032	0.0000
28	15.7052	0.0000
29	15.3068	0.0000
30	15.2014	0.0000
31	15.1501	0.0000
32	15.1265	0.0000
33	14.9802	0.0000
34	14.8030	0.0000
35	14.4510	0.0000
36	14.1996	0.0000
37	13.7890	0.0000
38	13.7363	0.0000
39	12.9282	0.0000
40	12.7680	0.0000
41	12.7266	0.0000
42	12.6087	0.0000
43	12.2648	0.0000
44	12.1890	0.0000
45	12.0982	0.0000
46	11.8294	0.0000
47	11.7016	0.0000
48	11.4560	0.0000
49	11.2090	0.0000
50	11.1213	0.0000
51	10.7712	0.0000
52	10.7328	0.0000
53	10.6481	0.0000
54	10.6173	0.0000
55	10.3024	0.0000
56	9.6433	0.0000
57	9.5038	0.0000
58	9.3535	0.0000
59	9.2609	0.0000
60	9.1913	0.0000
61	9.1712	0.0000
62	8.7780	0.0000
63	8.3359	0.0000
64	8.0547	0.0000
65	7.9255	0.0000
66	7.9088	0.0000
67	7.8633	0.0000
68	7.5570	0.0000
69	7.5383	0.0000
70	7.5089	0.0000
71	7.4765	0.0000
72	7.3171	0.0000
73	7.2970	0.0000
74	7.0873	0.0000
75	6.9892	0.0000
76	6.8032	0.0000
77	6.7951	0.0000
78	6.7392	0.0000

79	6.6238	0.0000
80	6.6086	0.0000
81	6.5127	0.0000
82	6.3864	0.0000
83	6.2726	0.0000
84	6.1810	0.0000
85	6.1495	0.0000
86	6.0758	0.0000
87	6.0626	0.0000
88	5.9047	0.0000
89	5.8516	0.0000
90	5.6973	0.0000
91	5.5818	0.0000
92	5.5361	0.0000
93	5.4705	0.0000
94	5.4054	0.0000
95	5.3989	0.0000
96	5.3978	0.0000
97	5.3317	0.0000
98	5.3001	0.0000
99	5.2844	0.0000
100	5.1989	0.0000
101	5.1912	0.0000
102	5.1638	0.0000
103	5.1346	0.0000
104	5.0924	0.0000
105	5.0292	0.0000
106	5.0183	0.0000
107	4.9417	0.0000
108	4.9104	0.0000
109	4.8875	0.0000
110	4.8459	0.0000
111	4.8429	0.0000
112	4.7986	0.0000
113	4.6807	0.0000
114	4.6594	0.0000
115	4.5394	0.0000
116	4.3648	0.0000
117	4.3568	0.0000
118	4.3121	0.0000
119	4.2875	0.0000
120	4.2417	0.0000
121	4.2333	0.0000
122	4.1918	0.0000
123	4.1287	0.0000
124	4.0712	0.0000
125	4.0416	0.0000
126	3.9304	0.0000
127	3.8653	0.0000
128	3.6866	0.0000
129	3.5958	0.0000
130	3.5696	0.0000
131	3.5328	0.0000
132	3.5163	0.0000
133	3.5109	0.0000
134	3.4661	0.0000
135	3.4587	0.0000

136	3.3542	0.0000
137	3.3382	0.0000
138	3.3115	0.0000
139	3.2884	0.0000
140	3.2832	0.0000
141	3.1770	0.0000
142	3.0697	0.0000
143	3.0686	0.0000
144	2.9449	0.0000
145	2.8037	0.0000
146	2.7957	0.0000
147	2.7891	0.0000
148	2.7581	0.0000
149	2.6753	0.0000
150	2.4716	0.0000
151	2.4511	0.0000
152	2.4155	0.0000
153	2.3485	0.0000
154	2.2981	0.0000
155	2.0808	0.0000
156	2.0730	0.0000
157	1.7348	0.0000
158	1.5711	0.0000

Stream Protection Duration
POC #1
The Facility PASSED

The Facility PASSED.

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
3.5783	17484	0	0	Pass
3.9729	12565	0	0	Pass
4.3674	8897	0	0	Pass
4.7620	6343	0	0	Pass
5.1566	4656	0	0	Pass
5.5512	3562	0	0	Pass
5.9457	2785	0	0	Pass
6.3403	2182	0	0	Pass
6.7349	1561	0	0	Pass
7.1295	1210	0	0	Pass
7.5240	978	0	0	Pass
7.9186	780	0	0	Pass
8.3132	638	0	0	Pass
8.7078	535	0	0	Pass
9.1023	424	0	0	Pass
9.4969	343	0	0	Pass
9.8915	293	0	0	Pass
10.2860	261	0	0	Pass
10.6806	239	0	0	Pass
11.0752	223	0	0	Pass
11.4698	205	0	0	Pass
11.8643	193	0	0	Pass
12.2589	181	0	0	Pass
12.6535	170	0	0	Pass
13.0481	161	0	0	Pass

13.4426	152	0	0	Pass
13.8372	142	0	0	Pass
14.2318	133	0	0	Pass
14.6264	127	0	0	Pass
15.0209	116	0	0	Pass
15.4155	111	0	0	Pass
15.8101	108	0	0	Pass
16.2046	99	0	0	Pass
16.5992	97	0	0	Pass
16.9938	92	0	0	Pass
17.3884	88	0	0	Pass
17.7829	79	0	0	Pass
18.1775	73	0	0	Pass
18.5721	68	0	0	Pass
18.9667	66	0	0	Pass
19.3612	63	0	0	Pass
19.7558	60	0	0	Pass
20.1504	57	0	0	Pass
20.5450	55	0	0	Pass
20.9395	49	0	0	Pass
21.3341	46	0	0	Pass
21.7287	44	0	0	Pass
22.1232	44	0	0	Pass
22.5178	39	0	0	Pass
22.9124	39	0	0	Pass
23.3070	39	0	0	Pass
23.7015	38	0	0	Pass
24.0961	35	0	0	Pass
24.4907	34	0	0	Pass
24.8853	33	0	0	Pass
25.2798	31	0	0	Pass
25.6744	30	0	0	Pass
26.0690	30	0	0	Pass
26.4636	30	0	0	Pass
26.8581	29	0	0	Pass
27.2527	27	0	0	Pass
27.6473	26	0	0	Pass
28.0419	25	0	0	Pass
28.4364	24	0	0	Pass
28.8310	21	0	0	Pass
29.2256	21	0	0	Pass
29.6201	20	0	0	Pass
30.0147	20	0	0	Pass
30.4093	20	0	0	Pass
30.8039	20	0	0	Pass
31.1984	20	0	0	Pass
31.5930	18	0	0	Pass
31.9876	18	0	0	Pass
32.3822	18	0	0	Pass
32.7767	18	0	0	Pass
33.1713	16	0	0	Pass
33.5659	16	0	0	Pass
33.9605	16	0	0	Pass
34.3550	16	0	0	Pass
34.7496	16	0	0	Pass
35.1442	15	0	0	Pass
35.5387	15	0	0	Pass

35.9333	14	0	0	Pass
36.3279	14	0	0	Pass
36.7225	12	0	0	Pass
37.1170	12	0	0	Pass
37.5116	12	0	0	Pass
37.9062	12	0	0	Pass
38.3008	12	0	0	Pass
38.6953	12	0	0	Pass
39.0899	12	0	0	Pass
39.4845	11	0	0	Pass
39.8791	10	0	0	Pass
40.2736	10	0	0	Pass
40.6682	9	0	0	Pass
41.0628	9	0	0	Pass
41.4573	9	0	0	Pass
41.8519	9	0	0	Pass
42.2465	9	0	0	Pass
42.6411	9	0	0	Pass

Water Quality BMP Flow and Volume for POC #1
On-line facility volume: 6.0805 **acre-feet**
On-line facility target flow: 3.3931 **cfs.**
Adjusted for 15 min: 3.3931 **cfs.**
Off-line facility target flow: 1.9045 **cfs.**
Adjusted for 15 min: 1.9045 **cfs.**

LID Report

LID Technique	Used for Water Quality	Total Volume Needs Treatment (ac-ft)	Volume Through Facility (ac-ft)	Infiltration Volume (ac-ft.)	Cumulative Volume Infiltration Credit	Percent Volume Infiltrated	Water Quality Treated	Percent Treatment?	Comment
Infilt Pond C POC	N	20313.78			N	100.00			
Total Volume Infiltrated		20313.78	0.00	0.00		100.00	0.00	0%	No Treat. Credit

Compliance with LID Standard 8
Duration Analysis Result = Passed

Stream Protection Duration

Predeveloped Landuse Totals for POC #2
Total Pervious Area:227.7
Total Impervious Area:0

Mitigated Landuse Totals for POC #2
Total Pervious Area:227.7
Total Impervious Area:0

Flow Frequency Return Periods for Predeveloped. POC #2

Return Period	Flow(cfs)
2 year	9.453983
5 year	18.751269
10 year	27.642348
25 year	42.801569
50 year	57.51558
100 year	75.693112

Flow Frequency Return Periods for Mitigated. POC #2

Return Period	Flow(cfs)
2 year	0
5 year	0
10 year	0
25 year	0
50 year	0
100 year	0

Stream Protection Duration
Annual Peaks for Predeveloped and Mitigated. POC #2

Year	Predeveloped	Mitigated
1902	6.246	0.000
1903	4.718	0.000
1904	33.939	0.000
1905	5.808	0.000
1906	2.062	0.000
1907	16.843	0.000
1908	6.764	0.000
1909	9.046	0.000
1910	19.255	0.000
1911	12.085	0.000
1912	77.843	1.755
1913	8.817	0.000
1914	50.844	0.000
1915	4.788	0.000
1916	10.048	0.000
1917	3.156	0.000
1918	6.084	0.000
1919	5.382	0.000
1920	12.020	0.000
1921	8.763	0.000
1922	22.619	0.000
1923	9.530	0.000
1924	4.652	0.000
1925	4.536	0.000
1926	8.035	0.000
1927	4.560	0.000
1928	6.400	0.000
1929	15.813	0.000
1930	5.877	0.000
1931	6.424	0.000
1932	6.832	0.000
1933	7.918	0.000
1934	27.707	0.000
1935	5.633	0.000

1936	7.878	0.000
1937	20.521	0.000
1938	6.479	0.000
1939	2.219	0.000
1940	8.440	0.000
1941	3.360	0.000
1942	18.130	0.000
1943	8.634	0.000
1944	25.406	0.000
1945	7.749	0.000
1946	14.041	0.000
1947	3.803	0.000
1948	14.258	0.000
1949	14.446	0.000
1950	4.515	0.000
1951	4.113	0.000
1952	50.783	7.074
1953	39.109	0.000
1954	6.849	0.000
1955	4.901	0.000
1956	2.873	0.000
1957	7.121	0.000
1958	26.457	0.000
1959	21.858	0.000
1960	4.398	0.000
1961	29.737	0.000
1962	7.022	0.000
1963	4.264	0.000
1964	42.383	0.000
1965	15.609	0.000
1966	4.977	0.000
1967	19.613	0.000
1968	7.449	0.000
1969	7.567	0.000
1970	15.844	0.000
1971	17.325	0.000
1972	71.605	0.000
1973	16.472	0.000
1974	17.212	0.000
1975	40.503	0.000
1976	28.810	0.000
1977	3.358	0.000
1978	27.189	0.000
1979	9.606	0.000
1980	19.926	0.000
1981	6.878	0.000
1982	4.449	0.000
1983	14.229	0.000
1984	14.551	0.000
1985	26.318	0.000
1986	6.950	0.000
1987	21.177	0.000
1988	6.670	0.000
1989	6.826	0.000
1990	9.281	0.000
1991	18.716	0.000
1992	14.449	0.000

1993	9.817	0.000
1994	15.884	0.000
1995	4.476	0.000
1996	19.610	0.000
1997	6.542	0.000
1998	15.149	0.000
1999	3.625	0.000
2000	8.159	0.000
2001	4.976	0.000
2002	38.857	0.000
2003	9.870	0.000
2004	11.896	0.000
2005	46.782	0.000
2006	4.233	0.000
2007	11.111	0.000
2008	8.046	0.000
2009	5.271	0.000
2010	6.874	0.000
2011	3.144	0.000
2012	9.224	0.000
2013	12.376	0.000
2014	6.602	0.000
2015	37.780	0.000
2016	3.159	0.000
2017	10.697	0.000
2018	25.208	0.000
2019	35.795	0.000
2020	17.250	0.000
2021	13.365	0.000
2022	9.977	0.000
2023	9.850	0.000
2024	64.683	0.000
2025	6.669	0.000
2026	10.472	0.000
2027	6.313	0.000
2028	4.045	0.000
2029	8.691	0.000
2030	20.644	0.000
2031	4.446	0.000
2032	3.072	0.000
2033	4.250	0.000
2034	5.863	0.000
2035	20.444	0.000
2036	9.044	0.000
2037	3.865	0.000
2038	20.483	0.000
2039	2.184	0.000
2040	5.955	0.000
2041	7.500	0.000
2042	18.567	0.000
2043	12.694	0.000
2044	12.165	0.000
2045	5.930	0.000
2046	7.032	0.000
2047	5.805	0.000
2048	7.202	0.000
2049	9.679	0.000

2050	9.773	0.000
2051	24.509	0.000
2052	4.830	0.000
2053	7.495	0.000
2054	44.017	0.000
2055	5.437	0.000
2056	3.707	0.000
2057	5.563	0.000
2058	5.827	0.000
2059	26.461	0.000

Stream Protection Duration
Ranked Annual Peaks for Predeveloped and Mitigated. POC #2

Rank	Predeveloped	Mitigated
1	77.8432	7.0742
2	71.6051	1.7552
3	64.6825	0.0000
4	50.8441	0.0000
5	50.7834	0.0000
6	46.7818	0.0000
7	44.0168	0.0000
8	42.3826	0.0000
9	40.5026	0.0000
10	39.1091	0.0000
11	38.8567	0.0000
12	37.7802	0.0000
13	35.7950	0.0000
14	33.9390	0.0000
15	29.7370	0.0000
16	28.8097	0.0000
17	27.7067	0.0000
18	27.1888	0.0000
19	26.4609	0.0000
20	26.4572	0.0000
21	26.3176	0.0000
22	25.4058	0.0000
23	25.2078	0.0000
24	24.5093	0.0000
25	22.6185	0.0000
26	21.8582	0.0000
27	21.1771	0.0000
28	20.6440	0.0000
29	20.5208	0.0000
30	20.4827	0.0000
31	20.4438	0.0000
32	19.9258	0.0000
33	19.6128	0.0000
34	19.6103	0.0000
35	19.2545	0.0000
36	18.7158	0.0000
37	18.5671	0.0000
38	18.1296	0.0000
39	17.3248	0.0000
40	17.2504	0.0000
41	17.2121	0.0000
42	16.8432	0.0000

43	16.4715	0.0000
44	15.8843	0.0000
45	15.8442	0.0000
46	15.8125	0.0000
47	15.6093	0.0000
48	15.1494	0.0000
49	14.5511	0.0000
50	14.4486	0.0000
51	14.4460	0.0000
52	14.2582	0.0000
53	14.2287	0.0000
54	14.0408	0.0000
55	13.3653	0.0000
56	12.6935	0.0000
57	12.3759	0.0000
58	12.1649	0.0000
59	12.0851	0.0000
60	12.0203	0.0000
61	11.8959	0.0000
62	11.1114	0.0000
63	10.6974	0.0000
64	10.4724	0.0000
65	10.0477	0.0000
66	9.9772	0.0000
67	9.8699	0.0000
68	9.8497	0.0000
69	9.8169	0.0000
70	9.7728	0.0000
71	9.6795	0.0000
72	9.6063	0.0000
73	9.5297	0.0000
74	9.2813	0.0000
75	9.2245	0.0000
76	9.0458	0.0000
77	9.0442	0.0000
78	8.8167	0.0000
79	8.7634	0.0000
80	8.6914	0.0000
81	8.6343	0.0000
82	8.4400	0.0000
83	8.1594	0.0000
84	8.0462	0.0000
85	8.0351	0.0000
86	7.9177	0.0000
87	7.8778	0.0000
88	7.7495	0.0000
89	7.5670	0.0000
90	7.4996	0.0000
91	7.4949	0.0000
92	7.4485	0.0000
93	7.2023	0.0000
94	7.1209	0.0000
95	7.0316	0.0000
96	7.0221	0.0000
97	6.9501	0.0000
98	6.8783	0.0000
99	6.8739	0.0000

100	6.8494	0.0000
101	6.8321	0.0000
102	6.8264	0.0000
103	6.7636	0.0000
104	6.6703	0.0000
105	6.6692	0.0000
106	6.6022	0.0000
107	6.5422	0.0000
108	6.4785	0.0000
109	6.4237	0.0000
110	6.3999	0.0000
111	6.3135	0.0000
112	6.2460	0.0000
113	6.0841	0.0000
114	5.9555	0.0000
115	5.9305	0.0000
116	5.8765	0.0000
117	5.8631	0.0000
118	5.8265	0.0000
119	5.8080	0.0000
120	5.8054	0.0000
121	5.6331	0.0000
122	5.5632	0.0000
123	5.4370	0.0000
124	5.3821	0.0000
125	5.2706	0.0000
126	4.9766	0.0000
127	4.9760	0.0000
128	4.9015	0.0000
129	4.8297	0.0000
130	4.7881	0.0000
131	4.7176	0.0000
132	4.6524	0.0000
133	4.5602	0.0000
134	4.5358	0.0000
135	4.5146	0.0000
136	4.4764	0.0000
137	4.4486	0.0000
138	4.4460	0.0000
139	4.3984	0.0000
140	4.2645	0.0000
141	4.2498	0.0000
142	4.2333	0.0000
143	4.1134	0.0000
144	4.0452	0.0000
145	3.8650	0.0000
146	3.8025	0.0000
147	3.7072	0.0000
148	3.6252	0.0000
149	3.3602	0.0000
150	3.3581	0.0000
151	3.1587	0.0000
152	3.1562	0.0000
153	3.1436	0.0000
154	3.0717	0.0000
155	2.8726	0.0000
156	2.2190	0.0000

157	2.1836	0.0000
158	2.0622	0.0000

Stream Protection Duration
POC #2
The Facility PASSED

The Facility PASSED.

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
4.7270	21074	5	0	Pass
5.2602	15174	3	0	Pass
5.7934	11041	3	0	Pass
6.3266	7806	2	0	Pass
6.8599	5656	1	0	Pass
7.3931	4265	0	0	Pass
7.9263	3345	0	0	Pass
8.4595	2653	0	0	Pass
8.9927	2048	0	0	Pass
9.5260	1494	0	0	Pass
10.0592	1178	0	0	Pass
10.5924	947	0	0	Pass
11.1256	758	0	0	Pass
11.6588	624	0	0	Pass
12.1920	508	0	0	Pass
12.7253	404	0	0	Pass
13.2585	331	0	0	Pass
13.7917	284	0	0	Pass
14.3249	245	0	0	Pass
14.8581	229	0	0	Pass
15.3914	210	0	0	Pass
15.9246	196	0	0	Pass
16.4578	187	0	0	Pass
16.9910	172	0	0	Pass
17.5242	157	0	0	Pass
18.0574	152	0	0	Pass
18.5907	145	0	0	Pass
19.1239	132	0	0	Pass
19.6571	125	0	0	Pass
20.1903	122	0	0	Pass
20.7235	114	0	0	Pass
21.2568	105	0	0	Pass
21.7900	100	0	0	Pass
22.3232	98	0	0	Pass
22.8564	93	0	0	Pass
23.3896	88	0	0	Pass
23.9228	85	0	0	Pass
24.4561	83	0	0	Pass
24.9893	73	0	0	Pass
25.5225	66	0	0	Pass
26.0557	64	0	0	Pass
26.5889	61	0	0	Pass
27.1222	57	0	0	Pass
27.6554	54	0	0	Pass
28.1886	51	0	0	Pass
28.7218	50	0	0	Pass

29.2550	45	0	0	Pass
29.7882	41	0	0	Pass
30.3215	40	0	0	Pass
30.8547	39	0	0	Pass
31.3879	38	0	0	Pass
31.9211	38	0	0	Pass
32.4543	38	0	0	Pass
32.9875	36	0	0	Pass
33.5208	34	0	0	Pass
34.0540	31	0	0	Pass
34.5872	30	0	0	Pass
35.1204	29	0	0	Pass
35.6536	29	0	0	Pass
36.1869	28	0	0	Pass
36.7201	28	0	0	Pass
37.2533	28	0	0	Pass
37.7865	28	0	0	Pass
38.3197	26	0	0	Pass
38.8529	26	0	0	Pass
39.3862	22	0	0	Pass
39.9194	22	0	0	Pass
40.4526	21	0	0	Pass
40.9858	19	0	0	Pass
41.5190	19	0	0	Pass
42.0523	19	0	0	Pass
42.5855	18	0	0	Pass
43.1187	18	0	0	Pass
43.6519	18	0	0	Pass
44.1851	16	0	0	Pass
44.7183	16	0	0	Pass
45.2516	16	0	0	Pass
45.7848	16	0	0	Pass
46.3180	16	0	0	Pass
46.8512	15	0	0	Pass
47.3844	15	0	0	Pass
47.9177	15	0	0	Pass
48.4509	15	0	0	Pass
48.9841	15	0	0	Pass
49.5173	15	0	0	Pass
50.0505	15	0	0	Pass
50.5837	15	0	0	Pass
51.1170	12	0	0	Pass
51.6502	12	0	0	Pass
52.1834	10	0	0	Pass
52.7166	10	0	0	Pass
53.2498	10	0	0	Pass
53.7831	10	0	0	Pass
54.3163	10	0	0	Pass
54.8495	10	0	0	Pass
55.3827	9	0	0	Pass
55.9159	9	0	0	Pass
56.4491	9	0	0	Pass
56.9824	9	0	0	Pass
57.5156	9	0	0	Pass

Water Quality BMP Flow and Volume for POC #2
On-line facility volume: 8.5564 **acre-feet**
On-line facility target flow: 4.7648 **cfs.**
Adjusted for 15 min: 4.7648 **cfs.**
Off-line facility target flow: 2.6759 **cfs.**
Adjusted for 15 min: 2.6759 **cfs.**

LID Report

LID Technique	Used for Water Quality Treatment?	Total Volume Needs Treatment (ac-ft)	Volume Through Facility (ac-ft)	Infiltration Volume (ac-ft.)	Cumulative Infiltration Credit	Percent Volume Infiltrated	Water Quality Percent Treated	Comment
Infilt Pond D POC	N	28458.60			N	100.00		
Total Volume Infiltrated		28458.60	0.00	0.00		100.00	0.00	0% No Treat. Credit

Compliance with LID Standard 8
Duration Analysis Result = Passed

POC #3 was not reported because POC must exist in both scenarios and both scenarios must have been run.**Perlnd and Implnd Changes**
No changes have been made.

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WWHM2012
PROJECT REPORT

Project Name: Basin E GW
Site Name: Pioneer Aggregates
Site Address: Pioneer Avenue
City : DuPont
Report Date: 11/25/2020
Gage : 38 IN CENTRAL
Data Start : 10/01/1901
Data End : 09/30/2059
Precip Scale: 1.00
Version Date: 2019/09/13
Version : 4.2.17

Low Flow Threshold for POC 1 : 50 Percent of the 2 Year

High Flow Threshold for POC 1: 50 year

PREDEVELOPED LAND USE

Name : Basin E Pre
Bypass: No

GroundWater: No

Pervious Land Use	acre
A B, Lawn, Flat	3.5
A B, Lawn, Steep	72.1
C, Lawn, Flat	12.7
SAT, Forest, Flat	4.3
Pervious Total	92.6

Impervious Land Use	acre
Impervious Total	0
Basin Total	92.6

Element Flows To:

Surface	Interflow	Groundwater

MITIGATED LAND USE

Name : Watershed E
Bypass: No

GroundWater: No

Pervious Land Use	acre
A B, Lawn, Flat	3.5
A B, Lawn, Steep	72.1
C, Lawn, Flat	12.7
SAT, Forest, Flat	4.3
Pervious Total	92.6

Impervious Land Use	acre
Impervious Total	0
Basin Total	92.6

Element Flows To:

Surface	Interflow	Groundwater
Trapezoidal Pond 3	Trapezoidal Pond 3	

Name : Trapezoidal Pond 3
Bottom Length: 600.00 ft.
Bottom Width: 96.00 ft.
Depth: 7 ft.
Volume at riser head: 9.8477 acre-feet.
Infiltration On
Infiltration rate: 8.1
Infiltration safety factor: 1
Wetted surface area On
Total Volume Infiltrated (ac-ft.): 1091797
Total Volume Through Riser (ac-ft.): 0
Total Volume Through Facility (ac-ft.): 1091797
Percent Infiltrated: 100
Total Precip Applied to Facility: 0
Total Evap From Facility: 0
Side slope 1: 3 To 1
Side slope 2: 3 To 1
Side slope 3: 3 To 1
Side slope 4: 3 To 1
Discharge Structure
Riser Height: 6 ft.
Riser Diameter: 24 in.

Element Flows To:

Outlet 1	Outlet 2

Pond Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	1.322	0.000	0.000	0.000
0.0778	1.329	0.103	0.000	10.86
0.1556	1.337	0.206	0.000	10.92
0.2333	1.344	0.311	0.000	10.98
0.3111	1.352	0.416	0.000	11.04
0.3889	1.359	0.521	0.000	11.10
0.4667	1.367	0.627	0.000	11.16
0.5444	1.374	0.734	0.000	11.22
0.6222	1.382	0.841	0.000	11.29
0.7000	1.389	0.949	0.000	11.35
0.7778	1.397	1.057	0.000	11.41
0.8556	1.404	1.166	0.000	11.47
0.9333	1.412	1.276	0.000	11.53
1.0111	1.420	1.386	0.000	11.59
1.0889	1.427	1.497	0.000	11.66
1.1667	1.435	1.608	0.000	11.72
1.2444	1.442	1.720	0.000	11.78
1.3222	1.450	1.832	0.000	11.84
1.4000	1.458	1.945	0.000	11.90
1.4778	1.465	2.059	0.000	11.97
1.5556	1.473	2.174	0.000	12.03
1.6333	1.481	2.288	0.000	12.09
1.7111	1.488	2.404	0.000	12.16
1.7889	1.496	2.520	0.000	12.22
1.8667	1.504	2.637	0.000	12.28
1.9444	1.511	2.754	0.000	12.34
2.0222	1.519	2.872	0.000	12.41
2.1000	1.527	2.990	0.000	12.47
2.1778	1.535	3.109	0.000	12.53
2.2556	1.542	3.229	0.000	12.60
2.3333	1.550	3.349	0.000	12.66
2.4111	1.558	3.470	0.000	12.72
2.4889	1.566	3.592	0.000	12.79
2.5667	1.573	3.714	0.000	12.85
2.6444	1.581	3.837	0.000	12.91
2.7222	1.589	3.960	0.000	12.98
2.8000	1.597	4.084	0.000	13.04
2.8778	1.605	4.208	0.000	13.10
2.9556	1.612	4.334	0.000	13.17
3.0333	1.620	4.459	0.000	13.23
3.1111	1.628	4.586	0.000	13.30
3.1889	1.636	4.713	0.000	13.36
3.2667	1.644	4.840	0.000	13.43
3.3444	1.652	4.968	0.000	13.49
3.4222	1.660	5.097	0.000	13.55
3.5000	1.668	5.227	0.000	13.62
3.5778	1.675	5.357	0.000	13.68
3.6556	1.683	5.487	0.000	13.75
3.7333	1.691	5.619	0.000	13.81
3.8111	1.699	5.751	0.000	13.88
3.8889	1.707	5.883	0.000	13.94
3.9667	1.715	6.016	0.000	14.01
4.0444	1.723	6.150	0.000	14.07
4.1222	1.731	6.284	0.000	14.14
4.2000	1.739	6.419	0.000	14.20
4.2778	1.747	6.555	0.000	14.27

4.3556	1.755	6.691	0.000	14.33
4.4333	1.763	6.828	0.000	14.40
4.5111	1.771	6.965	0.000	14.47
4.5889	1.779	7.104	0.000	14.53
4.6667	1.787	7.242	0.000	14.60
4.7444	1.795	7.382	0.000	14.66
4.8222	1.803	7.522	0.000	14.73
4.9000	1.811	7.662	0.000	14.79
4.9778	1.820	7.803	0.000	14.86
5.0556	1.828	7.945	0.000	14.93
5.1333	1.836	8.088	0.000	14.99
5.2111	1.844	8.231	0.000	15.06
5.2889	1.852	8.375	0.000	15.13
5.3667	1.860	8.519	0.000	15.19
5.4444	1.868	8.664	0.000	15.26
5.5222	1.876	8.810	0.000	15.33
5.6000	1.885	8.956	0.000	15.39
5.6778	1.893	9.103	0.000	15.46
5.7556	1.901	9.251	0.000	15.53
5.8333	1.909	9.399	0.000	15.59
5.9111	1.917	9.548	0.000	15.66
5.9889	1.926	9.697	0.000	15.73
6.0667	1.934	9.847	0.365	15.79
6.1444	1.942	9.998	1.161	15.86
6.2222	1.950	10.15	2.205	15.93
6.3000	1.959	10.30	3.421	16.00
6.3778	1.967	10.45	4.745	16.06
6.4556	1.975	10.60	6.112	16.13
6.5333	1.983	10.76	7.456	16.20
6.6111	1.992	10.91	8.711	16.27
6.6889	2.000	11.07	9.823	16.33
6.7667	2.008	11.22	10.75	16.40
6.8444	2.017	11.38	11.48	16.47
6.9222	2.025	11.54	12.02	16.54
7.0000	2.033	11.69	12.46	16.61
7.0778	2.042	11.85	13.07	16.68

Name : Groundwater
Time Series number 400 is connected to:

Element Flows To:
Outlet 1 **Outlet 2**
Trapezoidal Pond 3

ANALYSIS RESULTS

Stream Protection Duration

Predeveloped Landuse Totals for POC #1
Total Pervious Area:92.6

Total Impervious Area:0

Mitigated Landuse Totals for POC #1
Total Pervious Area:92.6
Total Impervious Area:0

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	Flow(cfs)
2 year	0.694472
5 year	1.66554
10 year	2.813589
25 year	5.188279
50 year	7.936065
100 year	11.870051

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	Flow(cfs)
2 year	0
5 year	0
10 year	0
25 year	0
50 year	0
100 year	0

Stream Protection Duration
Annual Peaks for Predeveloped and Mitigated. POC #1

Year	Predeveloped	Mitigated
1902	0.422	0.000
1903	0.344	0.000
1904	2.209	0.000
1905	0.399	0.000
1906	0.155	0.000
1907	1.106	0.000
1908	0.457	0.000
1909	0.639	0.000
1910	1.746	0.000
1911	0.792	0.000
1912	21.409	0.000
1913	0.870	0.000
1914	3.061	0.000
1915	0.347	0.000
1916	0.654	0.000
1917	0.215	0.000
1918	0.519	0.000
1919	0.392	0.000
1920	0.782	0.000
1921	0.601	0.000
1922	1.760	0.000
1923	0.892	0.000
1924	0.305	0.000
1925	0.344	0.000
1926	0.536	0.000
1927	0.323	0.000
1928	0.407	0.000

1929	2.441	0.000
1930	0.424	0.000
1931	0.436	0.000
1932	0.432	0.000
1933	0.512	0.000
1934	6.870	0.000
1935	0.403	0.000
1936	0.500	0.000
1937	1.364	0.000
1938	0.463	0.000
1939	0.161	0.000
1940	0.532	0.000
1941	0.249	0.000
1942	1.173	0.000
1943	0.548	0.000
1944	1.641	0.000
1945	0.514	0.000
1946	0.956	0.000
1947	0.253	0.000
1948	0.945	0.000
1949	0.947	0.000
1950	0.314	0.000
1951	0.307	0.000
1952	5.349	0.000
1953	3.215	0.000
1954	0.428	0.000
1955	0.335	0.000
1956	0.199	0.000
1957	0.541	0.000
1958	6.176	0.000
1959	5.202	0.000
1960	0.314	0.000
1961	3.901	0.000
1962	0.472	0.000
1963	0.284	0.000
1964	2.773	0.000
1965	3.175	0.000
1966	0.321	0.000
1967	1.279	0.000
1968	0.515	0.000
1969	0.479	0.000
1970	1.122	0.000
1971	1.544	0.000
1972	4.786	0.000
1973	1.154	0.000
1974	2.271	0.000
1975	3.088	0.000
1976	1.880	0.000
1977	0.219	0.000
1978	5.034	0.000
1979	0.600	0.000
1980	1.310	0.000
1981	0.430	0.000
1982	0.282	0.000
1983	0.920	0.000
1984	0.934	0.000
1985	1.721	0.000

1986	0.451	0.000
1987	1.370	0.000
1988	0.474	0.000
1989	0.476	0.000
1990	0.572	0.000
1991	1.181	0.000
1992	1.981	0.000
1993	1.047	0.000
1994	1.154	0.000
1995	0.296	0.000
1996	3.899	0.000
1997	0.422	0.000
1998	0.986	0.000
1999	0.289	0.000
2000	0.517	0.000
2001	0.314	0.000
2002	2.726	0.000
2003	0.648	0.000
2004	0.911	0.000
2005	8.312	0.000
2006	0.415	0.000
2007	0.681	0.000
2008	0.513	0.000
2009	0.335	0.000
2010	0.458	0.000
2011	0.229	0.000
2012	0.590	0.000
2013	0.800	0.000
2014	0.422	0.000
2015	2.610	0.000
2016	0.203	0.000
2017	0.955	0.000
2018	6.725	0.000
2019	4.625	0.000
2020	1.171	0.000
2021	1.569	0.000
2022	0.471	0.000
2023	0.769	0.000
2024	8.879	0.000
2025	0.456	0.000
2026	0.943	0.000
2027	0.402	0.000
2028	0.279	0.000
2029	0.789	0.000
2030	2.756	0.000
2031	0.302	0.000
2032	0.222	0.000
2033	0.291	0.000
2034	0.387	0.000
2035	1.379	0.000
2036	0.785	0.000
2037	0.253	0.000
2038	1.637	0.000
2039	0.152	0.000
2040	0.391	0.000
2041	0.478	0.000
2042	1.236	0.000

2043	1.078	0.000
2044	2.978	0.000
2045	0.461	0.000
2046	0.530	0.000
2047	0.428	0.000
2048	0.491	0.000
2049	0.625	0.000
2050	0.631	0.000
2051	1.624	0.000
2052	0.330	0.000
2053	0.486	0.000
2054	2.995	0.000
2055	0.346	0.000
2056	0.256	0.000
2057	0.394	0.000
2058	0.479	0.000
2059	4.711	0.000

Stream Protection Duration
Ranked Annual Peaks for Predeveloped and Mitigated. POC #1

Rank	Predeveloped	Mitigated
1	21.4094	0.0000
2	8.8787	0.0000
3	8.3120	0.0000
4	6.8704	0.0000
5	6.7252	0.0000
6	6.1764	0.0000
7	5.3485	0.0000
8	5.2023	0.0000
9	5.0335	0.0000
10	4.7860	0.0000
11	4.7110	0.0000
12	4.6246	0.0000
13	3.9014	0.0000
14	3.8987	0.0000
15	3.2147	0.0000
16	3.1751	0.0000
17	3.0876	0.0000
18	3.0614	0.0000
19	2.9947	0.0000
20	2.9781	0.0000
21	2.7732	0.0000
22	2.7561	0.0000
23	2.7264	0.0000
24	2.6097	0.0000
25	2.4414	0.0000
26	2.2706	0.0000
27	2.2091	0.0000
28	1.9806	0.0000
29	1.8805	0.0000
30	1.7598	0.0000
31	1.7465	0.0000
32	1.7205	0.0000
33	1.6411	0.0000
34	1.6368	0.0000
35	1.6236	0.0000

36	1.5692	0.0000
37	1.5440	0.0000
38	1.3790	0.0000
39	1.3702	0.0000
40	1.3637	0.0000
41	1.3103	0.0000
42	1.2793	0.0000
43	1.2355	0.0000
44	1.1814	0.0000
45	1.1732	0.0000
46	1.1709	0.0000
47	1.1540	0.0000
48	1.1538	0.0000
49	1.1223	0.0000
50	1.1055	0.0000
51	1.0782	0.0000
52	1.0465	0.0000
53	0.9860	0.0000
54	0.9556	0.0000
55	0.9546	0.0000
56	0.9466	0.0000
57	0.9454	0.0000
58	0.9428	0.0000
59	0.9338	0.0000
60	0.9199	0.0000
61	0.9109	0.0000
62	0.8924	0.0000
63	0.8699	0.0000
64	0.8001	0.0000
65	0.7922	0.0000
66	0.7890	0.0000
67	0.7853	0.0000
68	0.7816	0.0000
69	0.7695	0.0000
70	0.6807	0.0000
71	0.6538	0.0000
72	0.6477	0.0000
73	0.6389	0.0000
74	0.6309	0.0000
75	0.6251	0.0000
76	0.6011	0.0000
77	0.5999	0.0000
78	0.5899	0.0000
79	0.5717	0.0000
80	0.5483	0.0000
81	0.5405	0.0000
82	0.5358	0.0000
83	0.5318	0.0000
84	0.5302	0.0000
85	0.5191	0.0000
86	0.5171	0.0000
87	0.5151	0.0000
88	0.5143	0.0000
89	0.5127	0.0000
90	0.5122	0.0000
91	0.4998	0.0000
92	0.4915	0.0000

93	0.4862	0.0000
94	0.4794	0.0000
95	0.4792	0.0000
96	0.4776	0.0000
97	0.4759	0.0000
98	0.4742	0.0000
99	0.4718	0.0000
100	0.4713	0.0000
101	0.4629	0.0000
102	0.4608	0.0000
103	0.4584	0.0000
104	0.4566	0.0000
105	0.4561	0.0000
106	0.4511	0.0000
107	0.4364	0.0000
108	0.4317	0.0000
109	0.4305	0.0000
110	0.4285	0.0000
111	0.4277	0.0000
112	0.4236	0.0000
113	0.4222	0.0000
114	0.4218	0.0000
115	0.4216	0.0000
116	0.4151	0.0000
117	0.4072	0.0000
118	0.4033	0.0000
119	0.4024	0.0000
120	0.3992	0.0000
121	0.3940	0.0000
122	0.3919	0.0000
123	0.3911	0.0000
124	0.3872	0.0000
125	0.3469	0.0000
126	0.3465	0.0000
127	0.3445	0.0000
128	0.3440	0.0000
129	0.3351	0.0000
130	0.3348	0.0000
131	0.3297	0.0000
132	0.3228	0.0000
133	0.3213	0.0000
134	0.3139	0.0000
135	0.3138	0.0000
136	0.3138	0.0000
137	0.3066	0.0000
138	0.3054	0.0000
139	0.3020	0.0000
140	0.2963	0.0000
141	0.2907	0.0000
142	0.2892	0.0000
143	0.2844	0.0000
144	0.2815	0.0000
145	0.2794	0.0000
146	0.2564	0.0000
147	0.2530	0.0000
148	0.2527	0.0000
149	0.2494	0.0000

150	0.2290	0.0000
151	0.2219	0.0000
152	0.2188	0.0000
153	0.2150	0.0000
154	0.2027	0.0000
155	0.1985	0.0000
156	0.1609	0.0000
157	0.1552	0.0000
158	0.1521	0.0000

Stream Protection Duration
POC #1
The Facility PASSED

The Facility PASSED.

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.3472	19041	0	0	Pass
0.4239	9872	0	0	Pass
0.5005	5518	0	0	Pass
0.5772	3457	0	0	Pass
0.6539	2213	0	0	Pass
0.7305	1451	0	0	Pass
0.8072	1034	0	0	Pass
0.8838	745	0	0	Pass
0.9605	558	0	0	Pass
1.0371	456	0	0	Pass
1.1138	381	0	0	Pass
1.1904	332	0	0	Pass
1.2671	306	0	0	Pass
1.3437	275	0	0	Pass
1.4204	253	0	0	Pass
1.4971	230	0	0	Pass
1.5737	213	0	0	Pass
1.6504	197	0	0	Pass
1.7270	178	0	0	Pass
1.8037	161	0	0	Pass
1.8803	155	0	0	Pass
1.9570	146	0	0	Pass
2.0336	138	0	0	Pass
2.1103	134	0	0	Pass
2.1870	126	0	0	Pass
2.2636	119	0	0	Pass
2.3403	110	0	0	Pass
2.4169	105	0	0	Pass
2.4936	99	0	0	Pass
2.5702	95	0	0	Pass
2.6469	91	0	0	Pass
2.7235	89	0	0	Pass
2.8002	84	0	0	Pass
2.8768	83	0	0	Pass
2.9535	81	0	0	Pass
3.0302	78	0	0	Pass
3.1068	76	0	0	Pass
3.1835	72	0	0	Pass
3.2601	68	0	0	Pass

3.3368	66	0	0	Pass
3.4134	65	0	0	Pass
3.4901	62	0	0	Pass
3.5667	61	0	0	Pass
3.6434	58	0	0	Pass
3.7200	55	0	0	Pass
3.7967	55	0	0	Pass
3.8734	55	0	0	Pass
3.9500	52	0	0	Pass
4.0267	51	0	0	Pass
4.1033	48	0	0	Pass
4.1800	46	0	0	Pass
4.2566	43	0	0	Pass
4.3333	41	0	0	Pass
4.4099	37	0	0	Pass
4.4866	37	0	0	Pass
4.5633	34	0	0	Pass
4.6399	31	0	0	Pass
4.7166	28	0	0	Pass
4.7932	26	0	0	Pass
4.8699	25	0	0	Pass
4.9465	24	0	0	Pass
5.0232	24	0	0	Pass
5.0998	22	0	0	Pass
5.1765	22	0	0	Pass
5.2531	21	0	0	Pass
5.3298	18	0	0	Pass
5.4065	17	0	0	Pass
5.4831	17	0	0	Pass
5.5598	17	0	0	Pass
5.6364	17	0	0	Pass
5.7131	17	0	0	Pass
5.7897	17	0	0	Pass
5.8664	17	0	0	Pass
5.9430	17	0	0	Pass
6.0197	15	0	0	Pass
6.0963	15	0	0	Pass
6.1730	14	0	0	Pass
6.2497	11	0	0	Pass
6.3263	11	0	0	Pass
6.4030	11	0	0	Pass
6.4796	11	0	0	Pass
6.5563	11	0	0	Pass
6.6329	11	0	0	Pass
6.7096	11	0	0	Pass
6.7862	9	0	0	Pass
6.8629	9	0	0	Pass
6.9396	8	0	0	Pass
7.0162	8	0	0	Pass
7.0929	8	0	0	Pass
7.1695	8	0	0	Pass
7.2462	8	0	0	Pass
7.3228	8	0	0	Pass
7.3995	8	0	0	Pass
7.4761	8	0	0	Pass
7.5528	8	0	0	Pass
7.6294	8	0	0	Pass

7.7061	8	0	0	Pass
7.7828	8	0	0	Pass
7.8594	8	0	0	Pass
7.9361	8	0	0	Pass

Water Quality BMP Flow and Volume for POC #1
On-line facility volume: 7.31 **acre-feet**
On-line facility target flow: 4.0677 **cfs.**
Adjusted for 15 min: 4.0677 **cfs.**
Off-line facility target flow: 2.2884 **cfs.**
Adjusted for 15 min: 2.2884 **cfs.**

LID Report

LID Technique	Used for Water Quality	Total Volume Percent Treatment?	Volume Needs Treatment (ac-ft)	Infiltration Through Facility (ac-ft)	Cumulative Volume Infiltration (ac-ft.)	Comment
Trapezoidal Pond 3	POC	N	993535.27			N
100.00						
Total Volume Infiltrated			993535.27	0.00	0.00	
100.00	0.00	0%	No Treat. Credit			

Compliance with LID Standard 8
Duration Analysis Result = Passed

POC #2 was not reported because POC must exist in both scenarios and both scenarios must have been run. POC #3 was not reported because POC must exist in both scenarios and both scenarios must have been run.**Perlnd and Implnd Changes**
No changes have been made.

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APPENDIX D

Stormwater Design Calculations

Table 1. Wetpond Design Summary

Project No. 040010-016-01, CalPortland
Pioneer Aggregates South Parcel Project, DuPont, WA

Basin C WQ Pond										
Required Pond Volume	6.08	ac-ft								
Required Pond Volume	264844.8	cu ft								
Number of Ponds Wanted:	1									
Total Volume Required Per Pond:	264,845	cu ft								
Pond Design Based on Number of Pond Wanted:										
% Total Volume for Cell 1	0.3									
Total Volume for Cell 1	79,453	cu ft								
Depth Cell 1	6	ft	Length to Width Ratio:	3	Length:	162	ft	Total Bottom Area:	8,748	sq ft
Side Slopes XH:1V	3				Width:	54	ft	Total Top Area:	17,820	sq ft
								Volume Calculated:	79,704	Good? YES
Total Volume Required for Cell 2	185,391.4	cu ft								
Depth Cell 2	7	ft	Length to Width Ratio:	3.00	Length:	240	ft	Total Bottom Area:	19,200	sq ft
Side Slopes XH:1V	3				Width:	80	ft	Total Top Area:	34,404	sq ft
								Volume Calculated:	187,614	Good? YES
Basin D WQ Pond										
Required Pond Volume	8.55	ac-ft								
Required Pond Volume	372,438	cu ft								
Number of Ponds Wanted:	1									
Total Volume Required Per Pond:	372,438	cu ft								
Pond Design Based on Number of Pond Wanted:										
% Total Volume for Cell 1	0.3									
Total Volume for Cell 1	111,731	cu ft								
Depth Cell 1	6	ft	Length to Width Ratio:	3.03	Length:	200	ft	Total Bottom Area:	13,200	sq ft
Side Slopes XH:1V	3				Width:	66.0	ft	Total Top Area:	24,072	sq ft
								Volume Calculated:	111,816	Good? YES
Total Volume Required for Cell 2	260,706.6	cu ft								
Depth Cell 2	7	ft	Length to Width Ratio:	3.16	Length:	300	ft	Total Bottom Area:	28,500	sq ft
Side Slopes XH:1V	3				Width:	95	ft	Total Top Area:	46,854	sq ft
								Volume Calculated:	263,739	Good? YES

Notes

Yellow shading represents user input

Gray shading prepresents volume check for capacity

ac = acres, ac-ft = acre-feet, cu ft = cubic feet, ft = feet, sq ft = square feet

Table 2. Infiltration Calculations

Project No. 040010-016-01 CalPortland
Pioneer Aggregates South Parcel Project, DuPont,WA

Infiltration Pond C		Boring	15	15		18	18		
Original Ground Elevation	200	depth	168-178	178-188		168-778	178-188		
Existing Surface	25	D10	0.297	0.297		0.594	0.297		
Depth (bgs)	175	D60	12.7	9.525		12.7	4.75		
Analysis depth	12.5	D90	38.1	38.1		38.1	25.4		
		Fines	0.02	0.03		0.02	0.02		
	log (Ksat)		-1.35	-1.42		-0.79	-1.31		
	Ksat	cm/sec	0.04	0.04		0.16	0.05		
		in/hr	63.31	54.34		228.83	69.68		
			2.5 feet	10 feet		2.5	10		
		KsatAvg	55.92			KsatAvg	80.94		
	CFv	1	0.5	0.33	CFv	1	0.5	0.33	
	Correction Factor	0.36	0.18	0.1188		0.36	0.18	0.12	
	Ksat (in/hr)	20.132	10.066	6.644		29.140	14.570	9.62	8.13
								Ksat Final	8.1
Infiltration Pond D		Boring	8	8		7	7		
Original Ground Elevation	200	depth	168-178	178-188		168-180	180-185		
Existing Surface	25	D10	0.15	0.297		0.297	0.297		
Depth (bgs)	175	D60	4.75	12.7		9.525	12.7		
Analysis depth	12.5	D90	12.7	38.1		25.4	25.4		
		Fines	0.08	0.03		0.02	0.03		
	log (Ksat)		-1.53	-1.37		-1.23	-1.21		
	Ksat	cm/sec	0.03	0.04		0.06	0.06		
		in/hr	41.36	60.84		83.37	86.58		
		depth (ft)	2.5	10		5.0	7.5		
	KsatAvg	55.6033				KsatAvg	85.268		
	CFv	1	0.5	0.33	CFv	1	0.5	0.33	
	Correction Factor	0.36	0.18	0.1188		0.36	0.18	0.12	
	Ksat Design (in/hr)	20.02	10.01	6.61		30.70	15.35	10.13	8.37
								Ksat Final	8.2

Notes

Purple shading represents boring numbers

Pink shading represents Infiltration capacity calculations

bgs = below ground surface, cm/sec = centimeters per second, in/hr = inches per hour

Table 3. Infiltration Basin Design Summary

Project No. 040010-016-01, CalPortland
Pioneer Aggregates South Parcel Project, DuPont, WA

Basin C Designed Infiltration Pond:				
Length of bottom area (ft)	450			
Width of bottom area (ft)	113	Total Bottom Area:	50,762 sq ft	
Depth (ft)	5			
Side Slope X:1V	3	Total Top Area:	66,748 sq ft	(no freeboard - water surface)
Total Provided Volume (cu ft)	293,775			
Basin D Designed Infiltration Pond:				
Length of bottom area (ft)	1000			
Width of bottom area (ft)	37.7	Total Bottom Area:	37,655 sq ft	37655
Depth (ft)	5			
Side Slope X:1V	3	Total Top Area:	68,755 sq ft	(no freeboard - water surface)
Total Provided Volume (cu ft)	266,025			68755
Basin E Designed Infiltration Pond:				
Length of bottom area (ft)	600			
Width of bottom area (ft)	96.345	Total Bottom Area:	57,807 sq ft	
Depth (ft)	6			
Side Slope X:1V	3	Total Top Area:	82,120 sq ft	(no freeboard - water surface)
Total Provided Volume (cu ft)	419,781			

Appendix E

Groundwater Model Update

GROUNDWATER MODEL UPDATE

DuPont Mine South Parcel Expansion Area

Project No. 040001-014 • June 2017

Aspect CONSULTING

earth + water

GROUNDWATER MODEL UPDATE

DuPont Mine South Parcel Expansion Area

Project No. 040001-014 • June 2017

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Contents

1 Introduction 1

2 Overview of Groundwater Modeling 3

2.1 Model Setup 4
2.2 Calibration 5
2.3 Validation 6
2.4 Model Bias and Uncertainty 6
2.5 Predictive Analysis 7

3 Hydrogeologic Conceptual Model 8

3.1 Vashon Outwash Aquifer 8
3.2 Connection of Aquifer with Wetlands and Springs 9
3.2.1 Sequalitchew Lake and East Edmond Marsh 10
3.2.2 Upstream Marshes—Bell, Hamer and McKay 10
3.2.3 Edmond Marsh 10
3.2.4 Southern Lakes 11
3.2.5 Groundwater Discharges to Sequalitchew Creek Ravine 11
3.3 Deeper Aquifers 11

4 Setup of Updated Model 12

4.1 Model Code 12
4.2 Model Extent and Grid 13
4.3 Model Layers 13
4.3.1 Model Top Elevation 14
4.3.2 Hydrostratigraphic Units 14
4.4 Aquifer Parameters 15
4.5 Model Calibration and Validation Timeframes 15
4.6 Boundary Conditions 16
4.6.1 Recharge—Net Precipitation 16
4.6.2 Groundwater Inflow 17
4.6.3 Infiltration from Wetlands 17
4.6.4 Discharge to Surface Water 18
4.6.5 Discharge from Dewatering Wells 19
4.6.6 Discharge to the Mined Slope 20
4.6.7 Groundwater Outflow 20
4.6.8 No-Flow Boundaries 20

5 Model Calibration and Validation 21

5.1 Calibration Targets 21
5.2 Calibration Methods 22
5.3 Calibration Results 22

5.3.1 Overall Groundwater Level Calibration 23
5.3.2 Calibration of Groundwater Levels over Time 24
5.3.3 Calibration of Groundwater Levels at Individual Wells 24
5.4 Validation Results 25
5.4.1 Overall Groundwater Level Validation 25
5.4.2 Validation of Groundwater Levels over Time 26
5.4.3 Validation of Groundwater Levels at Individual Wells 26
5.5 Further Refinement of Model Results 26
5.6 Groundwater Balance Analysis 27
5.6.1 Overall Groundwater Balance Analysis 28
5.6.2 Wetland Complex Groundwater Balance Analysis 29

6 Model Predictions for Future Mining Conditions 29
6.1 Future Mining Step 1: Initial 10-well Dewatering Test 31
6.2 Future Mining Step 2: Active Dewatering In Preparation for Mining 31
6.3 Future Mining Step 3: Active Dewatering During Mining 32
6.4 Future Mining Step 4: Post-Mining Conditions 33
6.5 Quantifying Model Uncertainty 33
6.6 Minimum Groundwater Levels in Each Dewatering Step 34

References 36

Limitations 38

List of Tables

1 Summary of Hydrostratigraphic Units and Calibrated Parameter Values
2 Summary of Wetland Properties used in Model
3 Parameters Adjusted During Calibration
4 Model Calibration – Residual Statistics - Overall and Over Time
5 Model Calibration – Residual Statistics By Well
6 Model Validation – Residual Statistics – Overall and Over Time
7 Model Validation – Residual Statistics By Well
8 Well-Specific Maximum Water Level Changes
9 Minimum Predicted Groundwater Levels for Each Dewatering Step

List of Figures

1 Project Area Map
2 Geologic Map

3 Hydrogeologic Cross Section

4 Model Extent, Grid, and Existing Monitoring Well Network

5 Model Top Elevation – Baseline

6 Model Top Elevation – Post-Mining

7a Hydrostratigraphic Unit Extent and Thickness – Steilacoom Gravel

7b Hydrostratigraphic Unit Extent and Thickness – Upper Confining Unit

7c Hydrostratigraphic Unit Extent and Thickness – Vashon Outwash Deposits

7d Hydrostratigraphic Unit Extent and Thickness – Olympia Beds

7e Hydrostratigraphic Unit Extent and Thickness – Sea Level Aquifer

8a Hydraulic Conductivity Distribution by Hydrostratigraphic Unit – Steilacoom Gravel

8b Hydraulic Conductivity Distribution by Hydrostratigraphic Unit – Upper Confining Unit

8c Hydraulic Conductivity Distribution by Hydrostratigraphic Unit – Vashon Outwash Deposits

8d Hydraulic Conductivity Distribution by Hydrostratigraphic Unit – Olympia Beds

8e Hydraulic Conductivity Distribution by Hydrostratigraphic Unit – Sea Level Aquifer

9 Model Timeframe and Historical Precipitation

10 Average Recharge

11 Head-Dependent Boundary Conditions

12 Groundwater Inflow Heads Over Time

13 Wetland Water Depths Over Time

14 Dewatering Well Locations

15 Calibration and Refined Hydrographs

16 Map of Water Table Conditions – May 2010

17 Map of Model-Calculated Water Table Range - Baseline

18 Comparison of Observed and Calculated Groundwater Levels

19 Average Groundwater Balance Comparison – Overall

20 Baseline Groundwater Balance Over Time – Overall

21 Average Groundwater Balance Comparison – Wetlands

22 Baseline Groundwater Balance Over Time – Wetlands

23 Predicted Changes and Ranges in Groundwater Levels

24a Map of Maximum Calculated Groundwater Level Changes: Step 1

24b Map of Maximum Calculated Groundwater Level Changes: Step 2

24c Map of Maximum Calculated Groundwater Level Changes: Step 3

24d Map of Maximum Calculated Groundwater Level Changes: Post Mining

1 Introduction

This report documents the updated analysis used to predict groundwater levels during and after the proposed dewatering and mining of the South Parcel at CalPortland's Pioneer Aggregate facility in DuPont, Washington.

The South Parcel is a proposed 171-acre mining expansion located west of the existing mine and south of the processing area (see Figure 1). Groundwater saturates the gravels of the South Parcel to within 20 feet of the ground surface. Mining will require pumping groundwater to dewater the gravels that are currently saturated. Dewatering and removal of the gravel will result in localized changes in groundwater elevations around the South Parcel.

The foundation of the groundwater analysis is a numerical groundwater model (DuPont model) developed specifically for the project. The DuPont model is based on the conceptual model for the groundwater system developed from extensive analysis of project-specific borings and investigations, as well as compilation and review of other geologic and hydrogeologic investigations in the DuPont area. After development, the model was calibrated to historically observed groundwater levels, then validated against additional historical data. Once the model was able to reliably reproduce historical conditions, the calibrated and validated model was then used to predict the changes in groundwater levels during and after the proposed expansion of mining.

This model represents an update to previous groundwater modeling analysis developed for the South Parcel (CH2M Hill 2003, Aspect 2004a, Aspect 2009a, Aspect 2009b, and Aspect 2014). It incorporates revisions to the mining plan, expansion of the model area, inclusion of seasonal and annual variability in climate and groundwater levels, and elements of the USGS groundwater model for the Chambers-Clover Creek watershed, including model boundary conditions and hydrogeologic layers at depth (Savoca et al., 2010; Johnson et al., 2011).

The model was first developed and calibrated to match existing measured conditions between 2004 and 2010, and then validated to the monitoring data collected through 2015. The model simulation of existing conditions formed the baseline from which changes in future groundwater levels under proposed scenarios can be measured. The model was then used in a series of predictive runs to simulate groundwater conditions at four different steps of dewatering during the proposed mining plan.

This report is organized into the following sections to reflect the process of model development, calibration, and use:

- Section 2 summarizes the groundwater modeling process.
- Section 3 presents a summary of the hydrogeologic conceptual model.
- Section 4 describes the model setup.
- Section 5 describes the model calibration and validation.

- Section 6 describes the DuPont model predictive analysis.
- Section 7 presents model predictions for future mining conditions.

2 Overview of Groundwater Modeling

This section provides an overview of general groundwater modeling methods and terminology, based on multiple sources (Fetter, 1994; Anderson and Woessner, 1992; Hill and Tiedeman, 2007).

Groundwater models are tools used to simulate and predict what cannot be measured directly. Groundwater models quantitatively simulate groundwater flow and groundwater levels using mathematical equations based on the well-established mechanics of fluid flow in porous media.

Generally, the process of developing and testing a robust groundwater model involves the following steps:

1) Monitor groundwater and surface water levels and compile information about area geology and hydrology from numerous sources.
2) Develop a conceptual model of area hydrogeology by interpreting the existing information.
3) Develop a numerical hydrogeologic model that represents the conceptual model.
4) Calibrate the numerical model to observed groundwater measurements.
5) Validate the numerical model with additional groundwater measurements.
6) Predict future groundwater conditions by simulating anticipated changes (e.g., adding pumping wells or changes in topography).
7) Update the model as new information is collected, and refine the model if necessary.

The foundation of a groundwater model is the “conceptual model” that describes the hydrogeologic system based on data collected during field investigations. The reliability of a groundwater model depends on the appropriate translation of the conceptual model into mathematical terms. For example, natural hydrogeologic systems typically include geologic layers with differing hydraulic characteristics (e.g., hydraulic conductivity, storage coefficient). A numerical groundwater model includes a three-dimensional (3-D) grid of cells. Layers with differing hydraulic parameters can be established within the 3-D model grid to best match the natural geologic layering. The influence of surface water features (e.g., creeks, lakes), and flow between groundwater and surface water, can also be simulated within the numerical groundwater model. Because natural hydrologic systems are always variable (heterogeneous) in both space and time, mathematic models are always simplifications of the natural system.

Groundwater models are evaluated based on how well they can reproduce historical observations. Adjustments to groundwater models are made during calibration to improve the comparison between observed and model-calculated conditions. In addition to the calibration process, there is a validation step that compares observed and model-calculated conditions outside the calibration timeframe. For a calibrated and validated

model, the remaining differences between observed and model-calculated conditions are attributed to model bias and uncertainty, which are quantified using statistics.

Once calibrated and validated, the groundwater model is used to forecast conditions after incorporating anticipated hydrogeologic changes. The results of predictive models are interpreted within the context of the calibrated model bias and uncertainty. Post-modeling evaluation is used to provide more accurate forecasts of groundwater conditions, accounting for model bias to the extent practical, and identifying remaining prediction uncertainty.

The DuPont model is developed to predict groundwater level changes in response to the proposed mining plan, which includes active dewatering to accommodate mining, followed by cessation of pumping and establishment of a new hydrologic equilibrium condition. The results from the DuPont model are used for environmental evaluations and for design of the Monitoring Plan that will be followed during mining to directly measure groundwater level changes and thus allow ongoing assessment of, and adaptive response to, potential impacts. As described in this report, the DuPont model is a robust predictive tool developed based on hydrogeologic measurements collected from 2004 to 2015.

2.1 Model Setup

For three-dimensional, finite-difference groundwater models (like the DuPont model), the simulated aquifer system is digitized into a block of cells, including vertical layers of horizontal grids. Each cell is assigned information on cell dimensions, hydraulic conductivity, aquifer storage, and boundary conditions defined below:

- Cell dimensions are the length, width, and vertical thickness of the cell, which may vary with neighboring cells;
- Hydraulic conductivity describes the rate at which water can move through soils represented by the cell, typically distinguishing the horizontal and vertical values (in stratified soils, hydraulic conductivity is typically higher in the horizontal direction, along bedding, than vertically across the bedding);
- Aquifer storage describes the amount of water that can be stored in (or drained from) soils within the cell, typically distinguishing the confined and unconfined values; and
- Boundary conditions are the assigned mechanisms that result in cell-specific flux of water into or out of the model, and can change over time. Boundary conditions may include recharge from precipitation, groundwater underflow from outside the model domain, infiltration from surface water into the groundwater system, drainage from groundwater to surface water, well discharge, etc. Along the sides of a model domain that are parallel to the regional groundwater flow direction, no-flow boundary conditions can be established in a model; where used, no-flow boundary conditions are positioned far enough from areas within the model domain that are of primary interest for a project so that they do not artificially affect the model simulations in that area.

A “steady-state” model simulates average groundwater flow and levels assuming average hydrologic conditions over a specified time period without a change in aquifer storage –

it does not simulate changes over time. Conversely, a "transient" model simulates changes in aquifer storage, groundwater flow, and groundwater levels over time, based on specified changes in boundary conditions. Transient groundwater models are composed of multiple stress periods, and each boundary condition is specified for the length of each stress period. For example, each monthly stress period may specify a groundwater recharge rate based on the monthly rates of incident precipitation, runoff, and evapotranspiration.

A numerical groundwater model calculates a water balance for each cell within the model. For transient models, the water balance is calculated for each cell in each stress period. Because of the large number of calculations involved, groundwater models rely on numerical methods. These numerical methods allow for some small degree of approximation to provide a solution within a reasonable time. For example, a groundwater model may achieve a solution when the difference between calculated groundwater level changes is less than 0.01 foot, and the change in aquifer storage is less than 0.1 percent of the total calculated water balance.

2.2 Calibration

Model calibration is a standard component of groundwater modeling involving a systematic adjustment of cell-specific values assigned for less certain or spatially variable hydraulic parameters (such as hydraulic conductivity) to yield model-calculated groundwater levels that best match observed groundwater levels and minimize model bias. During calibration, adjusted parameter values should remain within a range that is considered reasonable based on the conceptual model.

When further parameter adjustment does not improve the model calibration, the remaining difference between calculated and observed groundwater levels, also called "residual," is attributed to model bias. The uncertainty in model results are quantified using residual statistics, such as the mean residual, the standard deviation of residuals, and the root mean square error of residuals. These statistics may be applied to the entire set of available data to describe the overall model calibration, or applied to groups of available data to describe spatial and temporal differences in model calibration.

Calibrated model results may be further refined using residual statistics to offset model bias. Deterministic regression methods (e.g., well-specific trend-line analysis) may be used where there is sufficient observation data.

Model bias in a calibrated groundwater model is typically due to a combination of causes. These potential causes of model bias are described below.

Conceptual Model. A groundwater model is a mathematical representation of the conceptual model. Elements missing from the conceptual model are not simulated, and may present as potential model bias during calibration.

Model Discretization. A groundwater model is a collection of cells and stress periods, and the properties within these units are averaged over space and time. The cell size defines the "averaging volume", while the stress period length defines the "averaging period". Differences within an averaging volume or averaging period are not simulated, and may present as potential model bias during calibration.

Assumptions. A groundwater model requires assumptions beyond the available data. For example, a model requires information on subsurface conditions between and beyond a network of wells. Making informed hydrogeologic assumptions based on available data is an important element of the modeling process, and may present as potential model bias during calibration.

2.3 Validation

Model validation involves testing a calibrated model for a set of conditions outside the calibration period. The purpose of model validation is to demonstrate the reliability of model results and analysis.

During groundwater model validation, the cell dimensions, hydraulic conductivity, and aquifer storage parameters remain the same as determined in the calibration process. The boundary conditions are modified to reflect changes in recharge rates, groundwater underflow, and surface water infiltration. Then, the calculated and observed groundwater levels are compared to assess model bias, and model bias is evaluated for consistency between the calibration period and the validation period. If the residual statistics are sufficiently similar, then the model is considered validated for those conditions tested.

2.4 Model Bias and Uncertainty

A groundwater model is necessarily a simplified mathematical representation of complex subsurface physical conditions and does not perfectly represent the real-world groundwater behavior. As such, the use of any model introduces bias and uncertainty that the numeric results are exactly correct.

One measure of the uncertainty of a groundwater model is its ability to reproduce the observed data set used for validation. Systematic differences between observed and calculated conditions are due to model bias. For example, model bias helps explain why groundwater levels are generally calculated higher than observed at a given location, and we can objectively adjust model results to account for model bias. Model uncertainty is defined as the “random” differences between observed and model-calculated conditions. For example, model uncertainty helps explain why groundwater levels were calculated higher than observed during some periods, and lower during others. We don’t attempt to adjust model results for uncertainty, but it helps qualify the results. Model uncertainty can be expressed as a range around a specific model result that we can expect the actual groundwater levels to be within.

Additional uncertainty occurs when the model is used for predicting scenarios outside the range of observed baseline conditions. Some examples are:

- Spatial distance – there is greater uncertainty in model predictions for locations at greater distance from existing wells.
- Climatic conditions – there is greater uncertainty when climate conditions are different from those experienced in the calibration and validation periods.
- Decrease in water levels with dewatering – there is greater uncertainty where the decrease in water levels resulting from dewatering is beyond the range of observed water levels.

2.5 Predictive Analysis

Predictive groundwater models use the calibrated and validated model to forecast groundwater conditions associated with a change in hydrogeologic conditions. Some forecasted conditions, such as groundwater levels, can eventually be measured whereas others, such as surface water infiltration, cannot be directly measured. The results of the calibrated/validated model establish “baseline” conditions, and are compared with results from predictive models. This type of difference analysis is typically sufficient for most groundwater model applications (e.g., Johnson et al, 2011). Predictive model results should be interpreted within the context of model bias and uncertainty to make fully-informed decisions.

Predictive model results may be refined to offset model bias. Modified well-specific trend-line analysis, based on the calibrated and validated model refinement and informed by additional constraints, may be used to improve prediction accuracy. Model uncertainty may be quantified based on the calibrated and validated model residual statistics. When a predictive model calculates conditions outside the range of those observed, the model uncertainty increases.

3 Hydrogeologic Conceptual Model

The conceptual model describes the physical geologic and hydrologic conditions understood to exist around the proposed mine expansion. It forms the basis for the numerical model developed to predict groundwater changes as a result of the proposed mining project.

The following sections describe the conceptual understanding of the surface and groundwater system in the project area as it relates to the groundwater model development and predictive analyses. Figures 1, 2 and 3 provide, respectively, a plan map, geologic map and hydrogeologic cross-section for the project area.

3.1 Vashon Outwash Aquifer

The South Parcel expansion lies within a thick glacial outwash sequence near Puget Sound, just north of the Sequalitchew Creek canyon, and east-southeast of the existing mine (Figure 2). The outwash includes the surficial, coarse-grained Steilacoom Gravel flood deposits, overlying older Vashon outwash; the outwash sequence overlies the low-permeability Olympia Beds (Qob) interglacial unit.

The underlying Qob is absent west of a line (termed Qob Truncation and shown in purple on Figures 1 and 2) located on the order of 1,500 to 3,000 feet inland from the current Puget Sound shoreline. During the time of the Vashon glaciation, the Qob's western extent was the shoreline. The shoreline was extended westward to the current configuration during the waning stages of the Vashon glaciation, when glacial outburst flooding deposited a thick deltaic sequence of Steilacoom Gravels into ancestral Puget Sound. Consequently, Steilacoom Gravels extend from ground surface to below sea level west of the Qob Truncation.

The occurrence/non-occurrence of the Qob creates a unique hydrogeologic condition. Groundwater in the outwash east of the Qob Truncation is held up by the occurrence of the thick, low permeability Qob deposits. The cross section (Figure 3) illustrates the steep hydraulic gradient that occurs where the groundwater drops over this feature within the current mine site. As the groundwater flows westerly over the Qob Truncation, it drops roughly 160 feet in 800 feet (0.2 ft/ft) through the permeable gravels to near sea level. Therefore, the water table is found at relatively shallow depths of 15 to 25 feet in the South Parcel area. West of the Qob Truncation, the water table is found at a depth of roughly 190 feet in the existing mine.

Monitoring of groundwater levels began in 2000 with a series of groundwater monitoring wells installed within and around the South Parcel. Groundwater levels in the Vashon Aquifer typically fluctuate 6 to 8 feet in response to seasonal precipitation patterns and annual variations. However, groundwater levels in the central marsh area fluctuate over a more limited range of 2 to 3 feet, whereas monitoring well CHMW-3S, on the south end of the South Parcel, fluctuates greater than 15 feet of seasonally (Aspect 2007). In addition, monitoring conducted for the adjacent Fort Lewis Landfill 5 and DuPont Works Consent Decree area indicate groundwater level variations on the order of 10 feet (URS 2000; URS 2003).

Five pumping tests were conducted along the east side of the proposed South Parcel mine expansion area to determine hydraulic properties of the outwash aquifer throughout its depth (CH2M Hill, 2000). These testing data, along with studies conducted for Fort Lewis Landfill 5 (Woodward-Clyde Consultants, 1991) and the Former DuPont Works site (URS, 2003), provide baseline hydraulic parameters for the Vashon Aquifer used as a starting point in development of the numerical groundwater flow model.

The surficial Steilacoom Gravels are highly permeable and are known to rapidly infiltrate precipitation and stormwater; the veneer of topsoil covering the Gravels is finer grained (can contain volcanic ash) and thus has lower infiltration capacity. The gravels form a relatively flat outwash plain in the area, in the center of which is a series of large wetlands—referred to as Bell, McKay, Hamer, and Edmond Marshes (Figure 1). These wetlands occur in areas where large ice blocks, stranded during the glacial flood outbursts, later melted forming kettle depressions lined with finer-grained, lower-permeability materials. These features store water for a much longer time relative to the rapidly infiltrating gravel outwash around these features. The wetland sediments from throughout the wetland complex were sampled and lab tested for permeability, and these data were used for simulating the wetland areas in the numerical groundwater model.

For purposes of developing the numerical groundwater model, the Vashon Aquifer is represented by two principal zones with distinct permeabilities, separated by a relatively lower permeability zone. The upper zone is comprised of the Steilacoom Gravel, which occurs from groundwater surface to an elevation of approximately 180 to 168 feet above mean sea level and, based on model calibration, has a hydraulic conductivity ranging from 35 to 3,900 feet/day within the model area. At that elevation, there is a lithologic change sometimes indicated by a slightly siltier zone or a slight increase in density during drilling. Below this siltier zone lies the deeper portion of the Vashon Aquifer, comprised of sand and gravel that, based on model calibration, has a lower average permeability, ranging between 0.3 and 49 feet/day. The deeper outwash zone occurs to the depth of the Qob, which occurs at an average elevation of 110 to 120 feet. The two aquifer zones are differentiated on Figure 3 by a dashed line within the Vashon Aquifer in the area of the mine site.

3.2 Connection of Aquifer with Wetlands and Springs

The principal drainage features in the Sequalitchew Creek watershed include Sequalitchew Creek, the Fort Lewis Diversion Canal, and the series of interconnected wetlands through which these drainages flow (see Figure 1). The bulk of the surface water originates at Sequalitchew Lake and from several Fort Lewis stormwater facilities located on the southeast project boundary. The Diversion Canal drains excess surface water from Sequalitchew Lake and the upper marshes (Bell, Hamer and McKay) to Puget Sound, and Sequalitchew Creek provides additional drainage of Edmond Marsh and, to a limited degree, the upper marshes during high-precipitation periods.

Since 2000, monitoring data have been collected to understand the hydraulic connection of the groundwater system with the area wetlands and Sequalitchew Creek system. The monitoring data indicate hydraulic connection between surface water and groundwater through the wetland complex within the upper Sequalitchew Creek drainage. Hydraulic connection is observed by similar water elevations, fluctuations, and time-trends at paired

surface water and groundwater monitoring stations. Hydraulic connection is also indicated in the middle reaches of Sequalitchew Creek where springs (groundwater) discharge to the ravine throughout most of the year. Sequalitchew Creek infiltrates water to the groundwater system in its lowermost reaches.

The monitoring data also indicate that the core wetland areas are generally underlain by fine-grained, low-permeability peat and silt deposits that hold water (Aspect, 2004). Where these peat deposits occur, the amount and rate of surface water that can leak into the groundwater system due to potential future groundwater drawdown would be limited by the natural low permeability of the underlying silts and peats. In other areas, development has removed the naturally low-permeability soils from historical wetland areas; the removal of peat and/or the natural heterogeneity of the soil materials, can create an avenue for greater hydraulic connection and thus wetland response to groundwater change. A summary of our understanding of the hydraulic connection of the groundwater system with the upstream marsh areas is provided below.

3.2.1 Sequalitchew Lake and East Edmond Marsh

The Sequalitchew Lake level is believed to be an expression of the water table, and the monitoring data at the outlet indicates year-round hydraulic connection between the surface water and groundwater in this area.

The principal water supply for Joint Base Lewis-McChord (JBLM) occurs on the eastern side of Sequalitchew Lake where Sequalitchew Springs are located, which are reported to yield as much as 9,000 gallons per minute (gpm) (approximately 20 cubic feet per second [cfs]). Most of the time the springs provide more flow that needed by JBLM for water supply, resulting in surface water outflow from the Lake passing over the Diversion Weir and into the Diversion Canal.

3.2.2 Upstream Marshes—Bell, Hamer and McKay

Surface water levels higher than groundwater levels indicate an influx of surface water in the wet season, with dropping surface water and groundwater levels in the dry season.

3.2.3 Edmond Marsh

Throughout Edmond Marsh, there is connection between surface water and groundwater; however, the connection is greater in the more easterly monitoring stations than in the west marsh area. In the central and eastern areas, stations EM-3 and EM-2 are located adjacent to roadways that, during their construction, may have excavated out the peat deposits. In addition, the creation and maintenances of a channel for Sequalitchew Creek through Edmond Marsh during the years when a fish hatchery operated in Sequalitchew Lake likely disturbed or removed portions of the peat deposits. The westernmost station EM-1 has the least amount of hydraulic connection, presumably because the underlying peat materials are still in place.

These monitoring data indicate an influx of stormwater in the wet season fills the wetland area. Beaver dams help to maintain marsh surface water levels higher than groundwater levels beneath the marshes during the wet season. During the dry season, the surface water and groundwater levels drop. The west end of Edmond Marsh completely dries each year by late spring.

3.2.4 Southern Lakes

A group of lakes (e.g., Grant Lake, Pond Lake, Old Fort Lake and several others) are located in the southwestern most study area. Monitoring data indicates these are water table lakes whose surfaces fluctuate with the groundwater level.

3.2.5 Groundwater Discharges to Sequalitchew Creek Ravine

Groundwater discharges from the Vashon Aquifer as springs in the Sequalitchew Creek ravine below elevations of approximately 195 feet down to the top elevation of the Qob deposits at elevation between approximately 100 to 120 feet, which spans a creek reach of approximately 0.7 miles. Based on stream gaging data, this groundwater discharge varies between approximately 0.5 cfs in the summer to 1.5 cfs in the winter. Progressing downstream past the Qob Truncation, Sequalitchew Creek becomes a losing stream as the water table drops through the outwash to near sea level.

3.3 Deeper Aquifers

Beneath the Qob is the regionally extensive and highly productive Sea Level Aquifer, which occurs throughout the DuPont area between elevations of roughly 50 and -100 feet relative to mean sea level. The Sea Level Aquifer is generally confined beneath the Qob aquitard, and has very limited hydraulic connection with the shallower Vashon Aquifer. West of the Qob Truncation, the Sea Level Aquifer becomes unconfined and its groundwater merges with flow from the Vashon Aquifer in the accumulation of Steilacoom Gravels extending below mean sea level (sometimes referred to as the unconfined Sea Level Aquifer; URS, 2003). Groundwater in the Sea Level Aquifer discharges to Puget Sound via intertidal and subtidal seeps. The Sea Level Aquifer is the City of DuPont's primary water supply source, with their Bell Hill wells No. 1 and No. 3 and Hoffman Hill wells No. 1 and No. 2 completed in it.

Below the Sea Level Aquifer and underlying aquitard unit is a deeper glacial aquifer unit, sometimes termed the Lakewood Aquifer, in which the City of DuPont's Bell Hill No. 2 is completed.

Below the Lakewood Aquifer, two deeper glacial aquifer units separated by interglacial aquitard units were observed during drilling of CalPortland's 1,000-foot-deep water well for the aggregate processing plant. CalPortland's well is completed in the deepest observed aquifer unit, screened between elevations of -685 and -770 feet.

4 Setup of Updated Model

The DuPont model represents a significant update to previous numerical groundwater models used on this project (CH2M Hill 2003, Aspect 2004a, Aspect 2009b)). The updates include changes to the model time period, structure and extent, calibration process, and mining plan scenarios.

Previous models were calibrated to an average "steady-state" condition. The updated model is a transient model calibrated to monthly hydrologic measurements collected from March 2004 through December 2010, and validated to measurements collected through December 2015. The model extent was also expanded to include the area west of the Olympia Beds (Qob) Truncation to Puget Sound to allow for simulation of groundwater discharges in the western portion of the project area. The model also now incorporates deeper geologic layers including the Sea Level Aquifer.

In 2010 and 2011, the USGS published a regional groundwater model that provides additional information outside the boundaries of the prior model, allowing us to supplement our site-specific hydrogeologic data with data from the greater Chambers-Clover Creek watershed (Savoca et al., 2010; Johnson et al., 2011). Elements of the USGS model were spatially correlated and numerically transcribed to the DuPont model.

The DuPont model was calibrated to groundwater conditions based on monitoring data from 2004 to 2010, and validated based on monitoring data through 2015. Overall, these 2004 to 2015 groundwater conditions are referred to as the "baseline." The calibration process used a state-of-the-science parameter estimate program (PEST) and is discussed in Section 5.

The DuPont model was then used to predict groundwater conditions during and after mining. Predictive scenarios representing the major steps in mining and dewatering were developed based on the current mining plan, which differs from prior models in that it no longer includes construction of a north fork of Sequalitchew Creek. Four predictive scenarios representing the planned mining steps (hereafter referred to as Steps 1, 2, 3, and 4) were developed and simulated.

4.1 Model Code

Groundwater flow equations were calculated using the program MODFLOW-SURFACT, version 3 (Hydrogeologic, 2012). This program is better suited than traditional MODFLOW programs for simulating the partially saturated flow conditions that are anticipated will be caused by the proposed mining of the South Parcel. An earlier version of the same software was used for previous modeling efforts.

The DuPont model was developed using an industry-standard computer program, Groundwater Vistas, version 6 (ESI, 2011), as a pre- and post-processor. An earlier version of the same software was used for previous modeling efforts.

The DuPont model was setup to minimize numerical error and provide for a practical computational run time. The head convergence criterion was set to 0.01 feet, which is a setting typical for groundwater models. The cumulative mass balance error was limited to 0.02 percent, which is more stringent than the 0.1 percent criterion for an "ideal" model

(Anderson and Woessner, 1992). The DuPont model requires up to 18 hours for a computational run.

4.2 Model Extent and Grid

Relative to earlier versions of the model, the DuPont model was expanded to simulate boundaries further from the South Parcel, so as to reduce the effects of model boundaries on the central area of interest. The model extent is shown on Figure 4 and the inset shows the DuPont model extent within the context of the regional USGS model extent. Compared to previous models, the DuPont model was expanded to the northwest to include the area beyond (downgradient of) the Qob Truncation. Inactive cells along the northeast and southeast model extents were converted to active cells to include a portion of American Lake as a well-defined surface water boundary condition. Model results for areas closer to the model extents are considered less accurate due to the proximity of model boundaries.

The DuPont model grid coordinate system was updated to be consistent with the project coordinate system and to provide quality assurance for model construction and interpretation of model results. The model horizontal datum is NAD 83 State Plane South in feet. The model vertical datum is NGVD 29 in feet. The model was rotated and offset to better align with the predominant groundwater flow direction. The grid was rotated 44.45 degrees counter-clockwise; and model x,y coordinates were offset 1,097,483 feet east and 653,755 feet north, respectively. The model coordinate, elevation, and offset information allows for georeferencing of model results.

The grid in the DuPont model was refined to reduce potential numerical error and allow greater spatial resolution in results. Grid spacing in the DuPont model was halved from previous models, with a range from 50-foot spacing across the mine property up to a maximum of 250-foot spacing at the model boundaries. This spacing resulted in 268 rows and 198 columns across the DuPont model domain, creating 53,064 cells in each layer and a total of 477,576 cells in the model.

4.3 Model Layers

The DuPont model was constructed with nine layers to simulate five hydrostratigraphic units, which is consistent with the upper five hydrostratigraphic units identified in the USGS model (Johnson et al., 2011). The five hydrostratigraphic units simulated in the DuPont model are, from the surface down:

- Steilacoom Gravel;
- Upper Confining Unit;
- Vashon Outwash;
- Olympia Beds; and
- Sea Level Aquifer.

Table 1 provides a brief description of the hydrostratigraphic units simulated in the model. Figure 7a through 7e provides the thickness and extent of the five

hydrostratigraphic units. Other reports provide a more detailed description of the hydrogeologic conceptual model for the project area, including the hydrostratigraphic units (Aspect, 2004a; Savoca et al., 2010; Johnson et al., 2011). Each hydrostratigraphic unit was simulated as two layers in the model, except the Upper Confining Unit, which was simulated with one layer. Using two model layers allowed integrating the information from co-located monitoring wells into the calibration of vertical hydraulic conductivity within a hydrostratigraphic unit.

4.3.1 Model Top Elevation

The ground surface elevation, shown on Figure 5, was based on available LiDAR surveys and represents the top elevation used in the DuPont model. This surface topography was used in the baseline and predictive simulations of future mining Steps 1 through 3. For future mining Step 4, the surface topography was modified within the South Parcel as shown in Figure 6 to reflect the changes from mining.

4.3.2 Hydrostratigraphic Units

The hydrostratigraphic units and their contact elevations were inferred from the network of mine exploration borings, off-property monitoring well logs, and area-wide cross sections including those developed for the DuPont Mine (Aspect 2004b) and the USGS model (Savoca et al., 2010; Johnson et al., 2011). Where a hydrostratigraphic unit is simulated using two layers, each layer is of equal thickness.

Model Layers 1 and 2 generally simulated the Steilacoom Gravel across the model extent, except where it was inferred to be absent. The areas of greater hydraulic conductivities in Layers 1 and 2 reflect Steilacoom Gravel, whereas areas of lesser hydraulic conductivities reflect glacial till deposits at the surface (Burke Hill, for example) or erosion through deeper hydrostratigraphic units (Sequalitchew Ravine, for example) (Figure 7a). The Steilacoom Gravel was simulated in all layers west of the Qob Truncation, where the main flow channel for the glacial outburst floods was inferred to have discharged.

East of the Qob Truncation, Layer 3 generally simulates a thin layer of finer-grained material (relative to the Steilacoom Gravel above and Vashon Outwash below), and is referred to as the Upper Confining Unit in this report. The lack of obvious till in the borings from the DuPont Mine led us to infer that the Steilacoom Gravel flood outwash may have eroded away most, if not all, of the till within the main flow channel. This is consistent with the hydrogeologic interpretation established for Parcel 1 of the Former DuPont Works Site located south of Sequalitchew Creek (URS, 2003). The USGS mapped till deposits on either side of the main flow channel, and we included that till in our model (see Figure 21 in Johnson et al., 2011). During model calibration, the model did not replicate observed water levels in the Steilacoom Gravel without a finer-grained layer within the flow channel, consistent with the USGS geologic interpretation. Figure 7b shows the Upper Confining Unit east of the Qob Truncation, and Steilacoom Gravel west of the Qob Truncation.

Layers 4 and 5 simulate the Vashon Outwash east of the Qob Truncation, as shown in Figure 7c. Layers 6 and 7 simulate the Olympia Beds east of the Qob Truncation, as shown in Figure 7d. Layers 8 and 9 simulate the Sea Level Aquifer east of the Qob Truncation, as shown in Figure 7e.

The Sequalitchew Creek ravine is an erosional feature created after deposition of the Steilacoom Gravel. As such, the ravine was simulated as cutting through the hydrostratigraphic layers as it descends toward sea level.

In the predictive model simulating the post-mining condition, the hydrostratigraphic units are modified to reflect the effects of mining as described in Section 5.

4.4 Aquifer Parameters

An initial range in aquifer parameter values (including horizontal hydraulic conductivity, vertical hydraulic conductivity, specific yield, and specific storage) was defined for each hydrostratigraphic unit based on data developed in previous studies (Aspect, 2004a; Aspect, 2004b). Aquifer parameter values for the model layers were calibrated using the process described in Section 5 to minimize the difference between observed and model-calculated groundwater levels. The calibrated average values are provided in Table 1.

The DuPont model was updated to allow spatial differences in hydraulic conductivity within a hydrostratigraphic unit. Allowing hydraulic conductivity to vary in this updated model permitted better calibration to the observed transient conditions (note that prior models were steady state and assumed homogeneous hydraulic conductivity within each hydrostratigraphic unit). The spatial distribution of final calibrated hydraulic conductivity is shown for the Steilacoom Gravel hydrostratigraphic unit, the Upper Confining Unit hydrostratigraphic unit, and the deeper Vashon Outwash hydrostratigraphic unit on Figure 8a through 8d.

Other parameters (specific yield, specific storage, and vertical anisotropy—the ratio of vertical to horizontal hydraulic conductivity) were held spatially constant within a hydrostratigraphic unit, as they had been in prior models. Vertical conductivity is calculated based on the horizontal conductivity, which varies spatially, and the vertical anisotropy, which does not. As such, vertical conductivity varies spatially within a hydrostratigraphic unit.

4.5 Model Calibration and Validation Timeframes

The DuPont model calibration timeframe was updated to simulate the period of monitoring from March 2004 through December 2010. The DuPont model simulates 82 monthly stress periods[1], preceded by one “lead-in” period of average conditions for the entire period. The first stress period was included to simulate steady-state average conditions, similar to previous models, and improve the model calibration process.

The roughly 6-year model calibration timeframe is robust in comparison with prior versions of the model and the recent work by USGS. The transient USGS model simulated the 24-month period from September 2006 to August 2008, which was preceded by a 3-year lead-in period.

[1] Stress periods are a time interval within the model when conditions change. Stress periods include multiple time steps for computational purposes, but conditions such as precipitation, pumping rates, or lake water levels only change at the beginning of the stress period.

The DuPont model validation timeframe was updated to simulate the period of monitoring from March 2004 through December 2015, or 142 monthly stress periods. This longer timeframe provided the baseline groundwater conditions for predictive analysis.

The validation timeframe overlaps the calibration timeframe because of a change in the precipitation data source. The model was calibrated using precipitation data from McMillin Reservoir, but beginning in 2012 this data source became unreliable, with significant gaps in coverage. For model validation, the precipitation data source was changed to the PRISM estimates for the McMillin Reservoir (details are presented in Section 4.6.1) for the entire validation period (2004-2015). Using the full period of record for validation allows for validation of the change in precipitation source as well as validating the model in additional years.

The validation period reflects a range of weather conditions, including both relatively wet and relatively dry years, as shown on Figure 9. Figure 9 shows the DuPont model timeframe compared to the USGS model timeframe, within the context of historical annual precipitation. The predictive models used the same 2004 to 2015 timeframe as the baseline model, but with different boundary conditions as noted below. Predictive models simulated dewatering and/or surface drainage during the initial stress period, so as to provide the maximum predicted change in groundwater levels for each phase of mining.

4.6 Boundary Conditions

Model boundary conditions were assigned to best simulate the observed or inferred hydrogeologic conditions, as described below. The predictive models used boundary conditions identical to the baseline model, except as noted below.

4.6.1 Recharge—Net Precipitation

Monthly-variable and spatially-variable recharge values were based on values assigned in the USGS transient model (see Figures 4 and 6 in Johnson et al., 2011; Savoca et al., 2010), which included net precipitation recharge after accounting for runoff, evapotranspiration, and other surficial processes. Figure 10 shows the distribution of average recharge rates across the model extent.

For the calibration time periods outside the USGS model timeframe, recharge values were correlated with precipitation data at the McMillin Reservoir (NWS station 455224), the nearest long-term weather station with a long-term record (active since 1941). The precipitation record for McMillin Reservoir became less reliable in 2012, with more frequent breaks in data collection.

Since the McMillin Reservoir observations no longer had good coverage for the entire model timeframe, a predicted monthly time series for the McMillin Reservoir location from the Oregon State University PRISM Climate Group (OSU 2017) was used instead of the actual weather station observations.

Figure 9 shows a collection of graphs with the following information:

- Annual precipitation (upper left): compares the annual precipitation at McMillin Reservoir with PRISM data, and shows the average annual precipitation with PRISM data and the groundwater model timeframes;

- Annual precipitation exceedance plot (lower left): shows the probability distribution of annual precipitation, highlighting the years during the validation period;
- Monthly precipitation and recharge (upper right): compares the monthly precipitation (bars) and recharge (lines) during the validation period, and shows the model timeframes; and
- Precipitation by month (lower right): shows the range in historical (1942 to 2015) monthly precipitation (high/low lines) and the monthly precipitation during the validation period (scatter plot).

The McMillin Reservoir and PRISM precipitation data sets compare closely with each other, and the switch to using PRISM data for modeling was seamless. The validation period for the DuPont model represents a wide-range in the precipitation recharge, including both relatively wet and relatively dry years and months.

4.6.2 Groundwater Inflow

Groundwater inflow to the model domain was simulated as occurring in three locations: 1) from American Lake, 2) across a portion of the northeast model boundary, and 3) across the southeast model boundary. Figure 11 shows the location of model boundary conditions, including groundwater inflow. The American Lake boundary was defined by monthly-variable specified head cells based on reported and/or precipitation-correlated water levels (Johnson et al., 2011). Groundwater underflow across the northeast model boundary occurs in the Steilacoom Gravel hydrostratigraphic unit (Layer 2) and was defined in the model by monthly-variable specified head cells based USGS model results (Johnson et al., 2011). Groundwater underflow across the southeast model boundary occurs in the Sea Level Aquifer (Layer 9) and was defined by monthly-variable specified head cells based on USGS model results (Johnson et al., 2011). For the period after the USGS model timeframe, specified heads were assigned based on correlations with precipitation patterns. Figure 12 shows a graph of specified heads over time assigned to the groundwater inflow boundaries of the DuPont model.

4.6.3 Infiltration from Wetlands

Wetlands simulated in the DuPont model include Bell Marsh, McKay Marsh, Hamer Marsh, and the Edmond Marsh complex (Table 2). In addition, the channel flowing through East Edmond Marsh was simulated distinctly from the surrounding wetland areas to reflect the “cookie cutter” dredging that occurred in the 1970s to 1990s.

Each wetland area, including the Sequalitchew Creek channel, was treated as a distinct head-dependent boundary condition within the model, as shown on Figure 11.

In a few areas, wetland soils have been removed during historical development activities within the Edmond Marsh complex. Specifically, it was assumed that wetland soils were removed and replaced with sand and gravel fill at the former railroad grade at the Robinson Trail, and along the DuPont-Steilacoom Road. These areas were not included as wetland boundary conditions.

Wetland boundary conditions (drains and rivers) used monthly-variable and spatially-variable heads based on observed staff gage readings during the period of monitoring. Graphs of wetland water depths over time are shown on Figure 13, calculated from observed staff gage readings and the estimated bottom elevation of the wetland. When wetland stages were observed to be dry, the model simulated no water depth. Perched wetland conditions, where the wetland may have surface water ponded above the groundwater table (see Figure 15; Aspect, 2004a), were not simulated with the DuPont model because that water is not in direct hydraulic connection with the groundwater system being simulated.

The connection between the wetlands and the aquifer was defined by river cells with calibrated conductance values simulating a 5-foot-thick layer of peat forming the wetland bottom (see Figure 15; Aspect, 2004a). The wetland properties assigned in the model are summarized in Table 2. Wetland conductance values[2] were calibrated such that the area-weighted average vertical hydraulic conductivity was 0.034 feet per day. This value was consistent with previous peat testing results, which averaged in the range of 0.03 to 0.08 feet per day.

For predictive modeling, the wetland stages were maintained at baseline conditions.

4.6.4 Discharge to Surface Water

Groundwater-to-surface water discharge was simulated for the Joint Base Lewis-McChord (JBLM) water supply overflow, Sequalitchew Lake, the Diversion Canal and drainage, the wetlands complex, and the Sequalitchew Creek ravine. The locations of these boundary conditions are shown on Figure 11, and each is described below. The groundwater model simulates groundwater discharge to surface water, and does not simulate surface water flow due to runoff.

We assumed that groundwater discharged to surface water travels directly to Puget Sound, without potential for re-infiltration to the groundwater system. This assumption may result in the model overestimating drawdown effects from mine dewatering, especially in the area of the Diversion Canal and the Sequalitchew Creek ravine.

4.6.4.1 Joint Base Lewis-McChord Water Supply Overflow

Overflow from the spring water supply for JBLM at the east end of Sequalitchew Lake was simulated to evaluate changes in overflow throughout the mining process. The overflow was defined with a drain cell based on the overflow elevation. Groundwater discharged to this drain cell was assumed to subsequently discharge to Puget Sound via Sequalitchew Lake and the Diversion Canal, without potential for re-infiltration to the groundwater system.

4.6.4.2 Sequalitchew Lake

Sequalitchew Lake was simulated as a reflection of the groundwater table, and was defined by drain cells with monthly-variable heads based on observed lake levels at

[2] Wetland conductance (C) is a model-specific value that depends on the cell dimensions, as shown in the following equation: C = Kv*L*W/m, where Kv is vertical hydraulic conductivity (ft/d), L is cell length (ft), W is cell width (ft), and m is the peat thickness (ft). A higher conductance value allows greater hydraulic connection between wetland surface water and underlying groundwater, and vice versa.

monitoring well MW-SL-1, which is located at the west shore of Sequalitchew Lake. Groundwater discharging to Sequalitchew Lake was assumed to travel directly to Puget Sound via the Diversion Canal, without potential for re-infiltration to the groundwater system.

4.6.4.3 Diversion Canal and Drainage

The Diversion Canal, and the drainage associated with JBLM North were defined by drain cells with heads assigned at the elevation of the ground surface. Losing reaches of the Diversion Canal to the aquifer were not simulated with the DuPont model because that water is not in direct hydraulic connection with the groundwater system being simulated. Except near Sequalitchew Lake, the bottom of the Diversion Canal is generally above the water table, and proposed mining will not affect the flow in the canal or the seepage rates from the canal.

Groundwater model results indicate a shallow water table in the vicinity of JBLM North. We assumed that groundwater discharging to channels or other surface water features on JBLM North travels via the Diversion Canal directly to Puget Sound, without potential for re-infiltration to the groundwater system.

4.6.4.4 Wetlands Complex

Surface water discharge from the wetlands was defined by drain cells with conductance values greater than values for the river cells simulating wetland infiltration. We assumed that surface water discharged from the wetlands was subsequently discharged to Puget Sound via the Diversion Canal or the Sequalitchew Creek ravine, without re-infiltration within the wetlands. Re-infiltration of water to the aquifer from the losing reach of Sequalitchew Creek near Edmonds Marsh was not simulated because of the complexity of surface water/groundwater interaction in this area. This is a conservative assumption because it reduces the amount of water infiltrating to the aquifer along the losing reach, and may result in overestimating the effects of mine dewatering in the vicinity of the losing reach.

Infiltration from the wetlands is discussed in Section 4.6.3.

4.6.4.5 Sequalitchew Creek Ravine

Seepage within the Sequalitchew Creek ravine was defined by drain cells with heads assigned to ground surface to simulate gaining conditions. We assumed that groundwater discharged to these drain cells was subsequently discharged to Puget Sound via Sequalitchew Creek.

4.6.5 Discharge from Dewatering Wells

Dewatering wells were included in the predictive scenarios for future mining Steps 1 through 3. These mining steps represent the phased increase in dewatering efforts through planning, preparation, and execution of mining:

- Step 1 – Initial Dewatering Test
- Step 2 – Preparation for Mining/Expanded Dewatering Test
- Step 3 – Active Dewatering During Mining

Dewatering wells are not included in Step 4 – Cessation of Active Dewatering – because, at that point, all dewatering wells will have been turned off allowing groundwater seeps to develop at the toe of the mined slope. Additional detail about the dewatering plan is presented in the main body of the Monitoring Plan (Aspect, 2017).

The DuPont model was used to simulate the effects of dewatering as though each dewatering step occurred throughout the 11-year baseline period. This approach simulates the effects of the dewatering activities under the range of weather conditions represented by the baseline period.

The DuPont model simulated 10, 24, and 66 dewatering wells along the eastern mine property boundary for Steps 1, 2, and 3, respectively. Figure 14 shows the locations of the proposed dewatering wells during the progressive mining Steps. The simulated wells were screened across multiple model layers for the aquifer above the Olympia Beds, with pumping rates of up to 1 cfs per well. The MODFLOW-SURFACT model code automatically re-allocates pumping to lower layers as upper layers are dewatered, and automatically reduces the pumping rate as the water level approaches the bottom of the well.

Planned re-infiltration of pumped water to the floor of the existing mine will discharge to Puget Sound via the Sea Level Aquifer, and thus will not influence upgradient effects of dewatering and mining in the Vashon Outwash. Simulation of the re-infiltration of the dewatering discharge was not included in the DuPont model as it would occur west of the truncation of the Olympia Beds and thus would not affect water levels in the Vashon Aquifer.

4.6.6 Discharge to the Mined Slope

Groundwater discharge along the toe of the newly mined slope in the South Parcel was simulated for future mining Step 4, and was defined by drain cells with heads assigned at the elevation of the toe of the proposed mine slope (see Figure 5 for post-mining elevations).

4.6.7 Groundwater Outflow

Submarine groundwater outflow to Puget Sound was simulated using drain cells with heads assigned to mean sea level. The locations of boundary conditions, including groundwater outflow, is provided on Figure 11.

4.6.8 No-Flow Boundaries

No-flow boundaries were assigned at the edges of the DuPont model where groundwater flow was inferred to be relatively parallel with the model boundary (Figure 4). This included the bottom of the model (bottom of Sea Level Aquifer), and the sides of the model perpendicular to the shore of Puget Sound, except in layers where information was available to specify head.

5 Model Calibration and Validation

The DuPont model was calibrated by adjusting parameter values to minimize the difference between observed and calculated hydrogeologic conditions. The DuPont model was calibrated to the monitoring data from March 2004 through December 2010. The DuPont model was then updated with monitoring data from January 2011 through December 2015 and validated to the entire March 2004 to December 2015 period.

Similar to the USGS model, the DuPont model was calibrated using a specialized program called PEST, version 12 (Dougherty, 2011), which optimizes a parameter estimation method to provide the best fit within the limits of the available data and assumptions used in the numerical model. Jim Rumbaugh, the software developer for Groundwater Vistas, assisted Aspect with calibrating the DuPont model.

The raw calibration results statistically indicated a good calibration, and were further refined using trend-line analysis to improve matching observed and calculated water levels. The model calibration process is described below, including establishing calibration targets, defining the calibration method, providing the calibration and validation results, and post-processing the model results.

5.1 Calibration Targets

Observed groundwater levels were assigned to the DuPont model as transient calibration targets at the mid-point elevation of the monitoring well screen. Head targets, drawdown targets, and head-difference targets were set up using the same observed water levels, but provide different information to PEST during model calibration. Targets, and their primary calibration parameters, are summarized below:

- Head targets (1,467 total during calibration; 2,503 total during validation) primarily informed the calibration of horizontal hydraulic conductivity values. Head targets were used during validation to calculate residual statistics.
- Drawdown targets (1,467 total) primarily informed the calibration of aquifer storage parameters. In this case, “drawdown targets” applied the same information used for head targets to reflect seasonal changes in water levels (not drawdown due to a pumping well). Drawdown targets were calculated as the arithmetic average water level minus the observed water level on a given date. Drawdown targets were not used during validation.
- Head-difference targets (414 total) primarily informed the calibration of vertical hydraulic conductivity where shallow and deep wells were co-located. In this case, head-difference targets applied the same information used for head targets to reflect the vertical hydraulic gradient. Head-difference targets were not used during validation.

Observed and calculated groundwater levels over time at monitoring wells are presented on Figure 15 (top graphs). Wells with more observations had greater influence on model calibration than those with fewer observations.

Select single-observation targets in the area south of Sequalitchew Creek were used to inform model calibration. These calibration data were assigned for the first stress period to represent average conditions and included the following:

- Groundwater level data from 1994 at monitoring wells that were part of the Remedial Investigation of the Former DuPont Works Site (URS, 2003); and
- Surface water levels from August 2004 at Wetland 8, Wetland 10, Strickland Lake, Grant Lake, and Old Fort Lake (Aspect, 2004b).

5.2 Calibration Methods

Calibration methods followed the guidance provided for highly parameterized inversion (Doherty and Hunt, 2010; Doherty, et al., 2010). Essentially, this guidance allows back-calculating multiple model parameters to result in a best-fit with observed data, while maintaining parameter values within an expected range.

Table 3 provides a list of the model parameters adjusted during the calibration process. The DuPont model calibration was conducted in two stages, as described below:

- The first stage of model calibration refined aquifer parameters and wetland conductance values using zones or reaches of piecewise constancy. Calibration results were used to focus efforts on the most sensitive parameters. Calibrated aquifer parameters included horizontal and vertical hydraulic conductivities, and unconfined and confined aquifer storage values.
- The second stage of model calibration involved refinements to the spatial distribution of hydraulic conductivity within the Steilacoom Gravel, the Upper Confining Unit, and the deeper Vashon Outwash. Calibration methods included the following:
  - Regularization with pilot points, allowing hydraulic conductivity values to vary one order of magnitude from the value determined during the first stage. Previously determined vertical: horizontal anisotropy was maintained. As shown in Table 1, the maximum and minimum calibrated hydraulic conductivity values for a hydrostratigraphic unit are within two orders of magnitude.
  - Singular value decomposition, which internalized sensitivity analysis and reduced the time required for calibration. The calibration process was concluded when successive iterations showed limited improvement in residual statistics (discussed below).

5.3 Calibration Results

The calibrated DuPont model provided a good “fit” between calculated and observed groundwater levels. Consistent with model calibration guidance (Anderson and Woessner, 1992; Hill and Tiedemann, 2007), we evaluated the sufficiency of DuPont model calibration based on comparing observed and calculated groundwater levels from multiple perspectives. First, we evaluated the overall model calibration. Then, we evaluated the transient model calibration for potential trends. Last, we evaluated the

model calibration for each monitoring well. Additional discussion of each step is provided below.

5.3.1 Overall Groundwater Level Calibration

We characterized the DuPont model as calibrated when additional adjustment in model parameters did not improve overall residual statistics, within the constraints of the model setup (Section 3) and the calibration targets and methods (Section 4.1 and 4.2).

A quantitative calibration evaluation, based on statistical analysis, met accepted industry standards for overall model comparison. The overall groundwater level calibration for the DuPont model was quantitatively evaluated using residual statistics for head targets (Table 4). Overall residual statistics were also calculated for drawdown (i.e., seasonal change in water levels) and head-difference targets, and we describe the level of calibration for these targets within the context of head targets for clarity and consistency. A description of common residual statistics is provided below:

- The overall **mean** residual reflects that calculated groundwater levels were 1.8 feet less than observed, on average.
- The overall **standard deviation** of residuals reflects that calibrated water levels were generally within 2.7 feet of the observed value.
- The **sum of squared** residuals is used for identification of specific targets which affect the overall model calibration, discussed further in Section 5.3.3.
- The overall **root mean square error** incorporates information on both the mean and standard deviation, and reflects that calibrated groundwater levels were generally within 3.2 feet of the observed value.

Thus, a broad interpretation of the mean and standard deviation is that the model-calculated groundwater levels across the entire model domain were 1.8 feet less than observed groundwater levels on average, and were usually within 2.7 feet of observed groundwater levels.

Consistent with model calibration guidance, selected residual statistics were scaled to the range of observed groundwater levels to compare with industry standards. The DuPont model calibration focused on groundwater conditions east of the Qob truncation, where the difference between the maximum and minimum observed groundwater levels was approximately 31 feet. The range in simulated groundwater elevations spanned approximately 230 feet (from American Lake to Puget Sound). The scaled standard deviation and root mean square error "*should be less than 10 to 15 percent for a good calibration*" (ESI, 2011). A description of the scaled residual statistics is provided below:

- The scaled standard deviation of residuals was less than 9 percent (2.7 feet / 31 feet) of the observed range.
- The scaled root mean square error of residuals was less than 11 percent (3.2 feet / 31 feet) of the observed range.

Thus, we interpreted the DuPont model as meeting industry standards, and as having a good calibration over the 6 years of observations covering a range of climatic conditions.

Residual statistics were calculated for drawdown (i.e. seasonal change in water levels) and head-difference targets (Table 4). Low values of scaled standard deviation indicate a good model fit. The overall scaled standard deviation of residuals for drawdown was 12 percent of the observed range, and for head-difference was 14 percent of the observed range.

A qualitative evaluation of the overall model calibration showed good agreement between calculated and observed groundwater levels and ranges based on mapped comparisons (Figures 16 and 17). The map on Figure B-13 compares measured to model-calculated water table elevation contours for May 2010. This qualitative calibration evaluation shows good agreement between water table elevation contours across most of the model domain within the context of seasonal variability, with the best agreement in the vicinity of the wetlands that are areas of primary interest for the project. The map on Figure 17 compares the seasonal range in model-calculated and observed groundwater levels. The range in model-calculated groundwater levels (contours) were approximately 86 percent of the observed values (posted values), on average.

5.3.2 Calibration of Groundwater Levels over Time

The DuPont model head calibration results were consistently good during seasonal and annual hydrologic cycles. Transient head calibration results were evaluated over two time scales, monthly and annual, as listed in Table 4, to evaluate if there were temporal trends in the accuracy of the model calibration.

The time-related residual statistics indicate a good annual model calibration with the scaled standard deviation between 8 to 12 percent. There is no discernible trend in the annual residual statistics, which suggests that the model calibration is consistently good during dry and wet years. The monthly residual statistics also indicate a consistently good calibration during dry and wet months, with the scaled standard deviation between 8 and 11 percent.

5.3.3 Calibration of Groundwater Levels at Individual Wells

Overall, individual monitoring wells selected for DuPont model calibration showed good model fit. The calibration was evaluated at individual wells to determine if there were spatial trends in model performance. Calibration at individual wells is summarized in a scatter plot (Figure 18, upper graph), which compares the observed and calibrated groundwater level elevations. Most wells fall close to the 1:1 line that represents the “perfect” model fit.

Based on the validation model results, head target residual statistics for individual wells are provided in Table 5, and are described in more detail below:

- Monitoring wells with fewer observations provided less information for the PEST calibration than other wells. These wells included 88-2-VD and MW-PL-1.
- All monitoring wells had mean residuals that were less than the range of observed values, except 88-2-VD.
- The standard deviation of residuals at any individual well was less than approximately 1.7 feet.

- The sum of squared residuals clearly identifies those wells most influencing the overall model calibration. The shallow and deep monitoring wells at MW-EM-1, CHMW-2, and CHMW-3 have greater mean residuals, and greater sum of squared residuals, than other locations. Although the offset at 88-2-VD is larger than other monitoring wells, the sum of squared residuals is limited by the relatively small number of observations.
- The root mean square error combines the mean and standard deviation of residuals. Based on this statistic, the calibration is better at monitoring wells MW-EM-3, MW-EM-2s and -2d, MW-SRC-2, and MW-HM-1 than at other locations.

The potential causes for poorer calibration at selected wells, identified by greater mean residual, are as follows:

- MW-EM-1S and MW-EM-1D appear to be sensitive to the groundwater and wetland interactions at the discharge point of West Edmond Marsh. Re-infiltration of surface water was not simulated at this location based on limited information for flow rates; ignoring re-infiltration is a conservative assumption with respect to predicting hydrogeologic impacts (see Section 4.6.4.5). Also, surface water was inferred to be seasonally perched above the water table (see Figure 15, Aspect 2004a), and the groundwater model was setup to simulate typical groundwater conditions.
- The shallow and deep monitoring wells at CHMW-2 and CHMW-3 are close to the Qob truncation, and are in areas with greater hydraulic gradients (inferred and calculated) than other monitoring wells. Groundwater levels at these monitoring wells appear to be sensitive where the curving water table crosses hydrostratigraphic contacts near the Qob truncation.

In summary, areas with the best model fit are the central portion of the Edmond Marsh Complex (MW-EM-2s, MW-EM-2d, and MW-EM-3) and the eastern boundary of the South Parcel (CHMW-1 and CHMW-4d) based on the residual statistics shown in Table 5. These areas are also the focus of attention for predicting the effects of proposed mining activities, and model predictions in these areas are considered more reliable than areas with poorer calibration.

5.4 Validation Results

Model validation was conducted, without changing the model construction (model grid/layering and aquifer parameters, to demonstrate that the validity of using PRISM data to assign recharge distribution. We characterized the DuPont model as validated because of the similarity between the calibration and validation residual statistics, as explained in further detail below.

5.4.1 Overall Groundwater Level Validation

The summary table below compares overall residual statistics between model calibration and model validation.

Type (Period)	Mean Residual (feet)	Standard Deviation of Residuals (feet)
Calibration (2004 to 2010)	1.8	2.7
Validation (2004 to 2010)	1.9	2.7
Validation (2011 to 2015)	1.8	2.5

The calibration and validation residual statistics for the period 2004 to 2010 compare closely, and demonstrate that the use of the PRISM data source, in place of the McMillin Reservoir data, was valid. The residual statistics for the period from 2011 to 2015 compares closely to the earlier period, and validates the model results for the conditions simulated.

Table 6 shows the residual statistics for head targets during model validation, and can be compared to Table 4 which provides statistics for head targets during model calibration. Specifically, the residual statistics for the model validation meets the industry standard for a reliable groundwater model.

5.4.2 Validation of Groundwater Levels over Time

Similar to calibration evaluation, the DuPont model head results were consistently validated over two time scales, monthly and annual, as listed in Table 6. Similar residual statistics over time indicated no temporal trends, and validated the model accuracy.

5.4.3 Validation of Groundwater Levels at Individual Wells

Overall, individual monitoring wells in the DuPont model showed good model fit for the validation period. Based on the validation model results, head target residual statistics for individual wells are provided in Table 7. The validation results provided similar well-specific residual statistics as the model calibration results.

The top graphs on Figure 15 show observed and calculated groundwater levels over time at individual monitoring wells. The middle graphs on Figure 15 compare the calculated and observed groundwater levels at individual wells. These graphs illustrate the offset and scatter described in the residual statistics, as well as the ranges in observed and calculated groundwater levels.

5.5 Further Refinement of Model Results

During calibration, the DuPont model was updated by including additional hydrologic complexity to better simulate the observed groundwater conditions. Some real-world complexity could not be incorporated in the model, and resulted in model bias quantified in the residual statistics. Therefore, the raw model results were refined to reduce model bias in groundwater levels calculated at individual wells using deterministic regression methods (Hill and Tiedeman, 2007). Similar methods were also used to improve the accuracy of the predicted groundwater levels (Xu et al., 2012; Doherty and Cristensen, 2011) for individual wells discussed in Section 6.

The trend-line analysis used to refine the model-calculated groundwater levels is shown on Figure 15 for each monitoring well (except 88-2-VD). To avoid introducing additional bias by refining groundwater level results for only wells with poorer calibration, trend-line analysis was performed for all wells. The top plot for each well on Figure 15 shows observed and validated groundwater water levels over time. The middle plot for each well on Figure 15 shows the trend-line analysis for observed and calculated water levels to determine the best-fit line, or "refinement trend line". The best-fit line also accounts for local hydrogeology by establishing a control point at elevation 120 feet NGVD29, which is the approximate contact elevation between the Vashon Outwash and the Olympia Beds. This allows for correlation of model-predicted results outside the range of observed water levels, and is most applicable for wells CHMW-1, CHMW-2, CHMW-3, and CHMW-4. The refined baseline groundwater levels have been corrected for the offset and slope in the refinement trend line, but do not account for the scatter around the 1:1 line. The bottom plot for each well on Figure 15 shows the observed and refined baseline groundwater levels.

Post-model refinement statistics for individual wells are provided in Table 7, and are described in more detail below:

- The refined mean residual was zero for all monitoring wells because the refinement method accounts for the well-specific offset.
- The refined standard deviation of residuals for all monitoring wells was similar to, and less than, the raw calibrated value.
- The refined sum of squared residuals was less than the calibrated value.
- The refined root mean square error was less than the calibrated value, and similar to the refined standard deviation of residuals.

Table 7 provides the refined range in groundwater levels, for comparison with the validation results and observed values. The trend-line analysis results in a range in groundwater levels of approximately 104 percent of observed values, on average.

In summary, the refinement method greatly improves the accuracy of model results, as measured by mean residual and other residual statistics. The refinement method is limited to the model-calculated groundwater levels at head targets, and does not extend to other model results such as groundwater balance analysis.

5.6 Groundwater Balance Analysis

The groundwater balance for the calibrated DuPont model provides baseline conditions to be used for comparison with the predictive future mining. The groundwater balance provides information on water inputs, outputs, and changes in aquifer storage during the model timeframe. Analysis of the components of the DuPont model groundwater balance allows comparison of baseline conditions to predicted conditions during the mining process.

The average values from the models (not including the first stress period) were used for the analysis. The results of the water balance analysis are presented below for the overall

model and for the wetland complex. Observed flows in the Diversion Canal and Sequalitchew Creek ravine were compared to model results.

The trend-line analysis used to refine model-calculated groundwater levels was not applied to the model-calculated groundwater balance. Groundwater balance elements were not monitored directly, and did not serve as model calibration targets.

5.6.1 Overall Groundwater Balance Analysis

The overall groundwater balance is consistent with the description of model boundary conditions above, and is expressed by the following equation:

$$R + GWin + WLinf = Dsw + Dwell + Dmine + GWout + \Delta S$$

Where:

R is recharge to groundwater from precipitation;

GWin is groundwater inflow to the model area;

WLinf is wetland infiltration to groundwater;

Dsw is groundwater discharge to surface water;

Dwell is groundwater discharge from dewatering wells (future mining Steps 1, 2, and 3 only);

Dmine is groundwater discharge into the mine (future mining Step 4 only);

GWout is groundwater outflow from the model area; and

ΔS is change in aquifer storage.

All terms in the water balance equation have units of cubic feet per second (cfs).

Time-averaged groundwater balances are presented on Figure 19, which shows a column chart and a table with rates provided in cfs. For the baseline model:

- Recharge and groundwater inflow represented approximately 13 and 83 percent of all model inflows, on average.
- The average infiltration from the wetland complex was approximately 5 cfs, and represented approximately 3.4 percent of all model inflows.
- The average change in aquifer storage was slightly positive, reflecting the transient boundary conditions assigned in the model, and represented 0.2 percent of all model inflows.
- Average groundwater outflow along the Puget Sound shoreline represented approximately 91 percent of all model outflows.
- Discharge to surface water (e.g., Sequalitchew Lake, wetlands, Sequalitchew Creek, Diversion Canal) represented the balance of model outflows (approximately 9 percent, on average). Dewatering wells were not simulated in the baseline model.

Figure 20 shows a line chart of the baseline model groundwater balance over the model timeframe, with rates provided in cfs. The monthly variability in recharge is largely balanced by changes in aquifer storage and discharge to surface water.

5.6.2 Wetland Complex Groundwater Balance Analysis

For the purposes of the groundwater balance analysis, wetlands were grouped consistent with the previous water balance analysis (Aspect, 2004a) as follows:

- Bell, Hamer, and McKay (BHM) Marshes
- East Edmond Marsh (East EM)
- West Edmond Marsh (West EM)

Time-averaged infiltration and discharge rates for the wetland complex are presented on Figure 21. For the baseline model:

- Infiltration in BHM Marshes represented approximately 29 percent of the total wetland infiltration, on average.
- Average infiltration in East EM, with the peat removed from the “cookie cutter” channel, represented approximately 68 percent of the total wetland infiltration.
- Average infiltration in West EM represented approximately 3 percent of the total wetland infiltration.
- For the combined wetlands, the average groundwater-to-surface water discharge was approximately 19 percent of infiltration from the wetlands.
- Average groundwater-to-surface water discharge rates to the BHM Marshes, East EM, and West EM were approximately 66, 26, and 7 percent, respectively, of total groundwater-to-surface water discharge within the wetlands.

Figure 22 shows a line chart of the infiltration and discharge for the wetland groups under baseline conditions, as well as the net wetland flow. Infiltration rates at the West EM were the lowest, occurred with the lowest frequency, and were the least sensitive to seasonal precipitation patterns, compared to the other wetland groups.

6 Model Predictions for Future Mining Conditions

Following calibration and validation, the DuPont model was used to predict decreases in groundwater conditions during the four sequential future steps of proposed dewatering and mining activity in the South Parcel. As described in Section 4.6.5, dewatering Steps 1, 2, and 3 simulated 10, 24, and 66 active dewatering wells, respectively. Step 4 simulated the post-mining condition with pumping terminated and groundwater passively discharging at the toe of the newly mined slope. For direct comparison with baseline model results, predictive models used the same baseline boundary conditions as the validation model, except for pumping at active dewatering wells.

Model results indicate that pumping rates will equilibrate within one month, and water levels will largely equilibrate within 60 days of a change in pumping rates. For the purposes of this modeling effort, we assumed surface water levels in the wetlands will be similar to historical conditions.

Results of the predictive models are discussed below by dewatering phase, in terms of predicted decreases in groundwater levels. To support the discussion, predicted decreases in groundwater levels are presented in a table, graphs, and maps. Baseline groundwater levels are sensitive to seasonal and longer-term precipitation patterns (e.g., see Figure 15), and groundwater levels during the four dewatering phases are predicted to likewise remain sensitive to precipitation patterns.

For each of the monitoring wells and each of the dewatering steps, Table 8 provides the maximum decrease in groundwater level based on refined model results, with and without including model uncertainty. For the purposes of communicating refined model results, we focus on the maximum decrease in groundwater level without including model uncertainty represented by the values on the left half of Table 8. Additional discussion of model uncertainty is provided in Section 6.5.

Figure 23 provides a collection of graphs comparing groundwater levels (elevations) for each dewatering step by well. The upper graphs on Figure 23 compare baseline groundwater levels and predicted groundwater levels for each of the four dewatering phases. The error bars illustrate the minimum groundwater levels at the 95-percent confidence interval, as a measure of model uncertainty. The 95-percent confidence interval was calculated using the 1-tailed test and the well-specific standard deviation of residuals from the residual statistics for the entire 11-year model validation period. For predictive model results, the 95-percent confidence interval was increased proportional to the average water level decrease at that location. Additional discussion of model uncertainty is provided in Section 6.5.

The middle graphs on Figure 23 show the ranges in monthly groundwater level elevations for baseline conditions and each of the four dewatering phases. The color bars reflect the potential effects of annual hydrologic variability. As described above, the error bars illustrate the minimum groundwater level at the 95-percent confidence interval, as a measure of model uncertainty.

The lower graphs on Figure 23 show the range in monthly groundwater levels decrease from baseline for each of the four dewatering steps. The color bars reflect the potential effects of annual hydrologic variability. As described above, the error bars illustrate the minimum groundwater level at the 95-percent confidence interval, as a measure of model uncertainty.

Figure 24a through Figure 24d shows maps of predicted maximum groundwater level decreases from baseline conditions for each of the four dewatering steps. The contour lines on Figure 24a through Figure 24d are lines of equal groundwater level decrease. Predicted groundwater level decreases during the planned four mining steps are described below.

6.1 Future Mining Step 1: Initial 10-well Dewatering Test

Step 1 dewatering will include 10 active wells located in the northern portion of the South Parcel, as shown on Figure 14. To simulate Step 1, the validated model was modified by adding 10 wells screened across the Steilacoom Gravels and Vashon Outwash. Wells were simulated to pump up to 1 cfs each unless the available drawdown in the well limited the pumping rate. After the first month of pumping all 10 wells, the combined pumping rate is predicted to be approximately 3.6 cfs, on average, and up to approximately 5.5 cfs during the wet season.

Groundwater level decreases are predicted to stabilize within approximately 60 days after pumping starts based on model results. During Step 1, the model-predicted decreases in groundwater levels are most evident at monitoring wells CHMW-2s and CHMW-2D, which are the closest monitoring wells to the proposed location of the Step 1 dewatering wells (see Figure 24a through Figure 24d; monitoring well locations are depicted on Figure 4). At more distant monitoring wells, the predicted groundwater level decreases are less than half the observed range in baseline groundwater levels. The maximum groundwater level decrease at CHMW-2D is predicted to be approximately 8.8 feet. The maximum groundwater level decrease at upgradient monitoring well MW-D-3 (adjacent to the Diversion Canal east of the mine expansion) is predicted to be approximately 1.8 feet. The maximum groundwater level decrease at monitoring wells MW-EM-1D and MW-EM-2D (in Edmonds Marsh) is predicted to be approximately 0.5 foot and 0.1 foot, respectively.

During Step 1, little or no effects on wetlands or groundwater discharge to Sequalitchew Creek were predicted by the model. The overall average wetland infiltration rate is predicted to remain similar to baseline conditions (Figure 19). The predicted average rates of wetland infiltration to groundwater, and discharge from wetland to surface water, are similar to baseline conditions (Figure 21). The timing of net wetland flow (wetland infiltration to groundwater and discharge from the wetland to surface water) is predicted to be approximately the same as baseline conditions (Figure 22). During Step 1, the JBLM water supply overflow showed no significant change in flow rates compared to baseline conditions.

6.2 Future Mining Step 2: Active Dewatering In Preparation for Mining

During Step 2, the dewatering well network will be expanded to the south along the South Parcel mine perimeter as well as adding a few wells in the interior as shown in Figure 14. To simulate Step 2, the validated model was modified by adding 24 wells screened across the Steilacoom Gravels and Vashon Outwash. The dewatering wells are arranged in two lines on either side of the initial mine trough, with 19 boundary wells and 5 inner wells. Wells were simulated to pump up to 1 cfs each unless the available drawdown in the well limited the pumping rate. After the first month of pumping all 24 wells, the combined pumping rate is predicted to be approximately 5.2 cfs, on average, and up to approximately 8.8 cfs during the wet season.

Groundwater level decreases at upgradient monitoring wells are predicted to stabilize within approximately 60 days after pumping starts based on model results. During Step 2, the maximum groundwater level decreases at CHMW-2D and CHMW-1 are predicted to be approximately 45 feet and 5.2 feet, respectively (see Table 8 and Figures 23 and 24). At this step, monitoring well CHMW-2D will be interior to the dewatering well network. The maximum groundwater level decrease at upgradient monitoring well MW-D-3 is predicted to be approximately 4.3 feet. The maximum groundwater level decreases at MW-EM-1D and MW-EM-2D are predicted to be approximately 1.5 feet and 0.2 feet, respectively.

During Step 2, the predicted overall wetland infiltration rate will be approximately 0.2 cfs greater than baseline conditions (Figure 19), assuming wetland water levels are maintained. Most of the predicted changes in infiltration will occur in the East Edmond Marsh area (Figure 21). The predicted timing of net wetland flow will remain approximately the same as baseline conditions (Figure 22). Groundwater discharge to Sequalitchew Creek during Step 2 is predicted to remain similar to baseline conditions. During Step 2, the JBLM water supply overflow showed no significant change in flow rates compared to baseline conditions.

6.3 Future Mining Step 3: Active Dewatering During Mining

Step 3 dewatering was simulated with 66 active wells along the eastern and southern South Parcel mine boundary, as shown in Figure 14. The dewatering wells are arranged in two lines on either side of the initial mine trough, with 54 boundary wells and 12 interior wells. The combined pumping rate is predicted to be approximately 6.9 cfs, on average, and up to approximately 12.2 cfs during the wet season. It may not be necessary to operate all dewatering wells as the final mine trough progresses, once an alternative (passive) dewatering system is in place. However, for the purposes of evaluating the maximum effects of dewatering during Step 3, the DuPont model simulated all dewatering wells operating simultaneously as a conservative assumption.

Groundwater level decreases are predicted to stabilize within approximately 60 days after pumping starts based on model results. During Step 3, the maximum groundwater level decreases at CHMW-2D, CHMW-1, CHMW-4D, and CHMW-3D are predicted to be approximately 51 feet, 60 feet, 15 feet, and 57 feet, respectively (see Table 8 and Figures 23 and 24). The maximum groundwater level decreases at MW-EM-1D and MW-EM-2D are predicted to be approximately 5.1 feet and 0.4 feet, respectively. The maximum groundwater level decreases at upgradient monitoring wells MW-D-3 and MW-93-MFS-C-5 are predicted to be approximately 7.7 feet and 4.2 feet, respectively. The groundwater levels during Step 3 are predicted to be approximately 10 to 20 feet above the Olympia Beds along the mine trough.

During Step 3, the predicted overall wetland infiltration rate will be approximately 0.6 cfs greater than baseline conditions (Figure 19), assuming wetland water levels are constant. Most of the predicted changes in infiltration will occur in the East Edmond Marsh area (Figure 21). Based on model results, the lower groundwater levels under West Edmond Marsh will reduce groundwater discharge to surface water during Step 3 (Figure 22). Groundwater discharge to Sequalitchew Creek during Step 3 is predicted to be 0.5 cfs less than baseline conditions, on average, with the greatest decreases during the wet

season. As with Steps 1 and 2, the JBLM water supply overflow showed no significant change in flow rates in Step 3 compared to baseline conditions.

6.4 Future Mining Step 4: Post-Mining Conditions

During Step 4, pumping from the dewatering well network will cease, groundwater will emanate from the toe of the mined slope, forming wetlands along the toe of the slope and on portions of the mine floor of the South Parcel. Overflow from the wetlands will be collected and conveyed to an infiltration pond on the floor of the existing mine, . As described in Section 4.3.1, the Step 4 ground surface (model top) elevation was modified to reflect the final mine grade (Figure 6) to simulate passive groundwater discharge into the mine. The flow rate of groundwater discharging into the mine is predicted to be 6.9 cfs, on average, and up to 13.7 cfs during the wet season. Collected groundwater discharging into the mine will be re-infiltrated in the western portion of the mine area. The re-infiltration of collected groundwater seeping into the mine will recharge the Sea Level Aquifer and will not affect groundwater levels in the Vashon Outwash aquifer. As such, re-infiltration was not simulated in the DuPont model.

Groundwater level decreases are predicted to stabilize within approximately 60 days after pumping stops based on model results. Groundwater levels will recover slightly relative to the active pumping of Step 3. During Step 4, the maximum groundwater level decreases at monitoring wells along the mine trough (CHMW-2D, CHMW-1, CHMW-4D, and CHMW-3S), are predicted to be approximately 32 feet, 30 feet, 14.0 feet, and 50 feet, respectively. The maximum groundwater level decreases at upgradient monitoring wells MW-D-3 and MW-93-MFS-C-5 are predicted to be approximately 6.6 feet and 3.6 feet, respectively. The maximum groundwater level decreases at MW-EM-1D and MW-EM-2D are predicted to be approximately 4.7 feet and 0.4 feet, respectively (see Figures 23 and 24).

During Step 4, the predicted overall wetland infiltration rate will be approximately 0.5 cfs greater than baseline conditions (Figure 19), assuming stream restoration efforts maintain wetland water levels. Most of the predicted changes in infiltration will occur in East Edmond Marsh area (Figure 21). Based on model results, the result of lower groundwater levels under West EM will reduce groundwater discharge to surface water during Step 4 than during Baseline conditions (Figure 22). Groundwater discharge to Sequalitchew Creek during Step 4 is predicted to be 0.5 cfs less than baseline conditions, on average, with the greatest decreases during the wet season.

During Step 4, the JBLM water supply overflow showed no significant change in flow rates compared to baseline conditions (Figure 19).

6.5 Quantifying Model Uncertainty

All predictions of any groundwater model, including the DuPont model, are subject to uncertainty – for example, in the model parameters and boundary conditions, conceptual model construction, and future conditions. While these some of these uncertainties can be controlled through the robustness of the data collection, calibration, and validation process, they cannot be eliminated and some uncertainties, particularly related to future conditions, are not knowable.

One method for acknowledging uncertainty in model predictions is to quantify the knowable components (i.e., model bias) and incorporate it into the evaluation of future conditions. We can calculate a lower confidence limit on the predicted groundwater levels, then perform environmental evaluations based on those lower limits. If the environmental analyses are still favorable, then we can have increased confidence in the groundwater model and a smaller chance of an adverse outcome.

We calculated a measure of overall model bias based on the scaled standard deviation of the differences between the validated model water levels and the measured water levels at each groundwater monitoring location over the validation period. The scaled standard deviation is the standard deviation divided by the range in the observed water levels. This analysis used the raw validation results, before application of post-modeling refinement. As such, this analysis incorporates uncertainty from the model validation (baseline conditions, without dewatering) and application of the model to the future dewatering scenarios.

A lower 95-percent confidence interval for predicted water levels was calculated by multiplying the scaled standard deviation by the sum of the range in future water levels and the drawdown and the z-value corresponding to a one-tailed 95-percent confidence interval for a normal distribution (i.e., z = 1.28). Expressed mathematically, this uncertainty is equal to:

1.28 * (scaled standard deviation) * (maximum drawdown + observed range).

As an example of this approach, consider monitoring well CHMW-2D. The observed range in water levels from 2004 to 2015 was 6.89 feet at CHMW-2D, and the standard deviation of the validated model is 0.66 feet (Table 7). Thus, the scaled standard deviation is 9.6 percent (0.66 feet/6.89 feet).

The maximum drawdown at CHMW-2D during Step 1 is predicted to be 8.8 feet (Table 8), based on refined model results. The model uncertainty is therefore approximately 1.9 feet (1.28 * 9.5% * (8.8 ft + 6.89 ft). Thus, the maximum predicted drawdown, including model uncertainty, is predicted to be approximately 10.7 feet (Table 8).

Similar calculations were made for each well in each month in each dewatering step, and are the basis for the minimum groundwater levels described in the following section.

6.6 Minimum Groundwater Levels in Each Dewatering Step

A primary use of the output from the predictive model runs is to establish minimum groundwater levels at the various monitoring wells for each dewatering step. These minimum water levels will be evaluated to determine environmental impacts, and if acceptable relative to the mitigation provided by the Restoration Plan, will be used as performance thresholds for the dewatering program. Measured groundwater levels below the performance threshold would trigger adaptive management, as described in the South Parcel Monitoring Plan (Aspect, 2017).

The minimum groundwater levels for each monitoring well, in each month, in each dewatering step are provided in Table 9. These minimum groundwater levels are the 95% lower confidence interval for the groundwater level predicted by the DuPont Model, and have been calculated for each existing monitoring well for each month of each

dewatering step. Minimum groundwater levels can be calculated with the DuPont Model for any new monitoring wells once the location has been determined.

Steps 1 and 2 will not last through all months of a year, but precise starting months and duration are not firmly established. Minimum groundwater levels were calculated for all months to allow flexibility in the future.

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Limitations

Work for this project was performed and this report prepared in accordance with generally accepted professional practices for the nature and conditions of work completed in the same or similar localities, at the time the work was performed. This report does not represent a legal opinion. No other warranty, expressed or implied, is made.

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Tables

Table 1: Summary of Hydrostratigraphic Units and Calibrated Parameter Values

Project #040001 -South Parcel Mine Expansion
Dupont, WA

Hydrostratigraphic Unit in DuPont Model	Correlated USGS Hydrogeologic Unit and Partial Description	Principal Layers in DuPont Model	Horizontal Hydraulic Conductivity (feet/day)					Vertical Anisotropy (-)	Specific Yield (-)	Specific Storage (1/foot)
			Max.	75 percentile	Average	25 percentile	Min.	horizontal: vertical		
Steilacoom Gravel	A1 – "recessional outwash…sand and gravel deposited by large meltwater streams…"	1,2	3,900	1,600	1,100	350	36	2.7	0.07	6.1E-05
Upper Confining Unit	A2 – "low-permeability unit composed of Vashon till and lesser amounts of ice-contact, moraine and fine-grained glaciolacustrine deposits…"	3	1.61	0.47	0.33	0.16	0.017	1.0	0.07	5.0E-05
Vashon Outwash	A3 – "aquifer composed of Vashon advance outwash…"	4,5	49	11	7.7	2.4	0.27	15.1	0.09	2.7E-05
Olympia Beds (Qob)	B – "low-permeability unit composed of fine-grained silts and clays deposited during the Olympia interglacial…"	6,7	0.018 (uniform)					10.0	0.09	1.1E-04
Sea Level Aquifer	C – "aquifer composed of pre-Olympia glacial drift deposits consisteing of sand and gravel…"	8,9	690 (uniform)					6.3	0.18	6.0E-05

Table 2: Summary of Wetland Properties used in Model

Project #040001 -South Parcel Mine Expansion
Dupont, WA

	Drain and River Cells			River Cells Only			
Wetland	Area In Model (acres)	Staff Gage(s) used to Establish Stage	Average Stage (feet)	Average Vertical K (feet/day)	Average Bottom Elevation (feet)	Wetland Water Depth (feet)	
						Average	Standard Deviation
Bell Marsh	11	SG-BM-1	218.4	0.55	215.6	2.8	1.0
McKay Marsh	35	SG-MKM-1	215.2	0.0086	213.6	1.6	1.1
Hamer Marsh	67	SG-HM-1	213.7	0.0090	211.7	2.0	0.9
East Edmond Marsh (JBLM)	25	SG-EM-3E, SG-SCM-1	212.1	0.020	210.0	2.1	0.5
East Edmond Marsh (JBLM) - Channel	10		212.1	11	210.0	2.1	0.5
East Edmond Marsh	27	SG-EM-2E, SG-EM-3W	211.9	0.0013	210.0	1.9	0.5
East Edmond Marsh - Channel	8		211.9	39	210.0	1.9	0.5
West Edmond Marsh - Eastern	29	SG-EM-2W, SG-EM-1/1A	210.4	0.0010	207.7	2.7	0.4
West Edmond Marsh - Middle	25		208.9	0.0026	206.6	2.2	1.1
West Edmond Marsh - Western	7		207.4	0.0015	205.8	1.6	1.4

Notes:

Wetlands were simulated with drains cells (for surface runoff) and river cells (for connection with aquifer) across the same areas, and with the same stage values.

The wetland area was assigned based on historical aerial photos.

Monthly-variable stages were assigned based on staff gage observations. Where two staff gages were used, stages were linearly interpolated.

Drain cells were uniformly assigned a vertical hydraulic conductivity (vertical K) of 10 feet per day.

Vertical K for river cells was calibrated.

The wetland bottom elevation was estimated.

The wetland peat was assigned a thickness of 1 foot.

The wetland water depth provides information on seasonal differences in water levels.

Table 3: Parameters Adjusted during Calibration

Project #040001 -South Parcel Mine Expansion
Dupont, WA

Hydraulic Conductivity		
Hydrostratigraphic Unit	***Horizontal Hydraulic Conductivity***	***Vertical Hydraulic Conductivity***
Steilacoom Gravel	Regularization with Pilot Points	Anisotropy Maintained
Upper Confining Unit	Regularization with Pilot Points	Anisotropy Maintained
Vashon Outwash	Regularization with Pilot Points	Anisotropy Maintained
Olympia Beds	Piecewise Constancy	Anisotropy Maintained
Sea Level Aquifer	Piecewise Constancy	Anisotropy Maintained
Storage Coefficients		
Hydrostratigraphic Unit	***Specific Yield***	***Specific Storage***
Steilacoom Gravel	Piecewise Constancy	Piecewise Constancy
Upper Confining Unit	Piecewise Constancy	Piecewise Constancy
Vashon Outwash	Piecewise Constancy	Piecewise Constancy
Olympia Beds	Piecewise Constancy	Piecewise Constancy
Sea Level Aquifer	Piecewise Constancy	Piecewise Constancy

River Cells	
Wetland	***Conductance***
Bell Marsh	Piecewise Constancy
McKay Marsh	Piecewise Constancy
Hamer Marsh	Piecewise Constancy
East Edmond Marsh (JBLM)	Piecewise Constancy
East Edmond Marsh (JBLM) - Channel	Piecewise Constancy
East Edmond Marsh	Piecewise Constancy
East Edmond - Channel	Piecewise Constancy
West Edmond Marsh - Eastern	Piecewise Constancy
West Edmond Marsh - Middle	Piecewise Constancy
West Edmond Marsh - Western	Piecewise Constancy

Table 4: Model Calibration - Residual Statistics - Overall and Over Time

Project #040001 -South Parcel Mine Expansion
Dupont, WA

		Residual Statistics					Range in Observed Values [Max. - Min.] (feet)	Scaled Statistics	
		Number of Observations	Mean (feet)	Standard Deviation (feet)	Sum of Squares	Root Mean Squared Error (feet)		Standard Deviation	Root Mean Square Error
Overall Model Fit									
Head Targets		1,467	1.77	2.71	15,382	3.24	30.81	9%	11%
Drawdown Targets		1,467	1.17	1.40	4,874	1.82	11.51	12%	16%
Head Difference Targets		414	0.11	1.80	1,343	1.80	13.14	14%	14%
Model Fit By Calendar Year									
Head Targets	2004	192	1.63	3.40	2,709	3.76	27.52	12%	14%
	2005	208	1.90	2.69	2,251	3.29	29.98	9%	11%
	2006	205	1.99	2.55	2,135	3.23	30.81	8%	10%
	2007	212	1.88	2.47	2,040	3.10	29.51	8%	11%
	2008	228	1.75	2.65	2,294	3.17	30.16	9%	11%
	2009	209	1.61	2.61	1,961	3.06	29.58	9%	10%
	2010	213	1.60	2.61	1,992	3.06	28.8	9%	11%
Model Fit By Month									
Head Targets	January	103	2.41	2.73	1,358	3.63	25.82	11%	14%
	February	102	2.14	2.73	1,222	3.46	26.43	10%	13%
	March	133	2.10	3.06	1,823	3.70	27.09	11%	14%
	April	134	2.37	3.01	1,959	3.82	27.86	11%	14%
	May	121	1.91	2.84	1,409	3.41	27.81	10%	12%
	June	122	1.74	2.66	1,223	3.17	28.12	9%	11%
	July	130	1.61	2.51	1,146	2.97	28.38	9%	10%
	August	124	1.41	2.43	976	2.81	28.26	9%	10%
	September	103	1.21	2.40	736	2.67	28.87	8%	9%
	October	148	0.90	2.52	1,055	2.67	29.92	8%	9%
	November	124	1.67	2.52	1,126	3.01	28.53	9%	11%
	December	123	1.92	2.71	1,348	3.31	27.54	10%	12%

Table 5: Model Calibration - Residual Statistics By Well

Project #040001 -South Parcel Mine Expansion
Dupont, WA

Well ID	Calibration Results							
	Residual Statistics (residual = observed - calculated)					Range in Observed Water Levels [Max. - Min.] (feet)	Range in Calculated Water Levels [Max. - Min.] (feet)
	Number of Observations	Mean (feet)	Standard Deviation (feet)	Sum of Squares	Root Mean Squared Error (feet)		
MW-EM-1s	79	5.26	1.50	2,362	5.47	7.02	7.50
MW-EM-1d	85	4.95	0.99	2,168	5.05	6.91	7.92
MW-EM-2s	82	0.23	0.35	14	0.42	2.28	2.39
MW-EM-2d	85	0.39	0.30	20	0.49	2.39	2.39
MW-EM-3	85	0.10	0.14	2	0.17	2.49	2.01
CHMW-1	85	-0.69	0.91	110	1.14	9.48	6.75
CHMW-2S	85	3.30	0.62	955	3.35	6.84	5.77
CHMW-2D	85	3.65	0.62	1,168	3.71	6.81	5.74
CHMW-3S	85	5.25	1.60	2,562	5.49	10.8	5.90
CHMW-3D	83	6.05	1.55	3,232	6.24	10.43	5.94
CHMW-4S	85	1.41	0.99	251	1.72	9.54	7.70
CHMW-4D	85	-0.18	0.90	72	0.92	9.40	7.57
MW-SRC-2	79	0.17	0.61	31	0.63	6.61	4.25
MW-D-3	81	2.11	1.05	450	2.36	7.77	5.49
MW-93-MFS-C5-3	83	-2.92	0.97	787	3.08	7.26	4.55
88-2-VD	10	-7.49	0.74	565	7.52	2.85	0.75
MW-BM-1	80	2.39	0.51	477	2.44	5.45	6.47
MW-HM-1	80	0.49	0.43	34	0.65	4.79	4.52
MW-PL-1	45	0.27	1.65	123	1.66	6.04	10.27

Notes:
1. Model results and statistics are presented at the typical field-measurement precision (0.01 ft).

Table 6: Model Validation - Residual Statistics Overall and Over Time

Project #040001 -South Parcel Mine Expansion
Dupont, WA

		Residual Statistics					Range in Observed Values [Max. - Min.] (feet)	Scaled Statistics	
		Number of Observations	Mean (feet)	Standard Deviation (feet)	Sum of Squares	Root Mean Squared Error (feet)		Standard Deviation	Root Mean Square Error
Overall Model Fit									
Head Targets		2,503	1.86	2.65	26,217	3.24	31.08	9%	10%
Model Fit By Calendar Year									
Head Targets	2004	193	1.66	3.38	2,732	3.76	27.52	12%	14%
	2005	208	2.04	2.72	2,394	3.39	29.98	9%	11%
	2006	205	2.17	2.58	2,317	3.36	30.81	8%	11%
	2007	212	2.06	2.52	2,242	3.25	29.51	9%	11%
	2008	228	1.87	2.67	2,417	3.26	30.16	9%	11%
	2009	209	1.69	2.62	2,023	3.11	29.58	9%	11%
	2010	213	1.88	2.64	2,239	3.24	28.8	9%	11%
	2011	203	1.58	2.48	1,751	2.94	29.26	8%	10%
	2012	206	1.89	2.47	1,991	3.11	29.44	8%	11%
	2013	208	1.68	2.54	1,918	3.04	28.76	9%	11%
	2014	209	1.85	2.55	2,066	3.14	28.65	9%	11%
	2015	209	1.92	2.55	2,128	3.19	29.8	9%	11%

Table 6: Model Validation - Residual Statistics Overall and Over Time

Project #040001 -South Parcel Mine Expansion
Dupont, WA

		Residual Statistics					Range in Observed Values [Max. - Min.] (feet)	Scaled Statistics	
		Number of Observations	Mean (feet)	Standard Deviation (feet)	Sum of Squares	Root Mean Squared Error (feet)		Standard Deviation	Root Mean Square Error
Overall Model Fit									
Head Targets		2,503	1.86	2.65	26,217	3.24	31.08	9%	10%
Model Fit By Month									
Head Targets	January	187	2.31	2.74	2,399	3.58	26.7	10%	13%
	February	154	2.21	2.73	1,893	3.51	26.51	10%	13%
	March	217	2.28	2.89	2,925	3.67	27.21	11%	13%
	April	252	2.39	2.84	3,464	3.71	28.3	10%	13%
	May	208	1.99	2.73	2,363	3.37	28.51	10%	12%
	June	193	1.84	2.60	1,953	3.18	28.99	9%	11%
	July	197	1.69	2.47	1,760	2.99	29.18	8%	10%
	August	231	1.51	2.35	1,802	2.79	29.29	8%	10%
	September	171	1.48	2.33	1,295	2.75	29.23	8%	9%
	October	253	1.33	2.57	2,116	2.89	30.78	8%	9%
	November	230	1.56	2.52	2,013	2.96	28.83	9%	10%
	December	209	1.86	2.69	2,230	3.27	27.69	10%	12%

Table 7: Model Calibration - Residual Statistics By Well

Project #040001 -South Parcel Mine Expansion
Dupont, WA

Well ID	Validation Results							Post-Model Refinement Results				
	Residual Statistics (residual = observed - calculated)					Range in Observed Water Levels [Max. - Min.] (feet)	Range in Calculated Water Levels [Max. - Min.] (feet)	Residual Statistics (residual = observed - calculated)				Range in Calculated Water Levels [Max. - Min.] (feet)
	Number of Observations	Mean (feet)	Standard Deviation (feet)	Sum of Squares	Root Mean Squared Error (feet)			Mean (feet)	Standard Deviation (feet)	Sum of Squares	Root Mean Squared Error (feet)	
MW-EM-1s	136	4.99	1.75	3,799	5.29	7.56	10.44	0.00	1.74	411	1.74	9.65
MW-EM-1d	131	4.97	0.98	3,355	5.06	7.9	10.92	0.00	0.94	115	0.94	9.43
MW-EM-2s	140	0.24	0.35	25	0.42	2.39	2.90	0.00	0.23	7	0.23	1.75
MW-EM-2d	144	0.38	0.30	34	0.48	2.54	2.91	0.00	0.20	6	0.20	1.94
MW-EM-3	144	0.11	0.14	5	0.18	3	2.59	0.00	0.13	3	0.13	2.88
CHMW-1	143	-0.55	0.92	163	1.07	9.48	9.08	0.00	0.88	109	0.87	10.63
CHMW-2S	145	3.46	0.71	1,804	3.53	7.55	7.16	0.00	0.70	71	0.70	7.63
CHMW-2D	145	3.79	0.66	2,141	3.84	6.89	7.14	0.00	0.65	61	0.65	7.56
CHMW-3S	145	5.41	1.55	4,596	5.63	10.8	8.15	0.00	1.33	253	1.32	12.54
CHMW-3D	143	6.17	1.51	5,771	6.35	10.43	8.17	0.00	1.23	216	1.23	13.00
CHMW-4S	145	1.37	1.03	425	1.71	9.54	10.49	0.00	1.02	150	1.02	11.25
CHMW-4D	145	-0.11	0.92	124	0.92	9.40	10.30	0.00	0.90	117	0.90	11.26
MW-SRC-2	138	0.28	0.61	62	0.67	6.7	5.17	0.01	0.49	32	0.49	5.84
MW-D-3	141	2.36	0.97	920	2.55	7.77	6.54	0.00	0.96	128	0.95	7.42
MW-93-MFS-C5-3	142	-2.76	1.01	1,229	2.94	7.26	5.34	0.00	0.91	118	0.91	7.68
88-2-VD	10	-7.45	0.69	559	7.47	2.85	0.86	0.00	0.48	2	0.46	2.42
MW-BM-1	140	2.39	0.46	831	2.44	5.72	7.53	0.00	0.45	29	0.45	6.95
MW-HM-1	139	0.83	0.59	142	1.01	5.95	4.51	0.00	0.54	40	0.54	5.66
MW-PL-1	86	0.56	1.55	231	1.64	6.04	10.70	0.00	0.84	59	0.83	5.05

Notes:
1. Model results and statistics are presented at the typical field-measurement precision (0.01 ft).

Table 8: Well-Specific Maximum Water Level Changes

Project #040001 -South Parcel Mine Expansion
Dupont, WA

Well ID	Predictive Model Results							
	Maximum Decrease in Water Level based on Refined Model Results				Maximum Decrease in Water Level based on Refined Model Results, and includes Model Uncertainty			
	Step 1	Step 2	Step 3	Step 4	Step 1	Step 2	Step 3	Step 4
MW-EM-1s	0.50	1.61	5.44	5.00	2.90	4.33	9.29	8.73
MW-EM-1d	0.47	1.51	5.12	4.71	1.81	3.01	7.20	6.72
MW-EM-2s	0.06	0.15	0.35	0.33	0.52	0.63	0.87	0.84
MW-EM-2d	0.07	0.17	0.39	0.36	0.46	0.58	0.83	0.80
MW-EM-3	0.01	0.02	0.02	0.02	0.20	0.21	0.21	0.21
CHMW-1	1.30	5.23	59.79	30.47	2.64	7.06	68.41	35.44
CHMW-2S	7.37	45.45	50.98	29.92	9.17	51.82	58.01	34.43
CHMW-2D	8.80	45.20	50.79	31.76	10.71	51.55	57.83	36.47
CHMW-3S	0.83	3.24	53.86	52.76	2.97	5.82	65.73	64.43
CHMW-3D	0.10	2.70	57.02	50.29	2.05	5.14	69.56	61.57
CHMW-4S	0.95	3.14	14.33	13.79	2.40	4.90	17.64	17.02
CHMW-4D	0.76	2.96	15.03	14.01	2.03	4.51	18.10	16.95
MW-SRC-2	0.29	0.33	0.30	0.34	1.11	1.15	1.12	1.16
MW-D-3	1.79	4.27	7.68	6.55	3.33	6.20	10.16	8.85
MW-93-MFS-C5-3	1.40	2.73	4.21	3.63	2.96	4.52	6.27	5.58
88-2-VD	0.40	0.57	1.41	1.35	1.41	1.63	2.72	2.64
MW-BM-1	0.21	0.35	0.39	0.74	0.83	0.98	1.03	1.41
MW-HM-1	0.25	0.41	0.27	0.41	1.03	1.21	1.05	1.22
MW-PL-1	0.10	0.35	1.10	1.01	2.11	2.45	3.44	3.33

Notes:

1. Model predictions are presented at the typical field-measurement precision (0.01 ft).
2. Maximum Change in Water Level based on refined model results.
3. Maximum Change in Water Level calculated for 95% lower confidence interval for 1-tailed test.
4. Shaded values indicate forecasted change in water level exceeds half the range in observed values.

Table 9 - Minimum Predicted Groundwater Levels for Each Dewatering Step

South Parcel Mine Expansion, Proj. No. 040001

Step 1 - Initial Pumping Test

Well	Groundwater Elevation in Feet (NGVD 29)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
MW-EM-1S	203.6	202.4	202.9	202.2	202.3	201.4	200.4	200.4	199.5	199.5	202.1	202.9
MW-EM-1D	204.6	203.4	203.9	203.2	203.3	202.5	201.5	201.5	200.7	200.7	203.1	203.9
MW-EM-2S	210.6	210.3	210.4	210.3	210.2	210.0	209.7	209.6	209.3	209.5	210.2	210.4
MW-EM-2D	210.8	210.4	210.6	210.5	210.4	210.2	209.8	209.7	209.4	209.6	210.4	210.5
MW-EM-3	212.1	211.9	211.8	211.9	212.0	211.6	211.4	210.8	210.2	210.3	211.5	211.9
MW-SRC-2	213.2	212.4	212.7	212.6	212.8	212.0	211.4	210.2	209.6	210.5	212.3	212.7
MW-BM-1	218.0	217.0	216.6	217.4	217.3	216.6	216.1	213.1	213.3	214.2	216.8	217.4
MW-HM-1	214.2	213.5	213.3	213.8	213.6	212.7	211.8	211.2	210.6	211.1	213.1	213.6
MW-PL-1	200.8	200.1	200.4	200.1	200.0	199.4	198.6	198.7	198.0	197.7	199.6	200.2
CHMW-1	191.3	189.9	190.4	189.6	189.7	189.0	188.1	188.0	187.4	187.5	190.0	190.7
CHMW-2S	184.6	183.3	183.7	183.0	183.0	182.5	181.7	181.6	181.2	181.4	183.5	184.0
CHMW-2D	183.4	181.8	182.4	181.4	181.5	180.8	179.8	179.7	179.3	179.4	182.1	182.7
CHMW-3S	193.3	191.7	192.4	191.3	191.5	190.6	189.6	189.5	188.7	188.8	191.7	192.6
CHMW-3D	193.2	191.5	192.2	191.1	191.3	190.4	189.2	189.1	188.3	188.4	191.5	192.5
CHMW-4S	196.1	194.7	195.3	194.4	194.6	193.7	192.7	192.6	191.9	191.9	194.6	195.5
CHMW-4D	194.3	192.9	193.5	192.6	192.7	191.9	190.9	190.8	190.1	190.1	192.8	193.6
MW-D-3	196.5	195.3	195.7	195.0	195.1	194.6	193.9	193.7	193.3	193.5	195.6	195.9
MW-93-MFS-C5-3	192.3	191.2	191.7	191.0	191.0	190.5	190.0	189.9	189.5	189.8	191.6	191.7

Table 9 - Minimum Predicted Groundwater Levels for Each Dewatering Step

South Parcel Mine Expansion, Proj. No. 040001

Step 2 - Preparation for Mining/Expanded Dewatering Test

Well	Groundwater Elevation in Feet (NGVD 29)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
MW-EM-1S	202.3	201.1	201.6	200.9	201.1	200.1	199.1	199.2	198.4	198.3	200.8	201.5
MW-EM-1D	203.4	202.3	202.8	202.2	202.3	201.4	200.5	200.5	199.7	199.7	202.0	202.7
MW-EM-2S	210.6	210.2	210.3	210.2	210.1	210.0	209.6	209.5	209.2	209.4	210.1	210.3
MW-EM-2D	210.8	210.4	210.5	210.4	210.3	210.1	209.7	209.6	209.3	209.5	210.3	210.5
MW-EM-3	212.1	211.9	211.8	211.9	212.0	211.6	211.4	210.8	210.2	210.3	211.5	211.9
MW-SRC-2	213.2	212.4	212.6	212.6	212.8	212.0	211.4	210.2	209.5	210.5	212.0	212.7
MW-BM-1	218.0	217.0	216.5	217.3	217.2	216.6	216.1	213.0	213.3	214.1	216.8	217.3
MW-HM-1	214.2	213.4	213.3	213.8	213.6	212.7	211.8	211.2	210.5	211.1	213.0	213.6
MW-PL-1	200.4	199.7	200.1	199.8	199.8	199.1	198.2	198.4	197.7	197.4	199.2	199.8
CHMW-1	187.0	185.7	186.3	185.5	185.6	184.9	184.0	184.0	183.3	183.4	185.8	186.4
CHMW-2S	143.8	141.4	142.2	141.0	141.0	140.1	139.1	138.9	138.3	138.6	141.8	142.9
CHMW-2D	142.5	141.0	141.6	140.7	140.7	140.0	139.1	138.9	138.3	138.5	141.2	141.9
CHMW-3S	190.6	189.0	189.8	188.8	189.0	188.1	187.0	187.0	186.2	186.2	189.0	189.8
CHMW-3D	190.2	188.6	189.4	188.3	188.5	187.5	186.3	186.3	185.4	185.3	188.4	189.3
CHMW-4S	193.7	192.3	193.0	192.1	192.3	191.4	190.4	190.4	189.6	189.6	192.2	193.0
CHMW-4D	191.8	190.5	191.2	190.3	190.5	189.6	188.6	188.6	187.8	187.8	190.4	191.1
MW-D-3	193.7	192.5	193.0	192.3	192.3	191.9	191.2	191.1	190.7	190.9	192.9	193.4
MW-93-MFS-C5-3	190.8	189.8	190.3	189.6	189.6	189.1	188.7	188.5	188.2	188.5	190.2	190.5

Table 9 - Minimum Predicted Groundwater Levels for Each Dewatering Step

South Parcel Mine Expansion, Proj. No. 040001

Step 3 - Active Dewatering during Mining

Well	Groundwater Elevation in Feet (NGVD 29)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
MW-EM-1S	197.5	196.4	196.9	196.4	196.5	195.6	194.7	194.8	194.1	194.1	196.1	196.8
MW-EM-1D	199.4	198.4	198.9	198.3	198.4	197.6	196.8	196.9	196.2	196.2	198.1	198.7
MW-EM-2S	210.3	210.0	210.1	209.9	209.9	209.7	209.4	209.3	209.0	209.2	209.9	210.0
MW-EM-2D	210.5	210.1	210.3	210.1	210.0	209.8	209.5	209.4	209.1	209.3	210.0	210.2
MW-EM-3	212.1	211.9	211.8	211.9	212.0	211.6	211.4	210.8	210.2	210.3	211.5	211.8
MW-SRC-2	213.2	212.4	212.7	212.6	212.8	212.0	211.4	210.2	209.5	210.5	212.0	212.7
MW-BM-1	217.8	216.8	216.4	217.2	217.1	216.4	215.9	212.8	213.1	213.9	216.7	217.2
MW-HM-1	214.2	213.4	213.3	213.8	213.6	212.7	211.8	211.2	210.4	211.1	213.0	213.6
MW-PL-1	199.4	198.7	199.0	198.8	198.7	198.0	197.1	197.3	196.6	196.2	198.1	198.8
CHMW-1	129.8	129.1	129.4	128.9	128.9	128.5	127.8	127.8	127.3	127.4	129.2	129.5
CHMW-2S	136.0	134.5	135.0	134.1	134.1	133.5	132.9	132.8	132.3	132.5	134.9	135.5
CHMW-2D	135.9	134.7	135.1	134.3	134.2	133.7	133.1	132.9	132.4	132.6	134.9	135.5
CHMW-3S	131.1	128.4	130.3	128.9	129.2	127.9	126.6	127.0	126.2	126.3	129.0	130.2
CHMW-3D	128.3	127.4	127.9	127.6	127.6	126.8	125.8	126.1	125.4	125.1	127.0	127.6
CHMW-4S	181.0	179.7	180.4	179.6	179.7	178.8	177.7	177.8	176.9	176.9	179.5	180.3
CHMW-4D	178.5	177.3	178.0	177.1	177.3	176.4	175.3	175.4	174.5	174.4	177.1	177.8
MW-D-3	189.9	188.6	189.1	188.4	188.4	187.9	187.4	187.3	186.9	187.3	189.1	189.6
MW-93-MFS-C5-3	189.5	188.5	189.0	188.4	188.3	187.9	187.5	187.4	187.2	187.5	189.0	189.3

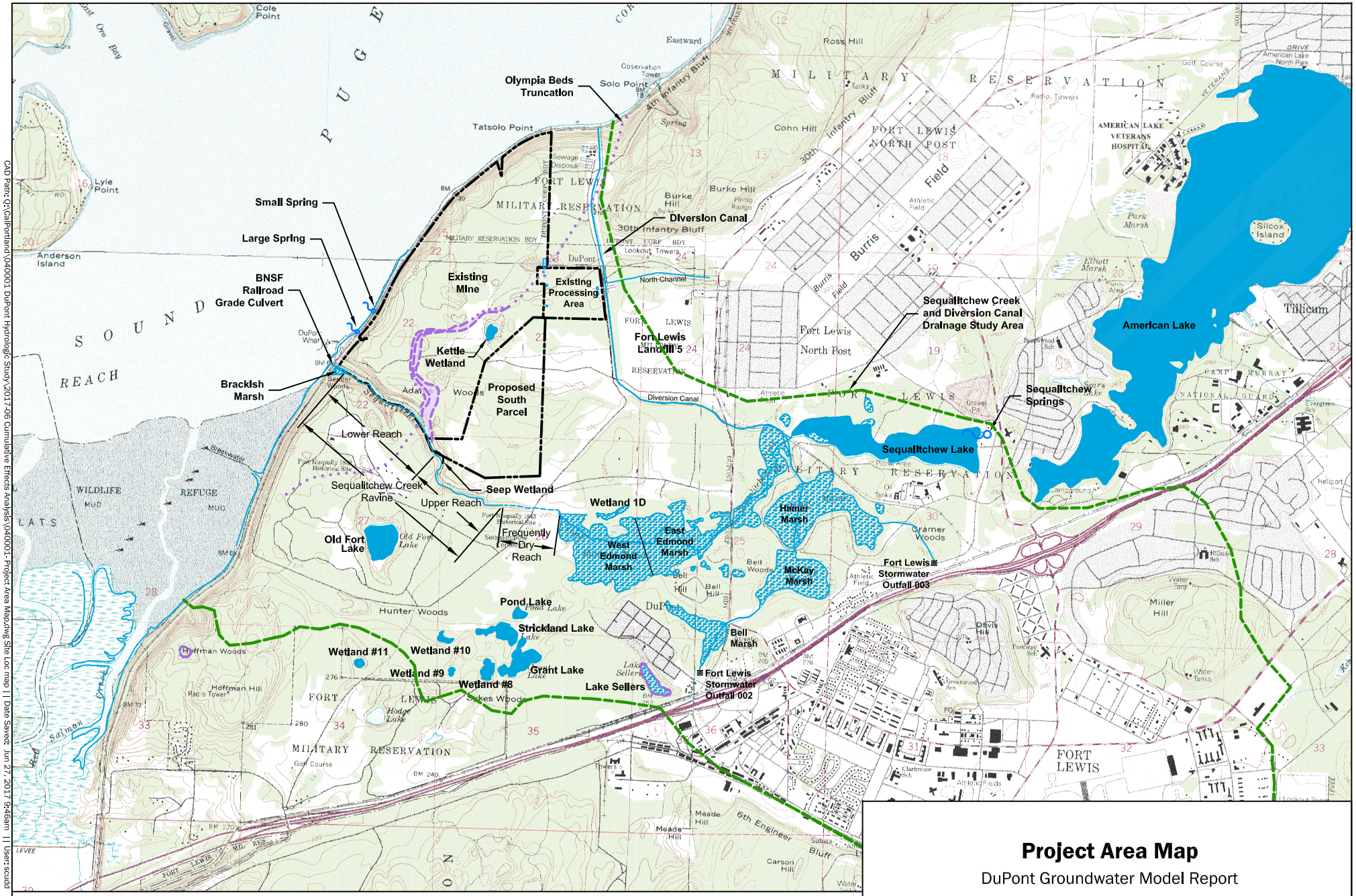
Table 9 - Minimum Predicted Groundwater Levels for Each Dewatering Step

South Parcel Mine Expansion, Proj. No. 040001

Step 4 - Cessation of Active Dewatering

Well	Groundwater Elevation in Feet (NGVD 29)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
MW-EM-1S	198.1	197.0	197.6	197.0	197.1	196.2	195.4	195.3	194.8	194.7	196.8	197.4
MW-EM-1D	199.9	198.9	199.4	198.8	199.0	198.2	197.3	197.3	196.7	196.7	198.7	199.3
MW-EM-2S	210.3	210.0	210.1	210.0	209.9	209.7	209.4	209.3	209.0	209.2	209.9	210.1
MW-EM-2D	210.5	210.2	210.3	210.1	210.1	209.9	209.5	209.4	209.1	209.3	210.1	210.2
MW-EM-3	212.1	211.9	211.8	211.9	212.0	211.6	211.4	210.8	210.2	210.3	211.5	211.8
MW-SRC-2	213.2	212.4	212.7	212.6	212.8	212.0	211.4	209.9	209.4	210.4	212.0	212.7
MW-BM-1	217.9	216.9	216.4	217.2	217.1	216.5	216.0	212.3	213.0	213.8	216.7	217.2
MW-HM-1	214.2	213.4	213.3	213.8	213.6	212.7	211.8	211.0	210.3	211.1	213.0	213.6
MW-PL-1	199.5	198.8	199.2	198.9	198.9	198.2	197.3	197.5	196.8	196.4	198.2	198.9
CHMW-1	163.2	162.7	162.9	162.7	162.6	162.4	162.1	162.1	161.8	162.0	162.9	163.1
CHMW-2S	169.3	165.0	168.1	163.2	162.8	158.9	157.1	157.2	156.2	156.9	167.9	168.8
CHMW-2D	160.3	158.5	159.2	158.1	157.9	156.9	155.4	155.5	154.6	155.2	159.1	159.8
CHMW-3S	140.4	140.2	140.3	140.2	140.2	140.0	139.7	139.7	139.5	139.7	140.3	140.3
CHMW-3D	141.9	141.6	141.8	141.6	141.6	141.4	141.1	141.1	140.9	141.0	141.6	141.8
CHMW-4S	183.0	181.9	182.5	181.8	181.9	181.3	180.5	180.5	179.9	180.0	181.9	182.4
CHMW-4D	181.0	180.0	180.6	179.9	180.0	179.4	178.7	178.7	178.2	178.2	180.0	180.5
MW-D-3	191.4	190.2	190.7	190.0	189.9	189.5	188.9	188.8	188.5	188.9	190.7	191.1
MW-93-MFS-C5-3	190.1	189.1	189.5	188.9	188.8	188.4	187.9	187.9	187.6	188.0	189.6	189.9

Figures



Project Area Map

DuPont Groundwater Model Report

DuPont, Washington

Aspect Consulting	Jun-2017	BY: OGR/SCC	FIGURE NO. 1
	PROJECT NO. 040001-014	REVISED BY: SCC	

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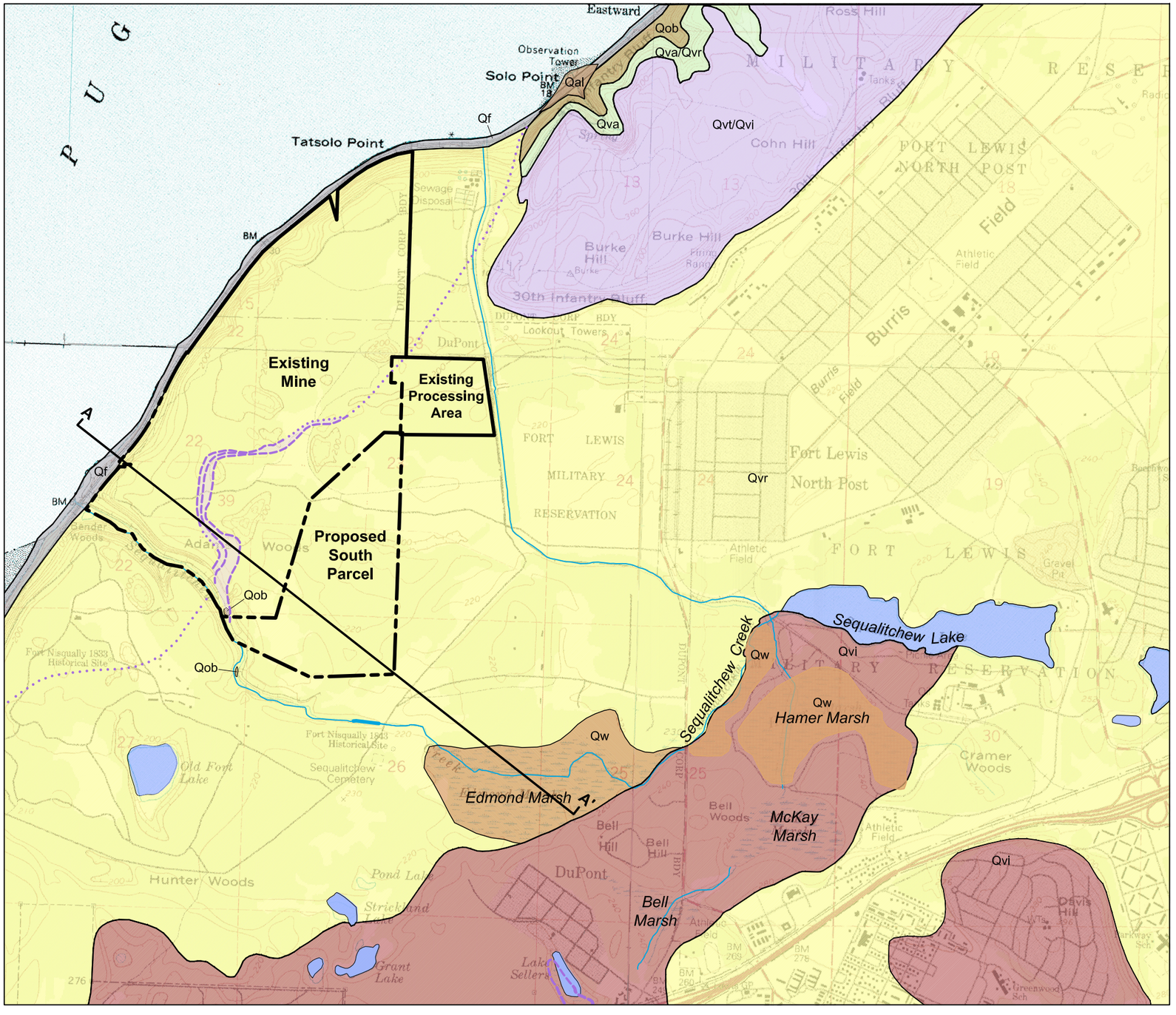

Legend

- **Qf (Fill)**
  Artificial fill. Likely consists primarily of crushed rock and rip-rap placed for railroad embankment.
- **Qw (Wetland Deposits)**
  Peat, organic-rich muck, silt and clay.
- **Qal (Recent Alluvium)**
  Silt, sand, gravel, and peat deposited in stream beds and estuaries, includes some lacustrine and beach deposits.
- **Qvr (Vashon Recessional Glacial Outwash)**
  Medium dense to dense, slightly silty to clean sand and gravel. Includes some silty beds. The majority of near-surface Vashon recessional outwash on the Project Site is made up of the Steilacoom Gravel member, which is composed of sandy gravel and gravelly sand, with minor amounts of silt.
- **Qvi (Ice-Contact Deposits)**
  Water-worked sands and gravels with interbeds and lenses of silty, till-like deposits.
- **Qvt/Qvi (Till and Ice Contact Deposits)**
  Dense to very dense discontinuous layers of silty, sandy, and gravelly basal till. Ice contact deposits contain water-worked sands and gravels with interbeds and lenses of silty, till-like deposits.
- **Qva (Vashon Advance Glacial Outwash)**
  Sand and gravel, and lacustrine clay, silt, and sand of northern source, deposited during Vashon glacial advance.
- **Qob (Olympia Beds)**
  The Olympia Beds Qob unit is generally composed of interbedded lacustrine silt and clay and fluvial deposits.
- **Olympia Beds Truncation (Surface Projection)**
  Approximate surface projection line showing the northwestward lateral subcrop extent of the Olympia Beds unit. Dashed where approximate, dotted where inferred.

Note: Map modified based on subsurface data and geologic interpretation from Walsh, Logan and Polenz 2003; Walsh et al. 2003, Walters and Kimmel, 1968, and Troost, Booth, and Borden, in review.

N

0 2000 4000
Feet

Geologic Map

DuPont Groundwater Model Report
DuPont, Washington

Aspect Consulting	Jun-2017	BY: DFR/SCC	FIGURE NO. 2
	PROJECT NO. 040001-014	REV BY: SCC	

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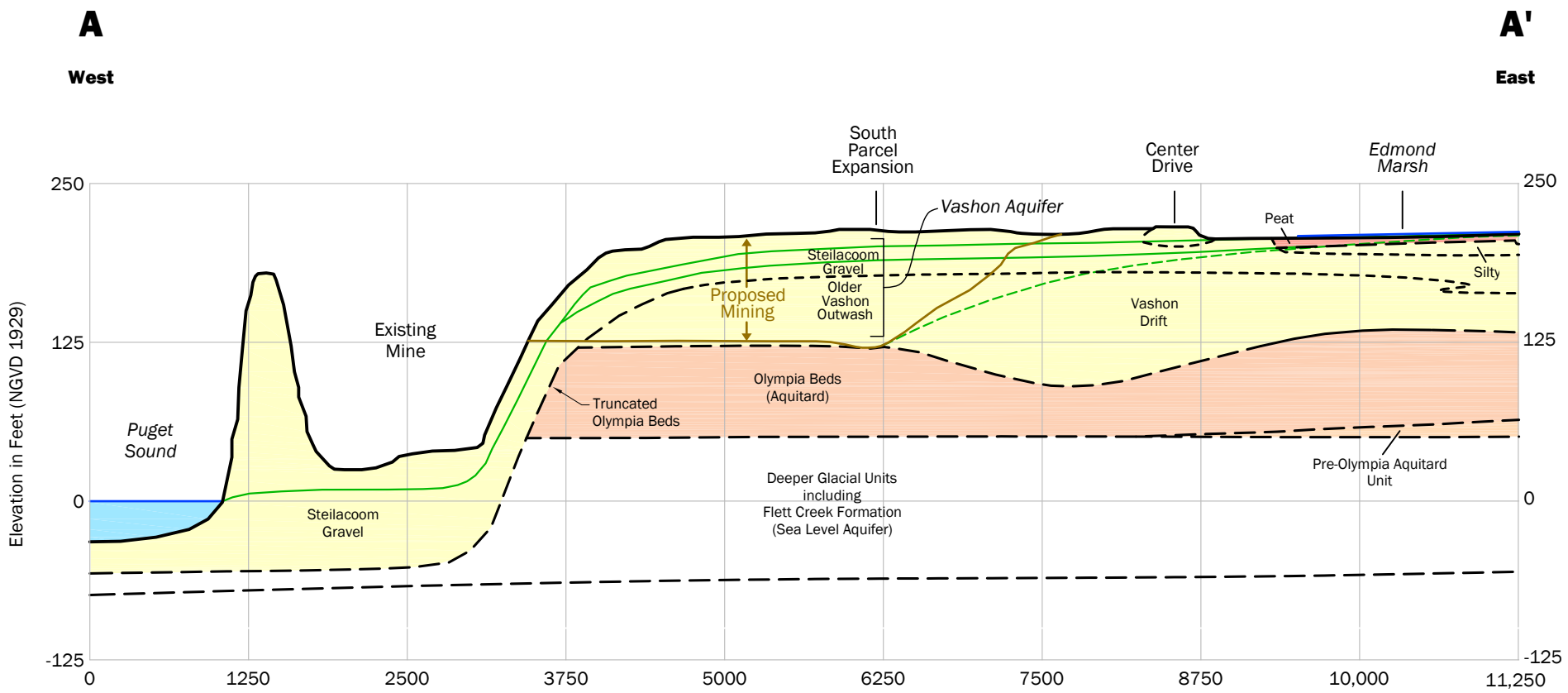


Predicted Water Table Change

Water Table Elevation February 2008
(Range at TW-4 shown for 2003-2008)

Note: 10x Vertical vs. Horizontal Exaggeration for Illustration

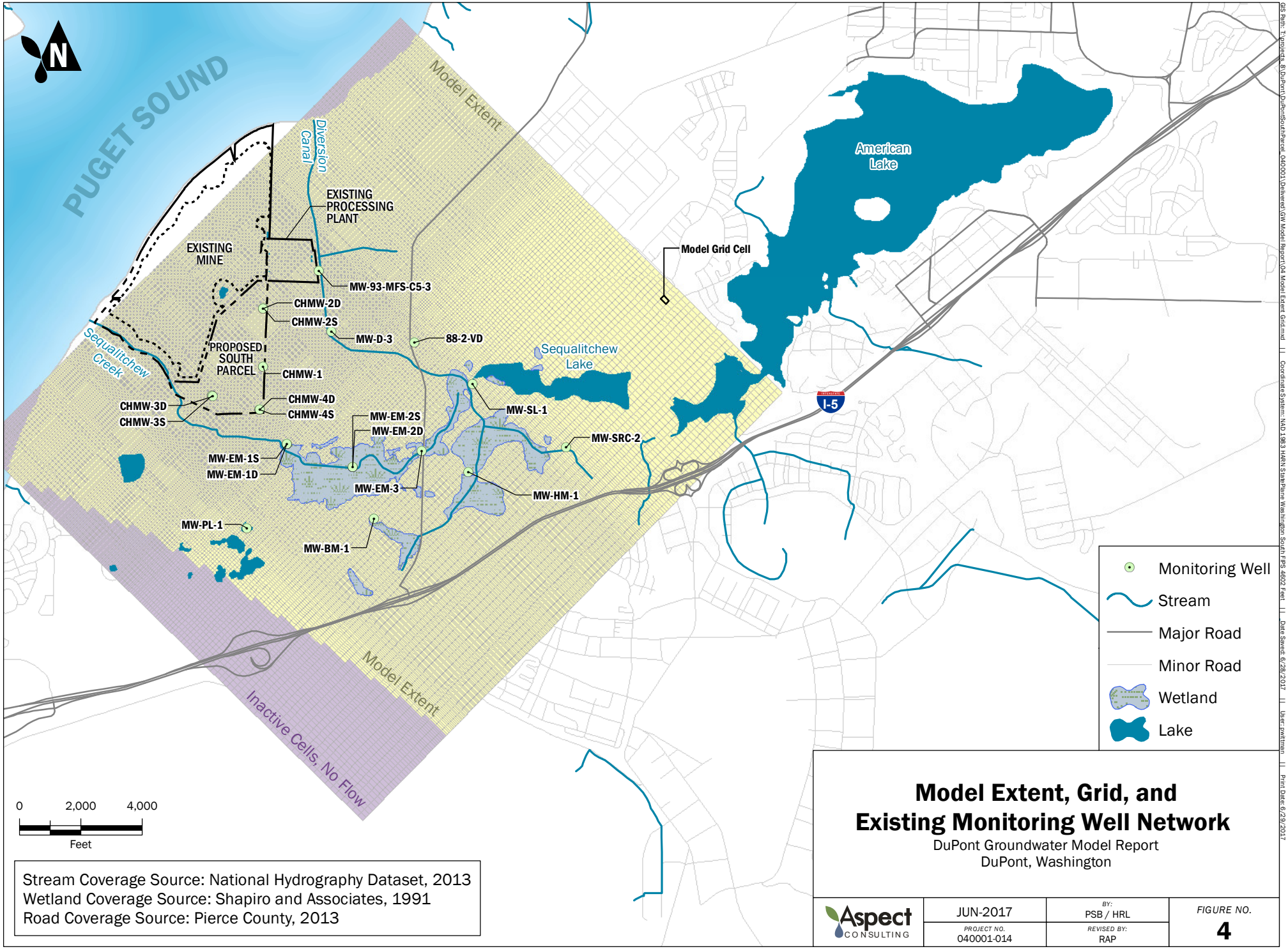
Horizontal Scale: 0 — 1250 Feet

Vertical Scale: 0 — 125 Feet

Hydrogeologic Cross Section

CalPortland DuPont South Parcel
Groundwater Modeling
DuPont, Washington

Aspect Consulting	DEC-2014	BY: OGR/SCC	FIGURE NO. 3
	PROJECT NO. 040001-014	REVISED BY: -	



Stream Coverage Source: National Hydrography Dataset, 2013
Wetland Coverage Source: Shapiro and Associates, 1991
Road Coverage Source: Pierce County, 2013

Model Extent, Grid, and Existing Monitoring Well Network

DuPont Groundwater Model Report
DuPont, Washington

Aspect CONSULTING	JUN-2017	BY: PSB / HRL	FIGURE NO. 4
	PROJECT NO. 040001-014	REVISED BY: RAP	

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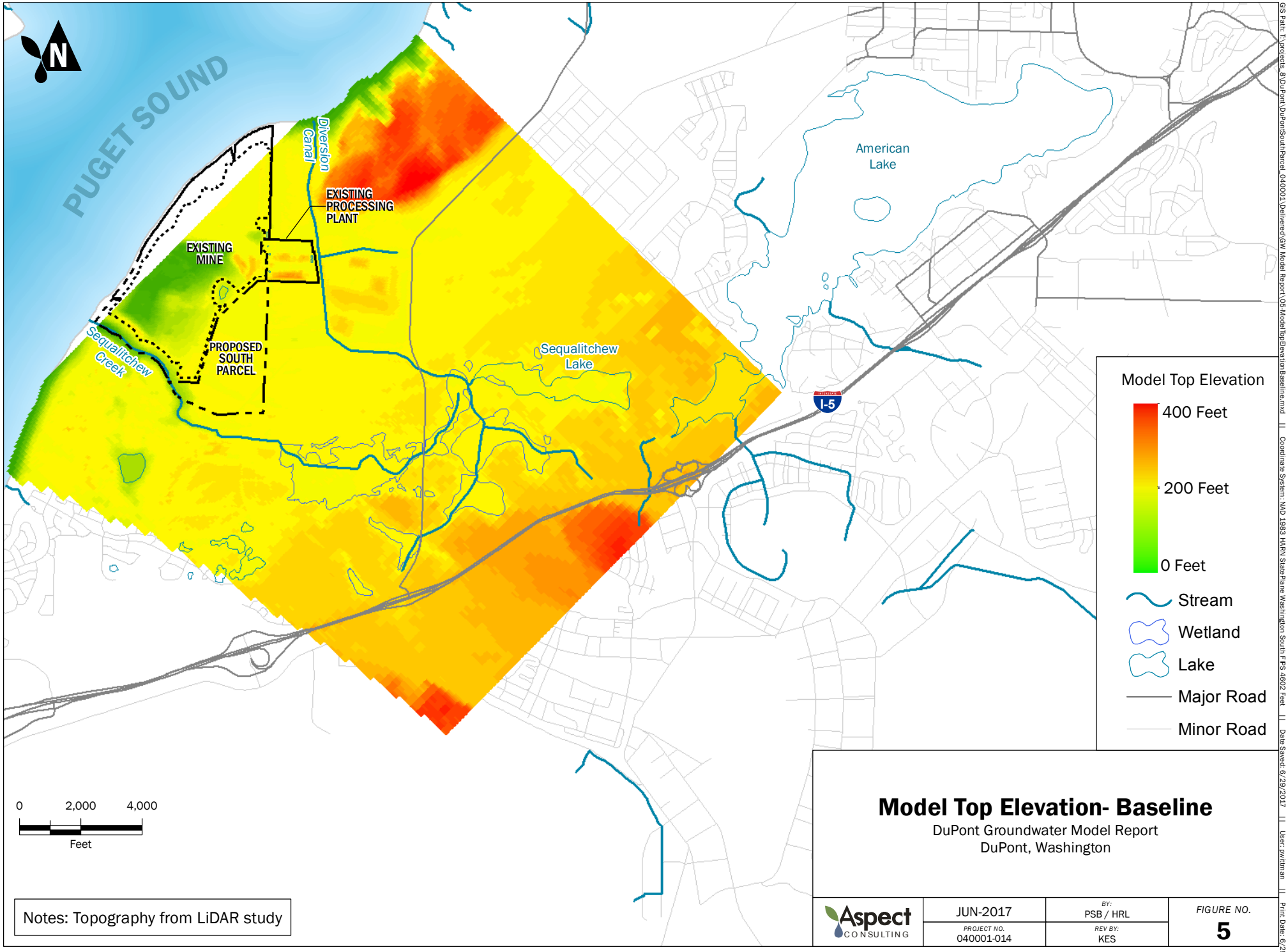

Model Top Elevation- Baseline

DuPont Groundwater Model Report
DuPont, Washington

Notes: Topography from LiDAR study

Aspect CONSULTING	JUN-2017	BY: PSB / HRL	FIGURE NO. 5
	PROJECT NO. 040001-014	REV BY: KES	

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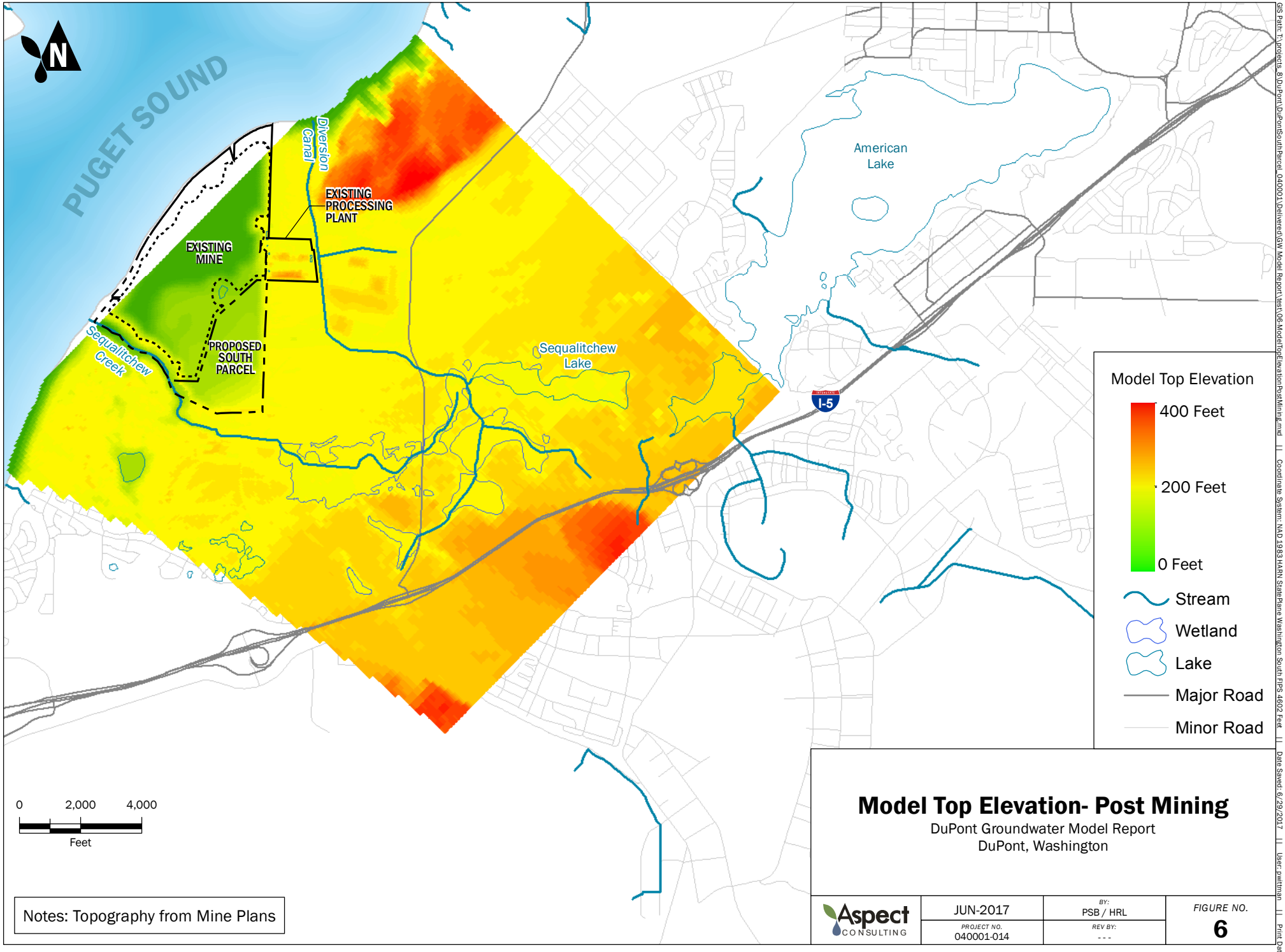

Model Top Elevation- Post Mining

DuPont Groundwater Model Report
DuPont, Washington

Notes: Topography from Mine Plans

Aspect CONSULTING	JUN-2017	BY: PSB / HRL	FIGURE NO. 6
	PROJECT NO. 040001-014	REV BY: ---	

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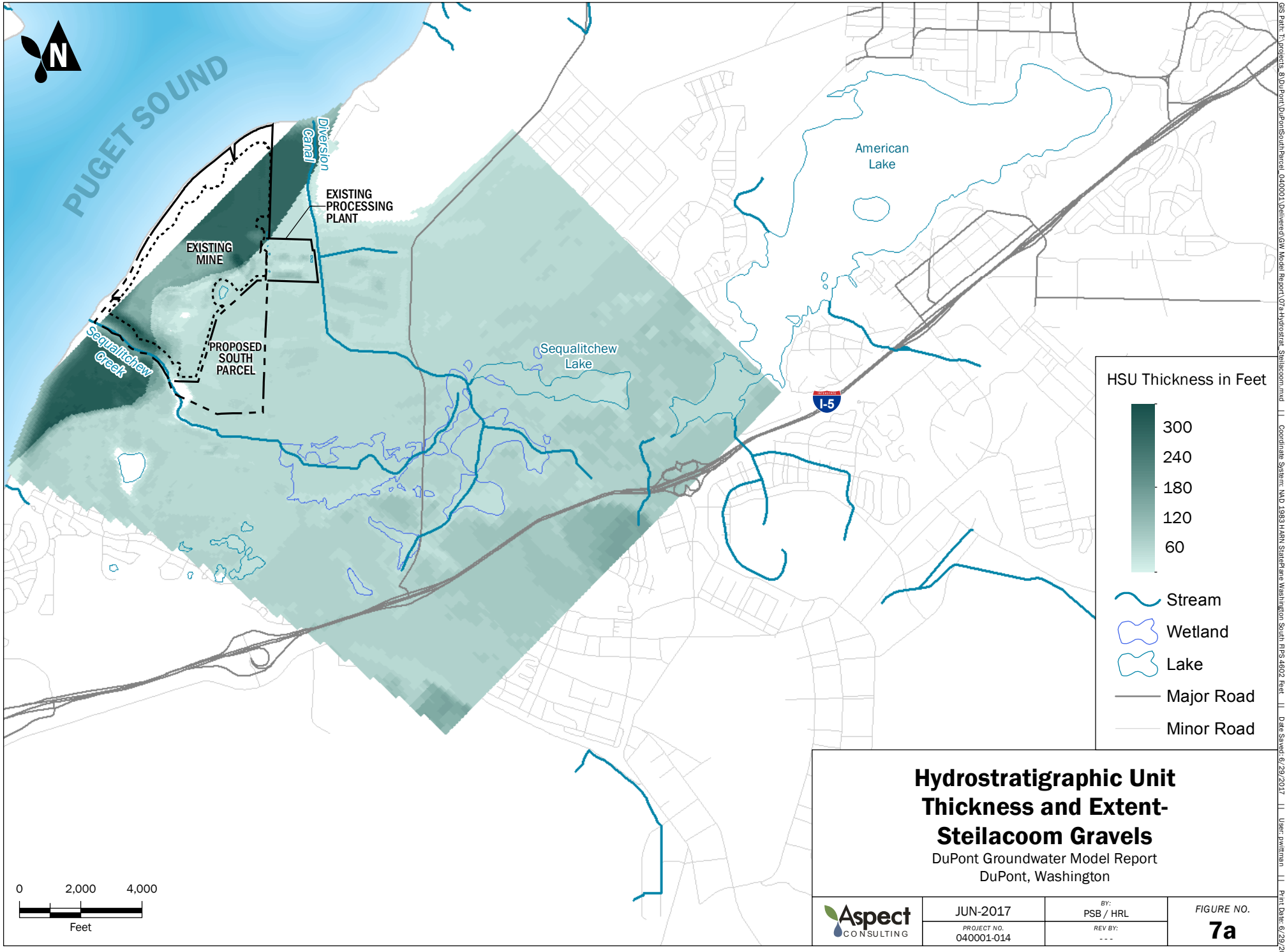
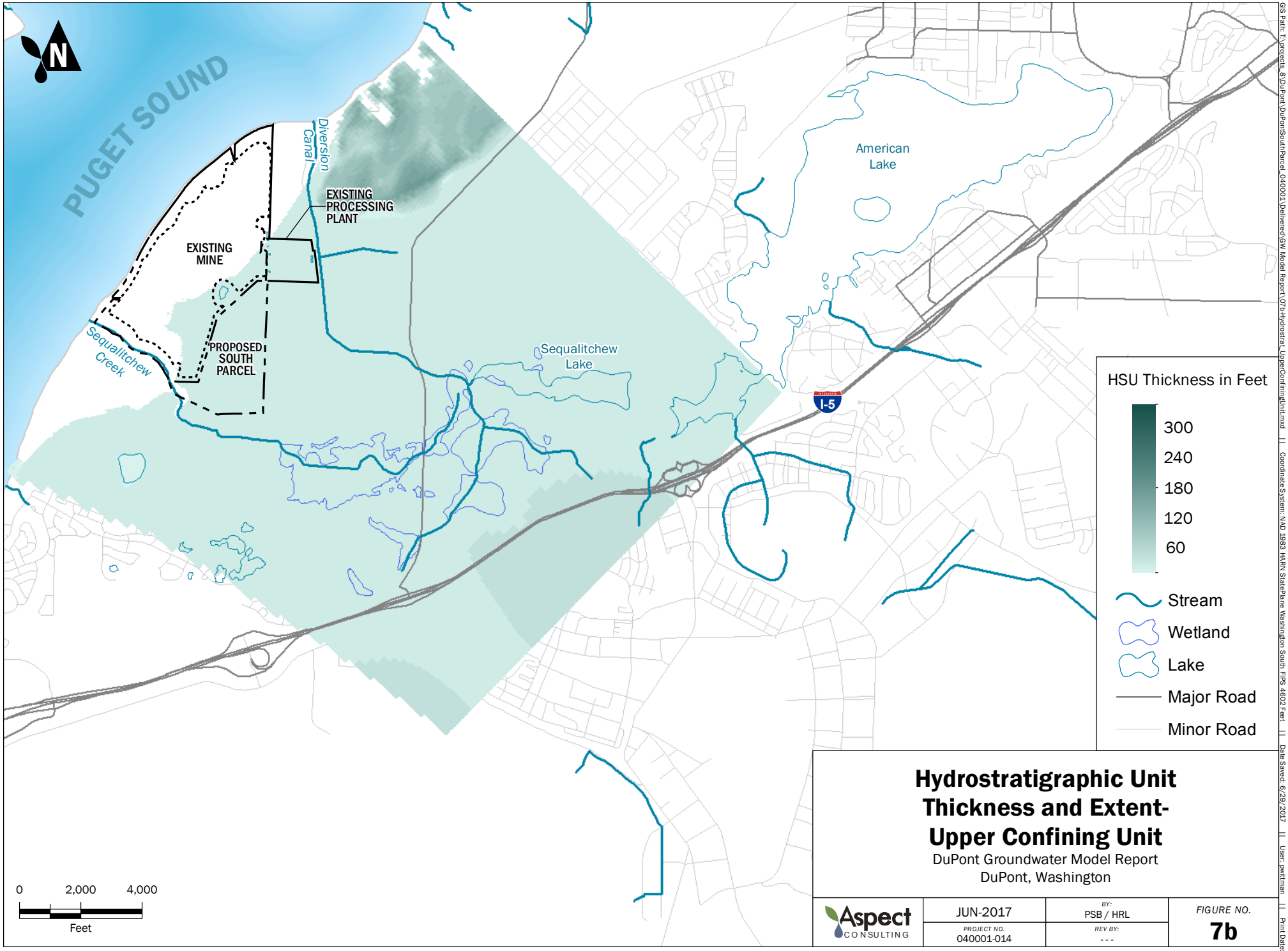


Hydrostratigraphic Unit Thickness and Extent- Steilacoom Gravels

DuPont Groundwater Model Report
DuPont, Washington

Aspect CONSULTING	JUN-2017	BY: PSB / HRL	FIGURE NO. 7a
	PROJECT NO. 040001-014	REV BY: ---	

GIS Path: T:\projects_8\DuPont\DuPontSouthParcel_040001\Delivered\GW Model Report\07a-Hydrostrat_Steilacoom.mxd || Coordinate System: NAD 1983 HARN StatePlane Washington South FIPS 4602 Feet || Date Saved: 6/29/2017 || User: pwittman || Print Date: 6/29/2017

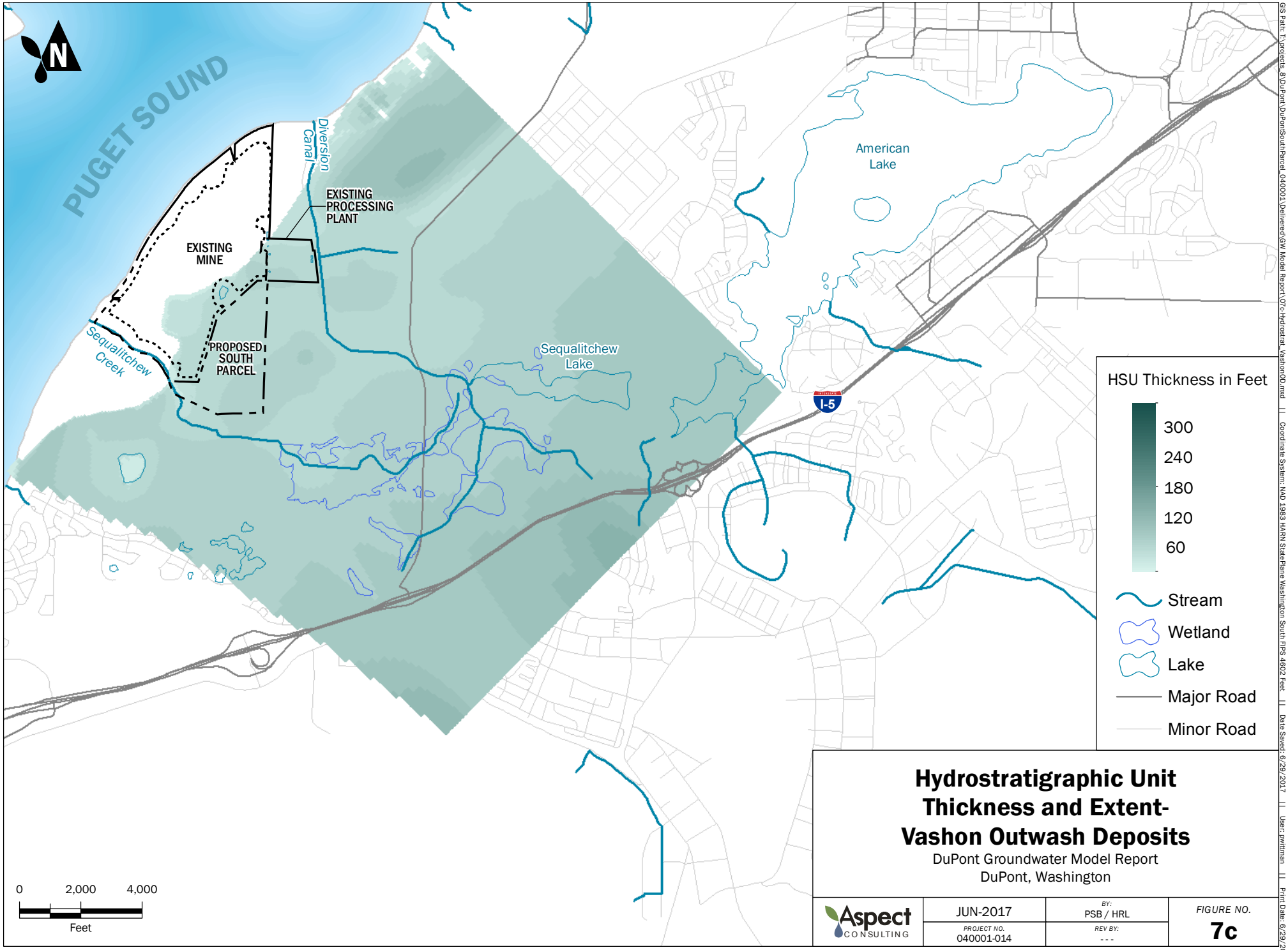


Hydrostratigraphic Unit Thickness and Extent- Upper Confining Unit

DuPont Groundwater Model Report
DuPont, Washington

Aspect CONSULTING	JUN-2017	BY: PSB / HRL	FIGURE NO. 7b
	PROJECT NO. 040001-014	REV BY: ---	

GIS Path: T:\projects_8\DuPont\DuPontSouthParcel_040001\Delivered\GW Model Report\07b-Hydrostrat_UpperConfiningUnit.mxd || Coordinate System: NAD 1983 HARN StatePlane Washington South FIPS 4602 Feet || Date Saved: 6/29/2017 || User: pwittman || Print Date: 6/29/2017



Hydrostratigraphic Unit Thickness and Extent- Vashon Outwash Deposits

DuPont Groundwater Model Report
DuPont, Washington

Aspect CONSULTING	JUN-2017	BY: PSB / HRL	FIGURE NO. 7c
	PROJECT NO. 040001-014	REV BY: ---	

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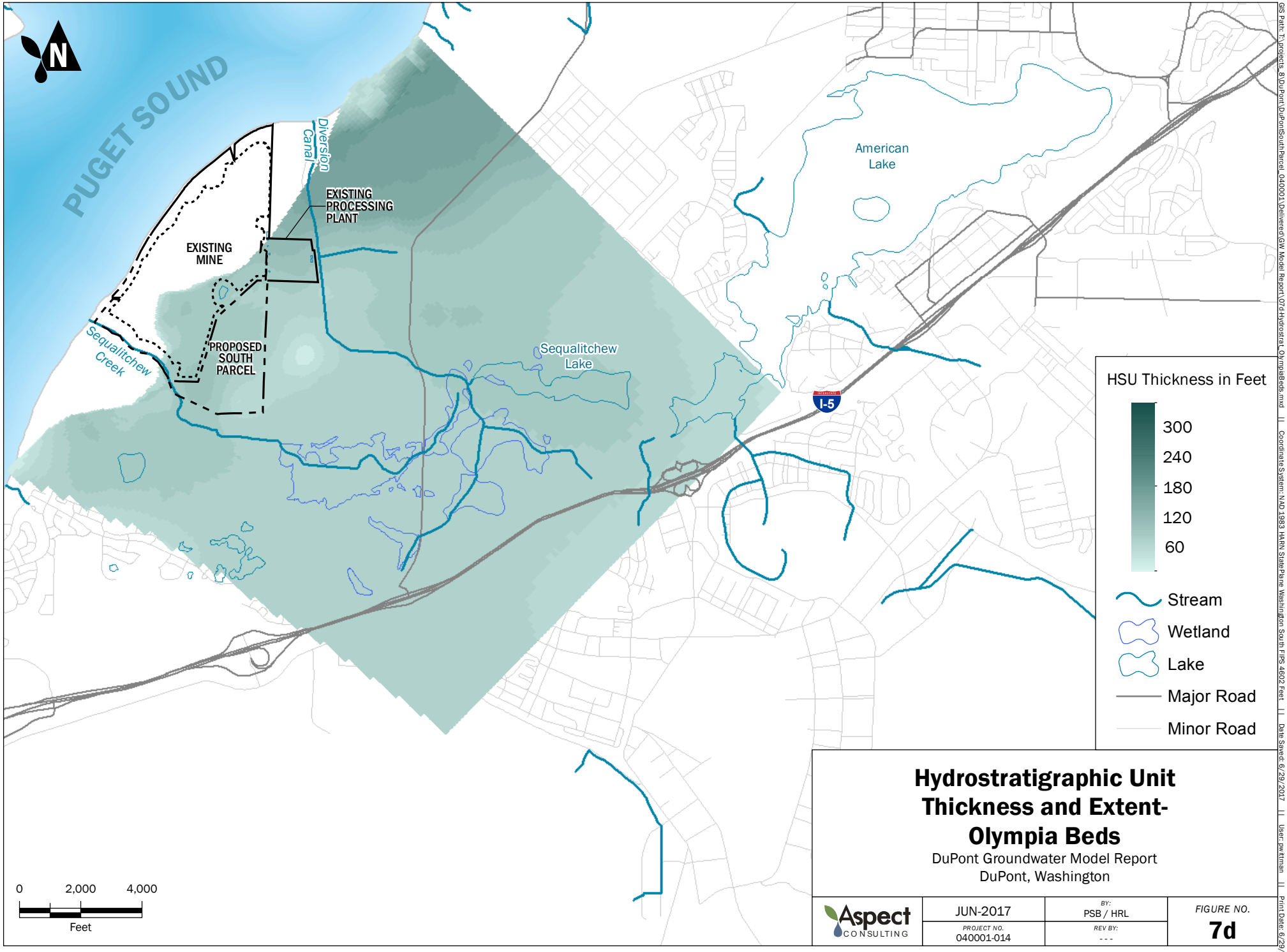
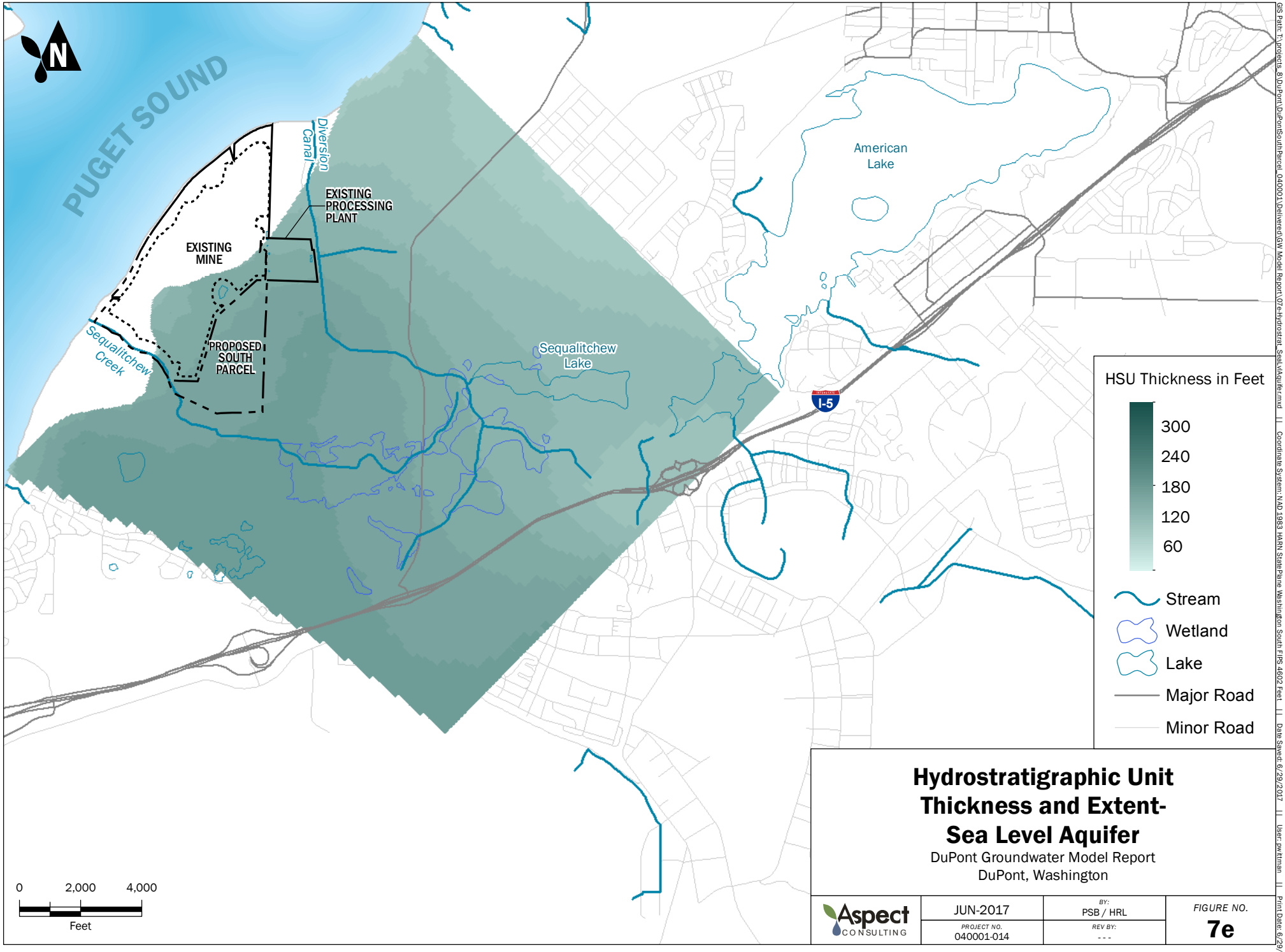


Hydrostratigraphic Unit Thickness and Extent- Olympia Beds

DuPont Groundwater Model Report
DuPont, Washington

Aspect CONSULTING	JUN-2017	BY: PSB / HRL	FIGURE NO. 7d
	PROJECT NO. 040001-014	REV BY: ---	

GIS Path: T:\projects_8\DuPont\DuPontSouthParcel_040001\Delivered\GW Model Report\07d-Hydrostrat_OlympiaBeds.mxd || Coordinate System: NAD 1983 HARN StatePlane Washington South FIPS 4602 Feet || Date Saved: 6/29/2017 || User: pwittman || Print Date: 6/29/2017



Hydrostratigraphic Unit Thickness and Extent- Sea Level Aquifer

DuPont Groundwater Model Report
DuPont, Washington

Aspect CONSULTING	JUN-2017	BY: PSB / HRL	FIGURE NO. 7e
	PROJECT NO. 040001-014	REV BY: ---	

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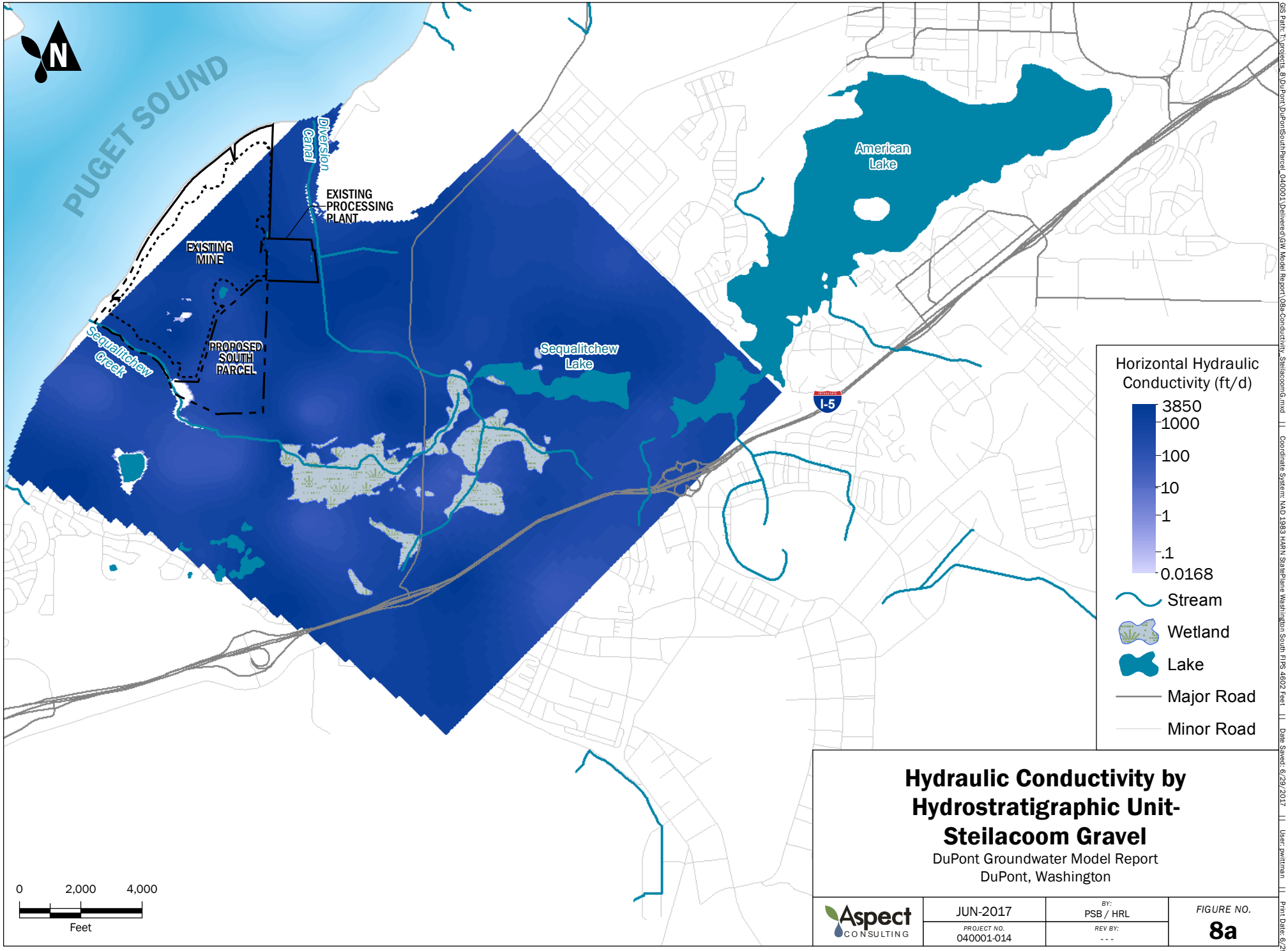

Hydraulic Conductivity by Hydrostratigraphic Unit- Steilacoom Gravel

DuPont Groundwater Model Report
DuPont, Washington

Aspect CONSULTING	JUN-2017	BY: PSB / HRL	FIGURE NO. 8a
	PROJECT NO. 040001-014	REV BY: ---	

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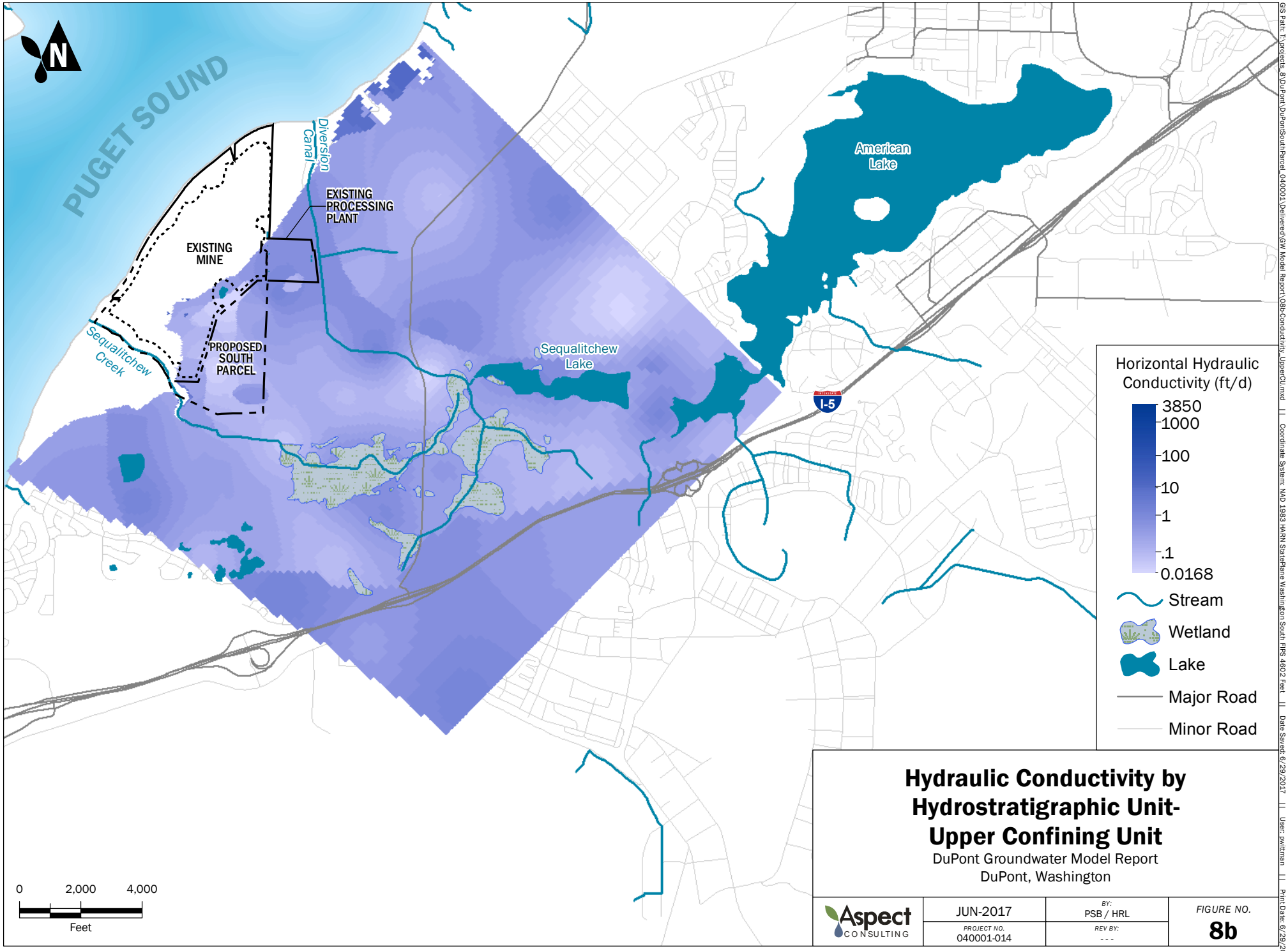

Hydraulic Conductivity by Hydrostratigraphic Unit- Upper Confining Unit

DuPont Groundwater Model Report
DuPont, Washington

Aspect CONSULTING	JUN-2017	BY: PSB / HRL	FIGURE NO. 8b
	PROJECT NO. 040001-014	REV BY: ---	

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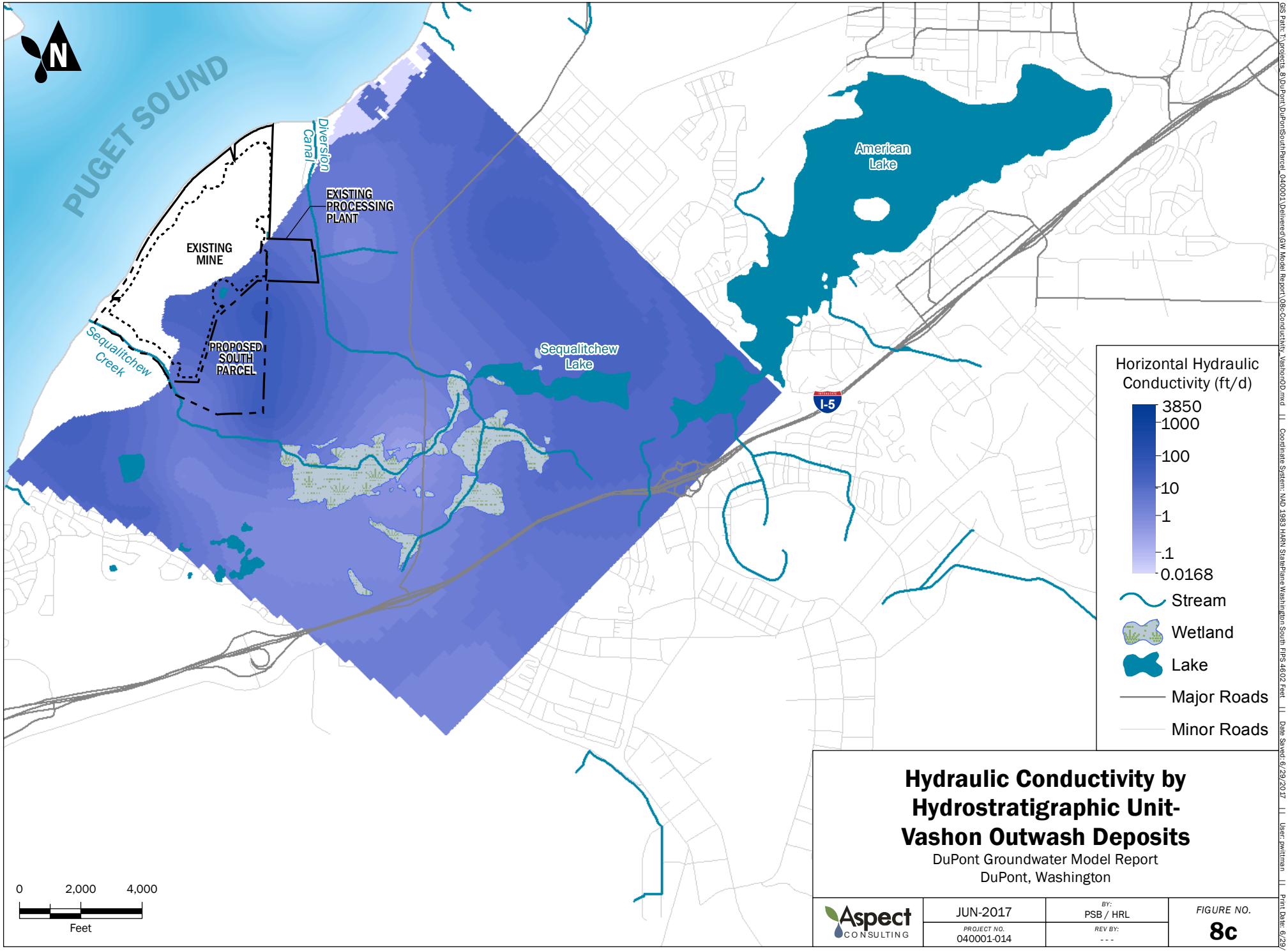

Hydraulic Conductivity by Hydrostratigraphic Unit- Vashon Outwash Deposits

DuPont Groundwater Model Report
DuPont, Washington

Aspect CONSULTING	JUN-2017	BY: PSB / HRL	FIGURE NO. 8c
	PROJECT NO. 040001-014	REV BY: ---	

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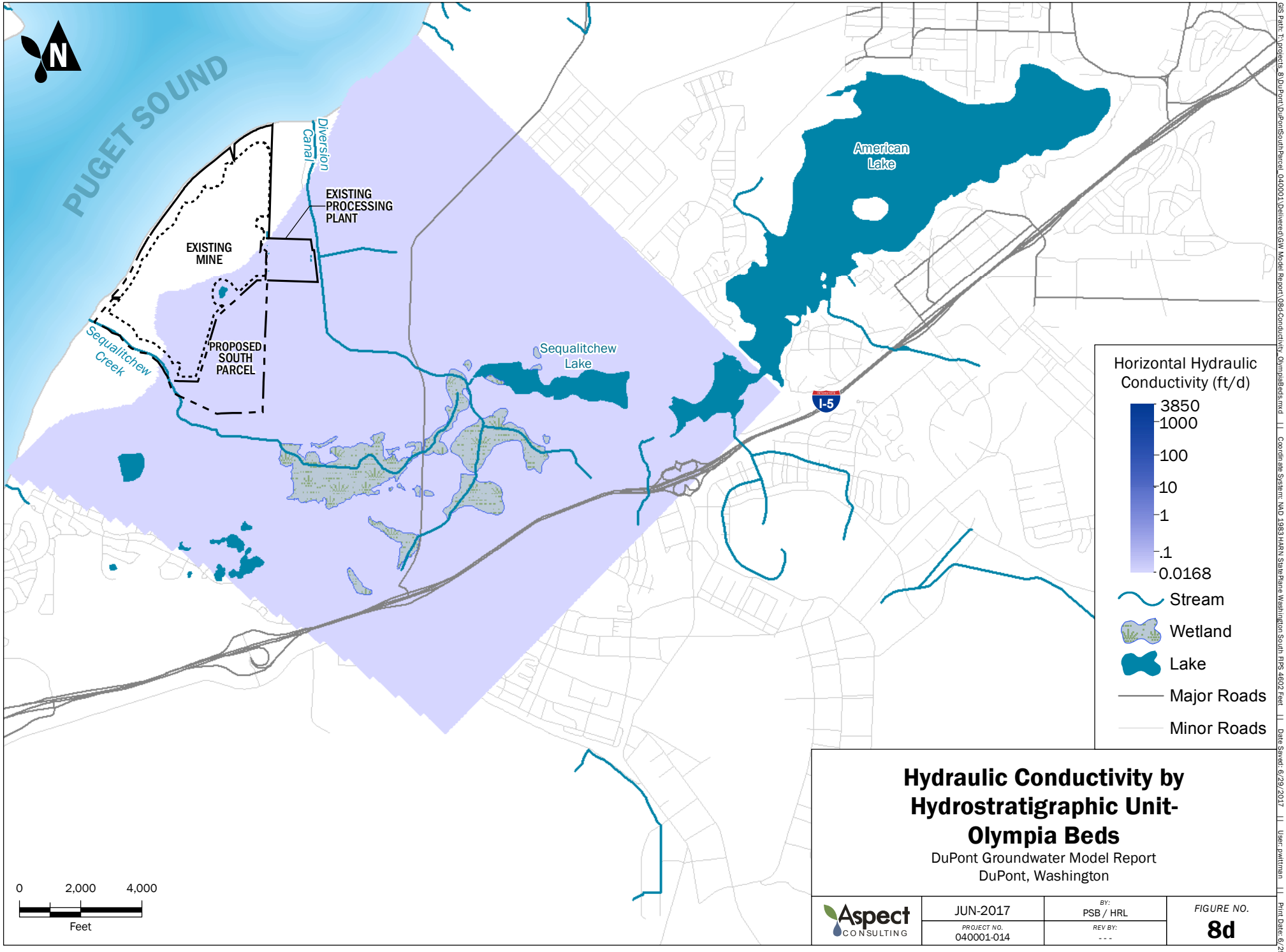

Hydraulic Conductivity by Hydrostratigraphic Unit- Olympia Beds

DuPont Groundwater Model Report
DuPont, Washington

Aspect CONSULTING	JUN-2017	BY: PSB / HRL	FIGURE NO. 8d
	PROJECT NO. 040001-014	REV BY: ---	

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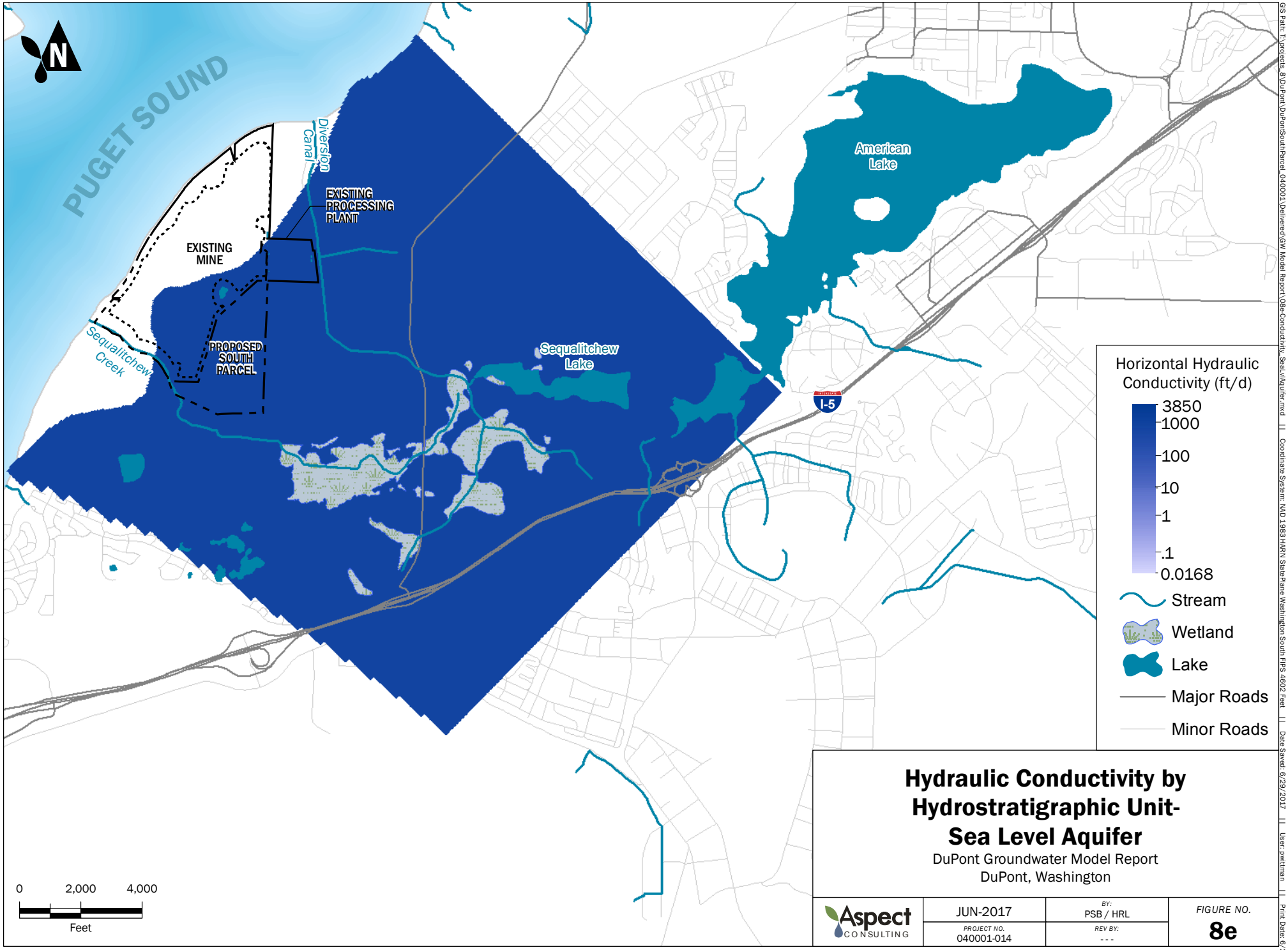

Hydraulic Conductivity by Hydrostratigraphic Unit- Sea Level Aquifer

DuPont Groundwater Model Report
DuPont, Washington

Aspect CONSULTING	JUN-2017	BY: PSB / HRL	FIGURE NO. 8e
	PROJECT NO. 040001-014	REV BY: ---	

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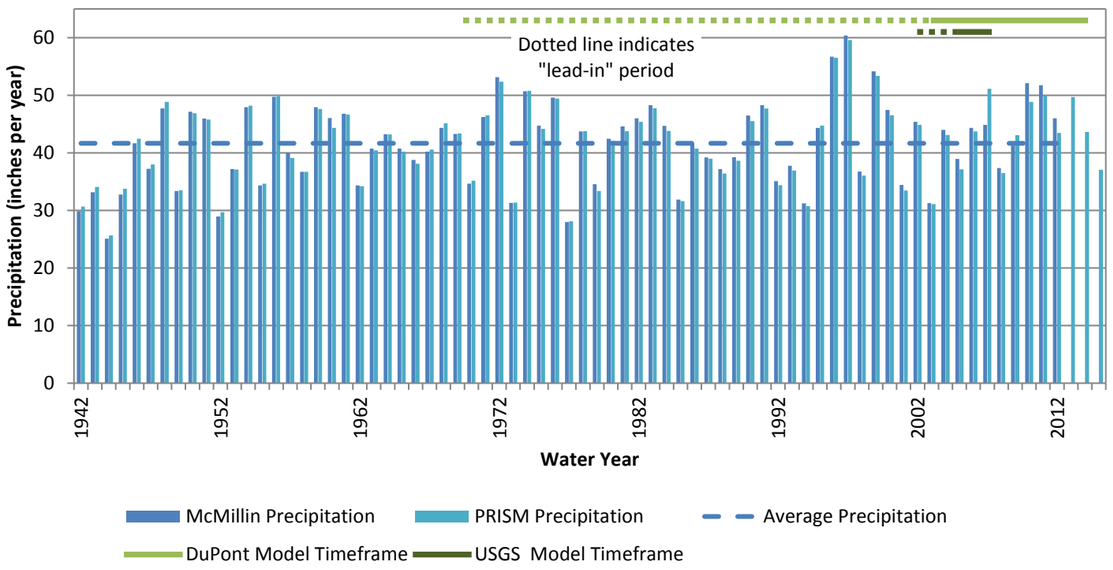

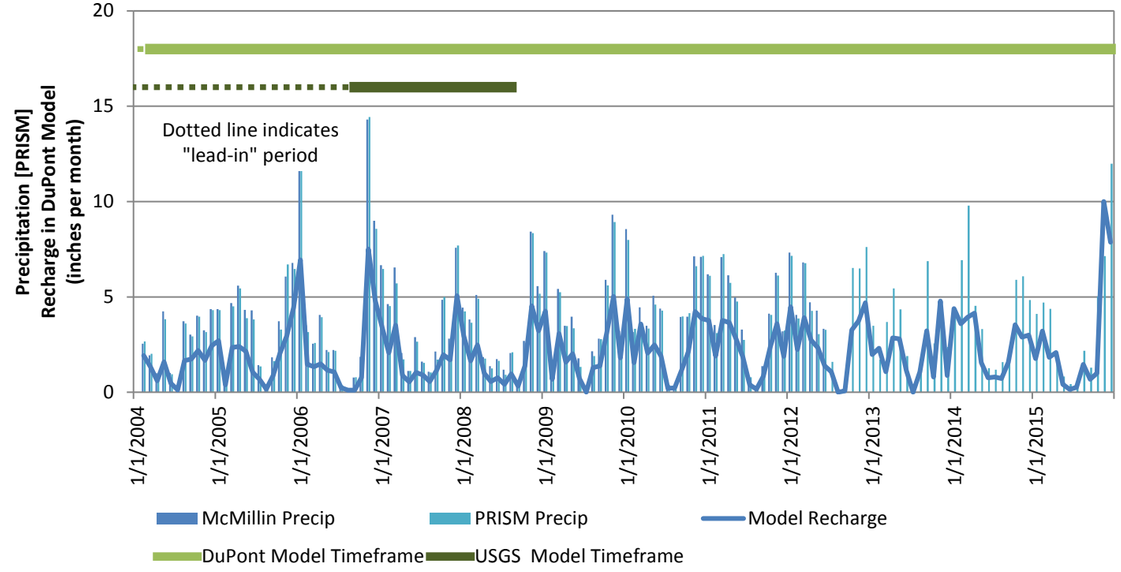

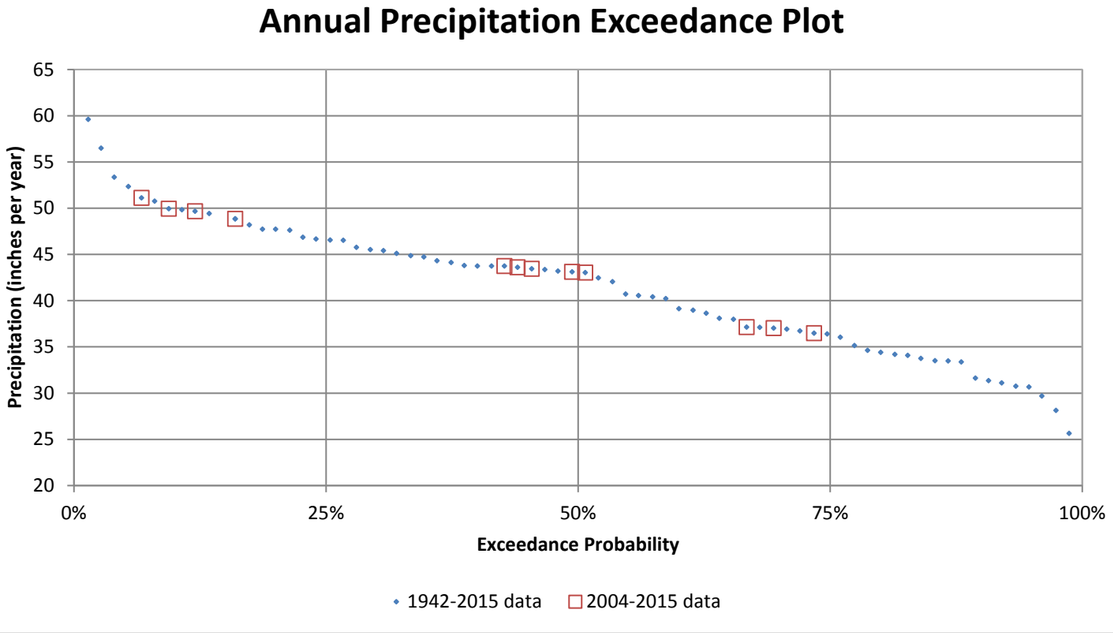

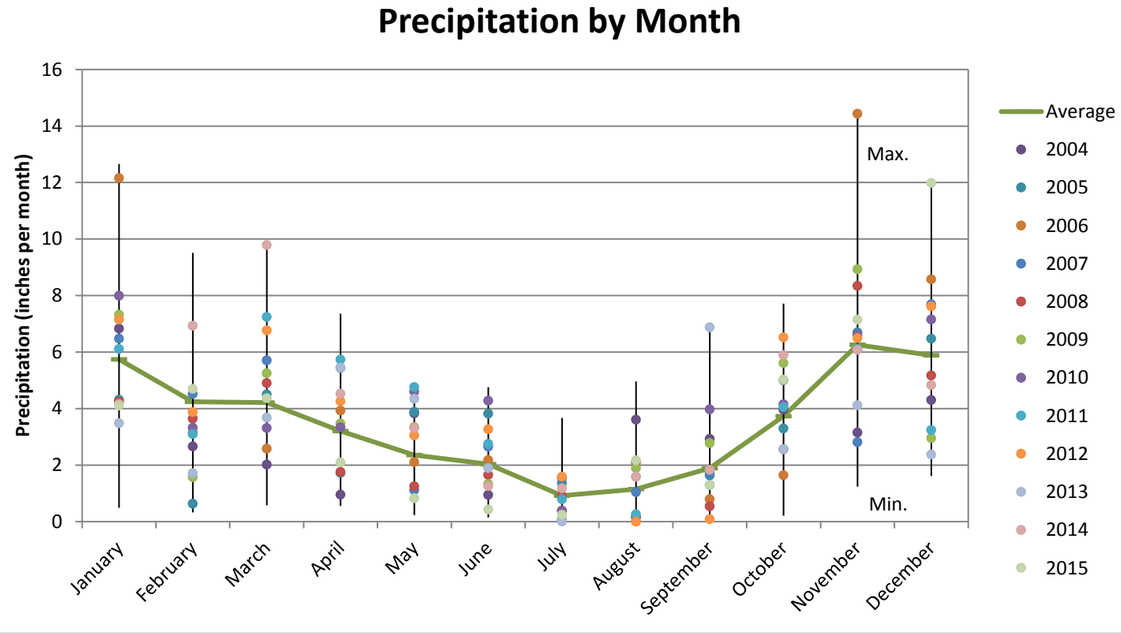

Aspect Consulting, LLC
June 2017
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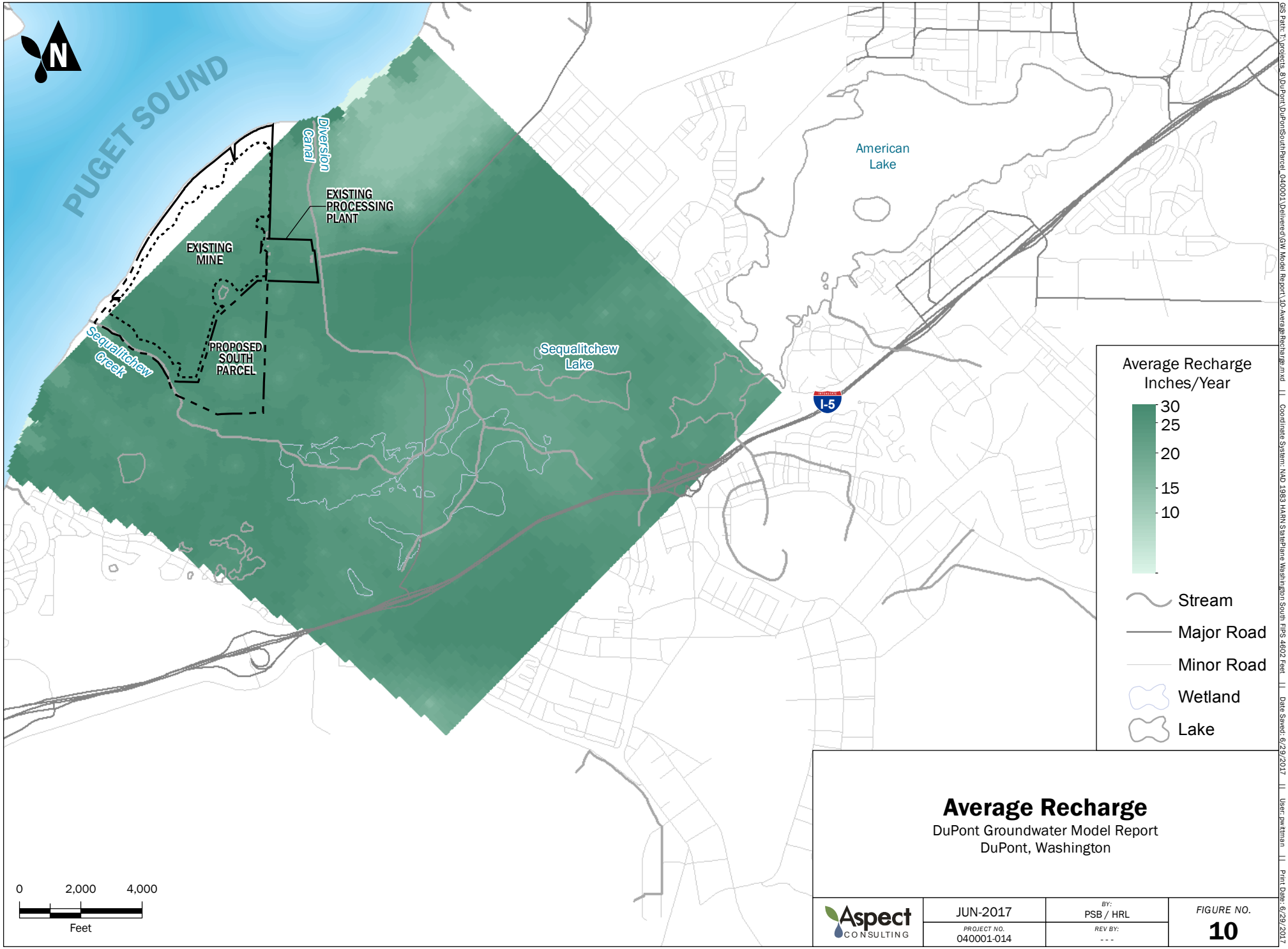
Figure 9
Model Timeframe and Historical Precipitation
Dupont Groundwater Model Report



Average Recharge

DuPont Groundwater Model Report
DuPont, Washington

Aspect CONSULTING	JUN-2017	BY: PSB / HRL	FIGURE NO. 10
	PROJECT NO. 040001-014	REV BY: ---	

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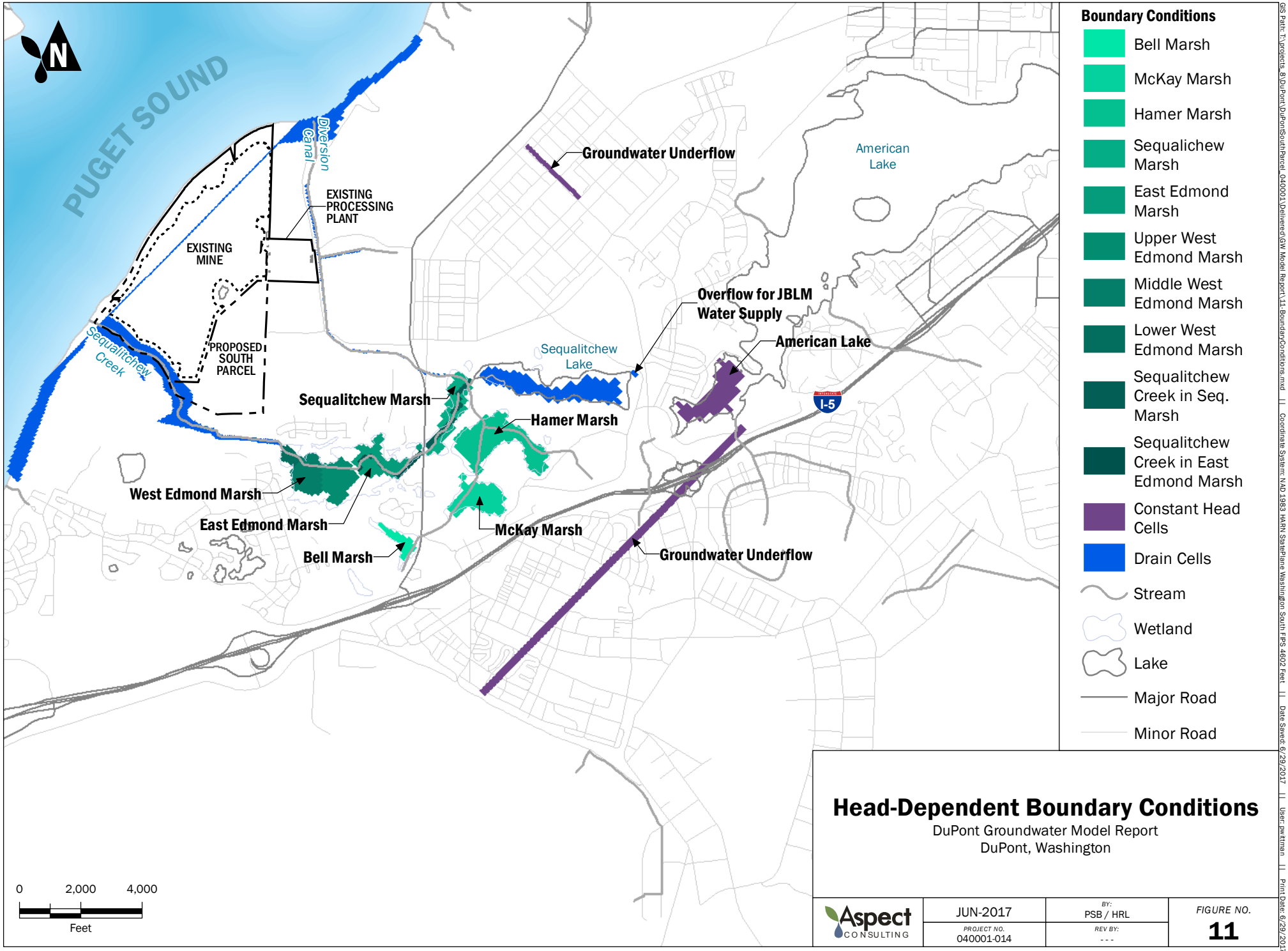

Head-Dependent Boundary Conditions

DuPont Groundwater Model Report
DuPont, Washington

Aspect CONSULTING	JUN-2017	BY: PSB / HRL	FIGURE NO. 11
	PROJECT NO. 040001-014	REV BY: ---	

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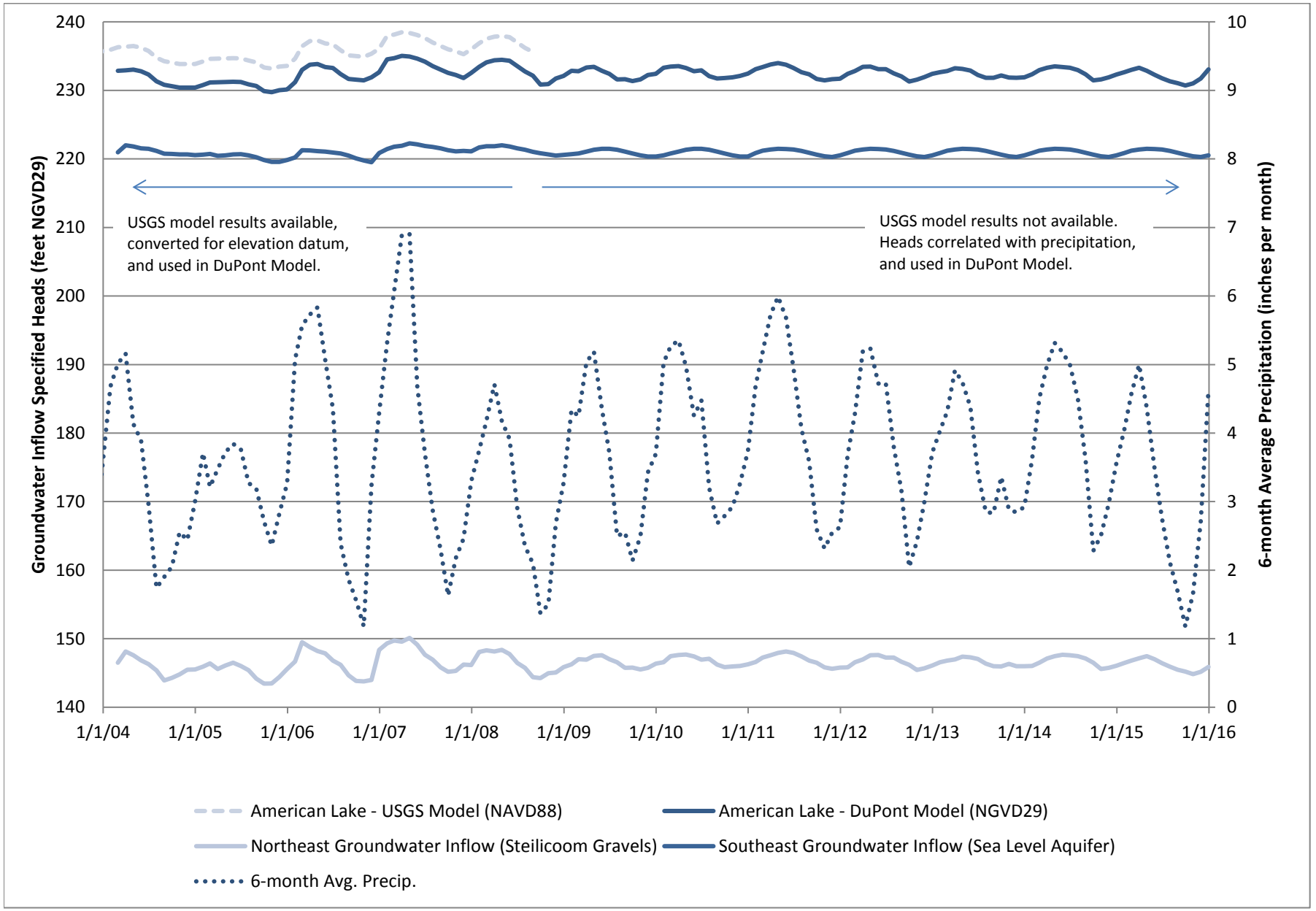

Aspect Consulting, LLC
June 2017
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Figure 12
Groundwater Inflow Heads over Time
DuPont Groundwater Model Report

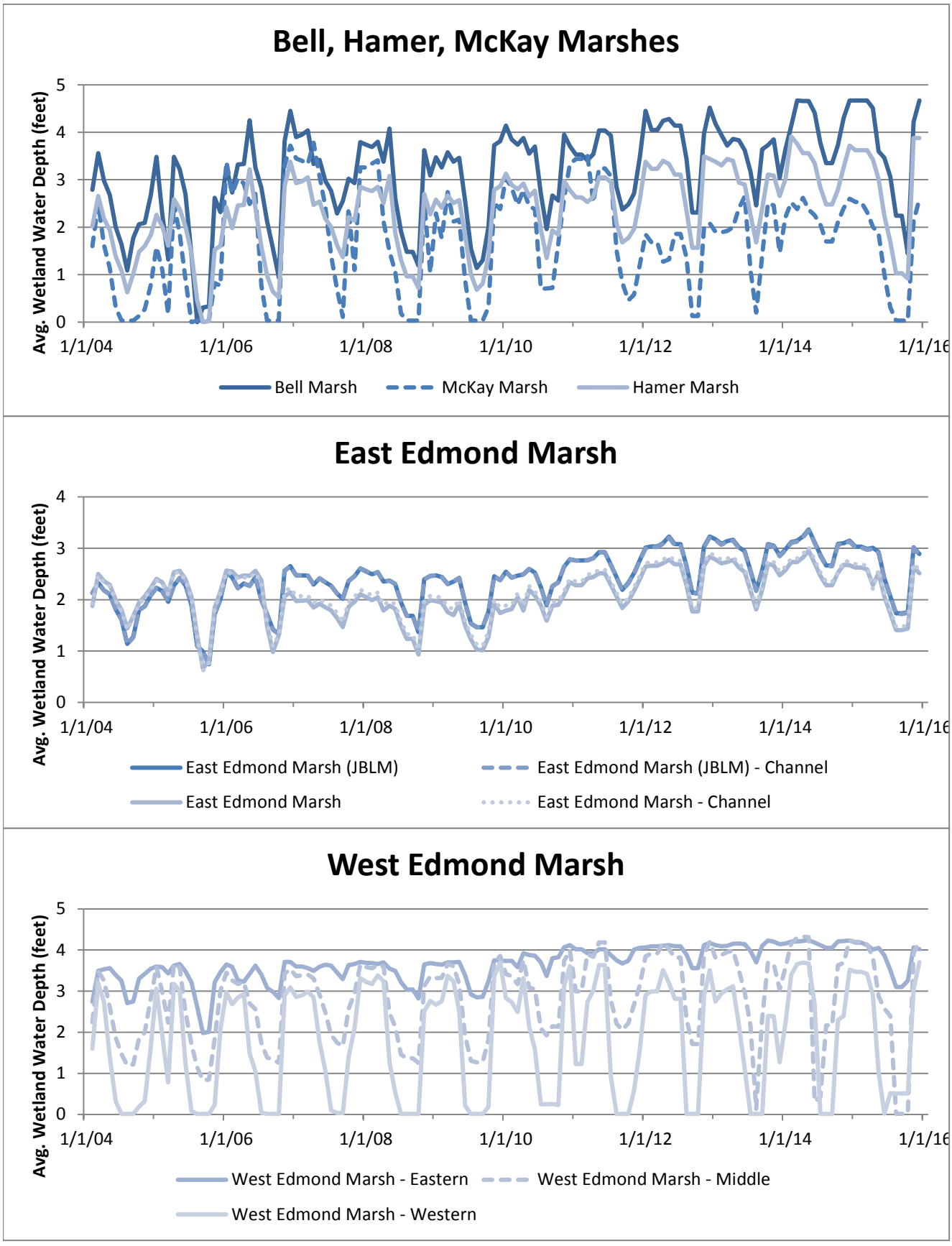
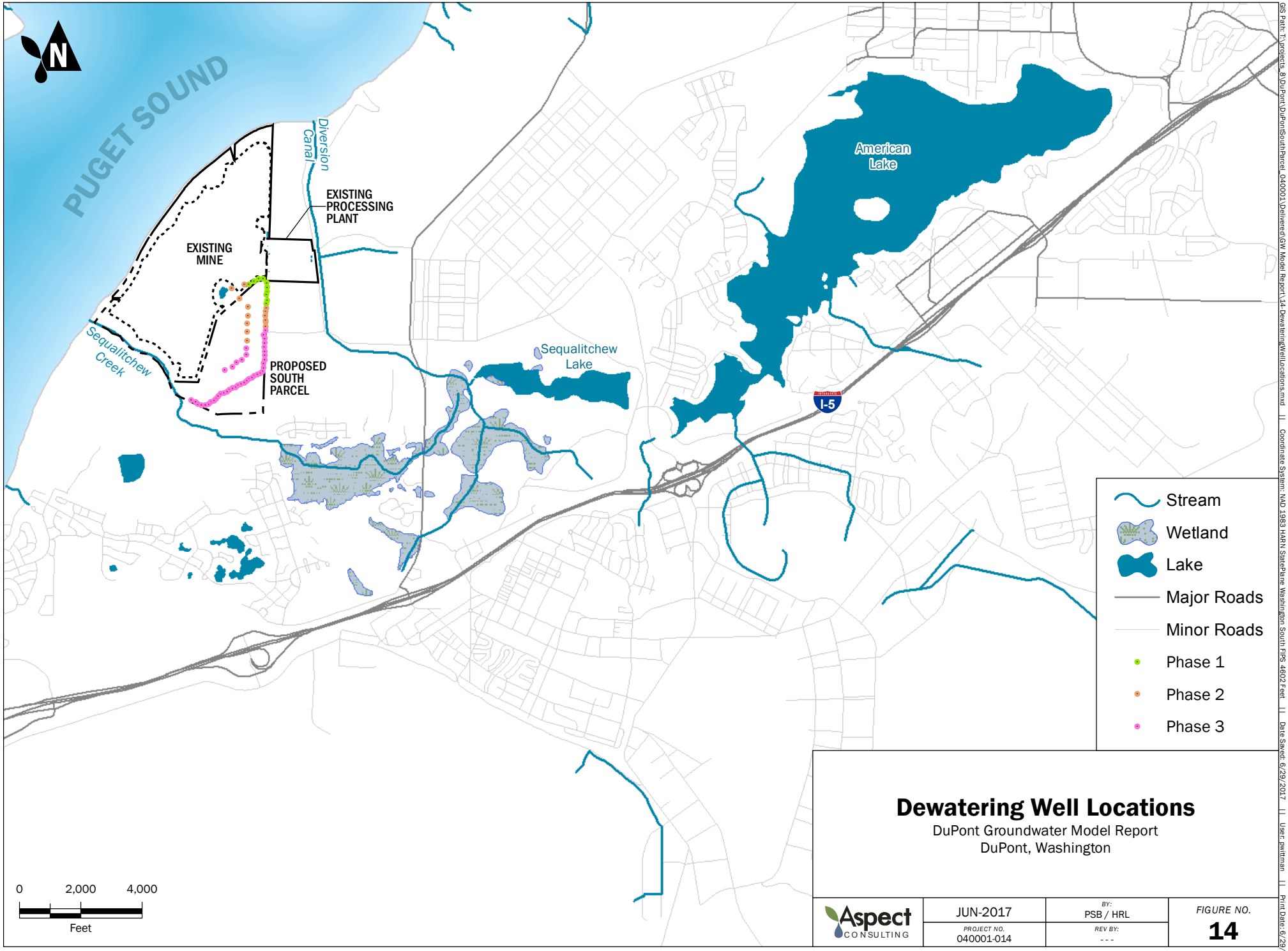


Figure 13
Wetland Water Depths Over Time



Dewatering Well Locations

DuPont Groundwater Model Report
DuPont, Washington

Aspect CONSULTING	JUN-2017	BY: PSB / HRL	FIGURE NO. 14
	PROJECT NO. 040001-014	REV BY: ---	

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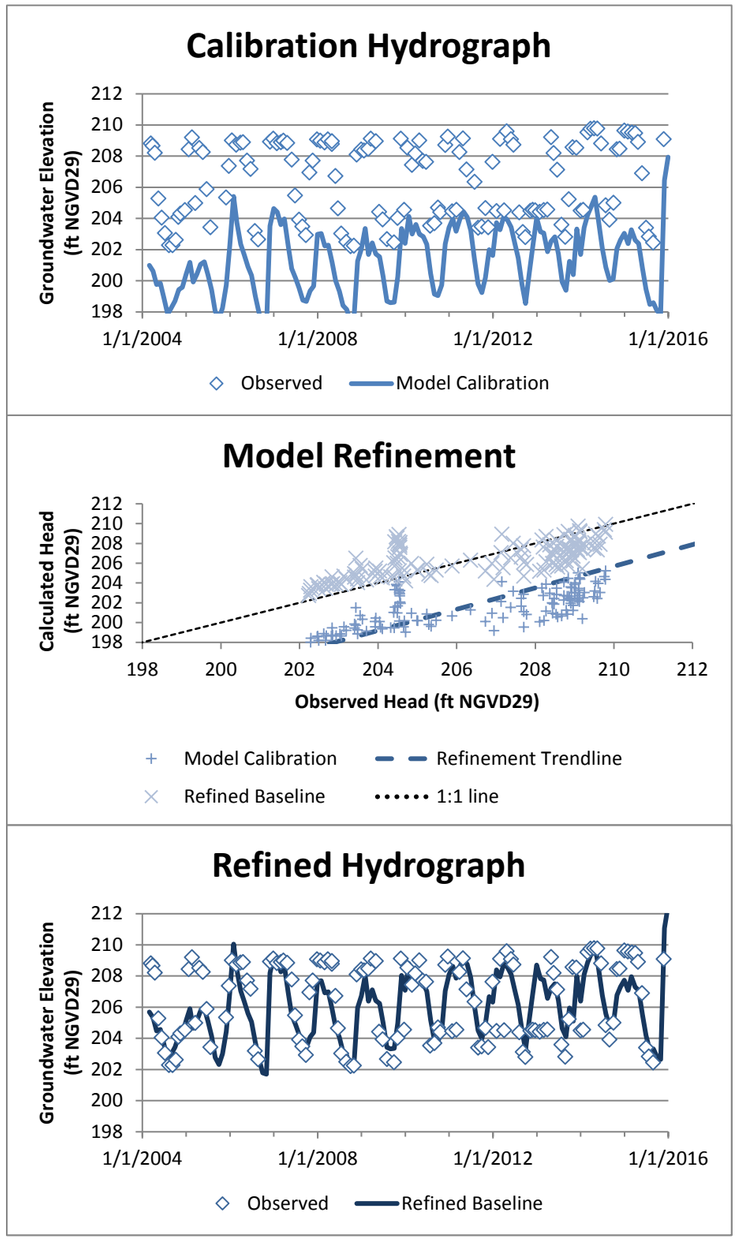

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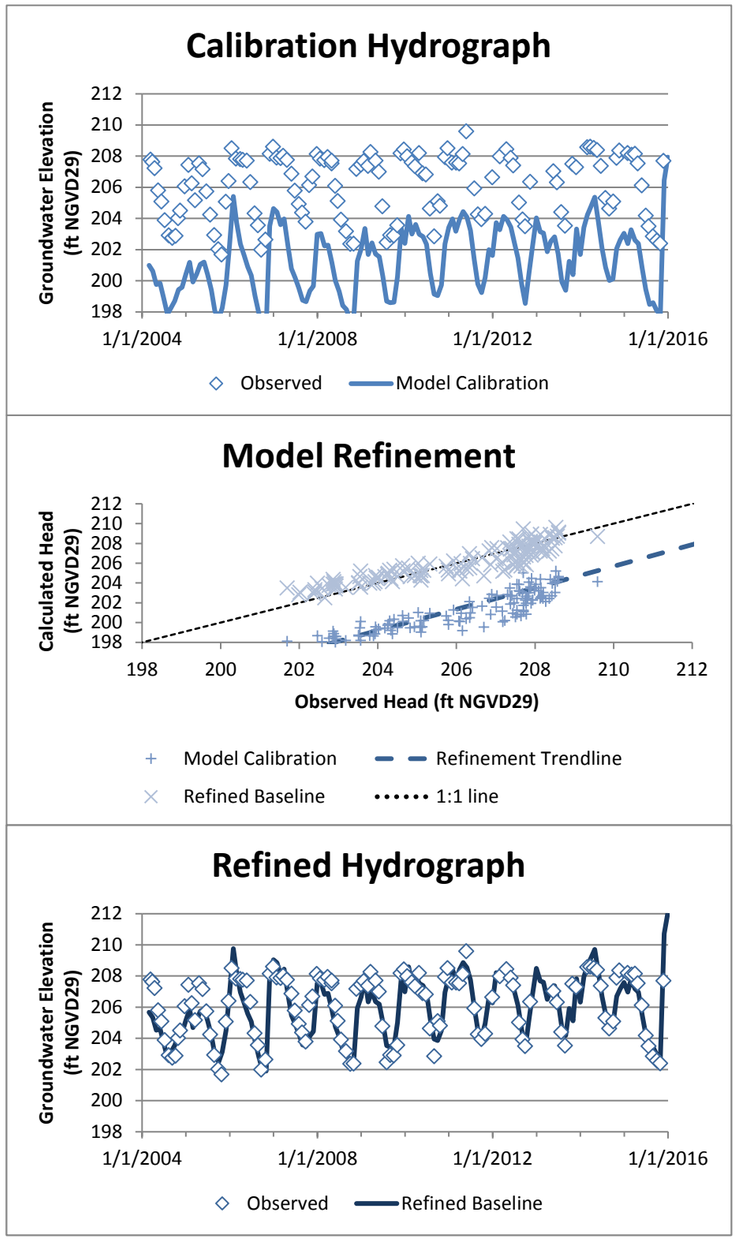

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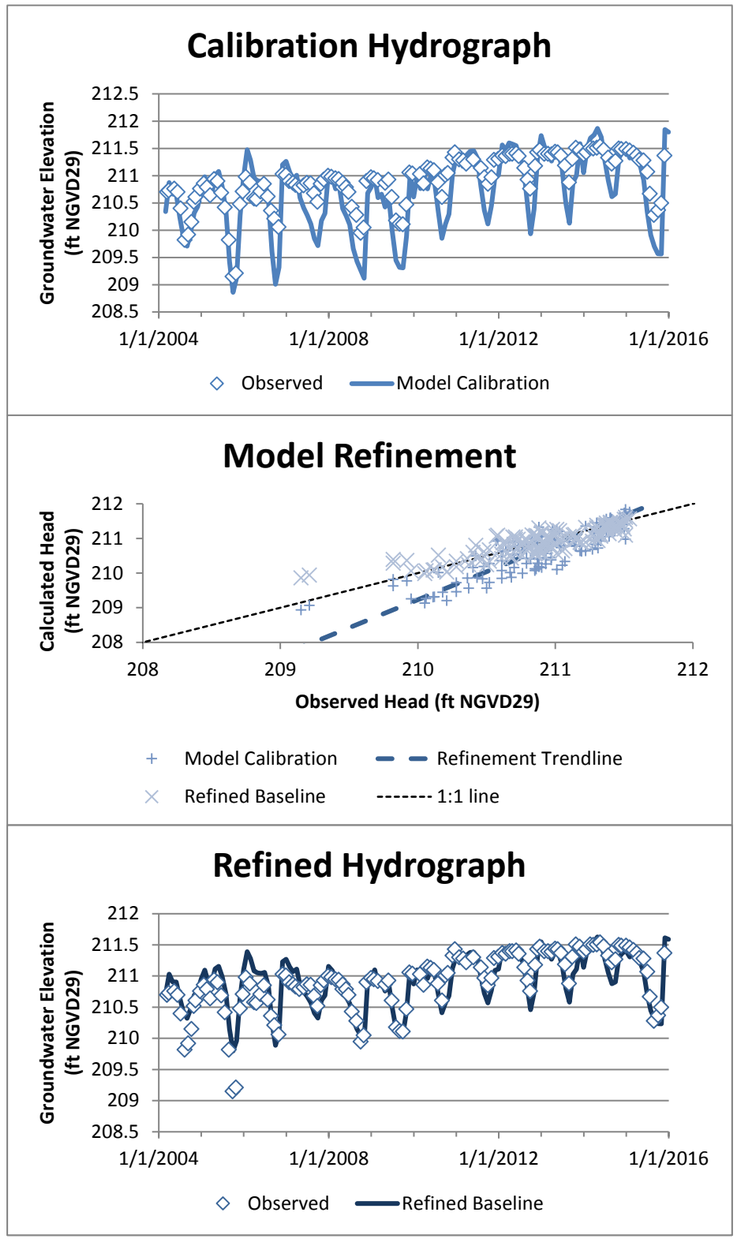
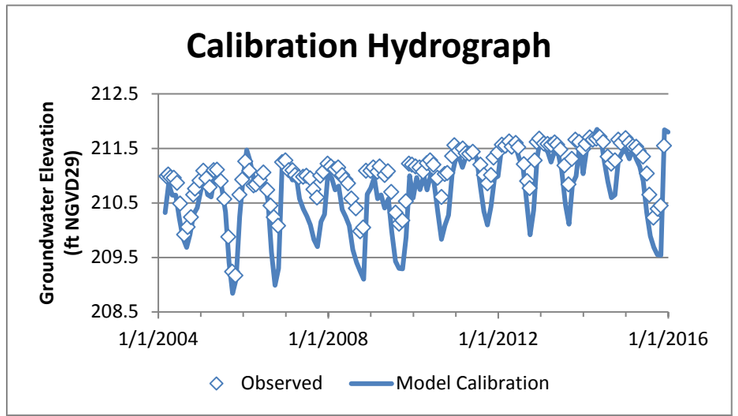
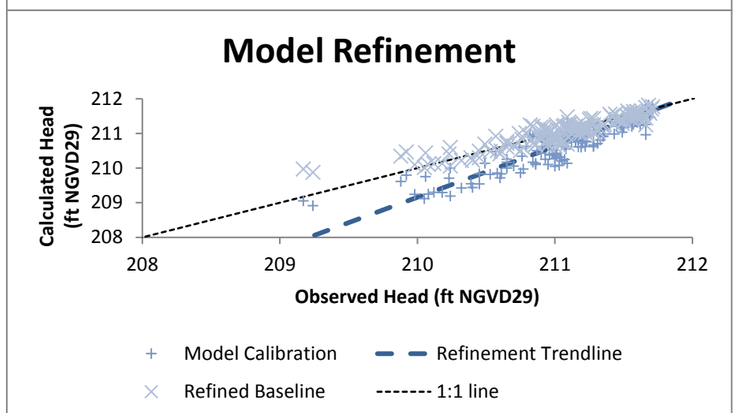
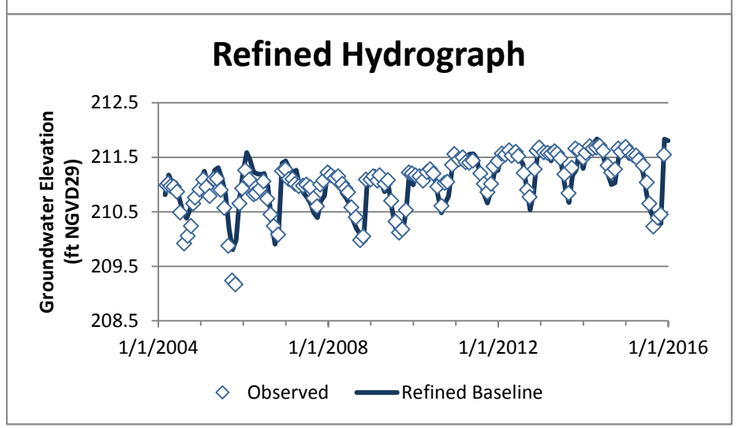


Figure 15
Calibration and Refined Hydrographs
Dupont Groundwater Model Report

MW-EM-2D







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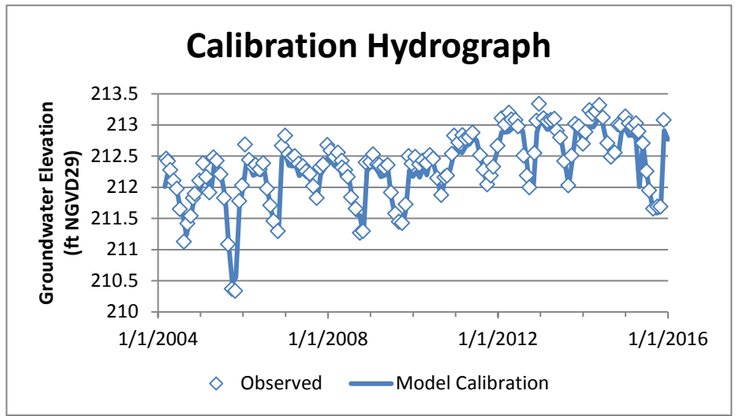

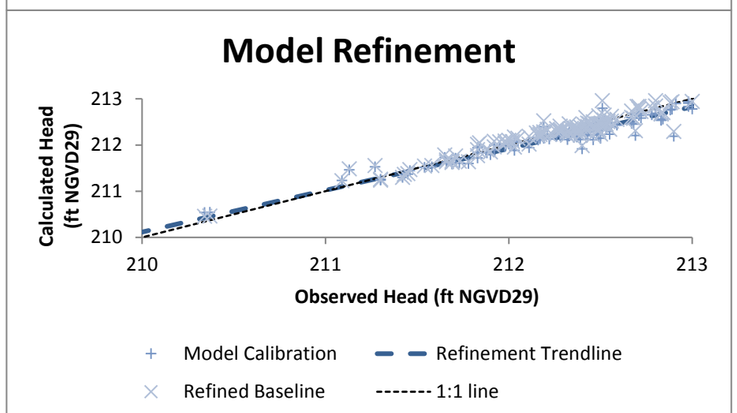

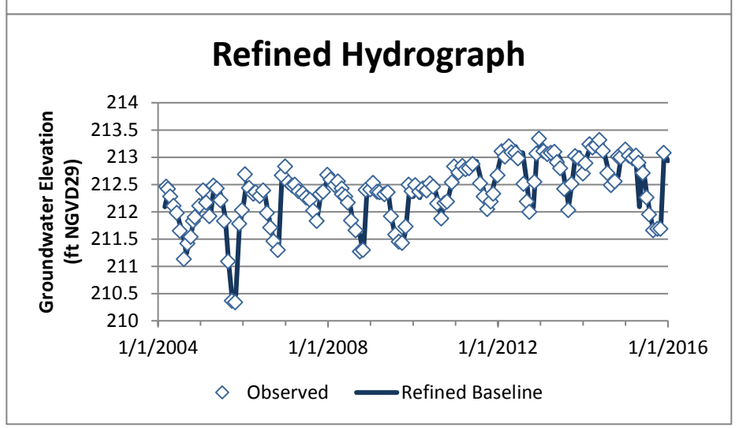

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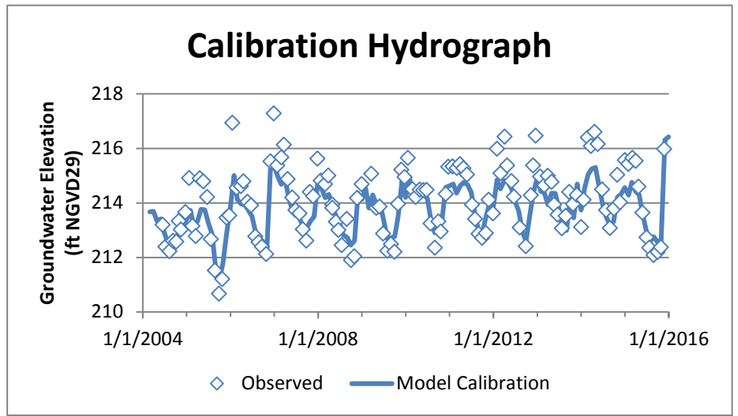

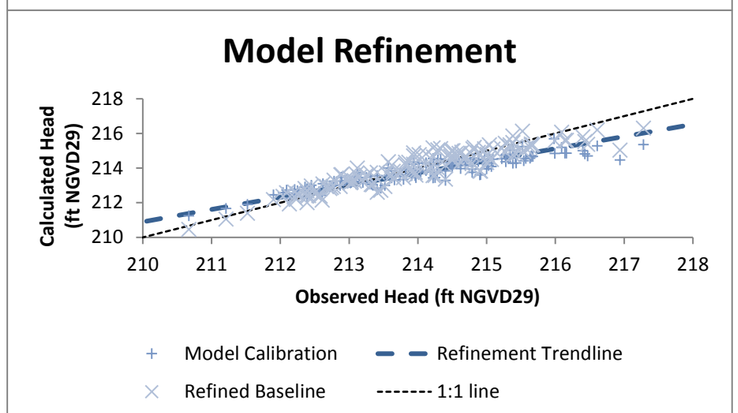

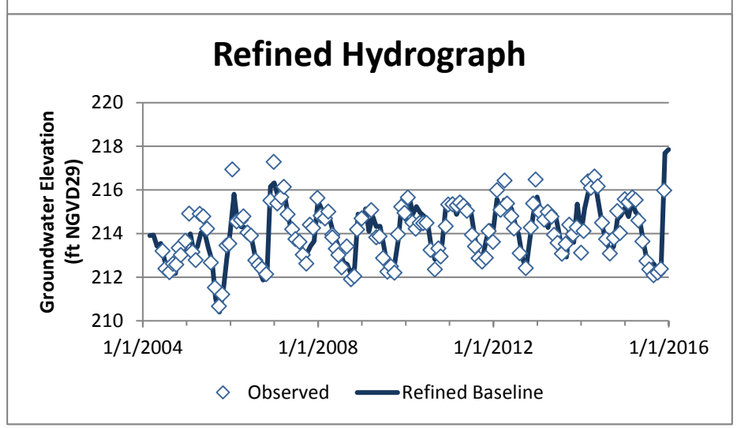

Figure 15
Calibration and Refined Hydrographs
Dupont Groundwater Model Report

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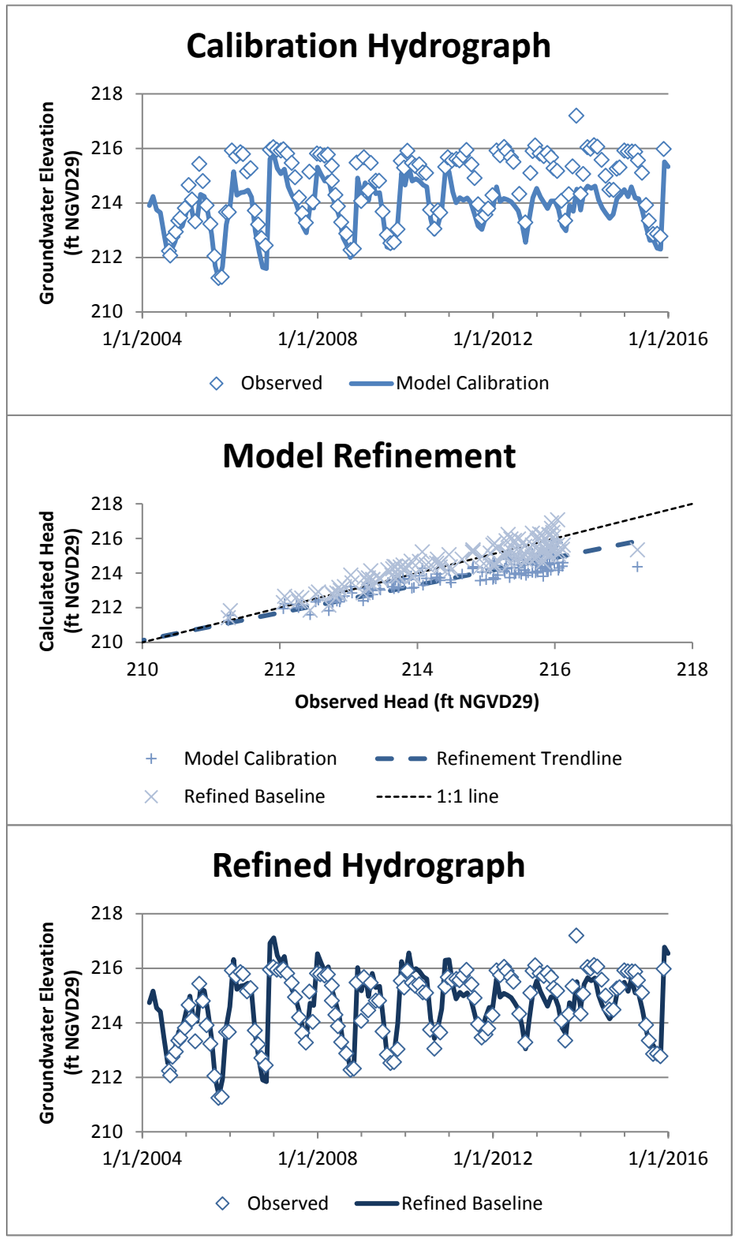

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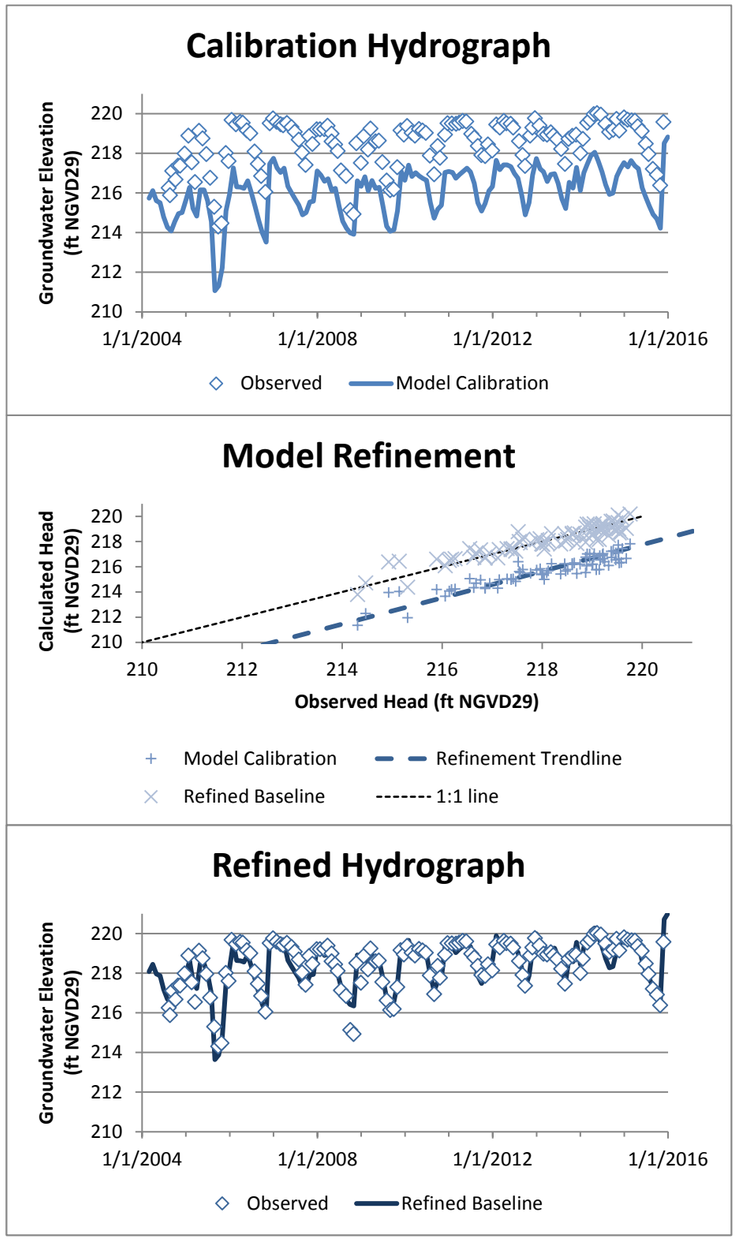

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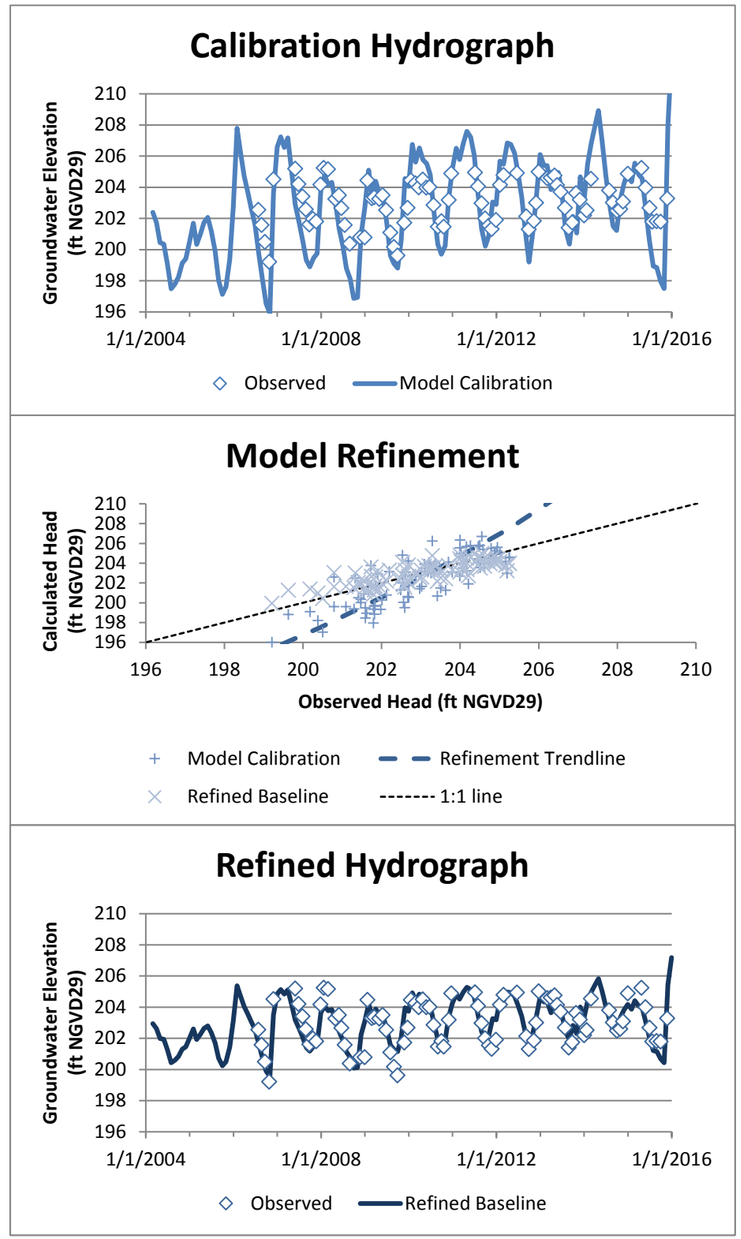
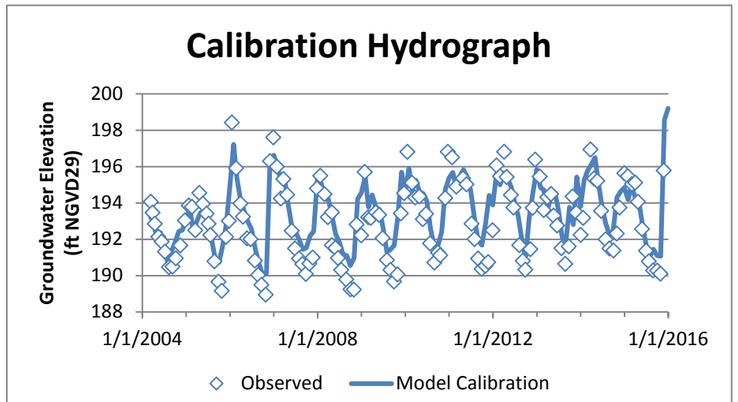
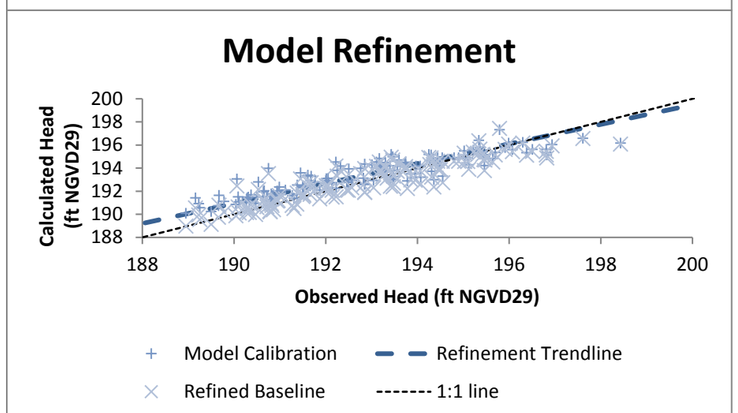
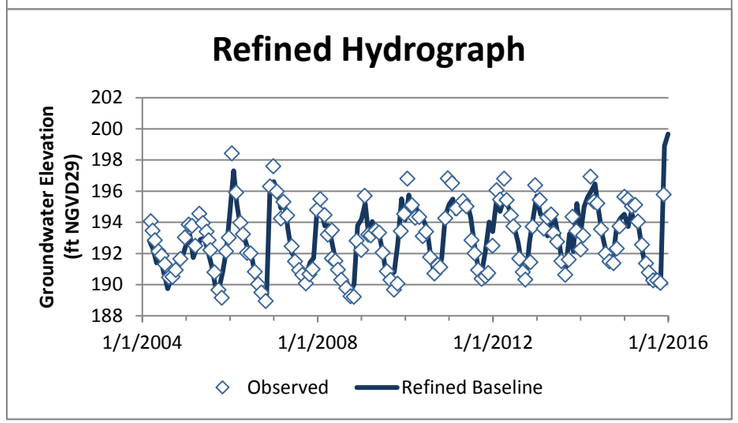


Figure 15
Calibration and Refined Hydrographs
Dupont Groundwater Model Report

CHMW-1







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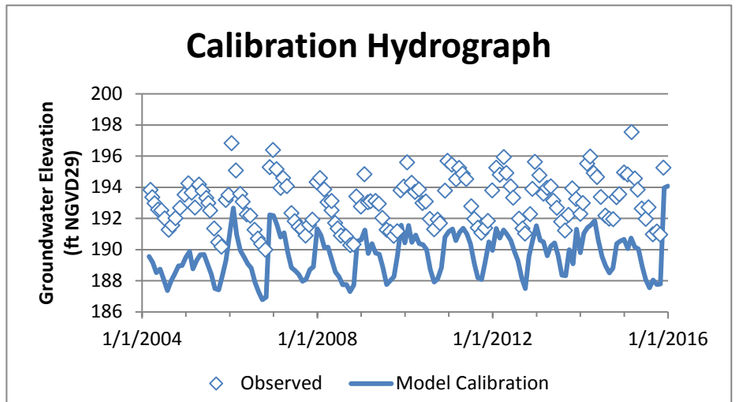

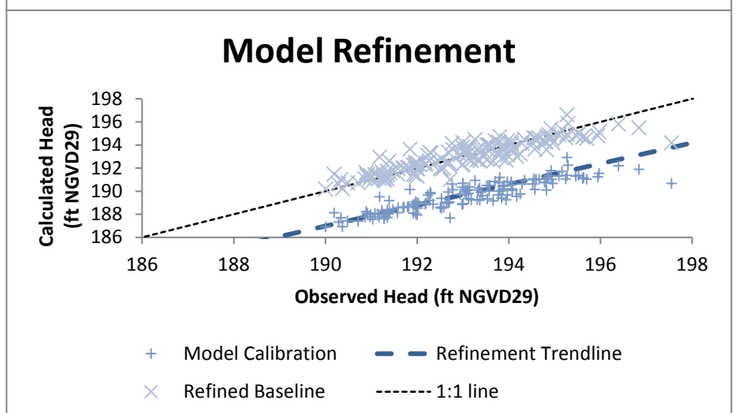

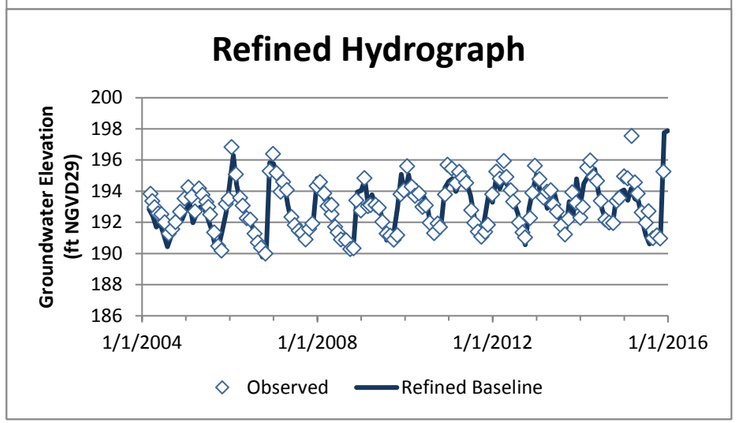

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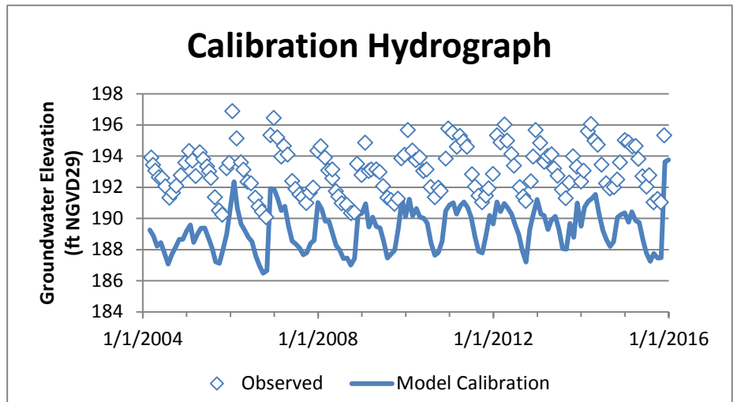

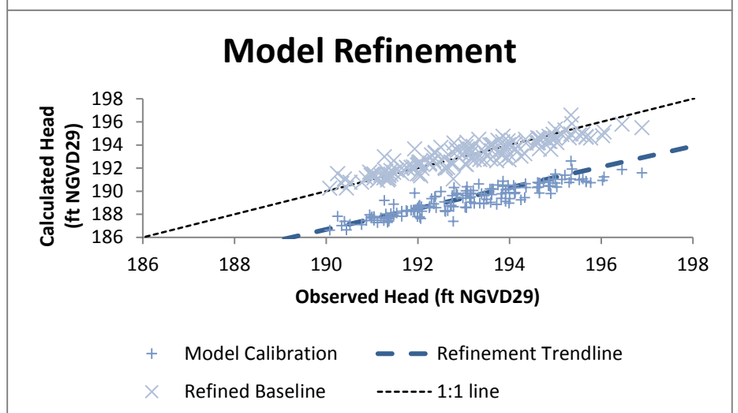

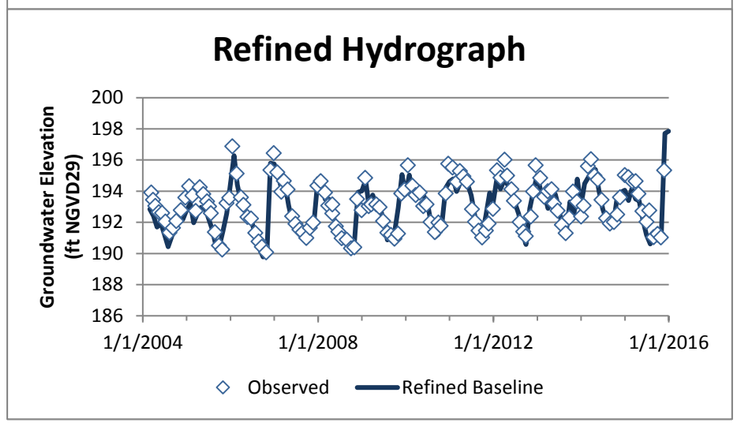

Figure 15
Calibration and Refined Hydrographs
Dupont Groundwater Model Report

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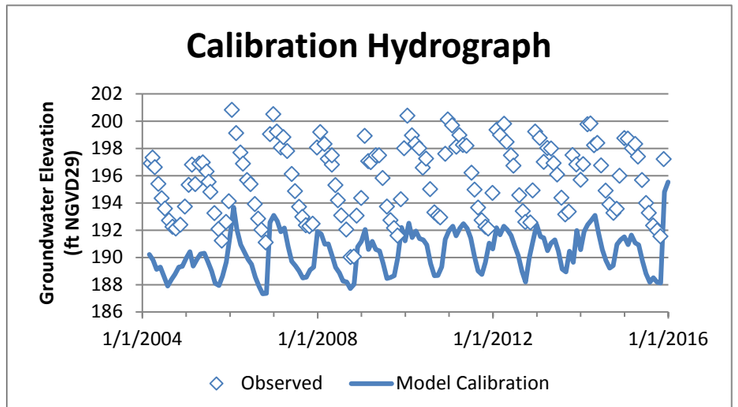

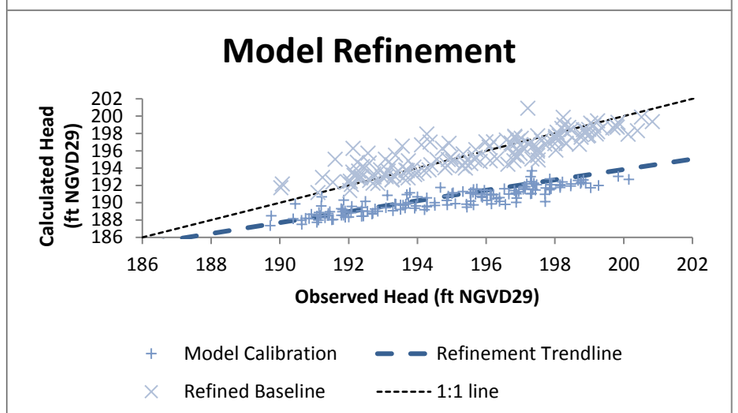

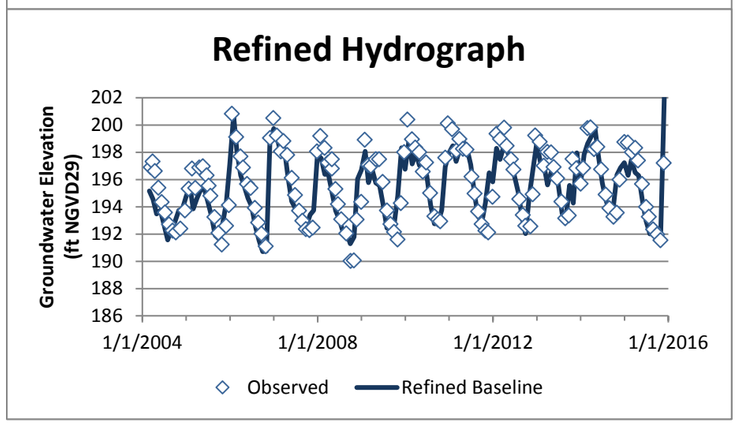

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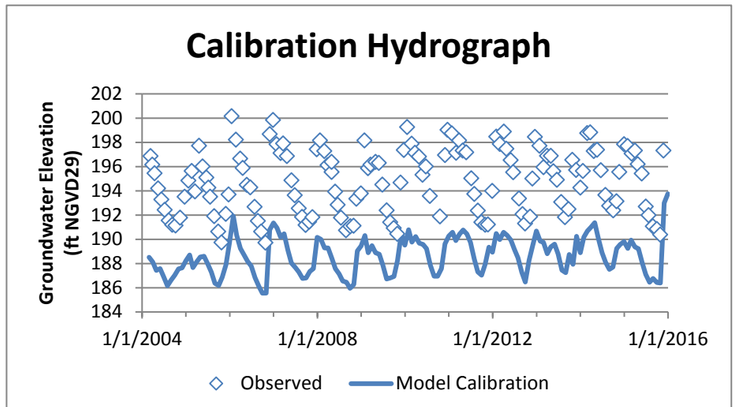

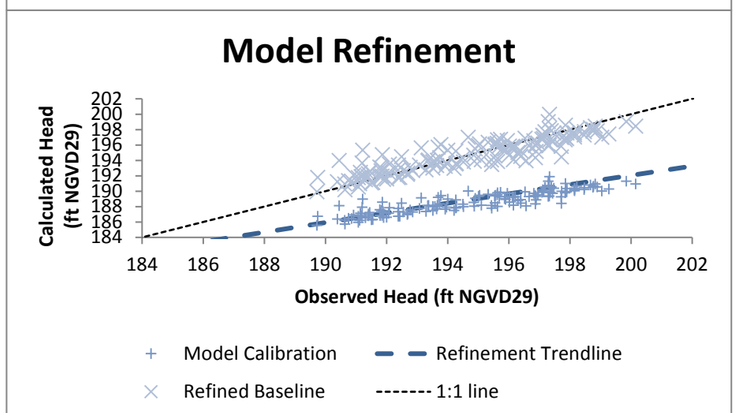

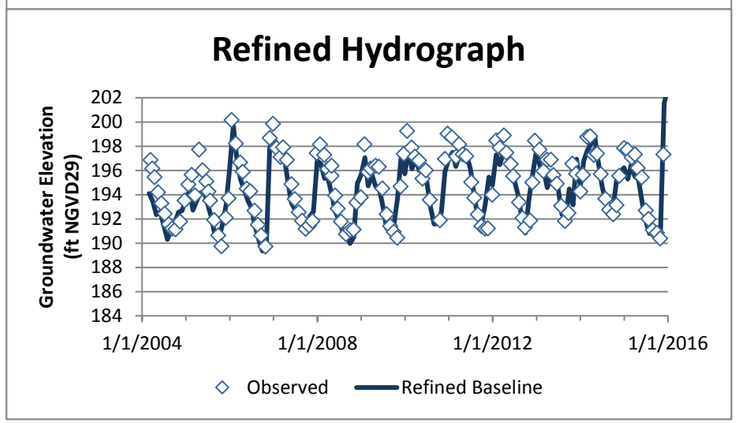

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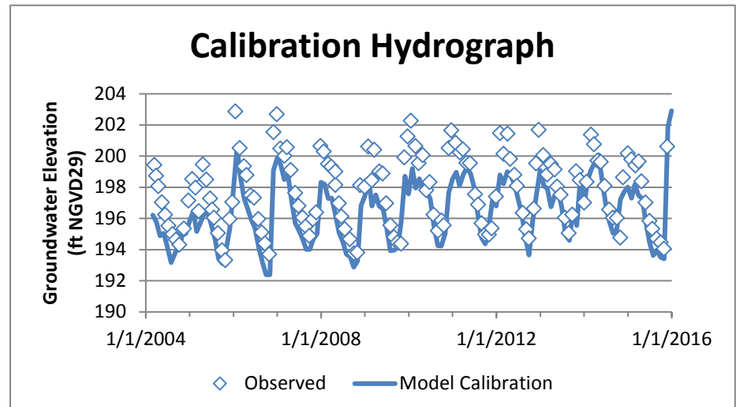
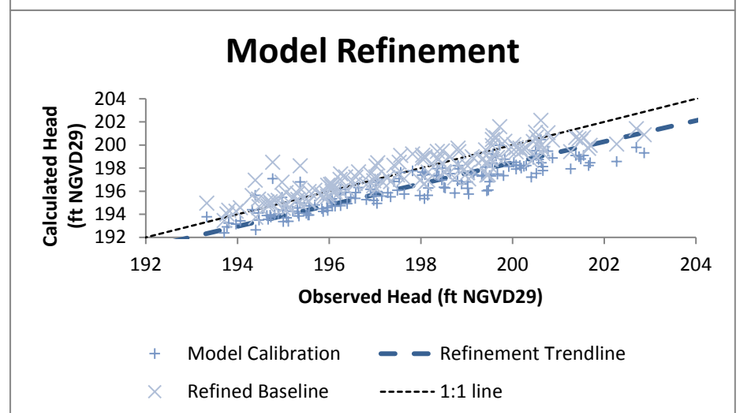




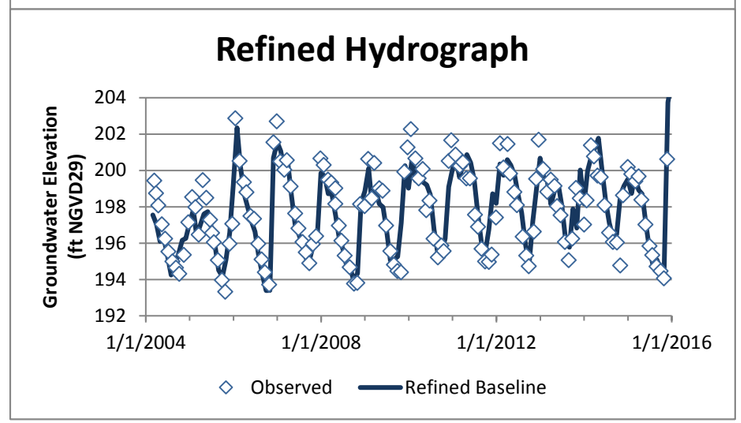
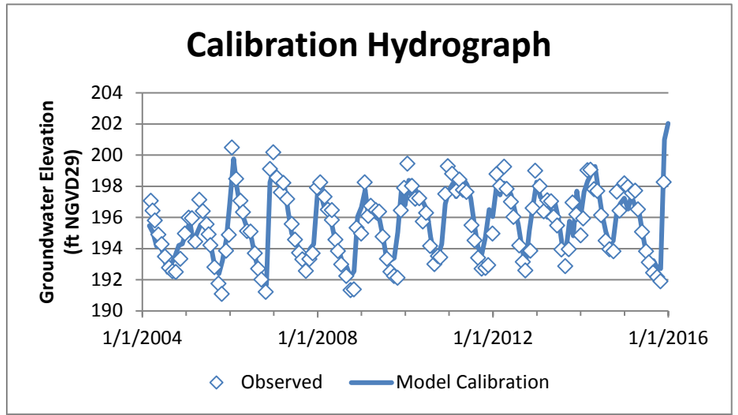
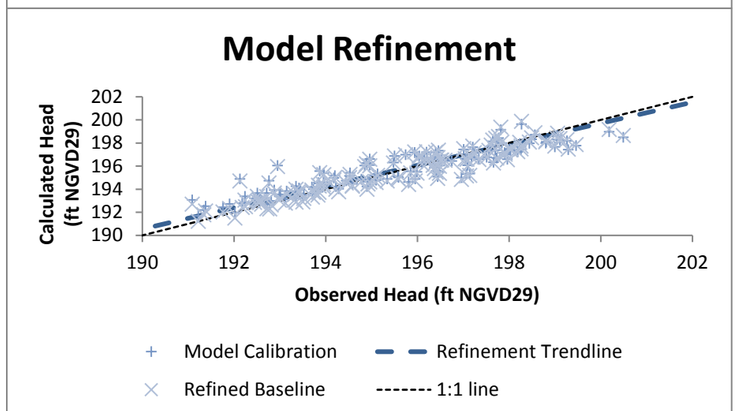
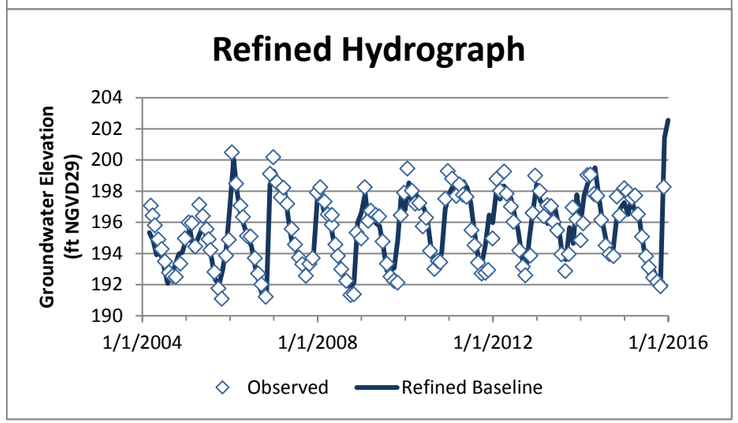


Figure 15
Calibration and Refined Hydrographs
Dupont Groundwater Model Report

CHMW-4D







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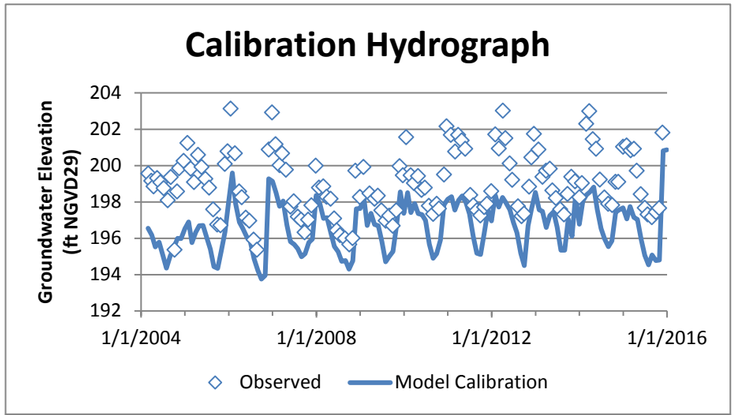

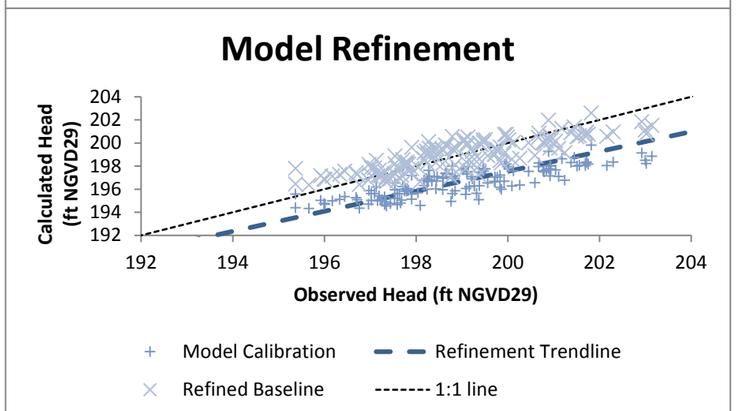

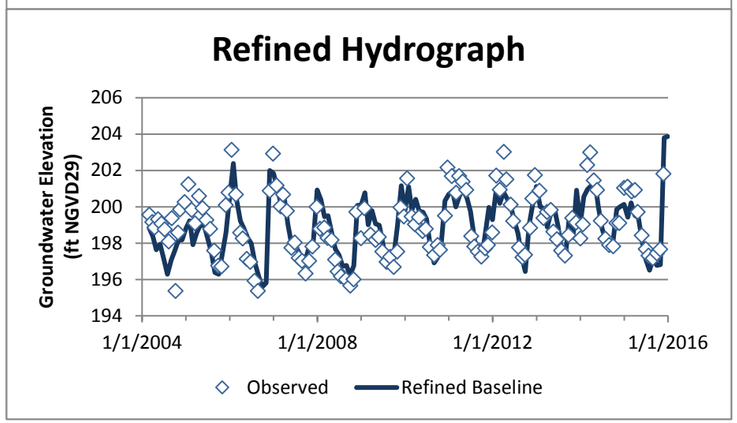

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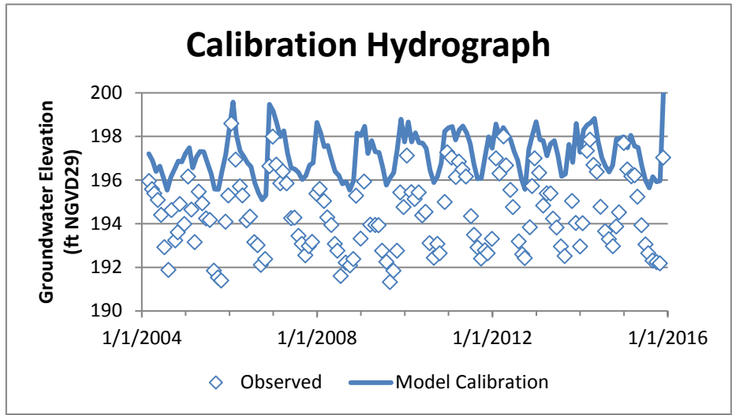
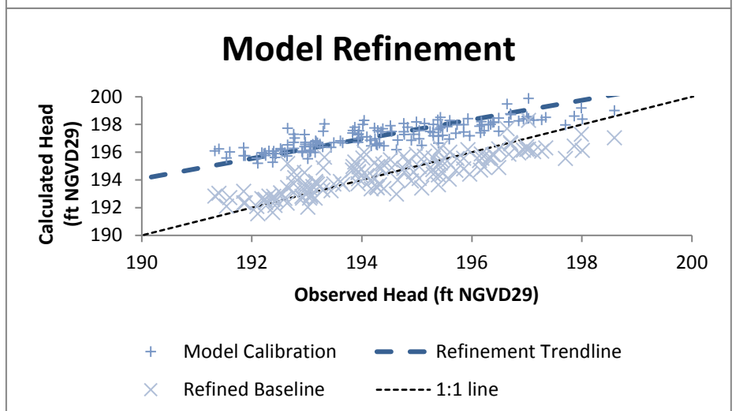




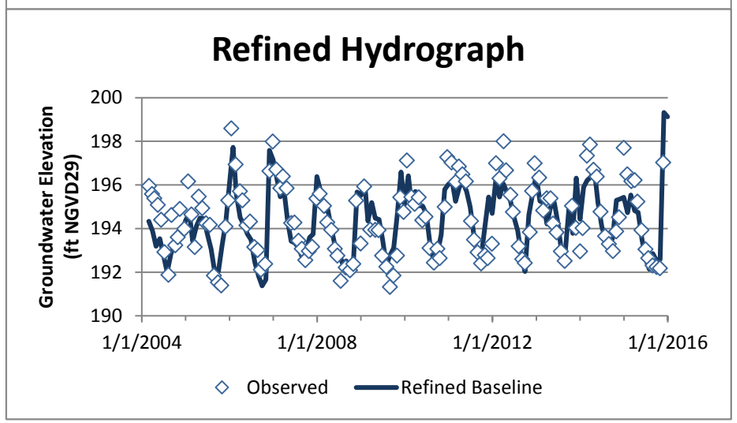
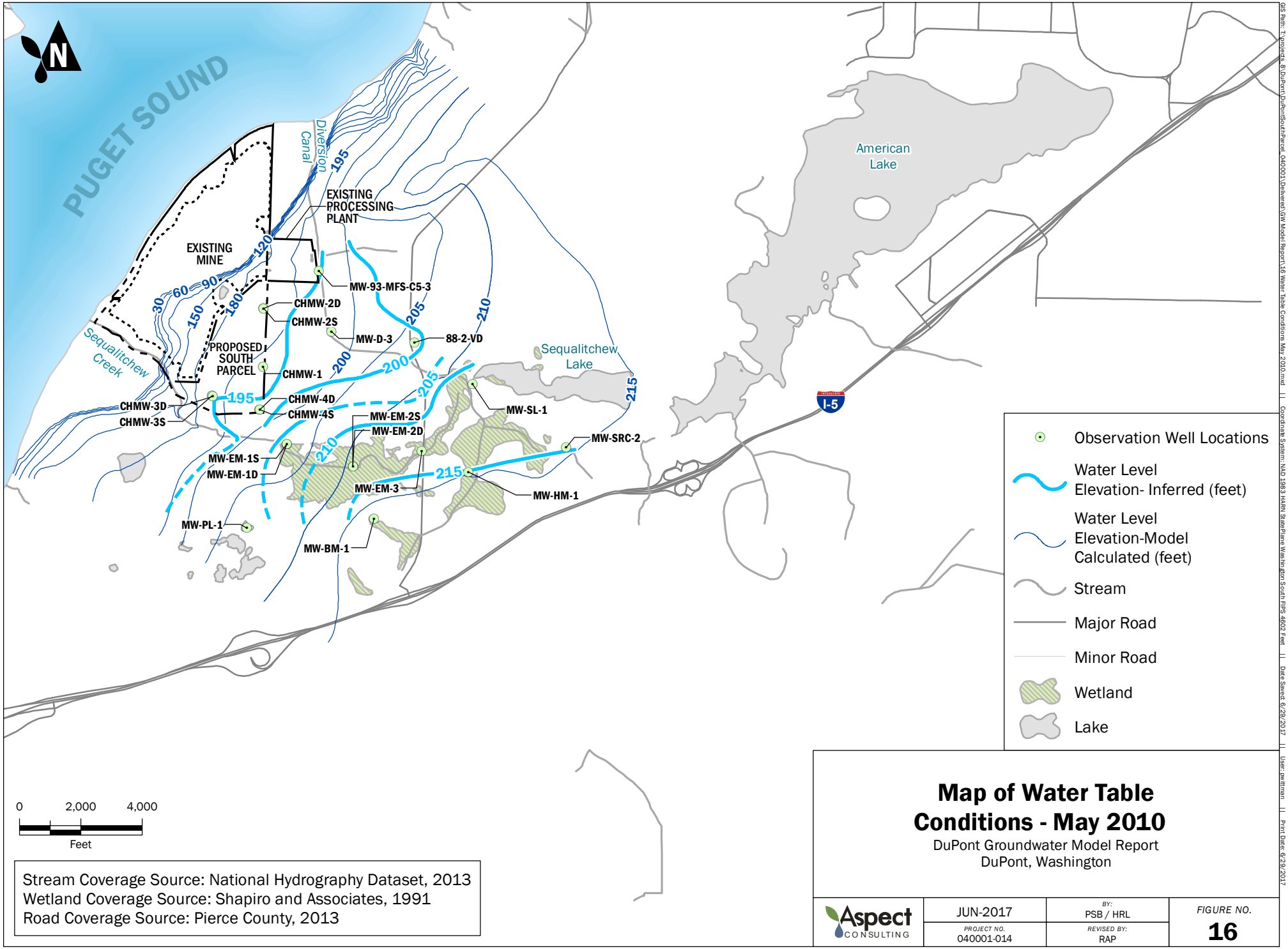


Figure 15
Calibration and Refined Hydrographs
Dupont Groundwater Model Report



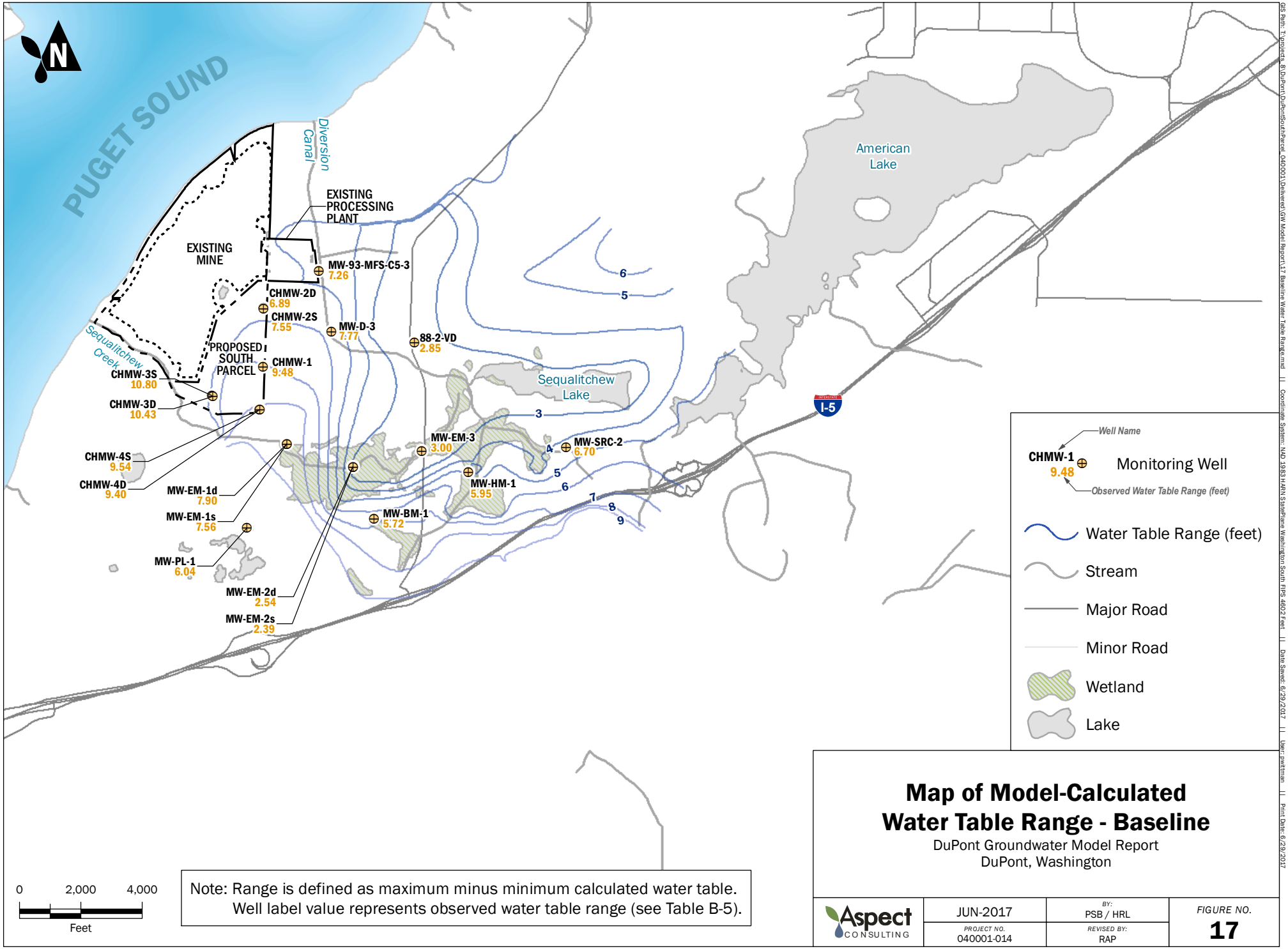
Stream Coverage Source: National Hydrography Dataset, 2013
Wetland Coverage Source: Shapiro and Associates, 1991
Road Coverage Source: Pierce County, 2013

Map of Water Table Conditions - May 2010

DuPont Groundwater Model Report
DuPont, Washington

Aspect CONSULTING	JUN-2017	BY: PSB / HRL	FIGURE NO. 16
	PROJECT NO. 040001-014	REVISED BY: RAP	

GIS Path: T:\projects_8\DuPont\DuPontSouthParcel_040001\Deliverest\GW Model Report\16 Water Table Conditions May 2010.mxd || Coordinate System: NAD 1983 HARN StatePlane Washington South FIPS 4602 Feet || Date Saved: 6/29/2017 || User: jwittman || Print Date: 6/29/2017



Note: Range is defined as maximum minus minimum calculated water table.
Well label value represents observed water table range (see Table B-5).

Map of Model-Calculated Water Table Range - Baseline

DuPont Groundwater Model Report
DuPont, Washington

Aspect CONSULTING	JUN-2017	BY: PSB / HRL	FIGURE NO. 17
	PROJECT NO. 040001-014	REVISED BY: RAP	

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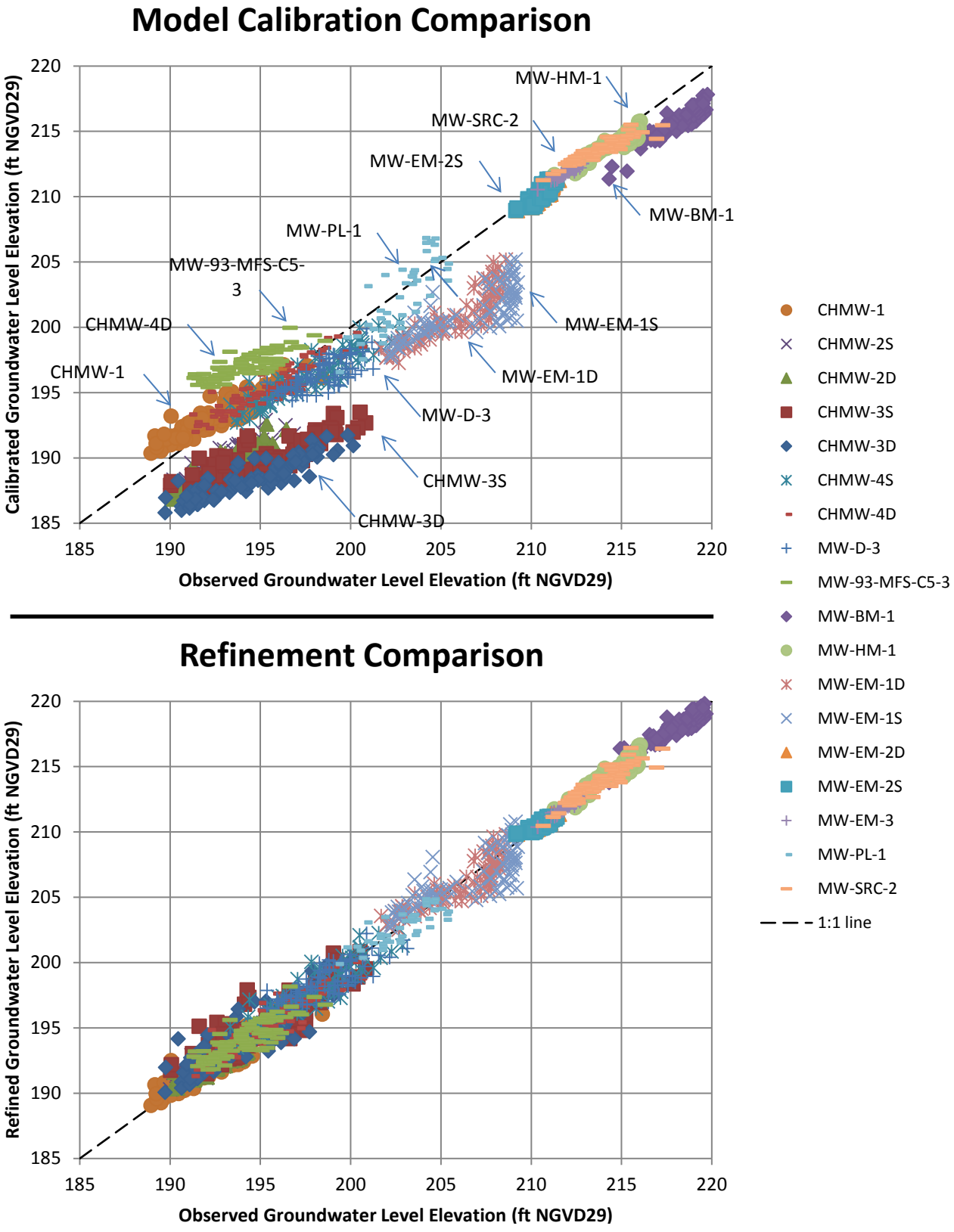
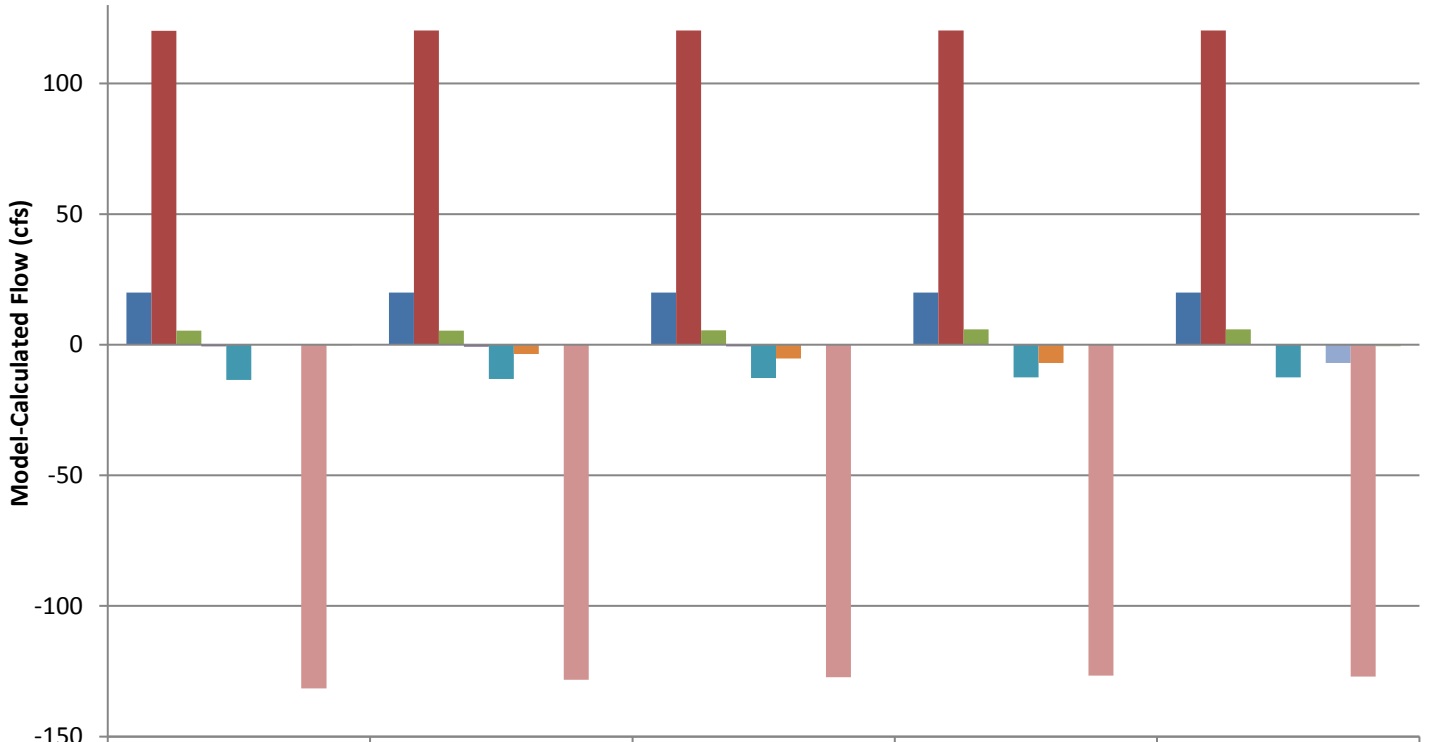


Figure 18
Observed vs. Calculated Groundwater Levels
Dupont Groundwater Model Report



	Baseline	Step 1	Step 2	Step 3	Step 4
Recharge	20.0	20.0	20.0	20.0	20.0
Groundwater Inflow	120.1	120.2	120.3	120.3	120.3
Wetland Infiltration	5.3	5.4	5.5	5.9	5.8
Discharge - Seq Ck	-0.6	-0.7	-0.6	-0.1	-0.1
Discharge - Other Surface Water	-13.5	-13.1	-12.8	-12.5	-12.6
Discharge - Well	0.0	-3.6	-5.2	-6.9	0.0
Discharge - Mine	0.0	0.0	0.0	0.0	-6.9
Groundwater Outflow	-131.5	-128.2	-127.2	-126.7	-127.1
Change in Storage	-0.2	-0.1	0.0	-0.1	-0.6

Figure 19
Average Groundwater Balance Comparison - Overall
DuPont Groundwater Model Report

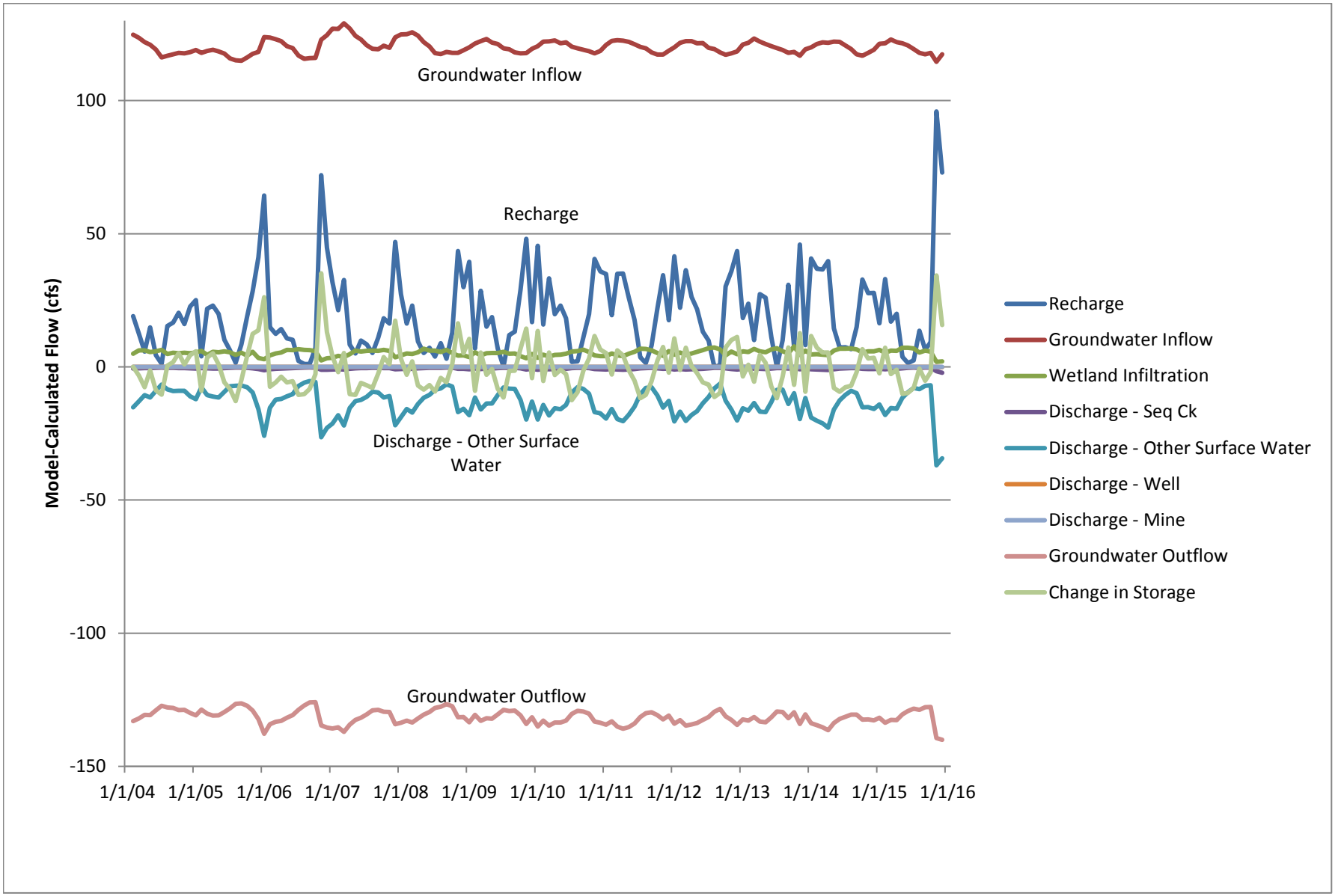
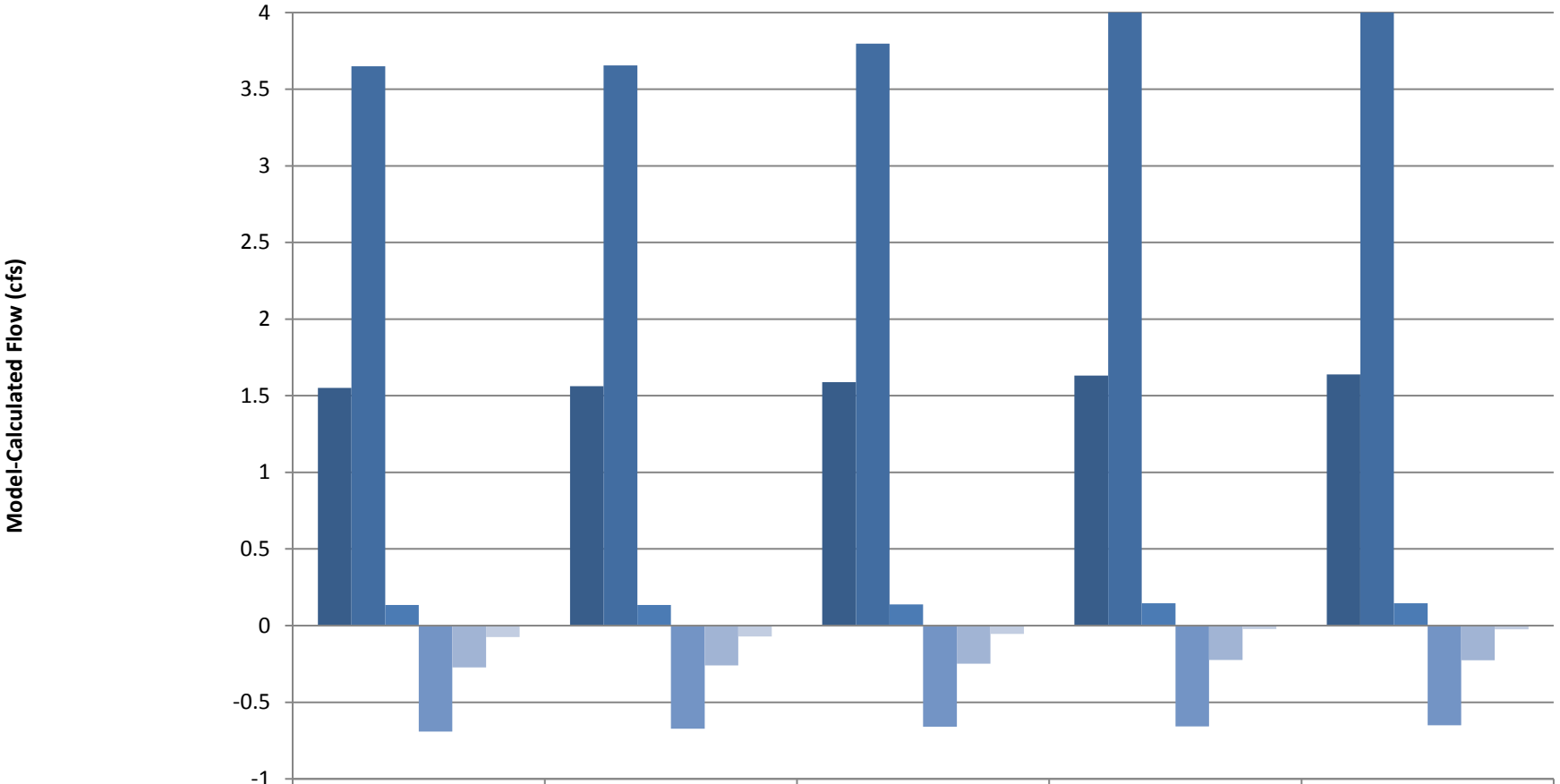


Figure 20
Baseline Groundwater Balance Over Time - Overall
DuPont Groundwater Model Report



	Baseline	Step 1	Step 2	Step 3	Step 4
Infiltration from BHM	1.6	1.6	1.6	1.6	1.6
Infiltration from East EM	3.6	3.7	3.8	4.1	4.0
Infiltration from West EM	0.1	0.1	0.1	0.1	0.1
Discharge to BHM	-0.7	-0.7	-0.7	-0.7	-0.6
Discharge to East EM	-0.3	-0.3	-0.2	-0.2	-0.2
Discharge to West EM	-0.1	-0.1	-0.1	0.0	0.0

Figure 21
Average Groundwater Balance Comparison - Wetlands
DuPont Groundwater Model Report

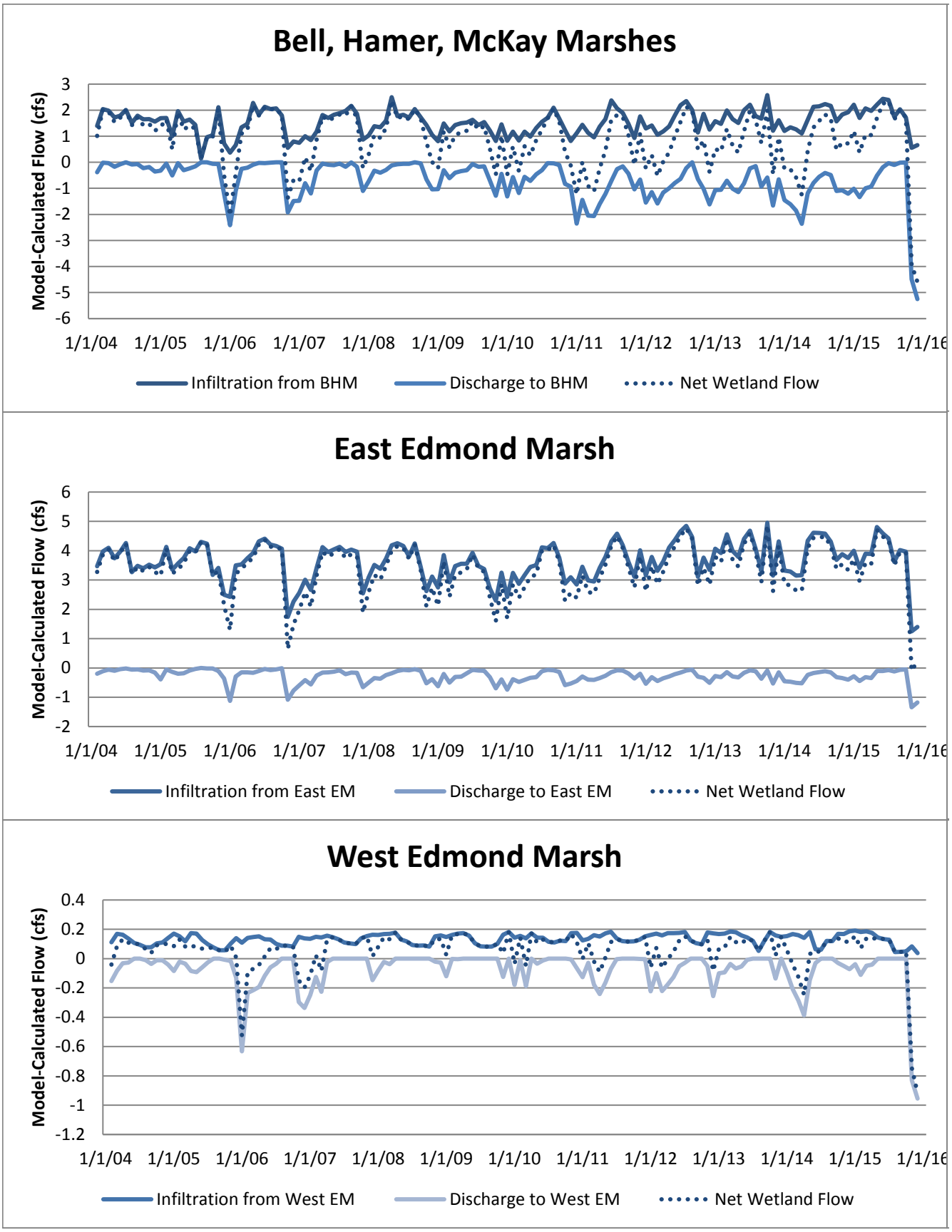
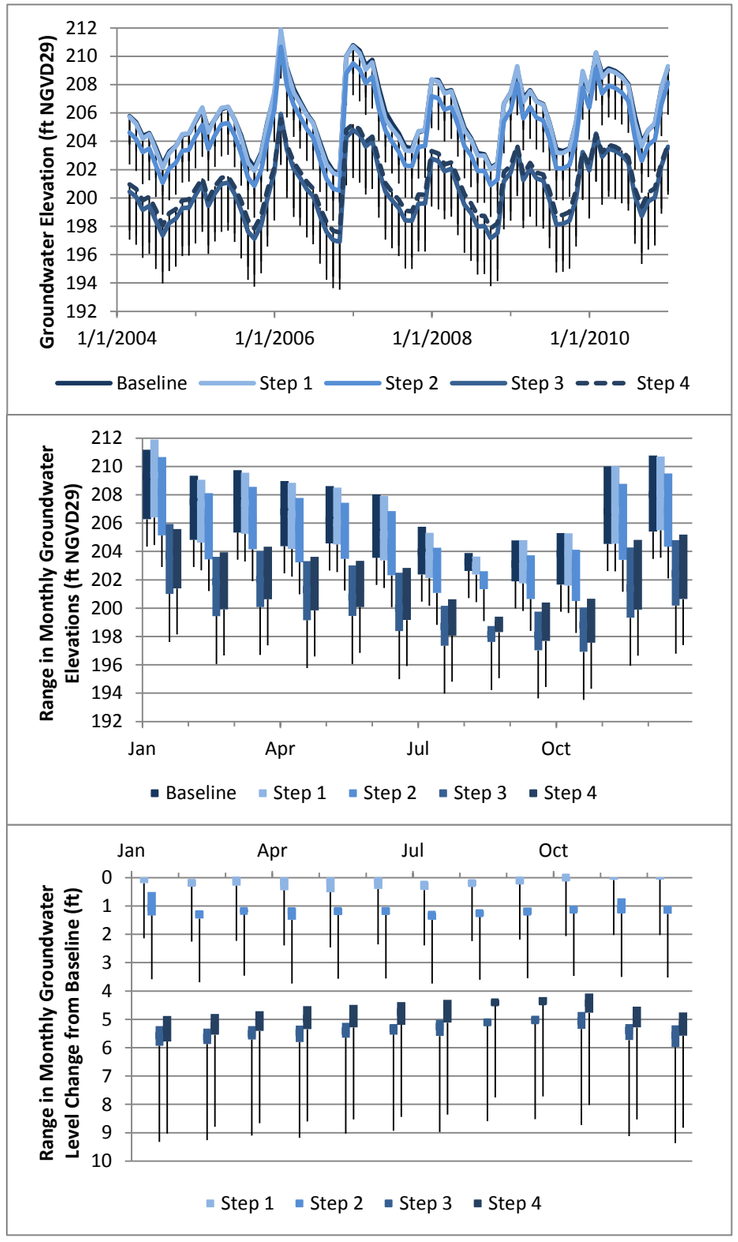


Figure 22
Baseline Groundwater Balance Over Time - Wetlands

MW-EM-1S



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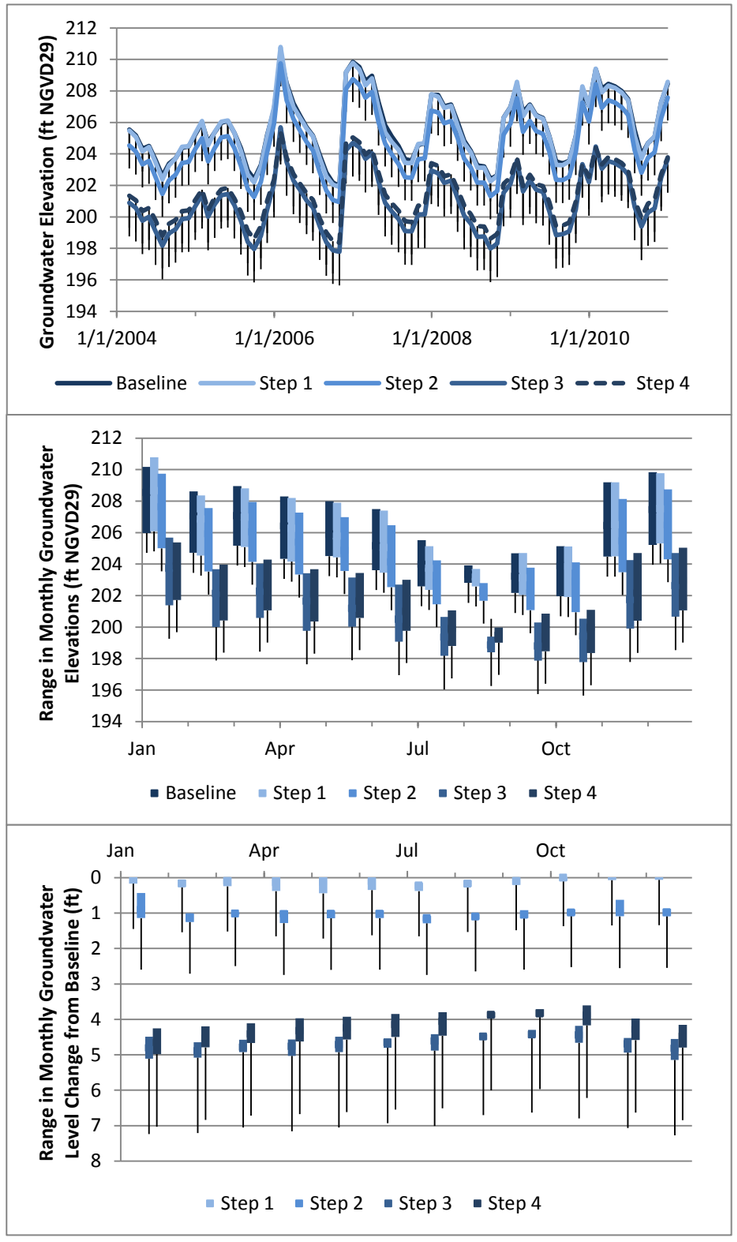

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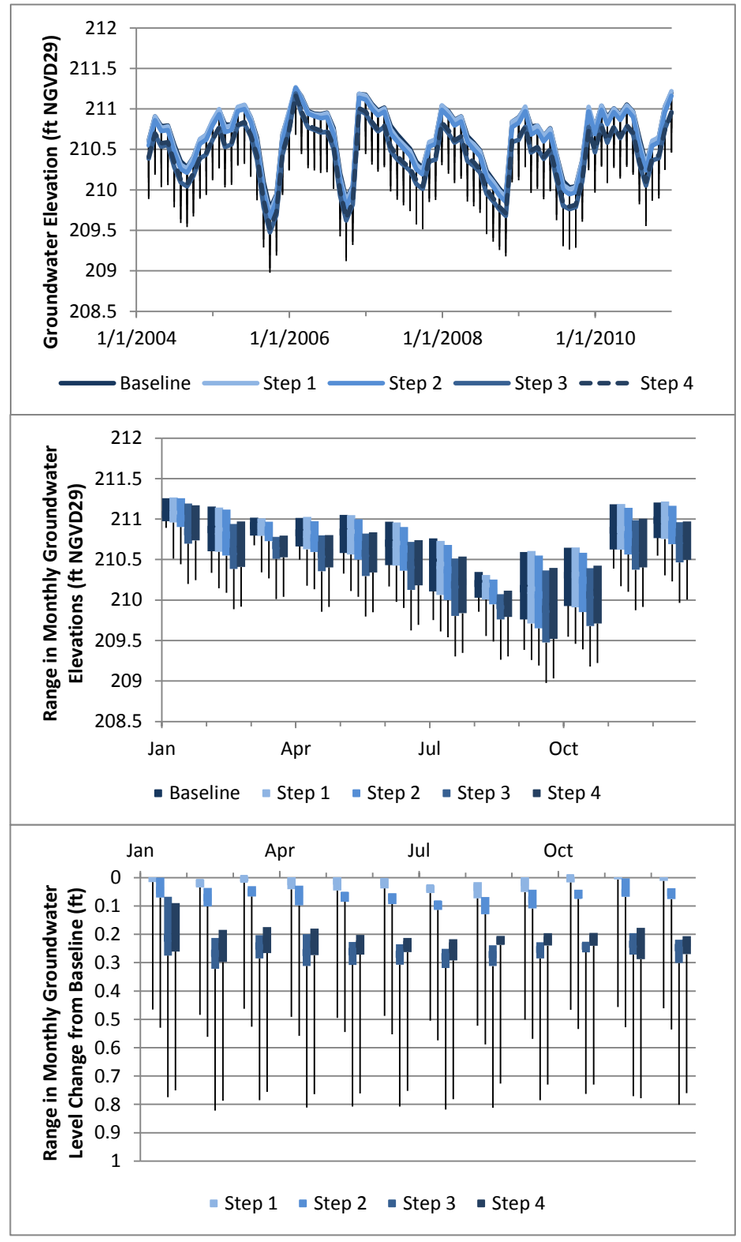

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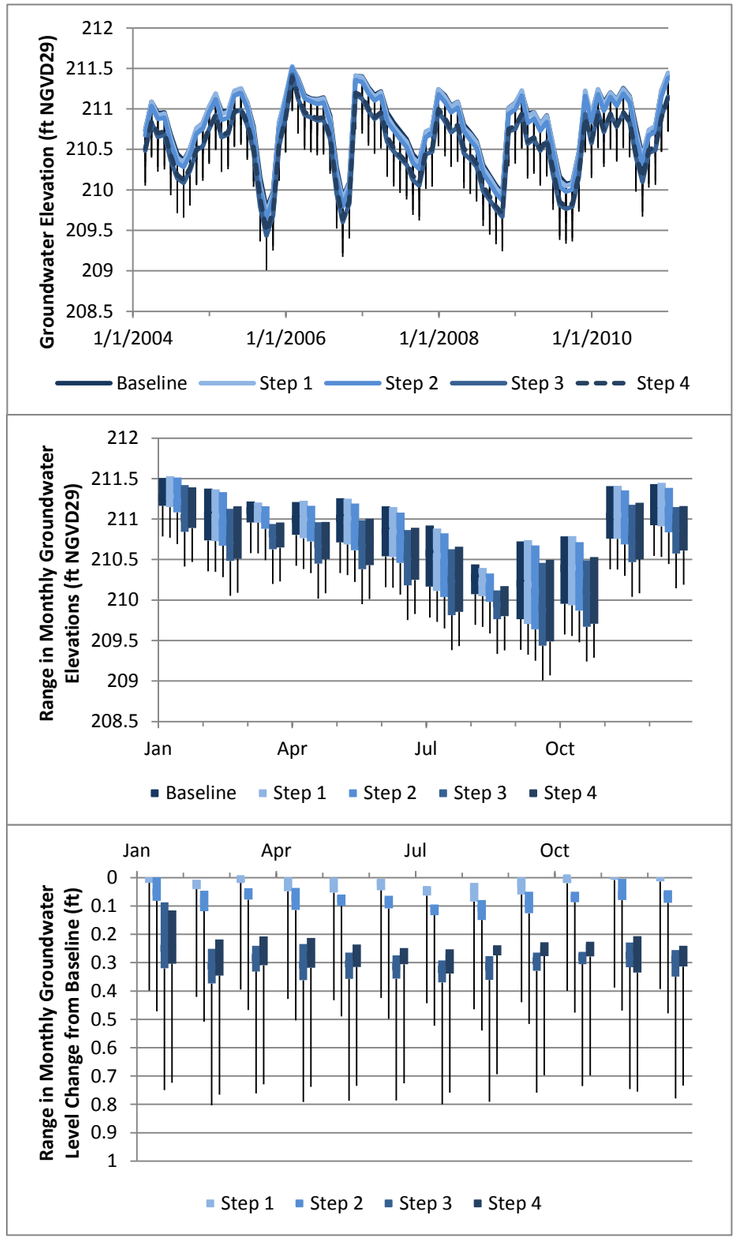
Figure 23
Predicted Changes and Ranges in Groundwater Levels
Dupont Groundwater Model Report

MW-EM-2D



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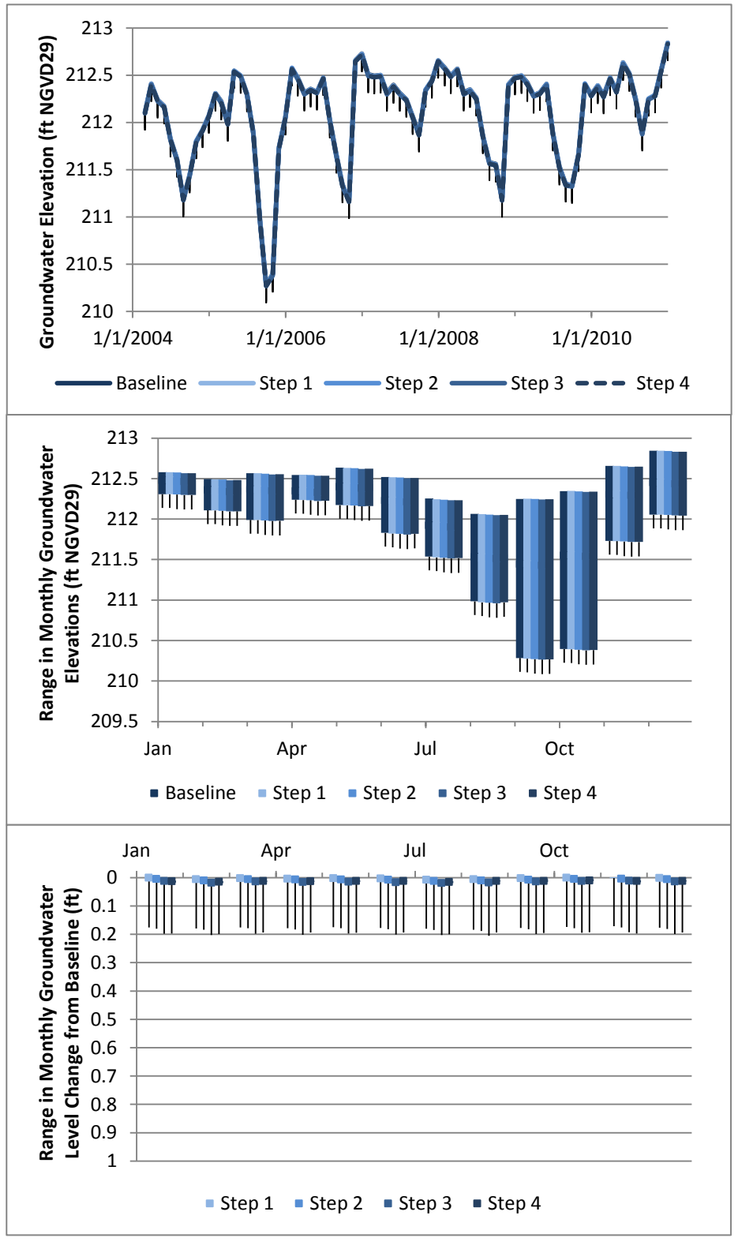

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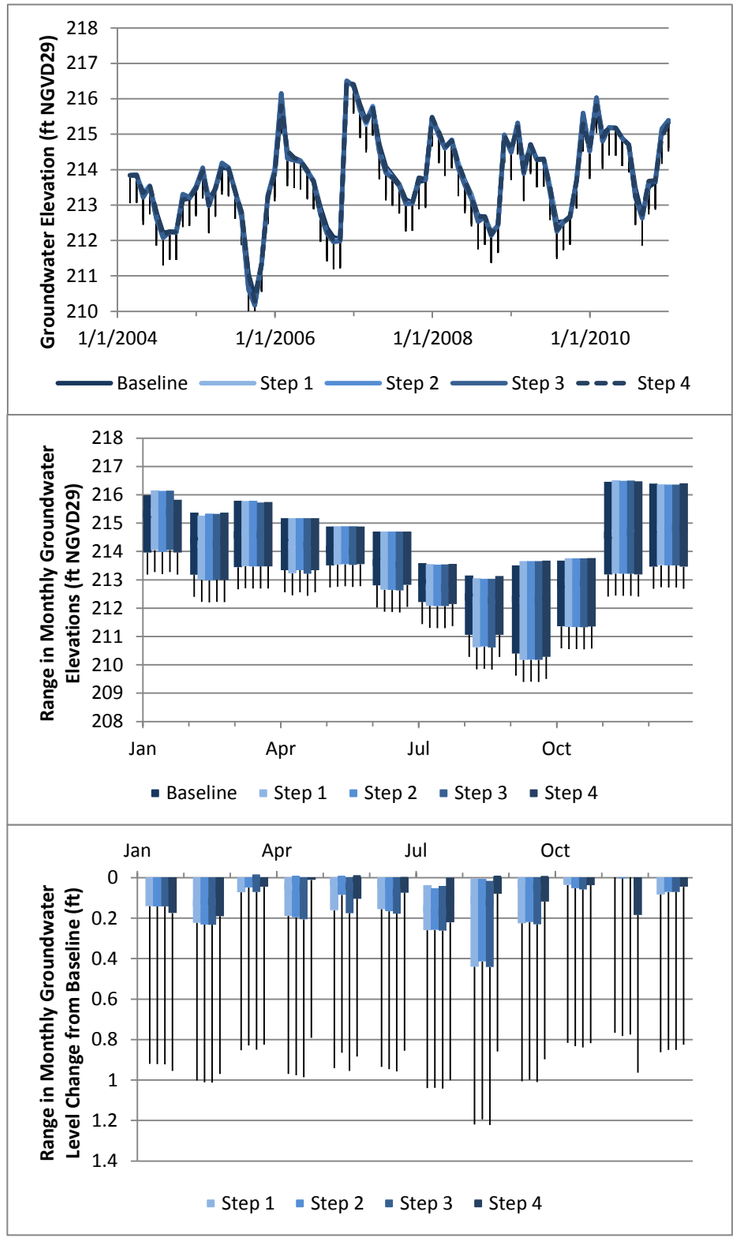

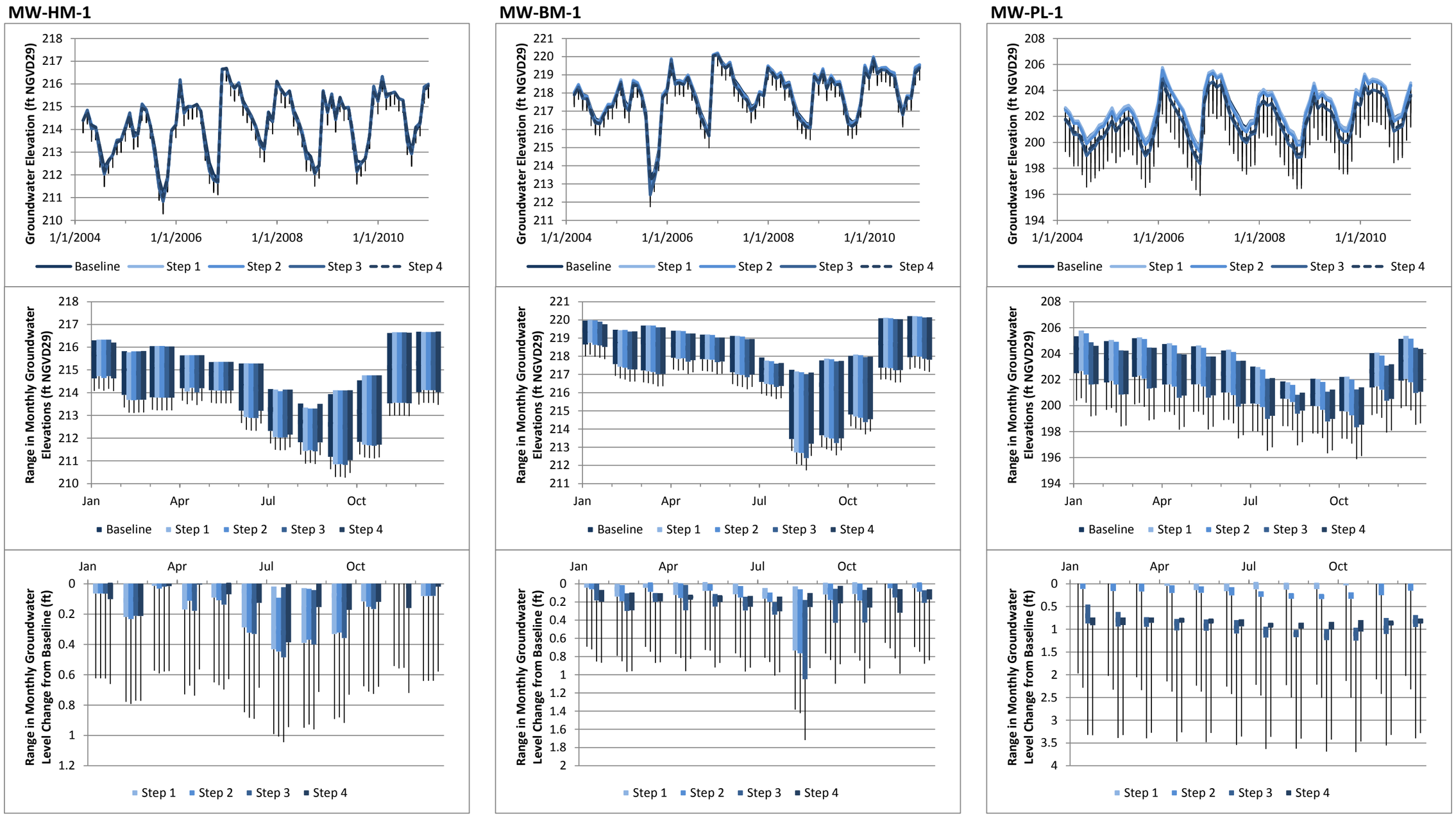

Figure 23
Predicted Changes and Ranges in Groundwater Levels
Dupont Groundwater Model Report

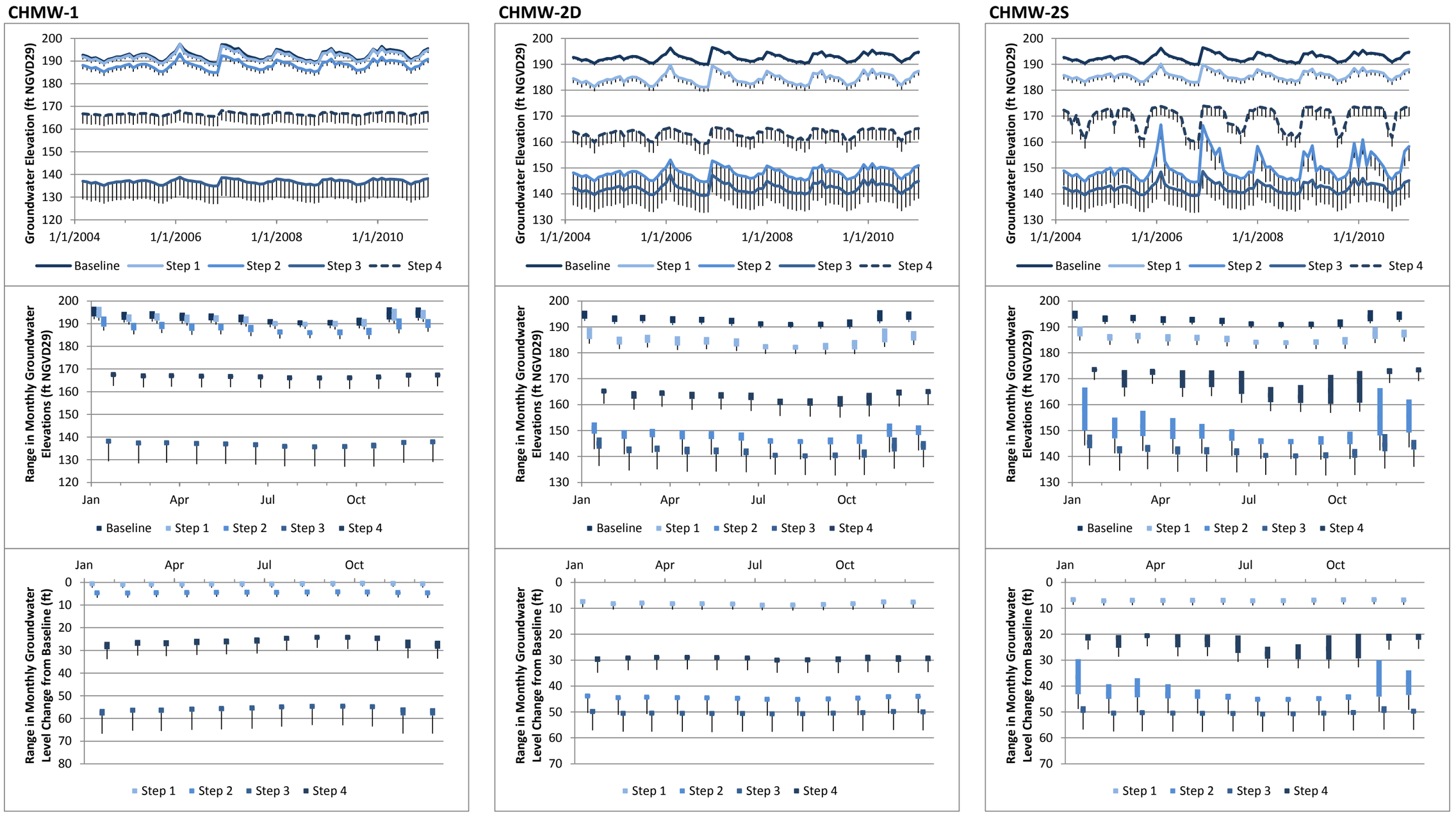

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Figure 23
Predicted Changes and Ranges in Groundwater Levels
Dupont Groundwater Model Report

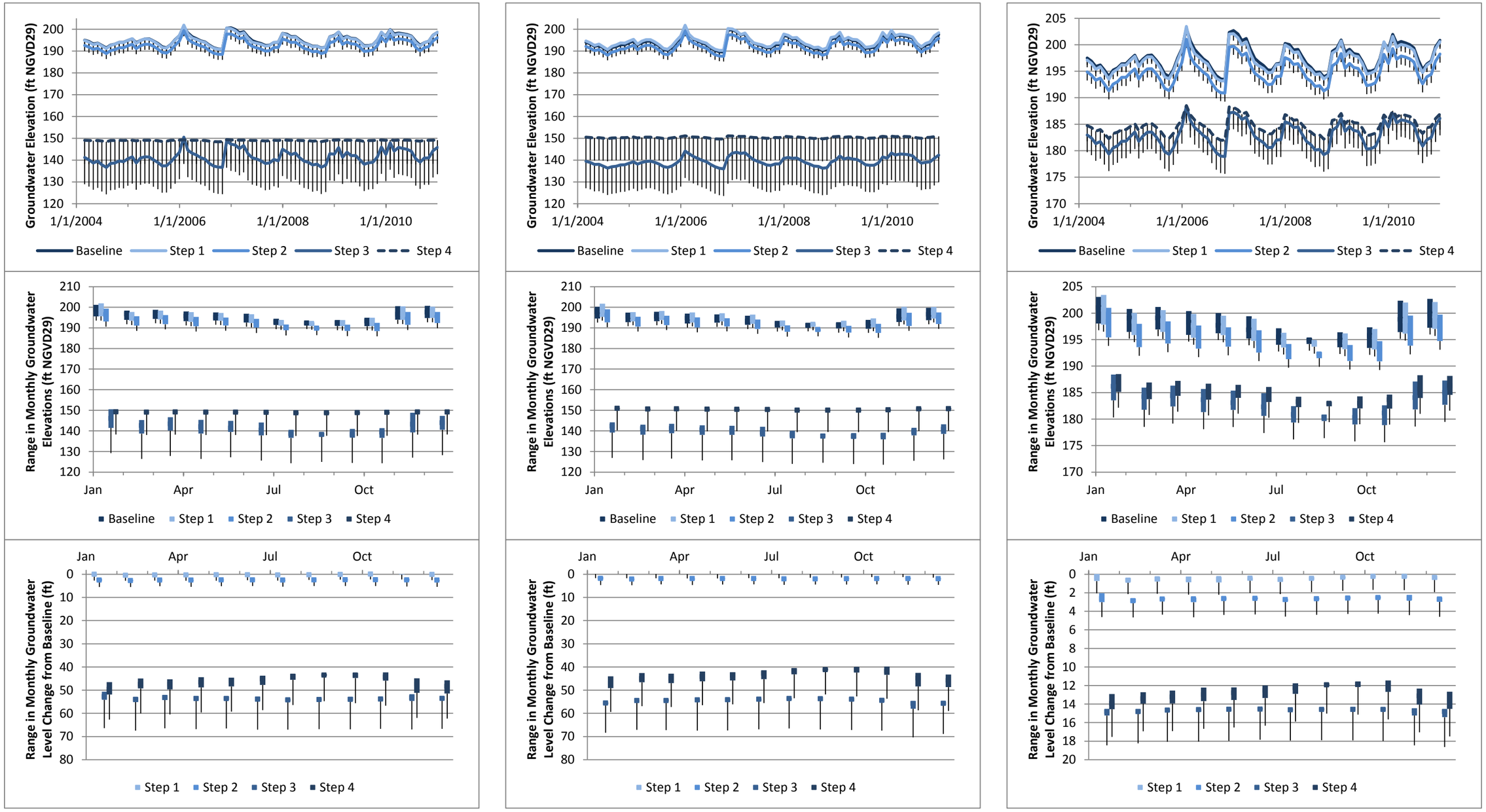

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Figure 23
Predicted Changes and Ranges in Groundwater Levels
Dupont Groundwater Model Report

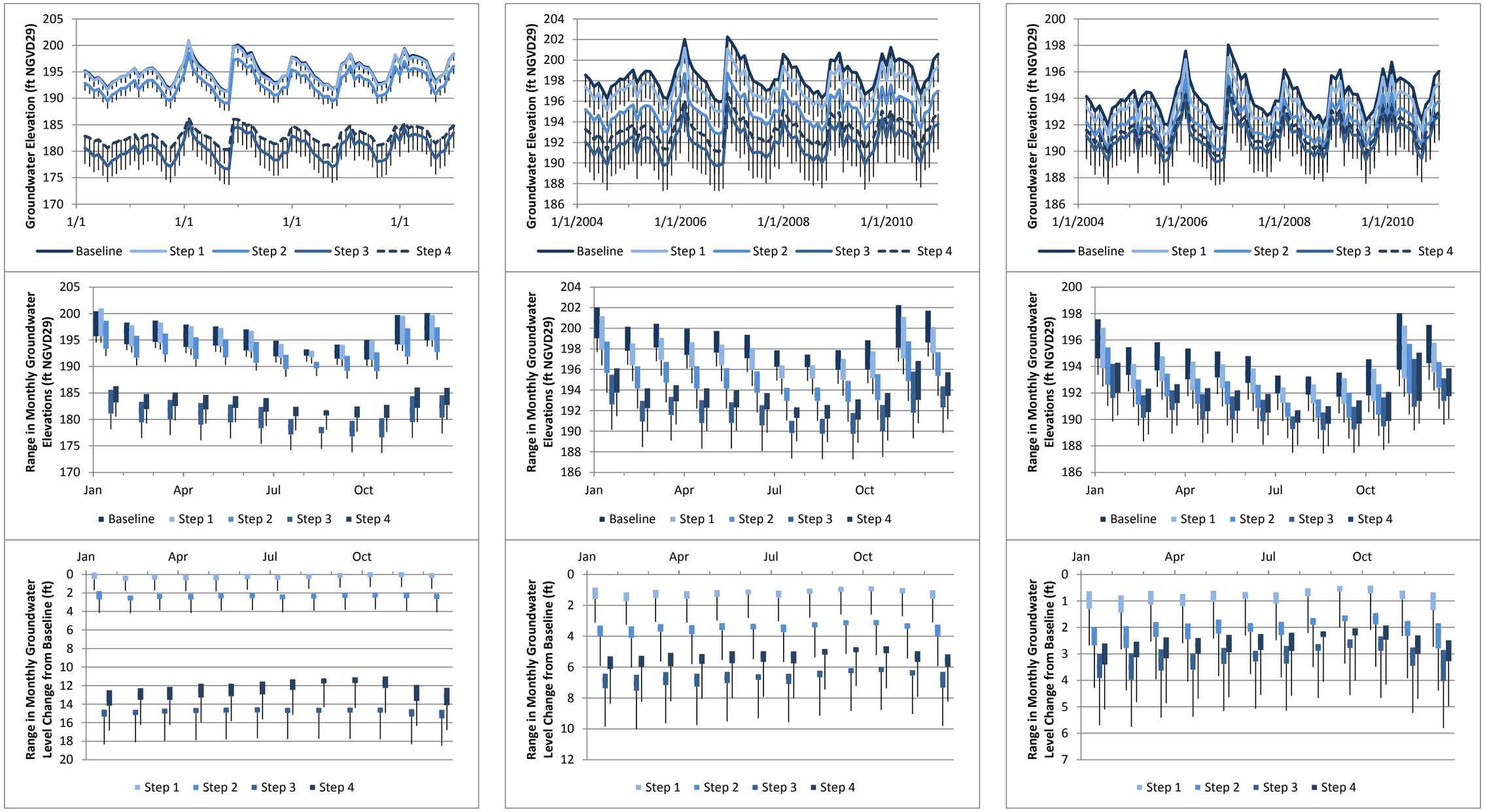

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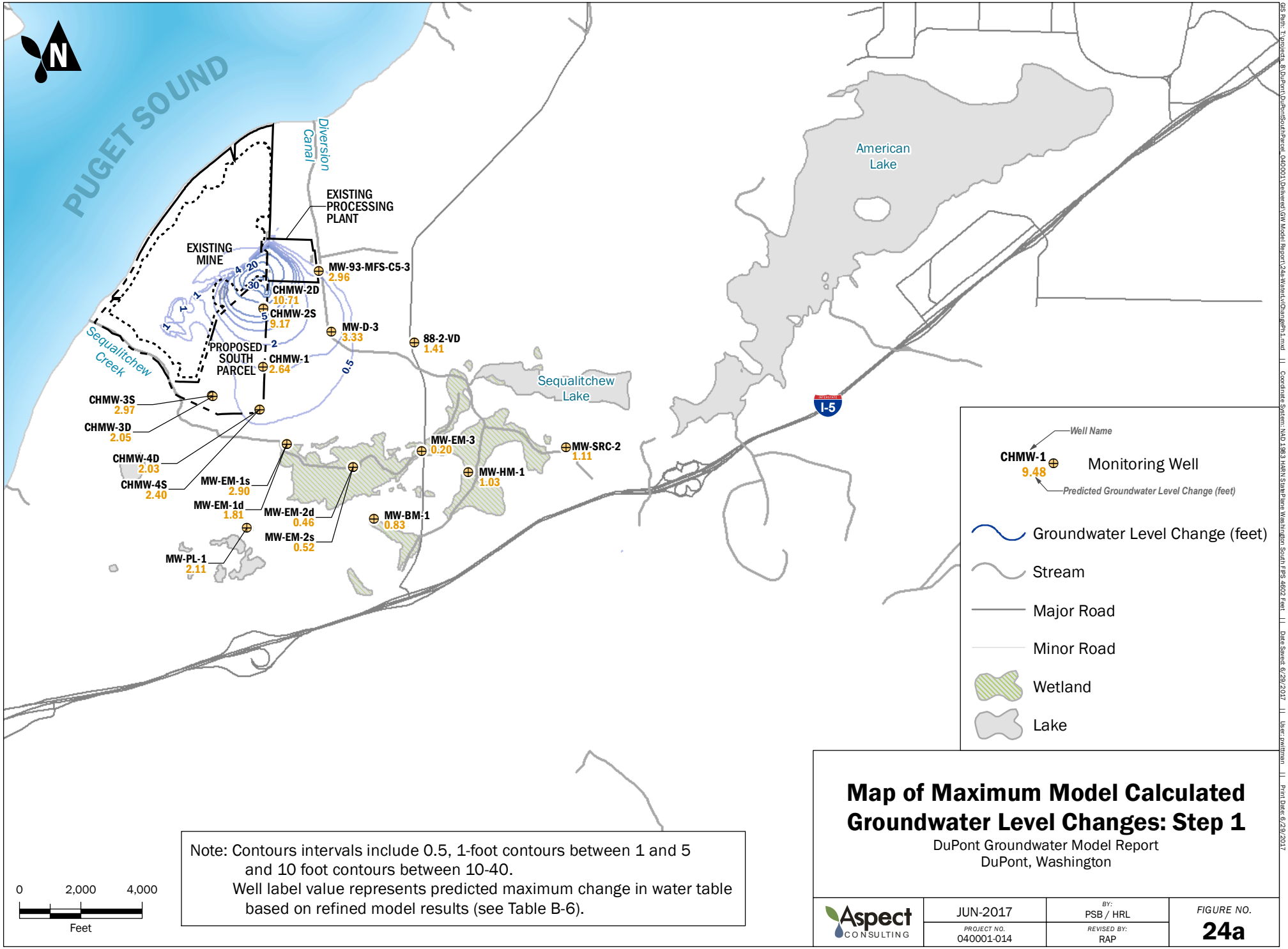
Figure 23
Predicted Changes and Ranges in Groundwater Levels
Dupont Groundwater Model Report



Note: Contours intervals include 0.5, 1-foot contours between 1 and 5 and 10 foot contours between 10-40.
Well label value represents predicted maximum change in water table based on refined model results (see Table B-6).

Map of Maximum Model Calculated Groundwater Level Changes: Step 1

DuPont Groundwater Model Report
DuPont, Washington

Aspect CONSULTING	JUN-2017	BY: PSB / HRL	FIGURE NO. 24a
	PROJECT NO. 040001-014	REVISED BY: RAP	

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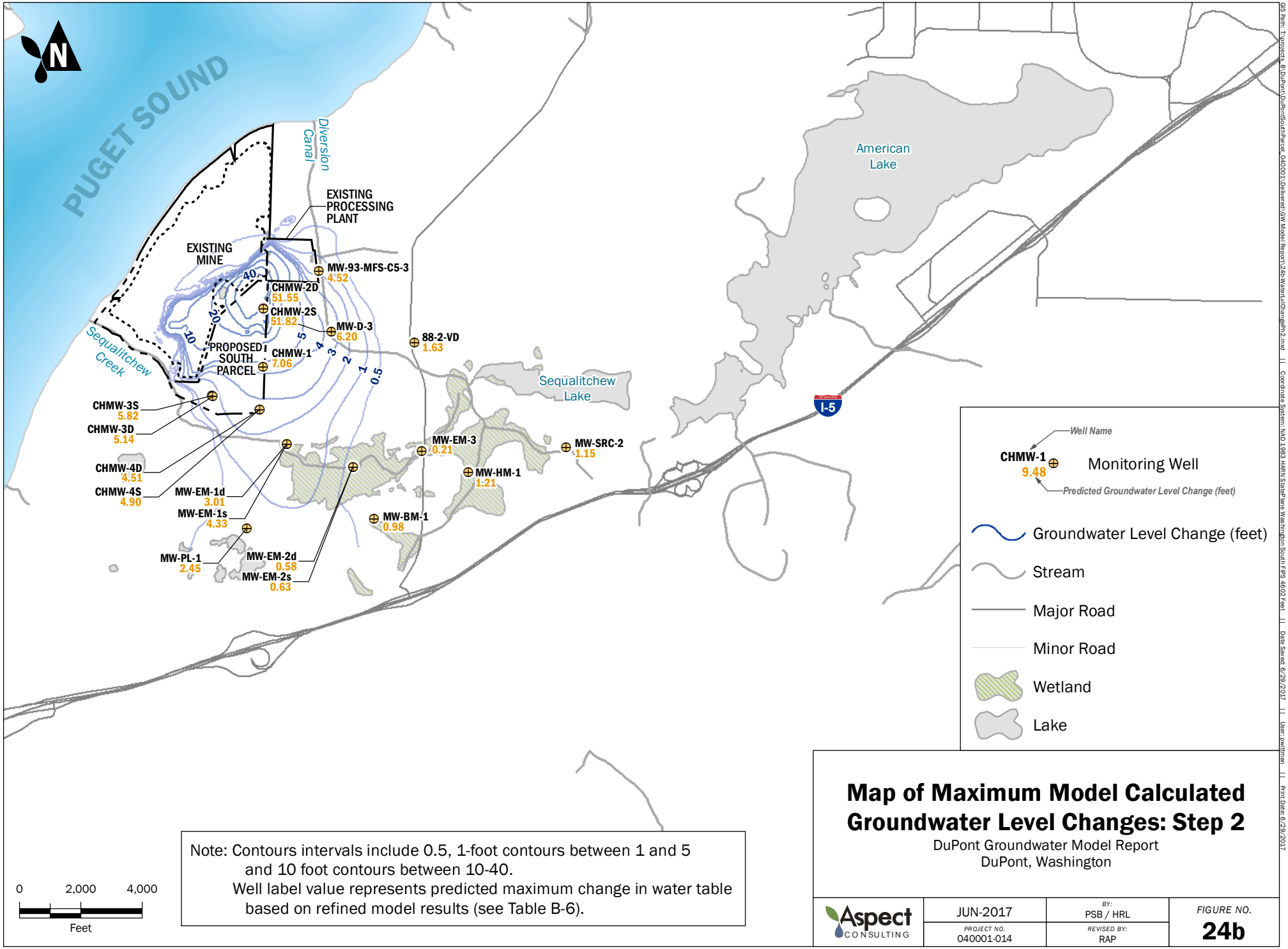


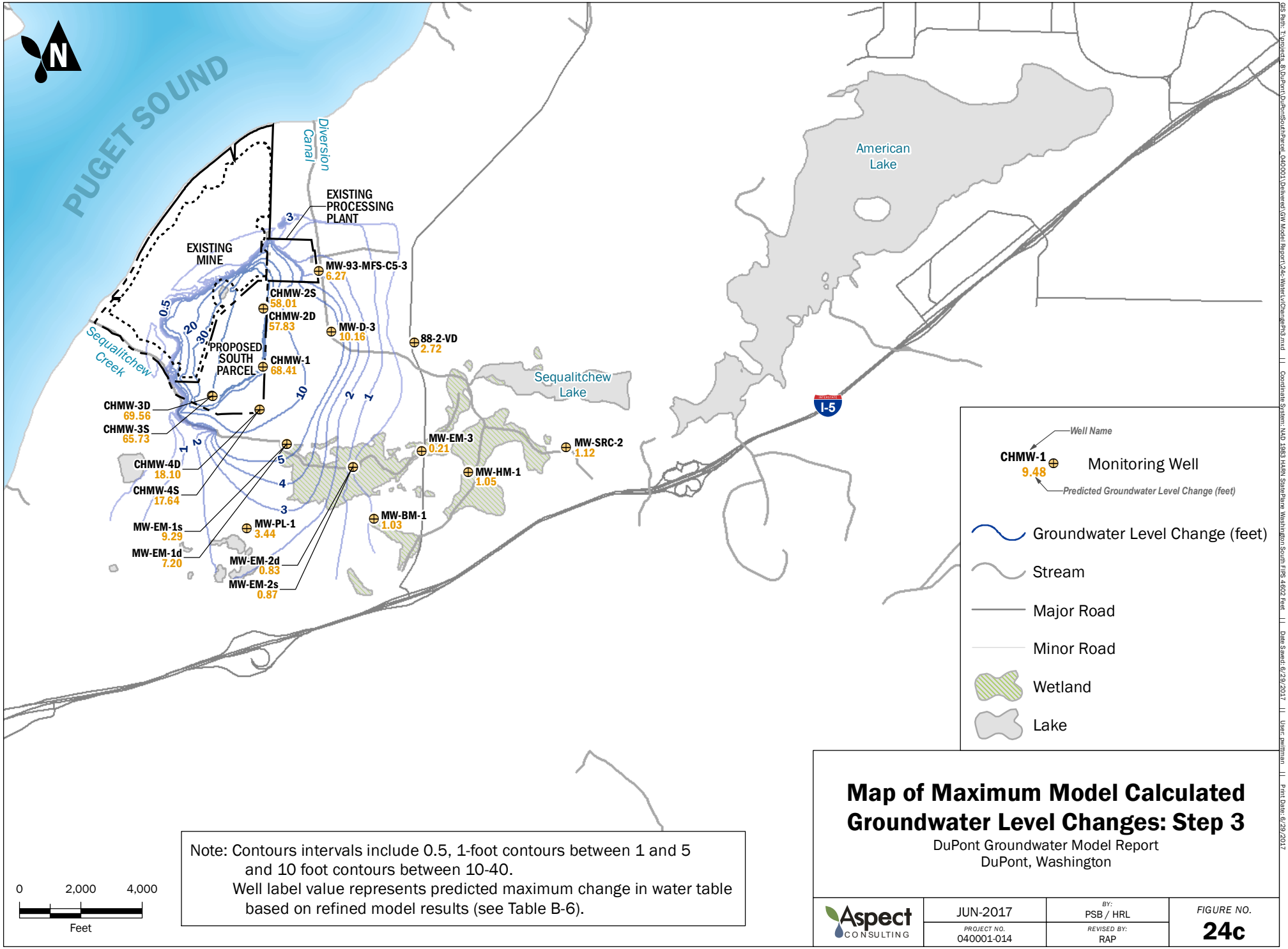
Note: Contours intervals include 0.5, 1-foot contours between 1 and 5 and 10 foot contours between 10-40.
Well label value represents predicted maximum change in water table based on refined model results (see Table B-6).

Map of Maximum Model Calculated Groundwater Level Changes: Step 2

DuPont Groundwater Model Report
DuPont, Washington

Aspect CONSULTING	JUN-2017	BY: PSB / HRL	FIGURE NO. 24b
	PROJECT NO. 040001-014	REVISED BY: RAP	

GIS Path: T:\projects_8\DuPont\DuPontSouthParcel_040001\Deliverable\GW Model Report\24b WaterLvlChangePh2.mxd || Coordinate System: NAD 1983 HARN StatePlane Washington South FIPS 4602 Feet || Date Saved: 6/29/2017 || User: pwittman || Print Date: 6/29/2017



Note: Contours intervals include 0.5, 1-foot contours between 1 and 5 and 10 foot contours between 10-40.
Well label value represents predicted maximum change in water table based on refined model results (see Table B-6).

Map of Maximum Model Calculated Groundwater Level Changes: Step 3

DuPont Groundwater Model Report
DuPont, Washington

Aspect CONSULTING	JUN-2017	BY: PSB / HRL	FIGURE NO. 24c
	PROJECT NO. 040001-014	REVISED BY: RAP	

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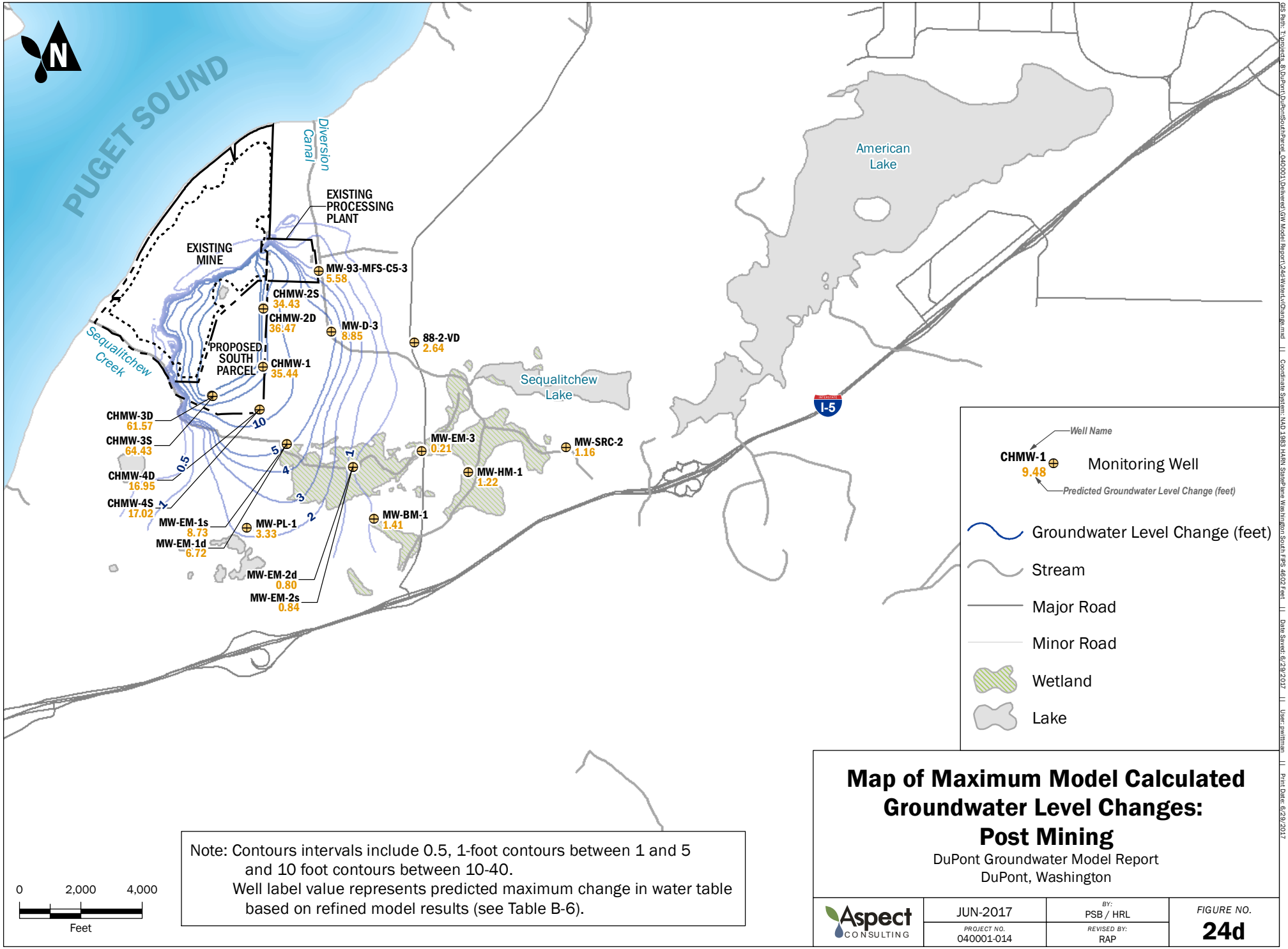

Note: Contours intervals include 0.5, 1-foot contours between 1 and 5 and 10 foot contours between 10-40.
Well label value represents predicted maximum change in water table based on refined model results (see Table B-6).

Map of Maximum Model Calculated Groundwater Level Changes: Post Mining

DuPont Groundwater Model Report
DuPont, Washington

Aspect CONSULTING	JUN-2017	BY: PSB / HRL	FIGURE NO. 24d
	PROJECT NO. 040001-014	REVISED BY: RAP	

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Appendix F

South Parcel Monitoring Plan

SOUTH PARCEL MONITORING PLAN

DuPont Mine South Parcel Expansion Area

Project No. 040001-014-02 • November 22, 2017

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earth + water

SOUTH PARCEL MONITORING PLAN

DuPont Mine South Parcel Expansion Area

Project No. 040001-014-02 • November 22, 2017

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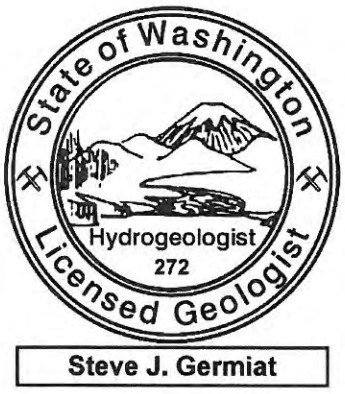



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Contents

Contents ..... **i**

1 Introduction **1**

2 Goals and Objectives **3**

3 Dewatering Plan Overview **4**

3.1 Four Steps of Dewatering Plan 5

3.2 Dewatering Well Construction 6

3.3 Predicted Effects of Dewatering on Groundwater Levels 6

4 Adaptive Management **9**

4.1 Process of Adaptive Management 9

4.2 Key Adaptive Management Commitments 10

4.2.1 Anticipated Schedule 10

4.2.2 Routine Reporting 14

4.2.3 Comparison of Groundwater Levels with Performance Thresholds 11

4.2.4 Notifications and Project Status Updates 12

4.2.5 Limitations on Mining 15

4.2.6 Meet and Confer Process 16

4.3 Detailed Adaptive Management Plan 17

4.3.1 Step 1 – Initial Pumping Test 17

4.3.2 Step 2 – Preparation for Mining/ Dewatering Test 20

4.3.3 Step 3 – Active Dewatering during Mining 24

4.3.4 Step 4 – Cessation of Active Dewatering 27

5 Relationship to Adaptive Management Process for Sequalitchew Creek Restoration Plan **29**

6 References **32**

7 Limitations **33**

List of Tables

1 Summary of Reporting by Dewatering Step *(in text)*

2 Frequency of Comparison to Performance Thresholds *(in text)*

3 Summary of Notifications by Dewatering Step *(in text)*

4 Performance Thresholds for Step 1 – Initial Pumping Test

5 Potential Response Actions during Step 1 – Initial Pumping Test *(in text)*

6 Performance Thresholds for Step 2 – Preparation for Mining/ Dewatering Test

7 Potential Response Actions during Step 2 – Preparation for Mining/ Dewatering Test *(in text)*

8 Performance Thresholds for Step 3 – Active Dewatering during Mining

9 Potential Response Actions during Step 3 – Active Dewatering during Mining *(in text)*

10 Performance Thresholds for Step 4 – Cessation of Active Dewatering

List of Figures

1 Project Area Map

2 Timeline of Dewatering Steps

3 Dewatering Plan

4 Monitoring Locations

5 Post-Mining Drawdown Contours

6 Predicted Changes and Ranges in Groundwater Levels

7 Adaptive Management Process

8 Timeline of Adaptive Management for South Parcel Mining

9 Adaptive Management Process During Step 1 – Initial Dewatering Test

10 Adaptive Management Process During Step 2 – Preparation for Mining/ Dewatering Test

11 Adaptive Management Process During Step 3 – Active Dewatering and Mining

12 Adaptive Management Process During Step 4 – Cessation of Active Dewatering

13 Anticipated Timeline of Mining and Restoration Activities

List of Appendices

A Performance Thresholds: Predicted Changes and Ranges in Groundwater Levels

B Sampling and Analysis Plan

1 Introduction

This document presents the Monitoring Plan for dewatering of the South Parcel of CalPortland's DuPont Mine. The South Parcel is a 177-acre property located southeast of the existing mine, shown on Figure 1. CalPortland proposes to expand the existing mine by extracting sand and gravel from the South Parcel. Groundwater saturates the lower level of gravels that are proposed for extraction. For mining to occur, these gravels of the South Parcel would need to be dewatered by installing a series of pumping wells to capture groundwater. The dewatering activity would affect groundwater levels in the surrounding area.

In 2011, CalPortland, the City of DuPont, Washington State Department of Ecology (Ecology), and a group of seven environmental organizations collectively known as the Environmental Caucus entered into a Settlement Agreement to define the conditions under which mining of the South Parcel could occur. The Settlement Agreement requires the development and permitting of a Restoration Plan for the Sequalitchew Creek watershed. It also requires the development of a Monitoring Plan for ensuring that changes in groundwater levels resulting from dewatering are within expected (and agreed-upon) limits.

Section 7.3 of the 2011 Settlement Agreement specifies that the Monitoring Plan will *"…include a series of monitoring actions to allow a comparison of predicted and actual changes in groundwater draw-down levels, and a process for the Parties to meet and confer if groundwater monitoring results do not meet the criteria provided in the Monitoring Plan."* This document was developed to meet that requirement.

The aim of the Restoration Plan is to increase available habitat for aquatic species through the restoration and enhancement of creek flow from Sequalitchew Lake to the Puget Sound. The Restoration Plan includes the following restoration actions, among others: comprehensive beaver management to restore flow from Sequalitchew Lake to West Edmond Marsh, improvements to the outlet of Sequalitchew Lake to reduce barriers to flow down the creek system, rehabilitating fish passage through the DuPont Railroad Trail by replacing a section of trail that is built on fill with a pedestrian bridge, culvert evaluation and replacement, and habitat restoration in Sequalitchew Creek downstream of Edmond Marsh. Implementing these actions will involve changes to marsh water levels and increases in Sequalitchew Creek flows.

The Restoration Plan actions are intended to occur concurrently with South Parcel mining activities. Under the terms of the Settlement Agreement, mining of the South Parcel cannot commence until all necessary permits for the Restoration Plan have been obtained. The Restoration Plan will include a monitoring component aimed at measuring the success of restoration actions and adaptively responding if goals are not met.

As specified in the Settlement Agreement, this Monitoring Plan focuses on observing and responding to changes in groundwater levels. Marsh water levels and streamflows will

also be monitored (as required by Section 7.2 of the Settlement Agreement), but they are not the focus of the adaptive management actions identified in the Monitoring Plan.

This Monitoring Plan consists of three components:

1) The main text, which outlines the framework for monitoring and decision making at a conceptual level.

2) A set of figures illustrating the performance thresholds for each month at each well in each dewatering step (Appendix A).

3) A sampling and analysis plan (SAP; Appendix B), which provides the specific details of monitoring, such as identification of monitoring locations, parameters, and frequency, as well as monitoring methods.

The parties acknowledge that the Monitoring Plan may be updated or amended by mutual agreement of the parties.

2 Goals and Objectives

This Monitoring Plan strives to monitor and respond to maintain groundwater at or above predicted levels beneath the marshes and Sequalitchew Creek, and manage groundwater to maintain conditions conducive to safe and efficient mining in the South Parcel.

Articulating the specific goals, objectives, and performance thresholds of a plan provides clarity in measuring the success of the actions taken and guidance for managing unanticipated circumstances. Goals are the overarching principles behind the Monitoring Plan. Objectives identify specific, measurable elements that are undertaken to meet the goal(s) of a project. They provide more detail on how the goals will be achieved, and criteria for determining when their achievement has occurred.

For each objective, a performance threshold is identified to measure success in meeting that objective. Failure to meet the performance threshold will trigger the adaptive management process and require iterative additional actions until it is met. If monitoring indicates that a performance threshold is not being met, additional action will be necessary and the adaptive management process (described in Section 4) will be used iteratively to identify and implement actions intended to improve conditions until the performance threshold has been met.

The goals, objectives, and thresholds of the Monitoring Plan are:

Goal 1. Maintain groundwater at or above predicted levels beneath Edmond Marsh and Sequalitchew Creek.

> **Objective 1A**. Groundwater levels at monitoring wells near Edmond Marsh and Sequalitchew Creek are at or above predicted levels.
>
> **Performance Threshold**: Monthly groundwater level measurements are at or above target levels established for each step of the dewatering process at each well and for each month of the year, based on statistical analysis of groundwater model predictions over a range of historical climate conditions. Initial target levels are included in Tables 4, 6, 8, and 10.

Goal 2. Maintain groundwater conditions conducive to safe and efficient mining and processing of the South Parcel aggregates.

> **Objective 2A**. Moisture content of mined aggregate is at appropriately low levels for safe and efficient mining and processing.

3 Dewatering Plan Overview

The entire mining process will take many years and is designed to proceed slowly from areas of least potential impact toward areas of increasing potential impact, allowing time and opportunity to confirm predictions and adaptively manage the mining and dewatering effort before irreversible changes occur.

Mining of the South Parcel will proceed slowly from the north to the south over a period of 5 to 8 years, extracting gravel to create a broad trough along the eastern property boundary. Wells will be installed and pumped in advance of mining to intercept groundwater and dry out the gravels for mining. The purpose of mining a trough is to minimize the amount of time that active dewatering by pumping wells is required. Once mining of each section of trough is completed, the adjacent wells can be turned off, allowing groundwater to passively seep from the stable mine slope and flow by gravity to an infiltration facility on floor of the existing mine. After mining the trough along the perimeter, gravel will be extracted from the interior area.

The following section describes four steps of the dewatering plan, but it is important to recognize that these steps occur on very different time scales. Figure 2 provides an overview of the timeline for the four steps of dewatering, assuming that mining proceeds rapidly during the period of active dewatering (Step 3).

The initial step is a 60-day pumping test that is completely reversible (i.e., no gravel will be extracted during the test). The results of that test will be analyzed and evaluated, and plans adjusted as necessary prior to commencing the next phase.

The second step involves installing and pumping additional dewatering wells to lower water levels in the first mine segment in preparation for mining. This step would last about six months and functions as a greatly expanded pumping test. As with the first step, it is also completely reversible.

The third step—active dewatering during mining—involves mining the trough described above. Additional dewatering wells will be installed and pumped as mining progresses. Mining will begin at the location farthest from the Edmond Marsh and Sequalitchew Creek and proceed slowly south. Completing the trough would require 5 to 8 years depending on market conditions and the success in meeting predicted groundwater levels. The potential impact on groundwater levels builds slowly over time as wells are added and mining progresses south. This allows ample opportunity to monitor and adapt to the conditions observed before mining proceeds into each dewatered segment.

The final step—passive dewatering—begins when mining of the trough described above is complete and the last dewatering well is turned off. Passive dewatering represents the groundwater condition that will continue in perpetuity. Groundwater, no longer intercepted by wells, would form seeps at the toe of the eastern mine slope. It would flow by gravity through newly created wetlands and a vegetated swale to an infiltration pond located at the bottom of the existing mine. Once this step has begun, further mining activities in the interior of the South Parcel would not affect groundwater.

Additional detail about each of these steps is described in the following section.

3.1 Four Steps of Dewatering Plan

The dewatering necessary to accomplish the mine expansion will occur in four steps as outlined below to address the needs of the mining operations and to provide an opportunity for adaptive management, as described in Section 4. Figure 3 depicts locations of the wells planned for installation in each step. All water generated during dewatering will be infiltrated within the footprint of the current mine, west of the expansion area. Infiltrated water will travel vertically into the ground to the aquifer then flow westward and discharge as seeps to Puget Sound

Step 1. Initial Pumping Test: The first step is a 10-well pumping test, conducted for a minimum of 60 days, to validate model predictions of dewatering effectiveness in the local vicinity of the test wells and make any necessary changes to the model parameters and/or plans for subsequent dewatering and mining activities. The 10 wells will be located in the northeastern portion of the South Parcel as shown on Figure 3. Monitoring will be conducted throughout the test in the pumping wells and existing monitoring wells. The combined pumping rate during Step 1 is predicted to be approximately 3.5 cubic feet per second (cfs) on average, and up to approximately 5 cfs if pumping during the wet season. The model predicts that groundwater level changes will stabilize within approximately 60 days of the start of pumping. No mining will occur in the South Parcel during this step. Step 1 could occur at any time prior to mining; it is not anticipated that all permits for mining would need to be obtained before Step 1 could occur.

Step 2. Preparation for Mining/ Dewatering Test: Following completion of the initial pumping test, the next step of the dewatering plan involves expanding the dewatering well network along the eastern edge of the mine area with two purposes: 1) to evaluate model predictions across a wider extent (making any necessary changes to model parameters and/or to subsequent dewatering/mining activities); and 2) to dewater gravels for the first segment of mining. No mining will occur in the South Parcel before this step is completed.

During Step 2, an expected 14 additional dewatering wells will be installed along the South Parcel mine boundary, including wells located interior to the mine, as shown on Figure 3. The dewatering wells will be arranged in two lines on either side of the initial mine trough, including 19 boundary wells and 5 interior wells. Two additional monitoring wells will also be installed to measure drawdown within the mine interior. Step 2 is expected to last for up to 6 months,with the first two months being a second pumping test again lasting a minimum of 60 days, followed by an estimated four additional months of pumping to dry gravels in the Segment 1A in preparation for mining. The results from the first 60 days would be used to evaluate the model; this evaluation would occur concurrently with the continued dewatering in preparation for mining. The predicted total system pumping rate of approximately 5.1 cfs on average and up to approximately 8 cfs during the wet season.

Since a key component of Step 2 is preparation of the site for mining, pumping during Step 2 would only occur once mining and restoration permits have been obtained.

Step 3. Active Dewatering during Mining: Step 3 is active dewatering as mining begins to form a broad trough in the northeastern corner of the site. Over the next 5 to 8 years,

mining will then proceed from north to south along eastern boundary of site. Step 3 dewatering is predicted to use 66 dewatering wells arranged in two lines on either side of the initial mine trough, with 54 boundary wells and 12 inner wells, as shown on Figure 3. The wells are installed and pumped ahead of the trough's southern progression; as mining of an area is completed, wells along that portion of the trough are shut off, allowing groundwater to begin seeping from the newly mined slope. Groundwater seeping into the mine will be collected in a vegetated swale and conveyed to the infiltration pond located at the bottom of the existing mine.

If all 66 dewatering wells were operating, the combined pumping rate is predicted to be approximately 6.8 cfs on average and up to approximately 11 cfs during the wet season. However, it is unlikely that all dewatering wells would need to be operated at any one time as wells will be phased off as mining progresses.

Step 4. Cessation of Active Dewatering: During Step 4, pumping from the dewatering well network will cease, and the post-mining groundwater flow condition will be established consistent with reclamation objectives. Once all dewatering wells are off, mining above the water table will continue in the interior of the South Parcel. Groundwater will flow from the toe of the newly mined slope on the eastern boundary of the property and be collected and conveyed to an infiltration pond in the bottom of the existing mine, from where it will continue its westward flow, ultimately entering Puget Sound. Groundwater levels will increase slightly following the cessation of active dewatering as they adjust to long-term equilibrium with the new spring locations that will form along the toe of the mined slope. Step 4 lasts through mining of the remaining interior areas and through the post-mining period.

3.2 Dewatering Well Construction

The dewatering wells are designed to accommodate large drawdowns (up to 70 feet), and operate under a wide range of flow rates against a wide range of heads. All dewatering wells will be screened to the depth of the Olympia Beds, with nominal 10-foot sumps installed into the top of the Olympia Beds. Expected well depths will range from about 75 to 115 feet to accommodate the variation in aquifer thickness (between ground surface and the Olympia Beds contact) and the 10-foot sump into the Olympia Beds. The dewatering wells will be screened across the lower zone and a portion of the upper aquifer zone (generally 40- to 50-foot screen lengths). Continuous slot, v-wire wrapped stainless-steel well screens will be used for maximum dewatering efficiency (low head loss). Anticipated well flows range from approximately 400 gallons per minute (gpm) initially to an average of approximately 50 to 200 gpm to maintain drawdown once storage is depleted.

3.3 Predicted Effects of Dewatering on Groundwater Levels

The effects of the four-step dewatering plan on groundwater levels have been evaluated using a numerical, three-dimensional, groundwater model developed specifically for the project (DuPont model). The model is transient, meaning that it simulates changes in groundwater levels over time, and runs on a monthly time step for a roughly 12-year period from March 2004 to December 2015 that includes wet and dry climate conditions.

This allows the model to be used to analyze the effects of the proposed dewatering plan over a range of weather conditions.

The model was developed using data from 2004 to 2010 and calibrated to observed water levels at 19 wells. The calibrated model achieved a "good fit" with a mean residual (difference between predicted and observed) of 1.7 feet or about 6 percent of the difference in minimum and maximum groundwater levels at the calibration targets. The model was validated over 2004 to 2015 (after a change in the precipitation data source) and the validation statistics were similar to the calibration with a mean residual of 1.87 feet providing confidence in its use to simulate groundwater conditions. Additional detail on groundwater model development, calibration, validation and predictive results is available in the Groundwater Model Update (Aspect, 2017).

The DuPont model was used to predict changes in groundwater conditions during the four sequential steps of proposed dewatering and mining activity in the South Parcel. These predictive runs used the same weather and boundary conditions as model calibration with the only change being the addition of pumping wells and changes in surface topography with mining. Dewatering Steps 1, 2, and 3 simulated 10, 24, and 66 active dewatering wells, respectively. Step 4 simulated the post-mining condition with pumping terminated and groundwater passively discharging at the toe of the newly mined slope.

Results of the predictive models are discussed below by dewatering step, in terms of predicted changes in groundwater levels. Baseline groundwater levels are sensitive to seasonal and longer-term precipitation patterns, and the model indicates that groundwater levels during the four dewatering steps will likewise remain sensitive to precipitation patterns. Monitoring well locations are shown on Figure 4.

In Step 1, the changes in groundwater levels are most evident at the monitoring wells closest to the pumping test (CHMW-2S and CHMW-2D). The maximum groundwater level change at CHMW-2D is predicted to be approximately 9 feet, whereas minimal groundwater level change (less than 0.5 foot) is predicted at monitoring wells in Edmond Marsh (MW-EM-1D and MW-EM-2D).

During Step 2, the maximum change in groundwater level is approximately 45 feet and would occur at CHMW-2D located on the northeastern edge of the South Parcel and within the dewatering well network. The maximum groundwater level changes in the closest monitoring wells in Edmond Marsh (MW-EM-1D and MW-EM-2D) are predicted to be approximately 1.3 feet and 0.2 feet, respectively.

During Step 3, maximum groundwater level changes of up to about 60 feet are predicted at wells within the mine area. The maximum groundwater level changes at MW-EM-1D and MW-EM-2D (Edmond Marsh) are predicted to be approximately 5.2 feet and 0.4 feet, respectively. The groundwater levels during Step 3 are predicted to be approximately 10 to 20 feet above the Olympia Beds along the mine trough.

During Step 4, following cessation of active pumping, the maximum change in groundwater levels along the eastern slope of the mine ranges from about 14 to 49 feet. The maximum groundwater level changes at the closest Edmond Marsh Wells (MW-EM-1D and MW-EM-2D) are predicted to be approximately 5.0 feet and 0.4 feet,

respectively. A map of the predicted contours of groundwater drawdown after cessation of active pumping is shown on Figure 5. Solid drawdown contours on Figure 5 indicate areas of greater certainty closer to the monitoring well network and model calibration targets, dashed drawdown contours indicate areas of lesser certainty.

The groundwater model was used to develop performance thresholds for each well in each month during each dewatering step. The thresholds are based on the predicted range in water levels under seasonal and annual variation in climate. The performance thresholds were established at the lower 95th-percentile confidence interval for the predicted water levels.

As an example, Figure 6 provides the range of model predictions (groundwater elevation, and change from baseline water levels) over varying climate conditions for well CHMW-2D, located near the proposed location of the pumping test. The vertical lines in Figure 6 indicate the lower end of the predicted range. The bottom of the vertical line is the performance threshold. The performance threshold will change by well, by month (to account for annual seasonal patterns), and by dewatering steps. Similar figures have been prepared for each monitoring well and are presented in Appendix A.

4 Adaptive Management

This Monitoring Plan implements adaptive management to observe and respond to changes in groundwater levels occurring during mining of the South Parcel. This section first introduces the fundamental steps of effective adaptive management, then establishes key commitments by CalPortland to be met throughout the adaptive management process, and then walks through the detailed adaptive management plan, including the groundwater performance thresholds, for each dewatering step.

4.1 Process of Adaptive Management

Adaptive management has been described as "*a systematic process for continually improving management policies and practices by learning from the outcomes of operational programs"* (Nyberg, 1999). Adaptive management typically consists of a monitoring system to identify changes in the environment coupled with a response system to adjust the activities in response to monitoring results. The adaptive management system proposed for implementation on this project was developed as a combination of the systems proposed by Ralph and Poole (2003) and Nyberg (1999). It consists of five key sequential elements, as illustrated on Figure 7:

A. **Assess:** Information is compiled from monitoring data, geologic investigations, groundwater modeling, and other available sources. The compiled information is used to identify issues, refine objectives, and screen potential alternative approaches. Predictions of the potential effects of the action on groundwater levels are developed.

B. **Design:** Based on the results of the assessment stage, design of the proposed action proceeds. Design will result in a specific plan of action, and supporting evaluations to ensure that the anticipated results are consistent with the identified objectives, the Monitoring Plan, and prior environmental assessments. Predictions of groundwater levels are refined as the design evolves. Analyses conducted during the design stage could result in an iterative process of assessment and design. Any required permitting is also included in the design stage.

C. **Implement and Monitor:** The approved plan is put into action, concurrently with monitoring focused on key indicators tied to the identified objectives. Monitoring data indicating conditions worse than forecasted are acted on rapidly, moving into the evaluation and adjustment stages.

D. **Evaluate:** Monitoring data are evaluated relative to the objectives and forecasted results developed in the assessment and design stages. Differences between forecasts and results are identified and the causes for those differences investigated.

E. **Adjust:** Information learned in previous steps is used to adjust the actions, if necessary. The Monitoring Plan provides an initial identification of potential adjustments in each dewatering step, but additional adjustments could be developed to fit specific situations.

The adaptive management process is iterative and would repeat until the mining project is completed. If an adjustment is identified, the process would begin again from the assessment and design stages, followed by implementation of the adjustment and associated monitoring, then evaluation and further response (if necessary). If an adjustment is not necessary, then the process still repeats. In this case, the assessment and design stages would largely rely on the previously approved plans, but there is still potential for more minor refinements based on the information learned.

Throughout the adaptive management process, status updates, monitoring data, and final reports will be shared with the Environmental Caucus. Should groundwater levels not meet the performance thresholds established in this plan, then CalPortland would notify the Environmental Caucus and plan and implement adjustments. If adjustments are unsuccessful in meeting predicted groundwater levels, CalPortland and the Environmental Caucus would initiate a technical review conference and, if necessary, meet and confer to share information and determine the appropriate additional steps.

4.2 Key Adaptive Management Commitments

This section establishes the commitments related to key components of adaptive management. First, an overview of the anticipated schedule for the four dewatering steps is presented. Then the commitments to the frequency that groundwater levels will be compared with the performance thresholds is established, followed by a summary of the notifications that will be provided if certain events occur (such as starting to pump new wells, or measurements of groundwater levels that are below performance thresholds). The next section summarizes the reports that will be provide throughout the process, ranging from relatively simple progress updates to detailed reports on the pumping tests. Then several overall limitations on advancement of mining and dewatering are established. Finally, the meet and confer process for resolving disputes is defined.

Additional detail about the adaptive management process as it applies to each dewatering Step is presented in Section 4.3.

4.2.1 Anticipated Schedule

Mining of the South Parcel will occur over many years, and the anticipated project schedule has been designed to include sufficient time for the adaptive management process to succeed in meeting performance thresholds before mining or dewatering advances. An overview of the anticipated schedule is presented on Figure 8; additional schedule detail is presented in the detailed adaptive management plan for each Step presented in Section 4.3.

Mining and dewatering activities would not begin until a series of conditions identified in Section 4.3 of the 2011 Settlement Agreement have been met. Those conditions include: 1) environmental review (SEPA) has been completed; 2) permits for the Restoration Plan have been issued [including the required authorizations and approvals from Joint Base Lewis-McChord (JBLM) for restoration activities on JBLM property], and applicable appeal periods have expired (except for federal permits); and 3) all necessary permits and approvals for South Parcel mining have been obtained. This paragraph is intended as a summary only; to the extent that it is inconsistent with the Settlement Agreement, the Settlement Agreement shall govern.

Step 1 is anticipated to require a year to complete from initial planning through reporting and discussion of the results and any resulting adjustments to the dewatering plan. Planning and well installation for Step 2 would overlap with completion of the reporting and review components of Step 1. Once Step 1 has been completed, the pumping test component of Step 2 would begin.

Step 2 is anticipated to require 6 months of active pumping—the first 2 months would be a larger-scale pumping test, and dewatering would continue over the subsequent 4 months in preparation for the start of mining. Reporting and review of results would be performed while dewatering continues.

Step 3 would only commence when groundwater levels are above the performance thresholds and water levels are at appropriately low levels for safe and efficient mining and processing. If groundwater levels meet performance thresholds, Step 2 would flow into Step 3 and the start of mining. Otherwise, Step 2 may require a longer period to perform the necessary adjustments to achieve sufficient dewatering for mining while maintaining groundwater levels consistent with the performance thresholds and prior environmental analyses, or update the environmental analyses, if necessary.

Mining would proceed south over a period of multiple years. The actual rate of mining depends on market demand. CalPortland expects that mining the first four segments (1A through 1D) would take 4 to 8 years and has committed (see Section 4.2.5) to completing those four segments in no less than 3 years total, or a minimum of 9 months for each segment. Figure 8 shows the timeline for mining of the South Parcel in the unlikely event that mining were to progress at this accelerated pace and the first four segments were to be completed in three years.

Step 4 will begin after active dewatering ceases. Depending on market demand for aggregate products, mining of the remainder of the South Parcel is expected to occur over 5 to 8 years after cessation of active dewatering.

4.2.2 Comparison of Groundwater Levels with Performance Thresholds

Success of the dewatering plan is evaluated by comparing groundwater levels with the performance thresholds.

A summary of the monitoring events where comparisons with the predicted ranges will be performed is provided in Table 1. The frequency of these comparisons will vary over time with more frequent evaluations at the start of each dewatering step or when changes to dewatering are made. If any of these monitoring results indicate groundwater levels are not above the performance thresholds, CalPortland will notify the Environmental Caucus according to the timelines described in Section 4.2.3, which vary by dewatering Step, and begin the adjustment process.

Table 1. Frequency of Comparison to Performance Thresholds

Dewatering Step	Frequency of Comparison
Step 1 – Initial Pumping Test	Changing frequency during test: hourly -> daily -> weekly
Step 2 – Preparation for Mining/ Dewatering Test	Changing frequency during first 2 months/ pumping test: daily -> weekly, then Weekly at key wells, Twice monthly at all others
Step 3 – Active Dewatering during Mining	For 3 months when new wells start pumping: weekly at key wells and twice monthly at all others, then Monthly.
Step 4 – Cessation of Active Dewatering	Monthly

Note: Key wells are the monitoring wells in the South Parcel (CHMW-1 through 4) and the closest marsh monitoring stations (EM-1 and -2), including both shallow and deep wells at those locations.

4.2.3 Notifications

Notifications are intended to alert the Environmental Caucus to the occurrence of an event. Routine reporting, including project status updates, data summaries, pumping test analyses, are described in the next section (Section 4.2.4).

CalPortland will inform the designated representative of the Environmental Caucus of each of the following types of events:

1) At the start of each dewatering step;

2) Major milestones within each step (such as addition of new pumping wells);

3) Upon collection of monitoring data indicating actual groundwater levels are lower than the performance thresholds; and

4) Implementation of response actions.

The Environmental Caucus will provide timely notice of any changes in its attorney, consultant, or designated representative or their contact information.

Notification points in each of the dewatering steps are summarized in Table 2, except for routine reporting milestones (which are summarized in Table 3). Notifications will be provided in writing by email, letter, or memorandum/report, as appropriate for the nature of the notification. It is anticipated that most notifications will be provided by email.

Groundwater monitoring data (including raw data) would be provided within 2 days of any notification that monitoring results are below performance thresholds.

Table 2. Summary of Notifications by Dewatering Step

Dewatering Step	Events Triggering Notification of Environmental Caucus	Timeline for Notification
Step 1 – Initial Pumping Test	Updates to pumping test plan	Within 3 days of updating plan
	Installation of pumping test wells	1 week prior to start of drilling
	Start of pumping test	1 week prior to start of pumping
	Monitoring results below performance thresholds	Within 24 hours of measurement
	Any adjustments implemented during pumping test	Within 24 hours of change
	End of pumping test	Within 24 hours
Step 2 – Preparation for Mining/ Dewatering Test	Updates to dewatering plan based on Step 1 results	Within 3 days of updating plan
	Installation of Step 2 dewatering wells	1 week prior to start of drilling
	Start of dewatering	1 week prior to start of pumping
	Monitoring results below performance thresholds	Within 48 hours of measurement
	Any adjustments implemented during dewatering	Within 24 hours of change
Step 3 – Active Dewatering during Mining	Commencement of mining in the South Parcel	1 month prior to start of mining
	Initiation of pumping at new wells	1 week prior to start of pumping
	Monitoring results below performance thresholds	Within 3 days of measurement
	Any adjustments implemented during dewatering	Within 3 days of change
	Cessation of active dewatering	Within 1 week of ceasing dewatering
Step 4 – Cessation of Active Dewatering	Monitoring results below predicted values	Within 3 days of measurement
	Completion of mining in South Parcel	Within 1 month of completion

The timeline for notification that monitoring results are below performance thresholds increases from 24 hours in Step 1 to 48 hours in Step 2 to 3 days in Steps 3 and 4 for four reasons:

1) the rate of change in groundwater levels will slow as mining progresses;

2) confidence increases over time as the number of wells pumping and set of successful groundwater measurements grows (mining and dewatering only advance when performance thresholds are met; see Section 4.2.5 for the specific limitations);

3) new wells begin pumping substantially in advance of mining both in time and space and dewatering proceeds from farthest away towards the creek and

marshes, which allows for the marginal impact of adding new wells to be reversible, even in during Step 3; and

4) Gravel would continue to be mined, but the volume that could be mined during the notification period is nominal compared with the volume of each mine segment, which are expected to require 1.5 to 2 years of mining to complete.

4.2.4 Routine Reporting

CalPortland will routinely share information about mining, dewatering, and the adaptive management process with the Environmental Caucus to achieve a variety of purposes, including sharing and interpreting monitoring data, documenting actions taken during a dewatering step, providing updated model predictions and analysis, and response actions, if necessary.

The specific reports required during each step of dewatering are summarized in Table 3. Additional detail about the individual reports and their role in the adaptive management process is presented in the Detailed Adaptive Management Plan in Section 4.3.

Table 3. Summary of Reporting by Dewatering Step

Dewatering Step	Reports	Minimum Frequency of Reporting
Step 1 – Initial Pumping Test	Pumping Test Design	One time
	Pumping Test Progress	Weekly during test
	Pumping Test Results	One time
Step 2 – Preparation for Mining/ Dewatering Test	Dewatering Plan for Step 2, if revised.	One time
	Pumping Test Progress	Weekly for first 2 months
	Pumping Test Results	One time – 4 months after start of Step 2
	Dewatering Summary Memos	Monthly
Step 3 – Active Dewatering during Mining	Dewatering Plan, Mining Plan, or SAP, if revised.	One time
	Dewatering Summary Memos,	Monthly for 3 months after each new set of dewatering wells, then quarterly
Step 4 – Cessation of Active Dewatering	Dewatering Summary Memos for first year	Quarterly for 2 years, then annually

The purpose and contents of each report are outlined below:

- Pumping Test Design/Dewatering Plans will provide the plan for performing the pumping tests and/or dewatering. These plans will include the proposed well pumping and observation well locations, depths, well construction, drilling methods, data collection, and timelines.

- Pumping Test Progress will provide a status update during the pumping test including an overview of progress toward completing the test, identifying which wells are pumping and pumping rates, locations and frequency of monitoring, any changes to the pumping test plan, and notes on how the test is proceeding.

- Pumping Test Results will present a detailed reporting of the execution of the pumping test, a summary of the data collected, including figures showing groundwater levels and pumping rates over time, comparisons of groundwater levels with performance thresholds, data analysis and results (estimates of key hydrogeologic parameters), and a comparison between model predictions and pumping test results for the purpose of model evaluation and validation.

- Dewatering Summary Memos will provide a summary of mining and dewatering progress, including information on any new wells installed, initiation of pumping at new wells, overview of wells that are pumping and pumping rates, cessation of pumping at wells, areas of active mining, and reclamation activities.

Reports will be prepared by a third-party consultant to be selected and paid for by CalPortland. The reports will be distributed to the Environmental Caucus electronically in protected documents, with hard copies available on request. Raw monitoring data will be provided with any groundwater measurement below a performance threshold, or when requested by the Environmental Caucus.

4.2.5 Limitations on Mining

In order to establish bounds on the pace and advancement of mining that will allow time for the adaptive management process to succeed, CalPortland commits to the following limitations on mining and dewatering activities in the South Parcel:

1) Mining associated with active dewatering (i.e., mining of the trough along the eastern boundary of the South Parcel; Figure 3) will last at least 3 years.

2) The mine trough has been divided into four segments (1A to 1D; Figure 3). Mining of each segment will last at least 9 months.

3) Mining will not advance into the next segment, unless groundwater levels meet performance thresholds.

4) Dewatering activity will not intensify through commencing pumping at new wells or increasing pumping rates at existing wells (except for normal seasonal changes in pumping rates), unless groundwater levels meet performance thresholds.

These limitations do not apply to operations of the existing mine and processing area, or extraction of gravel from areas west of the Olympia Bed truncation within the existing mine or North Parcel as these areas do not require dewatering.

4.2.6 Meet and Confer Process

Section 7.3 of the Settlement Agreement states that the Monitoring Plan will include a "process for the Parties to meet and confer if the groundwater levels do not meet the criteria provided in the Monitoring Plan." The process described below involves two steps for the parties (CalPortland and the Environmental Caucus) to follow with respect to groundwater information and data obtained during the monitoring process. The first step is for the parties' technical consultants to engage in one or more technical review conferences. If necessary, the second step would involve one or more meetings between the parties' designated representatives to discuss any differences of opinion or interpretation that the technical consultants are unable to resolve. Each of these two steps is discussed further below. This two-step process may be invoked at any time, including but not limited to the various specific points in the adaptive management process identified in Section 4.3 below.

Technical Review Conferences. The Environmental Caucus may initiate a request for a technical review conference of the parties' technical consultants at any time to discuss any questions or concerns it might have about any aspect of the groundwater monitoring data. The conferences may be in person or via conference call or other communications technology, and there may be multiple conferences to discuss any issues identified by the Environmental Caucus. The technical consultants would work in good faith during these review conferences to resolve any differences in interpretation of the groundwater monitoring data.

Party Representative Discussions. If the good-faith efforts of the technical consultants are unable to resolve any differences of opinion regarding the interpretation of the groundwater data, including but not limited to what the data shows regarding groundwater levels, either CalPortland or the Environmental Caucus may request a meeting of the parties' designated representatives or principals by providing notice to the other party of the desire to meet, and a brief explanation of the reasons for the request.

Once noticed is provided, CalPortland and the Environmental Caucus would work collaboratively to agree on a meeting format, date, time, and place to be held within 30 days of the request to hold a Technical Review Conference or a Party Representative Discussion. Meetings may be in person or via conference call or other communications technology, and there may be multiple meetings. This paragraph is intended to generally describe, but not constrain, the ways that the parties may choose to meet. Based on the issue raised, CalPortland would prepare and provide appropriate information summarizing the issue and current status of mining and dewatering activities, sharing related monitoring data (including raw data, if requested), and identifying potential responses.

Representatives of CalPortland and the Environmental Caucus will confer during the meeting on the most appropriate response with the goal of reaching consensus. If consensus cannot be reached, the parties would enter mediation, making good-faith efforts to hold a meeting with a mutually agreed-upon mediator within 45 days of the initiation of any request to the other party for mediation.

4.3 Detailed Adaptive Management Plan

This section is the core of the Monitoring Plan. It walks through each step of the dewatering plan providing conceptual details about how the stages of adaptive management would apply to that step. Specifically, this section establishes the objectives, provides an overview of monitoring activities, outlines an approximate schedule, summarizes the approach for data evaluation, and provides initial identification of potential response actions for each step of the dewatering plan.

Specific details of the monitoring activities (e.g., monitoring locations, frequency, and methods) are provided in the SAP in Appendix B.

Although the stages of adaptive management are presented sequentially in each step, it is important to recognize that the adaptive management process will be implemented iteratively within the step, particularly for Steps 2 and 3. For example, evaluation will be conducted each time monitoring data is collected, and that evaluation could trigger adjustment and looping back through the process during the same dewatering step. Alternately, if the monitoring data consistently indicate that performance thresholds are being met, the adaptive management process for a step could be completed without requiring iteration or adjustments.

4.3.1 Step 1 – Initial Pumping Test

Step 1 is envisioned as a 10-well pumping test, conducted for a minimum of 60 days, to validate model predictions of dewatering effectiveness in the local vicinity of the test wells, and make any necessary changes to the model parameters and/or to plans for subsequent dewatering and mining activities. No mining will occur in the South Parcel during Step 1.

The adaptive management process in Step 1 is illustrated on Figure 9.

A. Assess

The assessment stage for Step 1 will include compilation of existing monitoring data, geologic information, results from prior pumping tests conducted by CH2M Hill (2000), and the latest groundwater modeling simulations of the Step 1 pumping test. Monitoring data will continue to be collected and will be incorporated into the assessment for the pumping test.

Two initial objectives have been identified for the Step 1 pumping test:

1) Evaluate model predictions near the test wells.

2) Test dewatering design for meeting mining needs (i.e., achieving necessary drawdown), collecting information to refine the dewatering design, such as the number, screening, and spacing of wells.

B. Design

Based on the information collected during the assessment phase, CalPortland, and its consultants, will prepare a detailed plan for the pumping test. The plan will identify the number and location of pumping and observation wells, well drilling and construction, pumping rates, duration, monitoring locations, equipment, and frequency, etc.

The pumping test plan will be provided to the Environmental Caucus.

C. Implement and Monitor

CalPortland will install the pumping wells and any new observation wells, and conduct the pumping test. The minimum duration of pumping during the test will be 60 days.

Monitoring would consist of two components: 1) high-frequency automated monitoring at wells that are expected to be affected by the pumping test and at sensitive receptors, and 2) continuation of routine manual monitoring at other groundwater and surface water locations.

High-frequency monitoring using pressure transducers would be performed in observation wells near the pumping test location (CHMW-2D, -2S, and MW-D-3), and at wells located nearest to Sequalitchew Creek and West Edmond Marsh (CHMW-3S &-3D and MW-EM-1D). Typically, the frequency of data collection is programmed to vary throughout a pumping test with rapid data collection at the start tapering to less frequent as groundwater levels near stabilization.

Routine monitoring would continue to occur at the normal monitoring locations, including wetland, stream, and groundwater locations outside the area of influence of the pumping test. The streamflow monitoring stations are continuously recording. Manual measurements will be used at the wetland and groundwater locations not near the pumping test.

The Environmental Caucus will be notified of the installation of wells and the start and end of the pumping test. CalPortland will also provide weekly summaries of pumping test progress, and notification (within 24 hours) of any monitoring results below the performance thresholds. Routine reporting is summarized in Table 3 and notifications are outlined in Table 2.

D. Evaluate

Data will be screened as they are collected to determine if immediate action is required. In such an event, the Environmental Caucus would be notified within 24 hours, and the project would move immediately to the adjustment stage.

As monitoring data are collected, they also will be evaluated to see if the test is well-designed and the monitoring network is effective. If necessary, the project may enter the adjustment step to improve the pumping test to collect better information.

Once representative monitoring results are being collected, they will be screened against performance thresholds in Table 4 for the appropriate well and month. The performance thresholds were established at the lower 95th-percentile confidence interval for the predicted water levels [see Section 3.3 and the Groundwater Model Update (Aspect, 2017)]. The frequency of screening will vary during the test beginning with hourly at the start and reducing to daily then weekly as the test progresses, as outlined in Table 1.

If the monitoring results indicate that groundwater levels near the marshes are lower than the performance thresholds, CalPortland would develop and implement appropriate adjustments during the pumping test.

If monitoring results indicate groundwater levels are lower than the performance thresholds in wells that are not near the marshes or other sensitive receptors (i.e., monitoring wells on the South Parcel), then the test would be completed as planned. These results would be evaluated and any anticipated adjustments for future steps identified.

Even if the observations made during the test are above the performance thresholds, they still may provide valuable information for refining the model, mine plan, and Monitoring Plan. Those observations will be considered during assessment and design for Step 2.

The evaluation will also include comparison of climate and water level conditions prior to the test with the range of conditions experienced during the model calibration and validation period.

E. Adjust

Adjustments during the pumping test could occur for two reasons:

1) The monitoring data indicate that data collected are not sufficient to achieve the objectives of the test; or

2) The monitoring data indicate that groundwater levels are below the performance thresholds.

Potential adjustments consist of modifying or terminating the pumping test, and are listed in Table 5. Since no mining below the pre-project groundwater elevation would occur during this dewatering step, any change in groundwater could be reversed by turning the dewatering wells off.

Table 5. Potential Response Actions during Step 1 – Initial Pumping Test

Modify pumping test:
Changing pumping rates
Changing the number of pumping wells
Changing the duration of pumping
Changing monitoring locations including installing new wells
Performing additional testing
Cease pumping test.

CalPortland will notify the Environmental Caucus of any adjustments to the pumping test within 24 hours of the change.

Reporting and Discussion

At the conclusion of the Step 1 pumping test, whether completed as planned, adjusted, or terminated, CalPortland will prepare an interpretative report documenting the pumping test, summarizing the monitoring data, comparing monitoring results with prior model predictions, and making recommendations for the assessment and design phases of the next step.

The report will be provided to the Environmental Caucus, with a 3-month period for review and discussion of the results. CalPortland commits to meeting with the Caucus as often as necessary during the review period to facilitate open communications and timely review. Should the Environmental Caucus and CalPortland have different interpretations

of the dewatering test results, either party may request technical review conferences of the parties' technical consultants, followed by, if necessary, meetings of the parties' representatives, as described in Section 4.2.6 above.

Anticipated Schedule
The schedule for Step 1, in the context of the overall mining schedule, is illustrated in Figure 8. It is expected to require about a year to complete Step 1, with the following anticipated schedule:

- Planning the Pumping Test 1 month
- Installing and Developing Wells 2–3 months
- Performing the Pumping Test 2 months
- Evaluating Results and Reporting 2 months
- Model Updates (if necessary) 2–3 months
- Review by and discussion with Environmental Caucus 3 months

Incorporation of the results into the design of future steps could require additional time.

4.3.2 Step 2 – Preparation for Mining/ Dewatering Test

In Step 2, additional dewatering wells will be installed and will be pumped for several months to draw down groundwater until the gravel in the first mine segment of the South Parcel is dry enough to mine. If monitoring results are above performance thresholds during Step 2, the intent is to continue dewatering from those wells and transition smoothly into Step 3 – Active Dewatering during Mining. Step 3 would only commence when groundwater levels are above the performance thresholds.

The dewatering activity will also serve as a greatly expanded pumping test, the effects of which are completely reversible. The information collected in the first 60 days is most valuable as a pumping test, so evaluation and reporting on the test will focus on this period. The pumping test portion of Step 2 will occur for a minimum of 60 days.

The adaptive management plan for Step 2 is illustrated on Figure 10.

A. Assess
The planning for Step 2 will incorporate the results of Step 1, including any updates to the groundwater model, this Monitoring Plan, or mine plan resulting from Step 1.

In the assessment phase for Step 2, the results of the pumping test in Step 1 will be compared with the groundwater model. If they agree, then design would move forward as planned. If there are notable differences, the groundwater model would be evaluated and potentially modified.

The first level of model evaluation and modification would consist of updating the model to reflect the specific conditions of the Step 1 test (well locations, well construction, pumping rates, antecedent weather conditions, etc.) and developing a set of model predictions specific to the actual test conditions. These updates only modify the scenario for Step 1 and would not require recalibration of the model.

If the predictions from the updated model are notably inconsistent with the results of the pumping test, then the model parameters would be modified and calibrated to the observed data. Then, the full suite of predictive scenarios would be evaluated and compared with the groundwater levels included in the environmental analyses and permitting. If within the contemplated range, the project would move forward to the design phase with the revised model. If not, additional environmental analysis may be necessary.

The initially identified objectives for Step 2 are:

1) Evaluate whether groundwater levels at monitoring wells are above the performance thresholds; and,

2) Confirm that groundwater levels are low enough within the material to be mined to allow for safe and efficient mining and processing.

B. Design

Based on the results of the assessment step, the dewatering plan for Step 2 and the associated monitoring will be designed by CalPortland. Updates to the design will be simulated with the groundwater model and compared with prior environmental analyses as described above. If the model was updated in Step 1 or the assessment stage of Step 2, the predictive results from the updated model will be used to establish new performance thresholds.

Updates to the design and predictions of its impacts on groundwater will be provided to the Environmental Caucus.

C. Implement and Monitor

The additional dewatering wells for Step 2 will be installed and begin pumping. Pumped water will be discharged to an infiltration facility on the floor of existing mine. Pumping will occur for a minimum of 60 days to complete the dewatering test plus an estimated four additional months to dry gravels in Segment 1A sufficiently for mining.

Monitoring would consist of weekly monitoring at the key wells on the South Parcel in the portions of Edmond Marsh closest to the mine (key wells are defined in Table 1) and twice monthly monitoring at the other well, staff gage, and flow monitoring stations. Stations with continuously recording instrumentation, such as the flow monitoring stations, will be downloaded during these visits. Pressure transducers would also be installed to allow for continuous monitoring in key monitoring wells. Manual measurements will be collected from the other locations, such as staff gages and more distant wells.

The Environmental Caucus will be notified of the installation of wells and the start of dewatering. CalPortland will also provide weekly summaries of dewatering progress during the first two months, then monthly summaries. CalPortland will notify the Environmental Caucus (within 24 hours) of any monitoring results below the performance thresholds. Routine reporting is summarized in Table 3 and notifications are outlined in Table 2.

D. Evaluate

The evaluation stage in Step 2 is very similar to the evaluation stage of Step 1, as both actions are essentially pumping tests at different spatial scales.

Data will be screened as they are collected to determine if immediate action is required. In such an event, the Environmental Caucus would be notified and the project would move immediately to the adjustment stage.

Monitoring results will be screened against the performance thresholds in Table 6 for the appropriate well and month. The performance thresholds were established at the lower 95th-percentile confidence interval for the predicted water levels [see Section 3.3 and the Groundwater Model Update (Aspect, 2017)]. If the monitoring results indicate that groundwater levels are lower than the performance thresholds, CalPortland will develop and implement appropriate adjustments.

Even if the groundwater levels are above the performance thresholds, they still may provide valuable information for refining the model, mine plan, and/or this Monitoring Plan. Those observations will be considered during assessment and design for the next dewatering step.

The evaluation will also consider the effect of conditions occurring at the time of monitoring (such as climate conditions, development, and Restoration Plan activities) with the range of conditions experienced during the model calibration and validation period, and include that information in the interpretation of results.

E. Adjust

Adjustment during the pumping test could occur for two reasons:

1) The monitoring data indicate that dewatering could cause groundwater drawdown beyond that previously contemplated and permitted; or

2) The monitoring data indicate that groundwater levels are not sufficiently low within the mine to allow for safe and efficient mining and processing in Step 3.

The first case would trigger rapid development and implementation of adjustments by CalPortland. If adjustments are not feasible or are exhausted without success, CalPortland would request to initiate the technical review conference of the parties' technical consultants, followed by, if necessary, meetings of the parties' representatives, as described in Section 4.2.6. The Environmental Caucus may also initiate this process.

In the second case, CalPortland would refine the dewatering plan while pumping continues. Potential adjustments include modifying or terminating the pumping test, and are listed in additional detail in Table 7. The list of adjustments provided in Table 7 is not intended to limit the range of potential responses.

CalPortland will notify the Environmental Caucus of any adjustments within 24 hours of the change.

Step 2 is completely reversible as no mining below the pre-project groundwater elevation would occur. Any change in groundwater could be reversed by ceasing to pump from the dewatering wells.

Table 7. Potential Response Actions during Step 2 – Preparation for Mining/Dewatering Test

Revise monitoring (change frequency of monitoring, or monitoring locations).
Install additional monitoring locations.
Change pumping rates.
Change pumping locations (adding or decommissioning) wells.
Modify the duration of pumping.
Cease dewatering.

Reporting and Discussion

In addition to the dewatering summaries described above, an interpretative report will be prepared in the third month of pumping for Step 2. The report will summarize the pumping-test portion of Step 2 by summarizing the first 2 months of data, comparing monitoring results with prior model predictions, documenting any response actions taken, and making recommendations for the assessment and design phases of the next step.

The report will be provided to the Environmental Caucus, with a 2-month period for review and discussion of the results. CalPortland commits to making its technical consultant available to meet with the Caucus's technical consultant as often as necessary during the review period to facilitate open communications and timely review. Should the parties' technical consultants be unable to resolve any difference in opinion in interpreting the dewatering test results, either party may request a meeting of the parties' designated representatives, as described in Section 4.2.6 above.

Anticipated Schedule

Step 2 is expected to require a about a year to complete, though the planning and well installation stages may overlap with the later reporting and discussions related to Step 1. The schedule for Step 2 and relationship with the Step 1 pumping test are shown on Figure 8. The anticipated schedule for key elements of Step 2, assuming performance thresholds are met, is:

Planning the Dewatering	2 months	
Installing and Developing Wells	2–3 months	
Performing the Pumping Test	2 months	
Evaluating Results and Reporting	2 month	Simultaneously: Continue Dewatering in Preparation for Mining
Update Model (if necessary)	1 month	
Review by and discussion with EC	2 months	4 months

If groundwater levels meet performance thresholds, Step 2 would flow into Step 3 and the start of mining. Otherwise, Step 2 may require a longer period to perform the

necessary adjustments to achieve sufficient dewatering for mining while maintaining groundwater levels consistent with the performance thresholds and prior environmental analyses, or update the environmental analyses, if necessary.

Step 3 would only commence when groundwater levels are above the performance thresholds and water levels are at appropriately low levels for safe and efficient mining and processing.

4.3.3 Step 3 – Active Dewatering during Mining

During Step 3, mining will begin in the northeastern portion of the South Parcel and proceed south to mine a trough along the eastern boundary. Additional dewatering wells will be installed and pumped to dewater gravel in subsequent mine segments in the South Parcel. CalPortland would not start pumping additional dewatering wells until groundwater levels are at or above performance thresholds.

As mining is completed, reclamation of the eastern mined slope will begin. Pumping wells adjacent to mine segments that are under reclamation will be turned off incrementally to allow natural springs to form at the toe of the mined slope and vegetation to become established.

Steps 3 and 4 are different from the first two steps in that changes to groundwater in these steps are not as easily reversed. As such, the adaptive management plan is focused on identifying when adjustments are necessary.

The adaptive management plan for Step 3 is iterative, and activities would loop continuously through the adaptive management stages throughout implementation of Step 3. The adaptive management plan for Step 3 is illustrated on Figure 11.

A. Assess

The planning for Step 3 will begin prior to the completion of Step 2 to allow for a potentially smooth transition, if performance thresholds are being met. The planning stage will incorporate previously collected monitoring data as well as any updates to the groundwater model, monitoring plan, or dewatering and mining plans.

If monitoring data from prior steps meet the performance thresholds, the planning for Step 3 is expected to move forward in accordance with the mine plan.

Differences between monitoring results and predictions would result in re-evaluation of the groundwater model. The re-evaluation would first simulate the specific conditions of Step 2, then more broadly update the model if predictions still do not match observations. If significant model updates are required, the full suite of scenarios would be simulated and results compared with the prior environmental analyses and permitting. Only if model results are within the predicted range may the project move forward to the design phase with the revised model.

The initially identified objectives for Step 3 are:

1) Evaluate whether groundwater levels at monitoring wells are above the performance thresholds for the appropriate month; and

2) Confirm that groundwater levels are low enough within the material to be mined to allow for safe and efficient mining and processing.

B. Design

Based on the results of the prior steps and assessment for Step 3, the dewatering plan, mining plan, and the associated monitoring will be updated by CalPortland, if necessary. Updates to the design will be simulated with the groundwater model and compared with the performance thresholds. Updated documents will be provided to the Environmental Caucus.

C. Implement and Monitor

Mining will begin at the northern edge of the South Parcel in the area dewatered in Step 2. As mining progresses, additional dewatering wells will be installed to the south of the current wells and begin pumping. As mining is completed in an area, the nearby wells will be turned off, allowing groundwater to emerge from springs from the toe of the completed slope. Both pumped groundwater and spring flow will be conveyed to an infiltration pond installed on the floor of the existing mine.

Monitoring would continue at all normal well, wetland, and streamflow monitoring stations. Streamflow and select well monitoring stations would have continuous recording instruments installed. Other locations would use manual measurements.

The frequency of monitoring would vary during Step 3. In the 3 months after the start of pumping for each new group of monitoring wells, monitoring would be weekly at key wells (defined in Table 1) and twice monthly monitoring at the other well, staff gage, and flow monitoring stations. After that, monitoring will be performed monthly.

D. Evaluate

As with prior steps, monitoring results will be screened against performance thresholds for Step 3 (Table 8) for the appropriate well and month. The performance thresholds were established at the lower 95th-percentile confidence interval for the predicted water levels [see Section 3.3 and the Groundwater Model Update (Aspect, 2017)]. If the model was previously updated, performance thresholds based on predictive results from the updated model will be used for the comparison. The evaluation will also consider the effect of conditions occurring at the time of monitoring (such as climate conditions, development, and Restoration Plan activities) with the range of conditions experienced during the baseline period.

If the monitoring results indicate that groundwater levels are lower than the performance thresholds, CalPortland would evaluate and implement appropriate adjustments.

Although the primary focus is on changes in groundwater levels, streamflow and surface water monitoring results will also be reviewed. By this point in the project, streamflow and surface water monitoring results will be affected by Restoration Plan activities, which are likely to have a larger effect than mining on the surface water bodies. The Restoration Plan will incorporate its own adaptive management process.

E. Adjust

Step 3 involves mining below the current aquifer level. As such, it is more difficult to reverse than prior steps; however, mining is designed to begin away from the marshes

and Sequalitchew Creek and proceed southward toward them over a period of years. This will slowly change water levels beneath the marshes and creek and allow time for response actions should the monitoring data and evaluations indicate they are necessary.

If groundwater levels are below the performance thresholds, CalPortland would develop and implement adjustments. Unlike in the prior steps, re-examination of the groundwater model is not a first element of evaluating potential response actions in Step 3.

Either party may initiate a request for a technical review conference and, if necessary, meetings of the parties' representatives, as described under Section 4.2.6 above. If adjustments are not feasible or are exhausted without meeting performance thresholds, CalPortland would initiate the process to discuss alternative approaches and next steps.

Selection of potential response actions is shown in Table 9. The suite of appropriate response actions will change over time as mining progresses. For example, early in Step 3 there is more flexibility to alter the mine plan. As mining progresses further south, the ability for alterations to the mine plan to produce a meaningful change in groundwater levels is reduced.

Table 9. Potential Response Actions during Step 3 – Active Dewatering during Mining

Revise mine phasing to allow time for additional monitoring, analyses, testing, and planning.
Revise dewatering plan (number of wells, spacing, alignment, pumping duration).
Revise mining plan to change depth or extent of mining.
Install partial slurry cutoff wall.
Provide additional mitigation.
Cease dewatering and mining.

Reporting and Discussion

During Step 3, CalPortland will prepare summary memos providing comparison of observed groundwater levels over the past 3 months with model predictions, as well as an update on dewatering and mining status, and any response actions taken. The summary memos will be prepared monthly for 3 months after each new set of dewatering wells begins pumping, then quarterly. The memos will be provided to the Environmental Caucus.

Anticipated Schedule

Mining would proceed south over a period of years. Completion of Step 3 is expected to take 4 to 8 years. The mining schedule is, in part, driven by the market demand for aggregate. CalPortland has committed to complete Step 3 in no less than 3 years, or a minimum of 9 months per each of the first four segments (1A to 1D). The minimum timeline for completion of Step 3 is illustrated in Figure 8.

4.3.4 Step 4 – Cessation of Active Dewatering

This final step of dewatering commences once mining and reclamation advances to the point that the last dewatering wells installed in Step 3 have been turned off. At that point, groundwater will emerge from springs along the length of the toe of the mined (and reclaimed) slope along the eastern and a portion of the southern mine boundaries. Step 3 is expected to transition smoothly into Step 4, given the multiple-year duration of Step 3 and that ceasing to pump the dewatering wells will result in lower environmental impact.

Several steps of the adaptive management process (i.e., assess and design) are not as relevant in Step 4, because it is a largely passive step with respect to the effects on groundwater levels. Mining and reclamation activities will continue within the South Parcel, but those activities would no longer influence groundwater levels.

As such, this discussion focuses on ongoing monitoring, data evaluation, and potential response actions. The adaptive management plan for Step 4 is illustrated on Figure 12.

C. Monitoring

Monthly monitoring would continue for the duration of mining at the normal well, wetland, and streamflow monitoring stations. Continuous instrumentation will be maintained at streamflow monitoring stations. Staff gage and well monitoring locations will be manually measured.

D. Evaluate

Monitoring results would continue to be screened relative to the performance thresholds shown in Table 10, or as refined from the most recent groundwater model. The performance thresholds were established at the lower 95th-percentile confidence interval for the predicted water levels [see Section 3.3 and the Groundwater Model Update (Aspect, 2017)]. It is unlikely that events will result in short-term changes in groundwater levels in Step 4. Therefore, the evaluation will focus on longer-term comparisons with model predictions and observations of changes in the marshes and Sequalitchew Creek.

E. Adjust

If groundwater levels persist lower than the performance thresholds, CalPortland and the Environmental Caucus would hold one or more technical review conferences of the parties' technical consultants and, if necessary, meetings of the parties' representatives (as described in Section 4.2.6). to discuss and select appropriate adjustments. Either party may initiate this process.

Reporting

Quarterly summary memos will be prepared for the first year after cessation of dewatering. Annual reports will be prepared for the remaining duration of mining of the South Parcel.

Anticipated Schedule

Step 4 will begin after active dewatering ceases. Depending on market demand for aggregate products, mining of the remainder of the South Parcel is expected to occur over 5 to 8 years after cessation of active dewatering. Active adaptive management during Step 4 would cease when the following conditions are met:

- Mining of the South Parcel is complete, and

- Measured groundwater levels have been met performance thresholds for at least 3 consecutive years.

5 Relationship of Adaptive Management Process to Sequalitchew Creek Restoration Plan

Mining of the South Parcel and the restoration of Sequalitchew Creek are separate, but interacting, projects. Each project has its own adaptive management process tailored to achieving the goals and objectives of that project. The interaction between the two adaptive management processes is three-fold: 1) project schedules that encourage restoration in advance of the potential impacts from mining; 2) development of performance thresholds for mining that support restoration based on prior technical studies, including the cumulative effects analysis prepared in 2016 (Aspect and Anchor, 2016); and 3) coordinated monitoring and open sharing of information.

Project Schedules. The mining and restoration projects have been designed to facilitate restoration occurring in advance of the potential impacts from mining. This relationship between the project schedules is founded in key elements of the settlement agreement:

1) The mining project cannot begin until all permits for restoration have been obtained and the required authorizations or approvals from JBLM needed to implement the restoration elements on JBLM have been obtained.

2) The first actions of the mining project are pumping and dewatering tests (i.e., Steps 1 and 2) and are expected to take about 1.5 to 2 years to complete and no less than 9 months[1], as described in Section 4.2.1. The effects of Steps 1 and 2 on groundwater are completely reversible.

3) The first South Parcel mining segment is located furthest from the wetlands and Sequalitchew Creek. Mining and dewatering proceed slowly toward the Creek over a period of not less than 3 years, and more likely 4 to 8 years.

4) There are no schedule constraints or limits imposed on the pace of restoration activities.

The Restoration Plan schedule is anticipated to begin with the elements that immediately restore flow through the system—specifically, beaver management and improvements at the outlet of Sequalitchew Lake. The actions will be followed by improvements that enhance flows (e.g., connections from Hamer Marsh) and make it easier to maintain flows (e.g., installation of the Railroad Trail bridge and sealing\restoration of the losing reach). Finally, habitat restoration, through culvert replacements and enhancement of wetland and stream habitats, is the final component of the Restoration Plan.

Although a detailed schedule has not been developed for implementation of the Restoration Plan, it is anticipated restoration activities will begin immediately shortly after Restoration Plan permits are obtained and it should require no more than 6 years to complete construction and implementation of all elements of the Restoration Plan. The

[1] Minimum durations for the pumping test and review and discussion stages of Steps 1 and 2 are established in Section 4.3. The specified timeframes add up to a minimum duration of 9 months, however this duration is unrealistically short as it does not include time for other key steps, like well installation or report writing.

flow restoration actions should be completed within two years from the start of the project, and followed by flow maintenance and enhancement, which may require 3 years to complete, but could overlap with the flow restoration actions. Finally, construction of habitat restoration improvements could be completed within 3 years and could overlap or dovetail with the related flow maintenance and enhancement elements.

A timeline relating the anticipated schedules for restoration and mining is presented on Figure 13. Restoration activities should be successful in restoring flows to Sequalitchew Creek within the first 2 years. During this time, the mining project would complete the second pumping test (Step 2) and, if groundwater levels meet performance thresholds and mining progresses at the fastest allowable pace, mine Segment 1A and advance into Segment 1B. The anticipated increase in flow is much greater than the potential impact from the mining project, and the full benefit in flow quantity may be achieved in these first 2 years; whereas the impact from mining is minimal at first and increases slowly over time. The impact from mining is expected to peak during mining of Segment 1C, when the greatest number of wells are pumping[2].

Even if mining is proceeding rapidly, CalPortland has committed that mining of Segment 1 would not be completed in less than 3 years, with each segment lasting at least 9 months. At this pace, the peak impact from mining could be expected around 2 to 3 years after the start of restoration. Even if delayed, the flow restoration action should have occurred by this time and only a fraction of flow restoration is necessary to offset the impacts from mining.

Performance Thresholds that are Supportive of Restoration. The cumulative effects analysis (Aspect and Anchor, 2016) found that the changes in the marshes would be dominated by the Restoration Project (which requires lowering marsh water levels to achieve flow from Sequalitchew Lake to the ravine), rather than increased infiltration resulting from lower groundwater levels. The marshes would have significantly more water flowing through them than under current conditions, resulting in consistent water levels year-round at the target levels established in the Restoration Plan, except for some periods in the driest years.

The cumulative effects analysis also concluded that the predominant cumulative effect on Sequalitchew Creek would be an increase in annual average flows by approximately 10 cfs, with abundant year-round flow most of the time. By comparison, the stream flow reductions from mining is expected to be less than 1 cfs, and only apparent during limited periods in atypical summers.

The anticipated benefits to streamflow from restoration are much larger than the potential impacts from mining. As a result, the success of the restoration project is not expected to be particularly sensitive to the groundwater levels resulting from mining. Monitoring during mining will ensure that groundwater levels remain within the expected range that will support the anticipated increases in stream flow from the restoration project. If

[2] To be conservative, the potential impacts of mining described in the cumulative effects analysis (Aspect and Anchor, 2016) were based on all wells pumping at the same time. In practice, this condition is unlikely to occur as initial wells would be phased off as mining progresses.

groundwater levels are not maintained within the expected range, corrective actions will be implemented in accordance with the adaptive management plan for mining.

Coordinated Monitoring and Information Sharing. To facilitate the coordinated collection and exchange of information, the two projects share an integrated SAP (Appendix B). The SAP outlines the collection of information on groundwater levels, surface water levels, streamflow, and surface water quality to support both plans. Each plan also outlines how information will be shared so that plan implementers have the data necessary to make informed management decisions.

6 References

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7 Limitations

Work for this project was performed for CalPortland (Client), and this report was prepared in accordance with generally accepted professional practices for the nature and conditions of work completed in the same or similar localities, at the time the work was performed. This report does not represent a legal opinion. No other warranty, expressed or implied, is made.

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TABLES

Table 4 - Performance Thresholds for Step 1 - Initial Dewatering Test

Project No. 040001-014-02, South Parcel, DuPont, Washington

Well	Performance Threshold = Groundwater Elevation in Feet (NGVD 29)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
MW-EM-1S	203.6	202.4	202.9	202.2	202.3	201.4	200.4	200.4	199.5	199.5	202.1	202.9
MW-EM-1D	204.6	203.4	203.9	203.2	203.3	202.5	201.5	201.5	200.7	200.7	203.1	203.9
MW-EM-2S	210.6	210.3	210.4	210.3	210.2	210.0	209.7	209.6	209.3	209.5	210.2	210.4
MW-EM-2D	210.8	210.4	210.6	210.5	210.4	210.2	209.8	209.7	209.4	209.6	210.4	210.5
MW-EM-3	212.1	211.9	211.8	211.9	212.0	211.6	211.4	210.8	210.2	210.3	211.5	211.9
MW-SRC-2	213.2	212.4	212.7	212.6	212.8	212.0	211.4	210.2	209.6	210.5	212.3	212.7
MW-BM-1	218.0	217.0	216.6	217.4	217.3	216.6	216.1	213.1	213.3	214.2	216.8	217.4
MW-HM-1	214.2	213.5	213.3	213.8	213.6	212.7	211.8	211.2	210.6	211.1	213.1	213.6
MW-PL-1	200.8	200.1	200.4	200.1	200.0	199.4	198.6	198.7	198.0	197.7	199.6	200.2
CHMW-1	191.3	189.9	190.4	189.6	189.7	189.0	188.1	188.0	187.4	187.5	190.0	190.7
CHMW-2S	184.6	183.3	183.7	183.0	183.0	182.5	181.7	181.6	181.2	181.4	183.5	184.0
CHMW-2D	183.4	181.8	182.4	181.4	181.5	180.8	179.8	179.7	179.3	179.4	182.1	182.7
CHMW-3S	193.3	191.7	192.4	191.3	191.5	190.6	189.6	189.5	188.7	188.8	191.7	192.6
CHMW-3D	193.2	191.5	192.2	191.1	191.3	190.4	189.2	189.1	188.3	188.4	191.5	192.5
CHMW-4S	196.1	194.7	195.3	194.4	194.6	193.7	192.7	192.6	191.9	191.9	194.6	195.5
CHMW-4D	194.3	192.9	193.5	192.6	192.7	191.9	190.9	190.8	190.1	190.1	192.8	193.6
MW-D-3	196.5	195.3	195.7	195.0	195.1	194.6	193.9	193.7	193.3	193.5	195.6	195.9
MW-93-MFS-C5-3	192.3	191.2	191.7	191.0	191.0	190.5	190.0	189.9	189.5	189.8	191.6	191.7

Table 6 - Performance Thresholds for Step 2 - Preparation for Mining/Expanded Dewatering Test

Project No. 040001-014-02, South Parcel, DuPont, Washington

Well	Performance Threshold = Groundwater Elevation in Feet (NGVD 29)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
MW-EM-1S	202.3	201.1	201.6	200.9	201.1	200.1	199.1	199.2	198.4	198.3	200.8	201.5
MW-EM-1D	203.4	202.3	202.8	202.2	202.3	201.4	200.5	200.5	199.7	199.7	202.0	202.7
MW-EM-2S	210.6	210.2	210.3	210.2	210.1	210.0	209.6	209.5	209.2	209.4	210.1	210.3
MW-EM-2D	210.8	210.4	210.5	210.4	210.3	210.1	209.7	209.6	209.3	209.5	210.3	210.5
MW-EM-3	212.1	211.9	211.8	211.9	212.0	211.6	211.4	210.8	210.2	210.3	211.5	211.9
MW-SRC-2	213.2	212.4	212.6	212.6	212.8	212.0	211.4	210.2	209.5	210.5	212.0	212.7
MW-BM-1	218.0	217.0	216.5	217.3	217.2	216.6	216.1	213.0	213.3	214.1	216.8	217.3
MW-HM-1	214.2	213.4	213.3	213.8	213.6	212.7	211.8	211.2	210.5	211.1	213.0	213.6
MW-PL-1	200.4	199.7	200.1	199.8	199.8	199.1	198.2	198.4	197.7	197.4	199.2	199.8
CHMW-1	187.0	185.7	186.3	185.5	185.6	184.9	184.0	184.0	183.3	183.4	185.8	186.4
CHMW-2S	143.8	141.4	142.2	141.0	141.0	140.1	139.1	138.9	138.3	138.6	141.8	142.9
CHMW-2D	142.5	141.0	141.6	140.7	140.7	140.0	139.1	138.9	138.3	138.5	141.2	141.9
CHMW-3S	190.6	189.0	189.8	188.8	189.0	188.1	187.0	187.0	186.2	186.2	189.0	189.8
CHMW-3D	190.2	188.6	189.4	188.3	188.5	187.5	186.3	186.3	185.4	185.3	188.4	189.3
CHMW-4S	193.7	192.3	193.0	192.1	192.3	191.4	190.4	190.4	189.6	189.6	192.2	193.0
CHMW-4D	191.8	190.5	191.2	190.3	190.5	189.6	188.6	188.6	187.8	187.8	190.4	191.1
MW-D-3	193.7	192.5	193.0	192.3	192.3	191.9	191.2	191.1	190.7	190.9	192.9	193.4
MW-93-MFS-C5-3	190.8	189.8	190.3	189.6	189.6	189.1	188.7	188.5	188.2	188.5	190.2	190.5

Table 8 - Performance Thresholds for Step 3 - Active Dewatering during Mining

Project No. 040001-014-02, South Parcel, DuPont, Washington

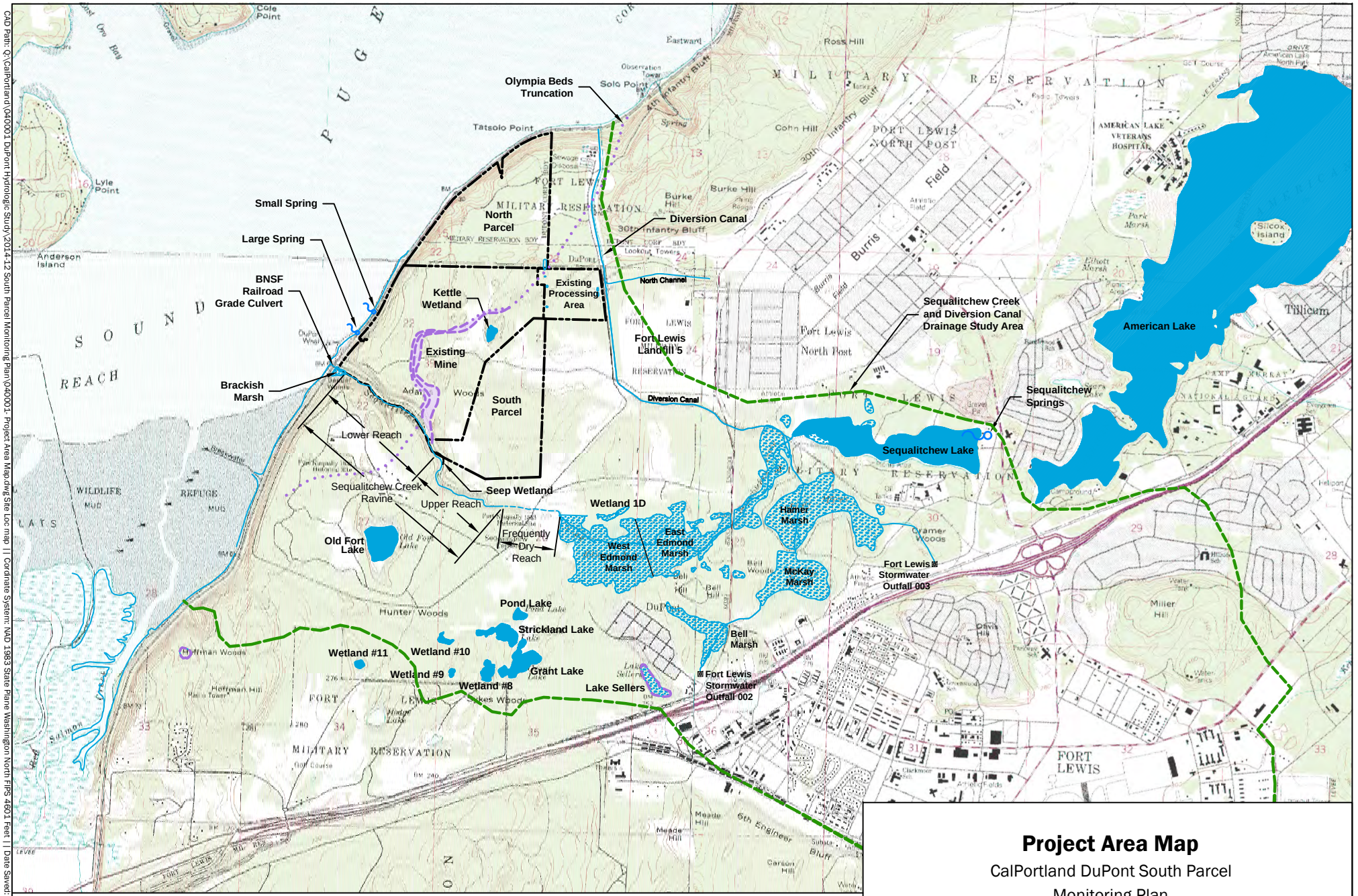
Well	Performance Threshold = Groundwater Elevation in Feet (NGVD 29)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
MW-EM-1S	197.5	196.4	196.9	196.4	196.5	195.6	194.7	194.8	194.1	194.1	196.1	196.8
MW-EM-1D	199.4	198.4	198.9	198.3	198.4	197.6	196.8	196.9	196.2	196.2	198.1	198.7
MW-EM-2S	210.3	210.0	210.1	209.9	209.9	209.7	209.4	209.3	209.0	209.2	209.9	210.0
MW-EM-2D	210.5	210.1	210.3	210.1	210.0	209.8	209.5	209.4	209.1	209.3	210.0	210.2
MW-EM-3	212.1	211.9	211.8	211.9	212.0	211.6	211.4	210.8	210.2	210.3	211.5	211.8
MW-SRC-2	213.2	212.4	212.7	212.6	212.8	212.0	211.4	210.2	209.5	210.5	212.0	212.7
MW-BM-1	217.8	216.8	216.4	217.2	217.1	216.4	215.9	212.8	213.1	213.9	216.7	217.2
MW-HM-1	214.2	213.4	213.3	213.8	213.6	212.7	211.8	211.2	210.4	211.1	213.0	213.6
MW-PL-1	199.4	198.7	199.0	198.8	198.7	198.0	197.1	197.3	196.6	196.2	198.1	198.8
CHMW-1	129.8	129.1	129.4	128.9	128.9	128.5	127.8	127.8	127.3	127.4	129.2	129.5
CHMW-2S	136.0	134.5	135.0	134.1	134.1	133.5	132.9	132.8	132.3	132.5	134.9	135.5
CHMW-2D	135.9	134.7	135.1	134.3	134.2	133.7	133.1	132.9	132.4	132.6	134.9	135.5
CHMW-3S	131.1	128.4	130.3	128.9	129.2	127.9	126.6	127.0	126.2	126.3	129.0	130.2
CHMW-3D	128.3	127.4	127.9	127.6	127.6	126.8	125.8	126.1	125.4	125.1	127.0	127.6
CHMW-4S	181.0	179.7	180.4	179.6	179.7	178.8	177.7	177.8	176.9	176.9	179.5	180.3
CHMW-4D	178.5	177.3	178.0	177.1	177.3	176.4	175.3	175.4	174.5	174.4	177.1	177.8
MW-D-3	189.9	188.6	189.1	188.4	188.4	187.9	187.4	187.3	186.9	187.3	189.1	189.6
MW-93-MFS-C5-3	189.5	188.5	189.0	188.4	188.3	187.9	187.5	187.4	187.2	187.5	189.0	189.3

Table 10 - Performance Thresholds for Step 4 - Cessation of Active Dewatering

Project No. 040001-014-02, South Parcel, DuPont, Washington

Well	Performance Threshold = Groundwater Elevation in Feet (NGVD 29)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
MW-EM-1S	198.1	197.0	197.6	197.0	197.1	196.2	195.4	195.3	194.8	194.7	196.8	197.4
MW-EM-1D	199.9	198.9	199.4	198.8	199.0	198.2	197.3	197.3	196.7	196.7	198.7	199.3
MW-EM-2S	210.3	210.0	210.1	210.0	209.9	209.7	209.4	209.3	209.0	209.2	209.9	210.1
MW-EM-2D	210.5	210.2	210.3	210.1	210.1	209.9	209.5	209.4	209.1	209.3	210.1	210.2
MW-EM-3	212.1	211.9	211.8	211.9	212.0	211.6	211.4	210.8	210.2	210.3	211.5	211.8
MW-SRC-2	213.2	212.4	212.7	212.6	212.8	212.0	211.4	209.9	209.4	210.4	212.0	212.7
MW-BM-1	217.9	216.9	216.4	217.2	217.1	216.5	216.0	212.3	213.0	213.8	216.7	217.2
MW-HM-1	214.2	213.4	213.3	213.8	213.6	212.7	211.8	211.0	210.3	211.1	213.0	213.6
MW-PL-1	199.5	198.8	199.2	198.9	198.9	198.2	197.3	197.5	196.8	196.4	198.2	198.9
CHMW-1	163.2	162.7	162.9	162.7	162.6	162.4	162.1	162.1	161.8	162.0	162.9	163.1
CHMW-2S	169.3	165.0	168.1	163.2	162.8	158.9	157.1	157.2	156.2	156.9	167.9	168.8
CHMW-2D	160.3	158.5	159.2	158.1	157.9	156.9	155.4	155.5	154.6	155.2	159.1	159.8
CHMW-3S	140.4	140.2	140.3	140.2	140.2	140.0	139.7	139.7	139.5	139.7	140.3	140.3
CHMW-3D	141.9	141.6	141.8	141.6	141.6	141.4	141.1	141.1	140.9	141.0	141.6	141.8
CHMW-4S	183.0	181.9	182.5	181.8	181.9	181.3	180.5	180.5	179.9	180.0	181.9	182.4
CHMW-4D	181.0	180.0	180.6	179.9	180.0	179.4	178.7	178.7	178.2	178.2	180.0	180.5
MW-D-3	191.4	190.2	190.7	190.0	189.9	189.5	188.9	188.8	188.5	188.9	190.7	191.1
MW-93-MFS-C5-3	190.1	189.1	189.5	188.9	188.8	188.4	187.9	187.9	187.6	188.0	189.6	189.9

FIGURES



Project Area Map

CalPortland DuPont South Parcel
Monitoring Plan
DuPont, Washington

Aspect CONSULTING	DEC-2014	BY: OGR/SCC	FIGURE NO. 1
	PROJECT NO. 040001-014	REVISED BY: -	

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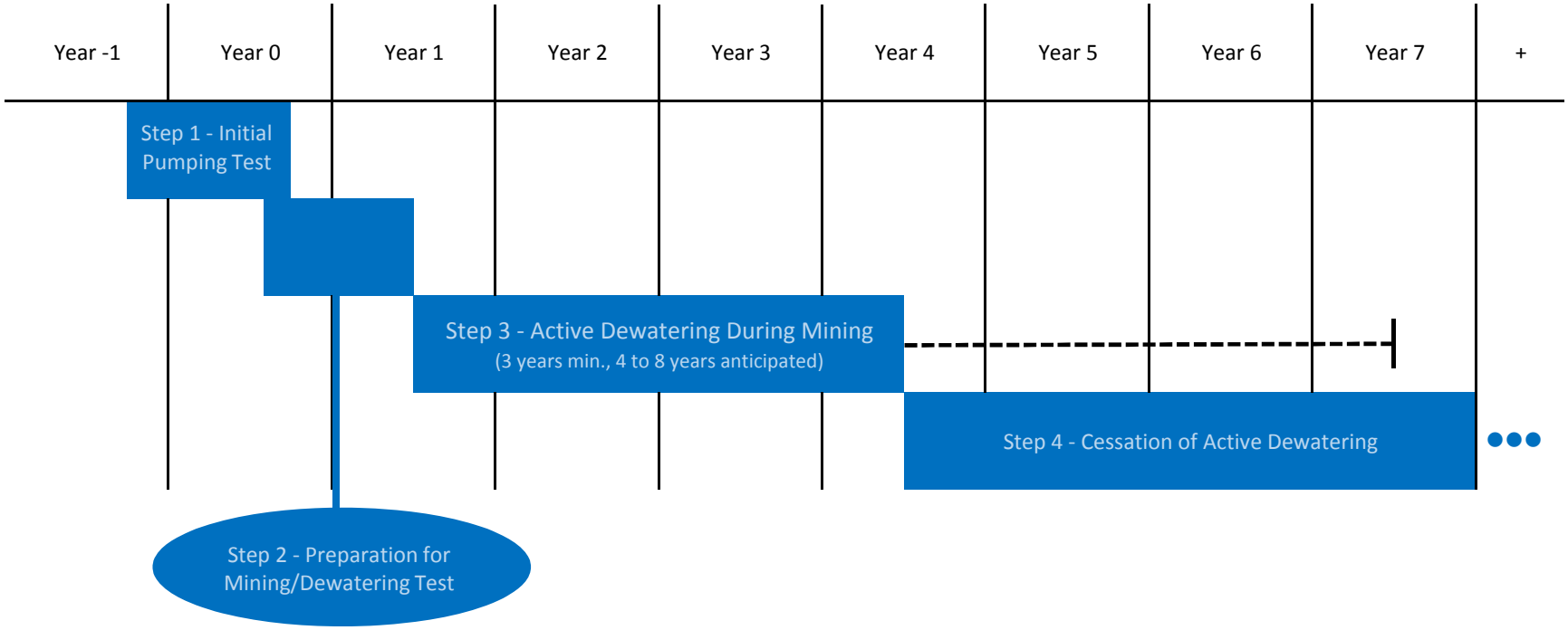
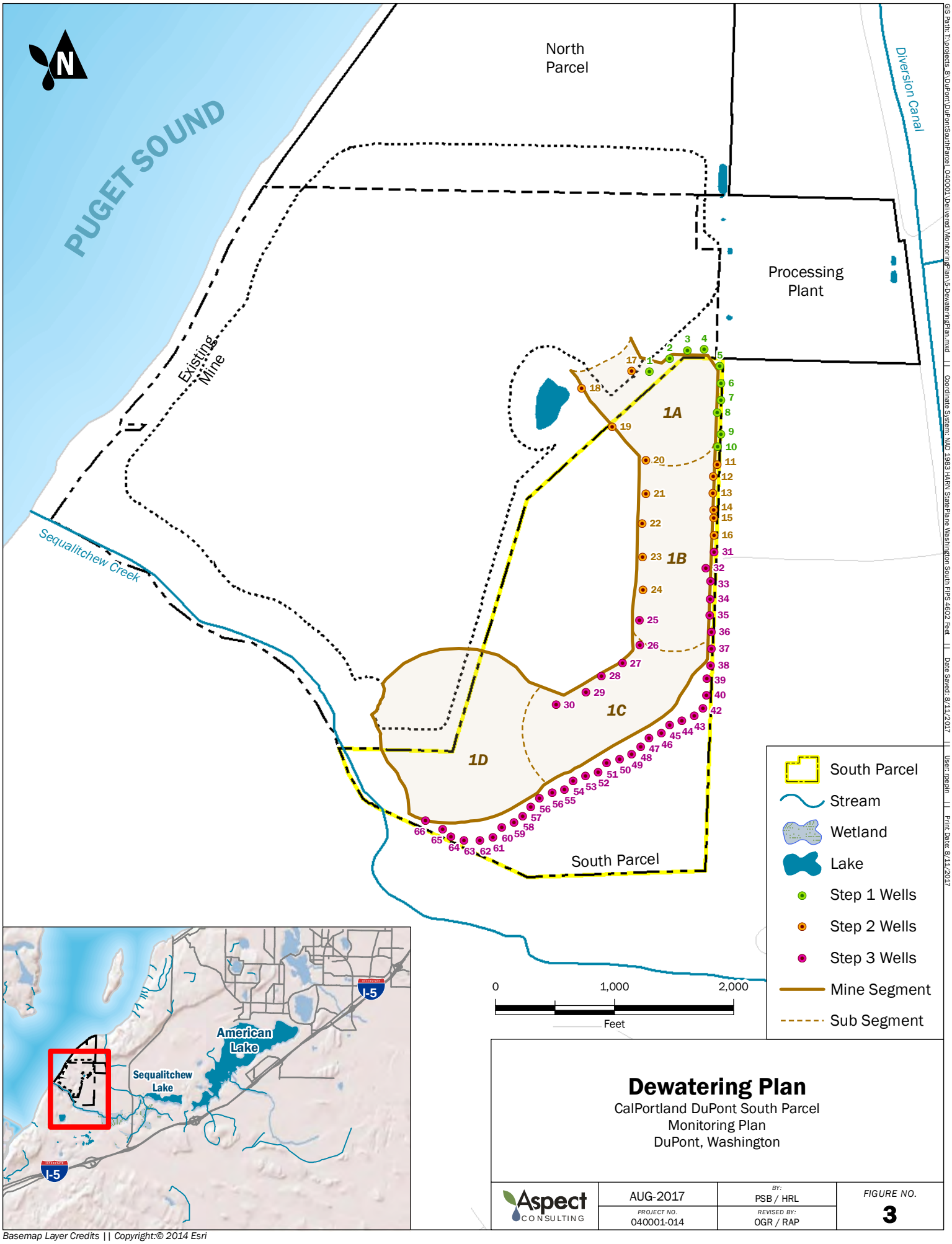


Notes:

1) Year 1 begins with the start of pumping in Step 2.

2) Timeline for Step 3 is based on CalPortland's commitment to a minimum duration of 3 years. The dashed line indicates the anticipated duration (6 years).

Figure 2
Timeline of Dewatering Steps
South Parcel Monitoring Plan
DuPont, Washington



Dewatering Plan

CalPortland DuPont South Parcel
Monitoring Plan
DuPont, Washington

Aspect CONSULTING	AUG-2017	BY: PSB / HRL	FIGURE NO. 3
	PROJECT NO. 040001-014	REVISED BY: OGR / RAP	

Basemap Layer Credits || Copyright:© 2014 Esri

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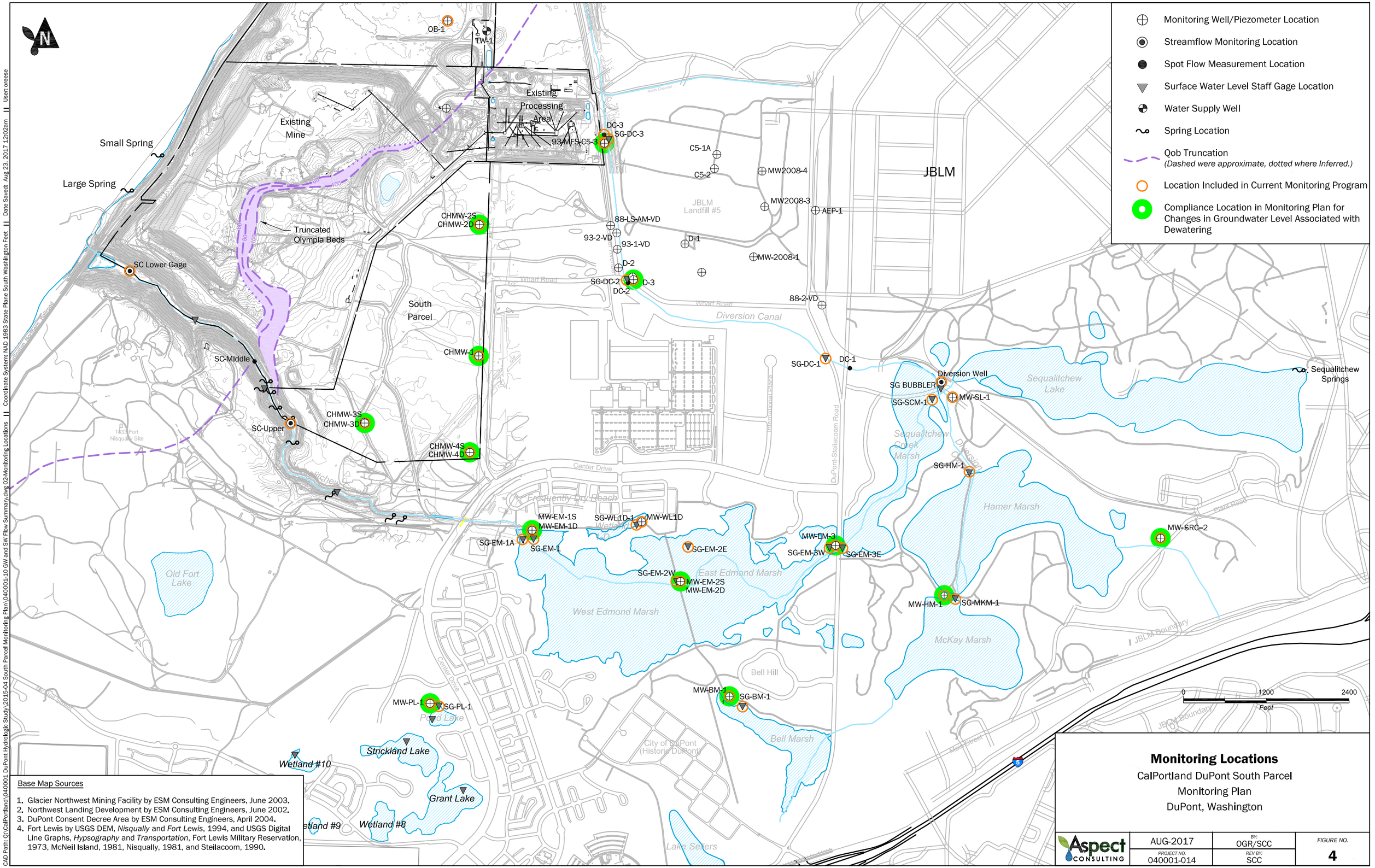

Base Map Sources

1. Glacier Northwest Mining Facility by ESM Consulting Engineers, June 2003.
2. Northwest Landing Development by ESM Consulting Engineers, June 2002.
3. DuPont Consent Decree Area by ESM Consulting Engineers, April 2004.
4. Fort Lewis by USGS DEM, *Nisqually* and *Fort Lewis*, 1994, and USGS Digital Line Graphs, *Hypsography* and *Transportation*, Fort Lewis Military Reservation, 1973, McNeil Island, 1981, Nisqually, 1981, and Steilacoom, 1990.

Monitoring Locations

CalPortland DuPont South Parcel
Monitoring Plan
DuPont, Washington

Aspect Consulting	AUG-2017	BY: OGR/SCC	FIGURE NO. 4
	PROJECT NO. 040001-014	REV BY: SCC	

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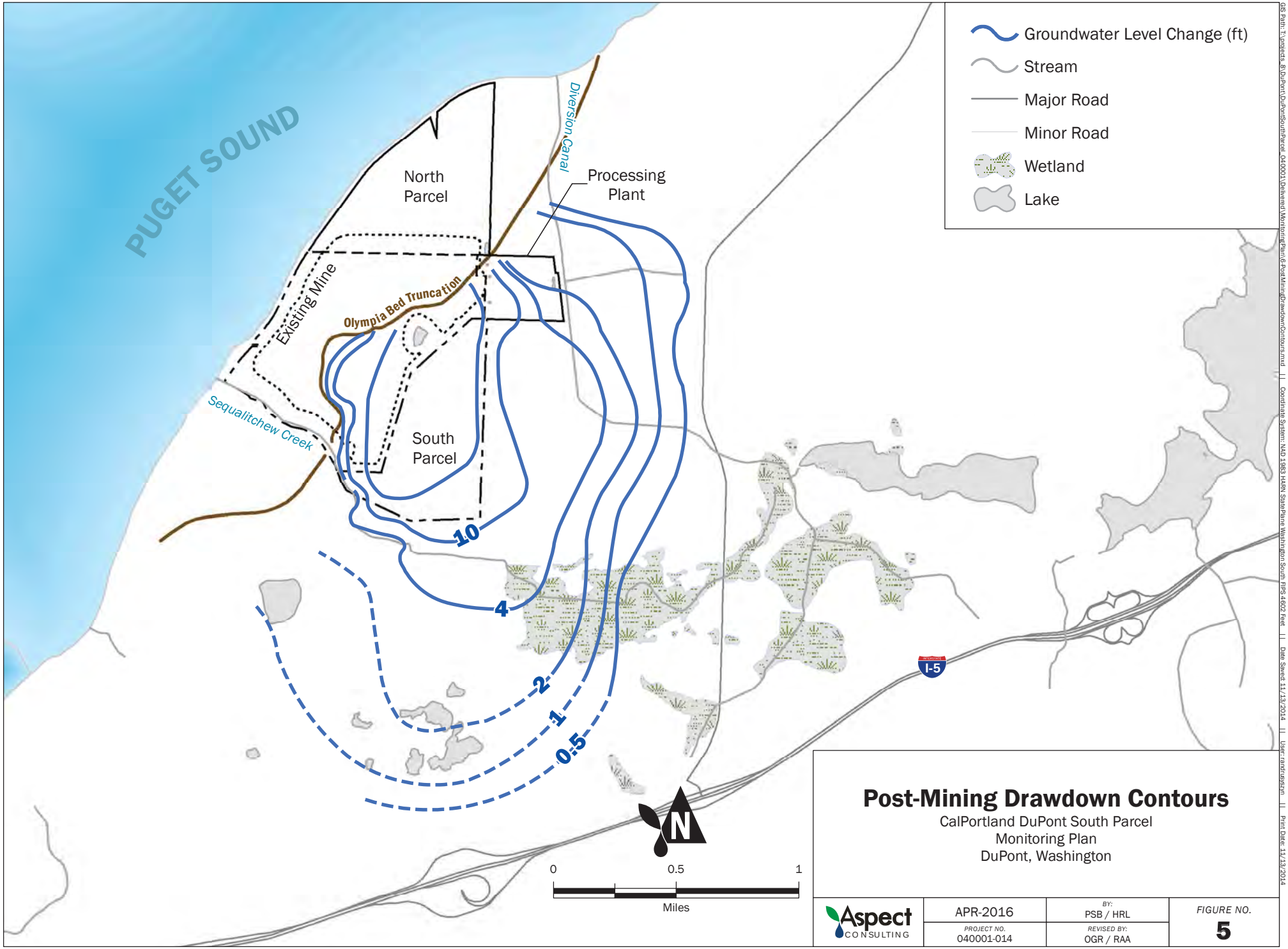

Post-Mining Drawdown Contours

CalPortland DuPont South Parcel
Monitoring Plan
DuPont, Washington

Aspect CONSULTING	APR-2016	BY: PSB / HRL	FIGURE NO. 5
	PROJECT NO. 040001-014	REVISED BY: OGR / RAA	

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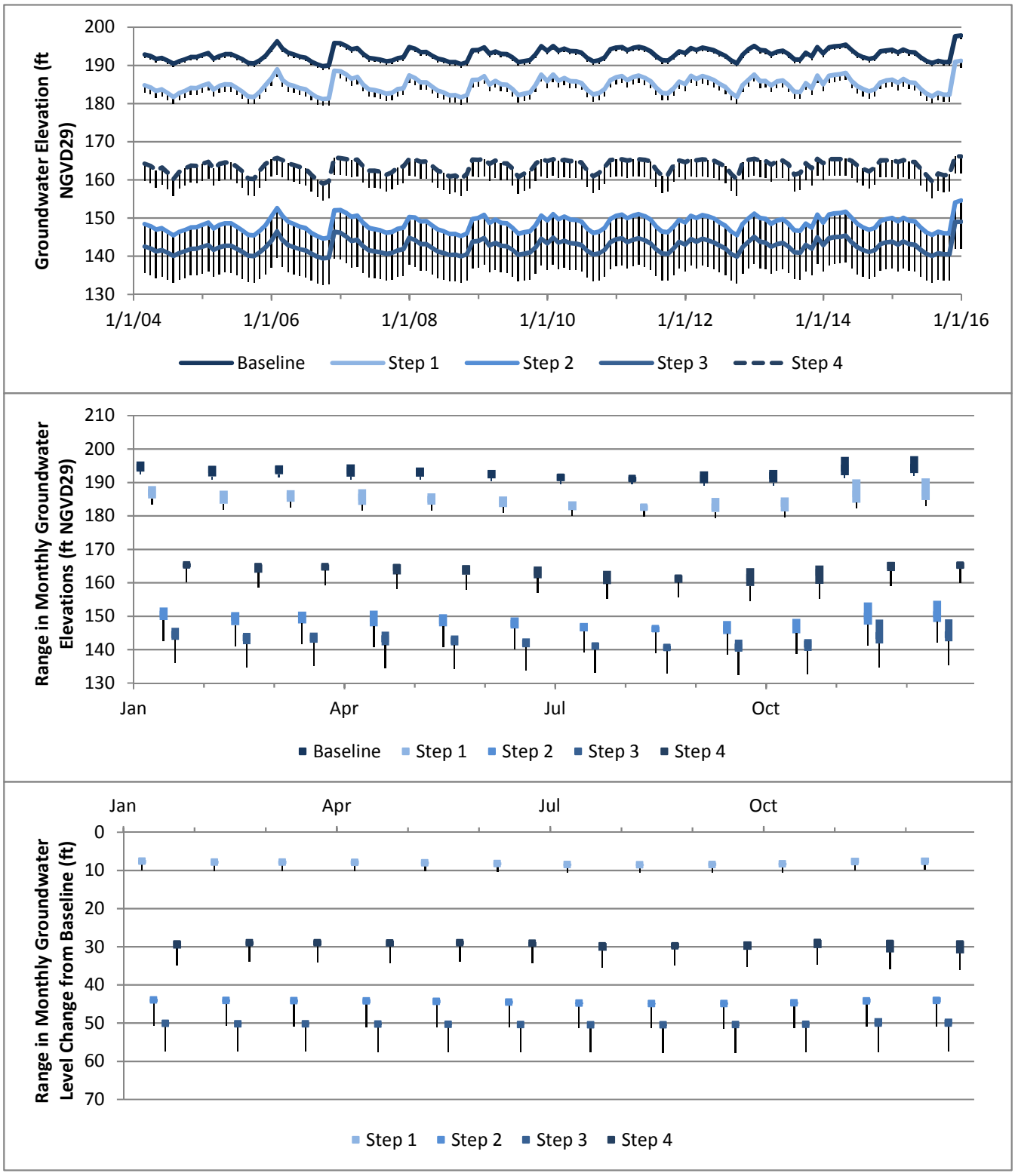
CHMW-2D



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03/20/2017
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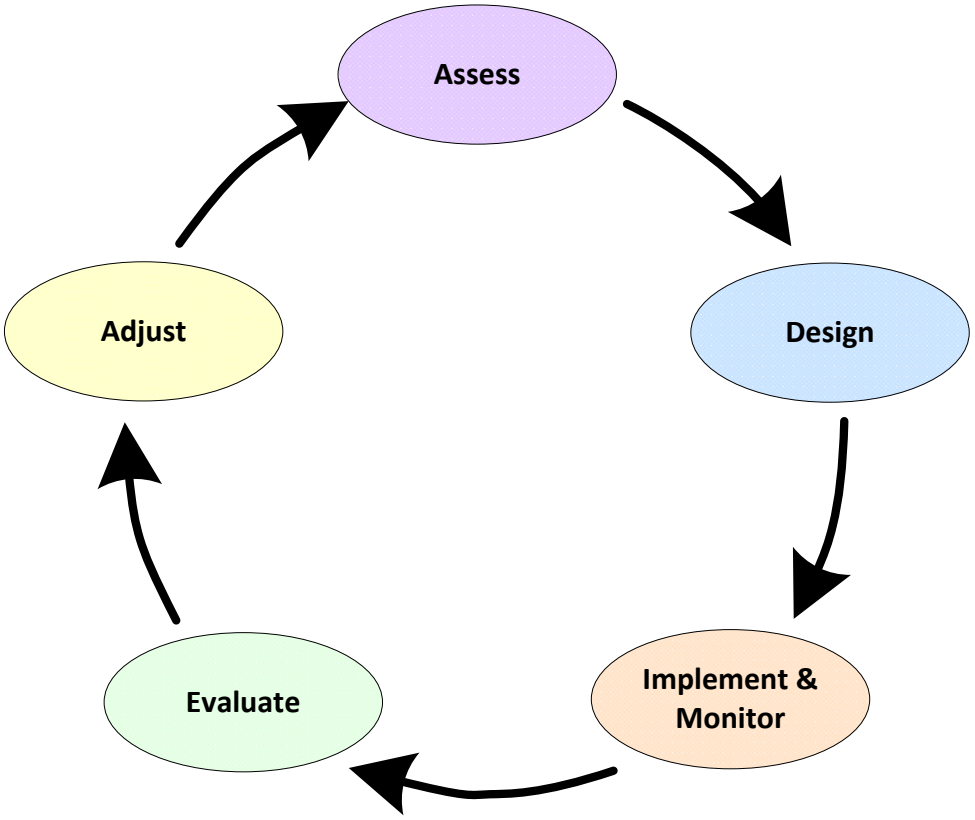
Figure 6
Predicted Changes and Ranges in Groundwater Levels



Adaptive Management Process

CalPortland DuPont South Parcel
Monitoring Plan
DuPont, WA

Aspect CONSULTING	APR-2016	BY: OGR	FIGURE NO. 7
	PROJECT NO. 040001-014	REV BY: ---	

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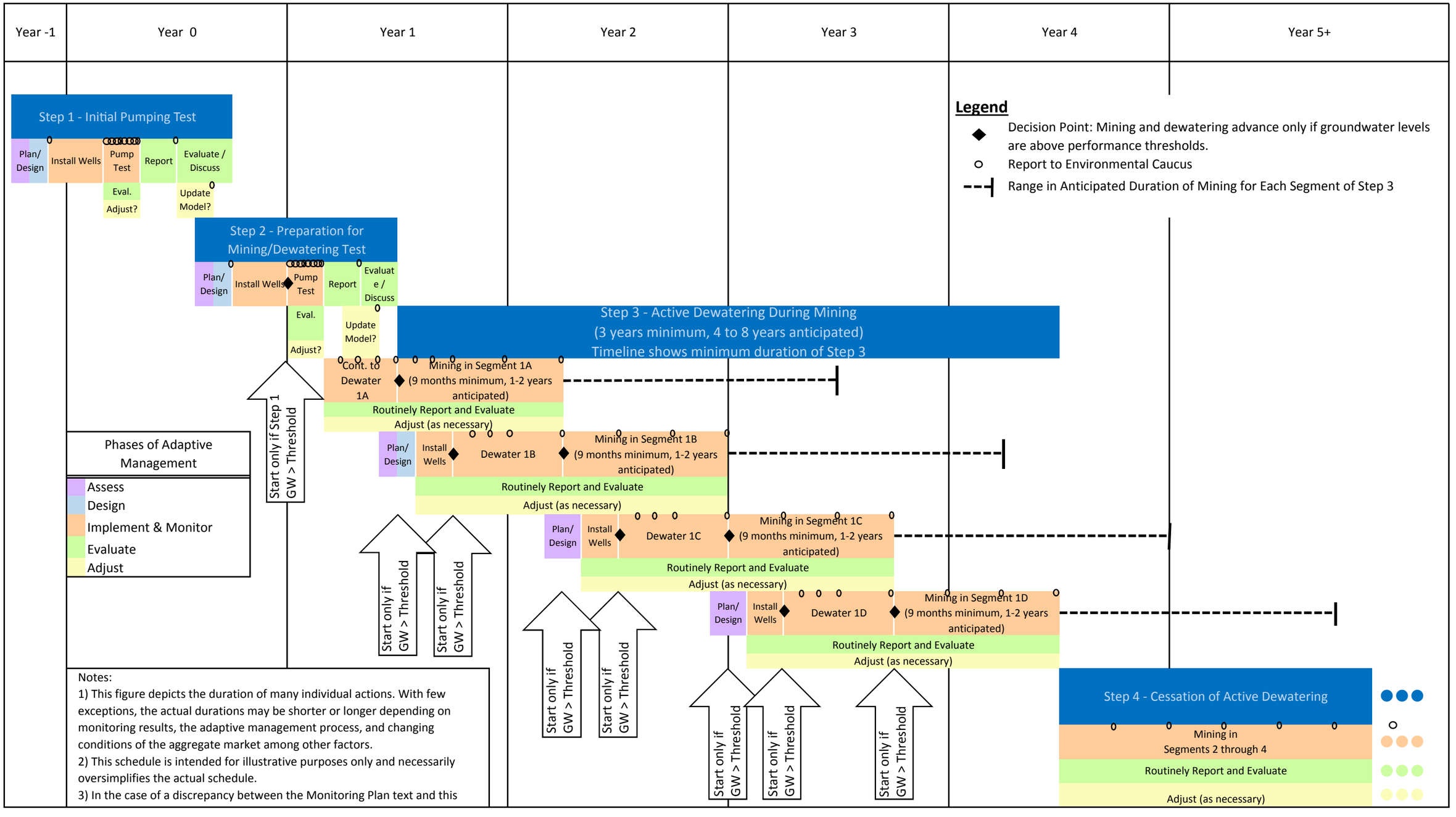
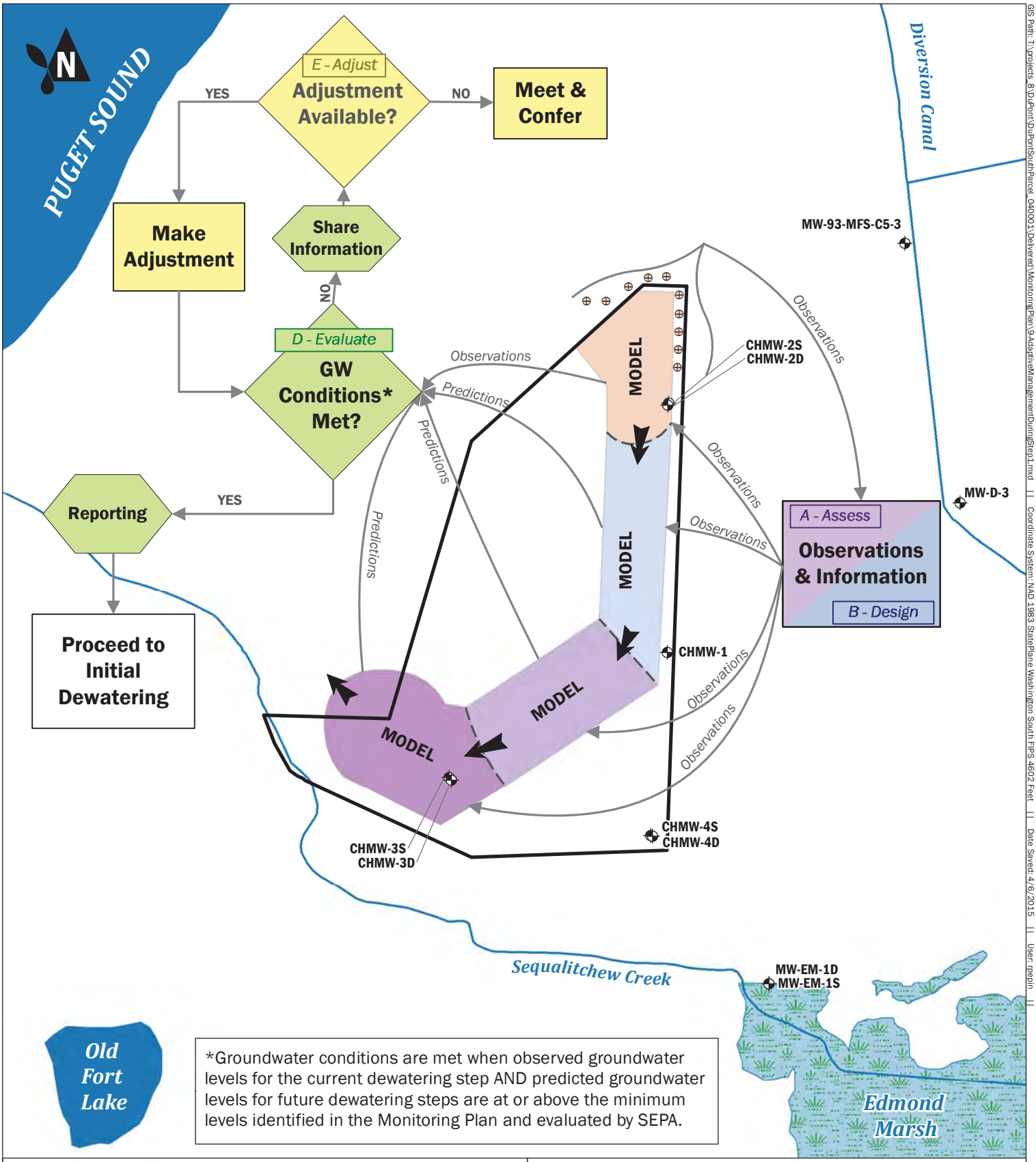


Figure 8
Timeline of Adaptive Management for South Parcel Mining



Adaptive Management Process During Step 1 - Initial Dewatering Test

CalPortland DuPont South Parcel
Monitoring Plan
DuPont, Washington

Aspect CONSULTING	APR-2016	BY: OGR / RAP	FIGURE NO. 9
	PROJECT NO. 040001-014	REVISED BY: ---	

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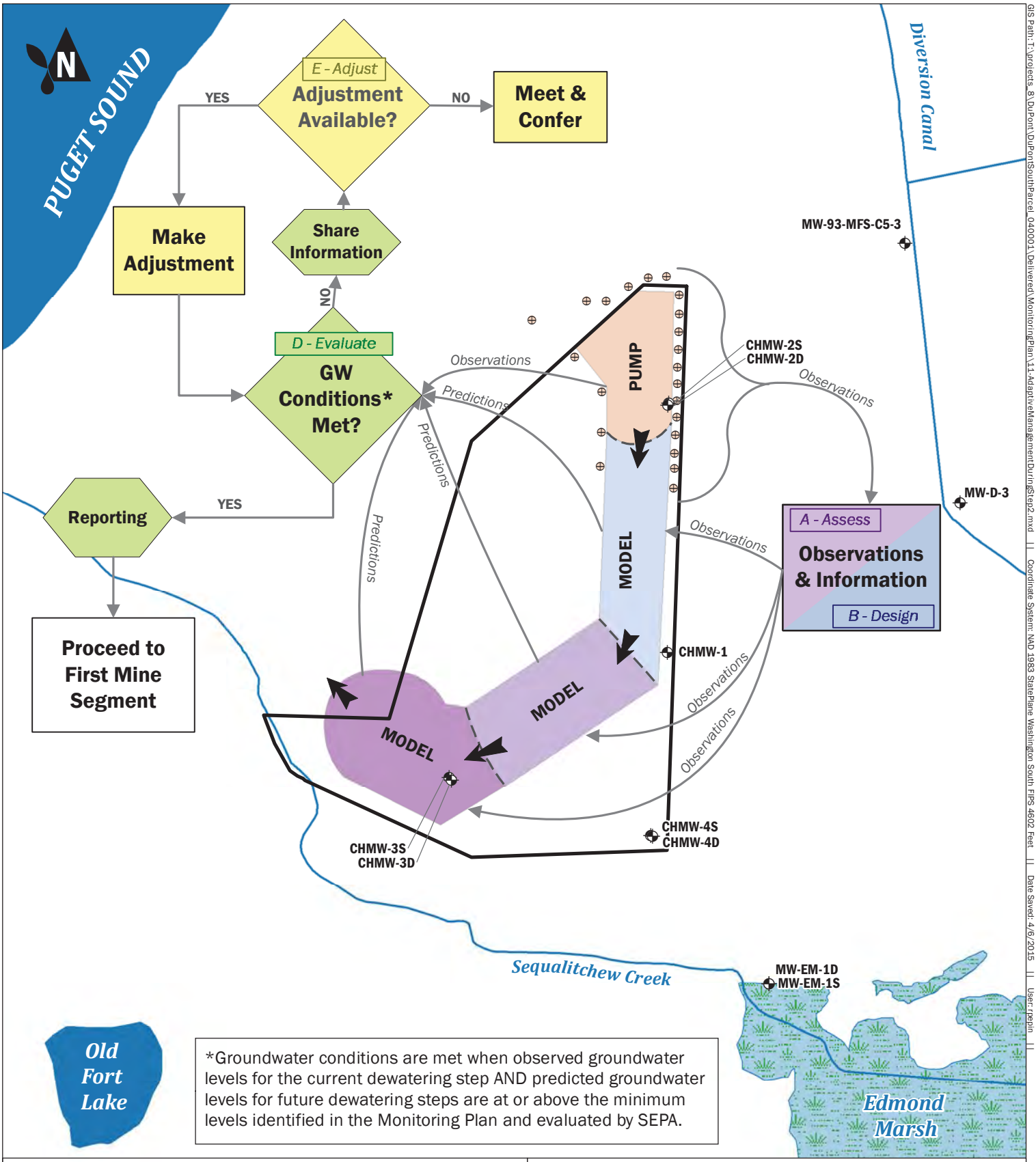
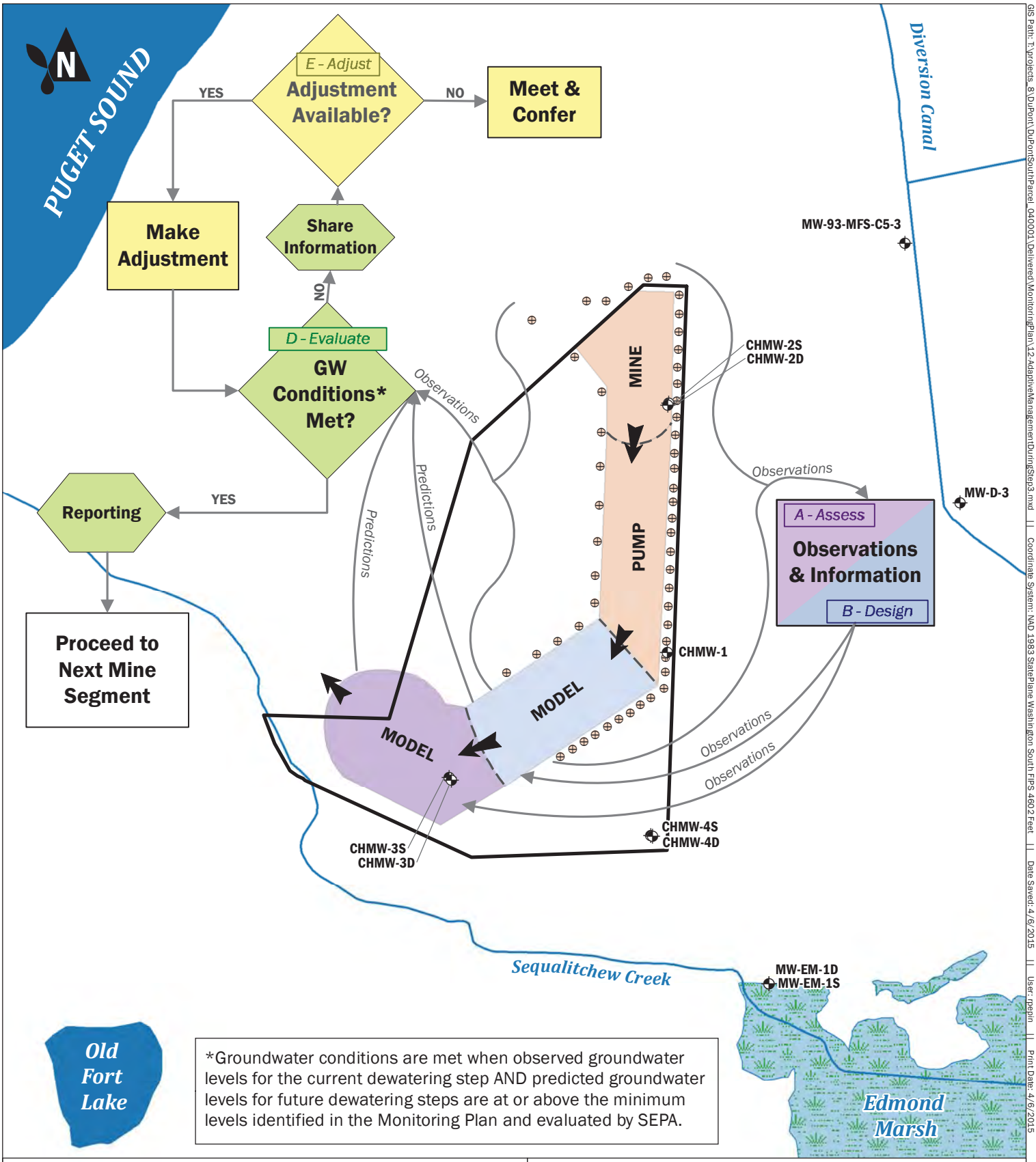


Adaptive Management Process During Step 2 - Preparation for Mining/ Dewatering Test

CalPortland DuPont South Parcel
Monitoring Plan
DuPont, Washington

Aspect CONSULTING	APR-2016	BY: OGR / RAP	FIGURE NO. 10
	PROJECT NO. 040001-014	REVISED BY: ---	

GIS Path: T:\projects_8\DuPont\DuPontSouthParcel_040001\Delivered\MonitoringPlan\11-AdaptiveManagementDuringStep2.mxd || Coordinate System: NAD 1983 StatePlane Washington South FIPS 4602 Feet || Date Saved: 4/6/2015 || User: rpepin ||



Adaptive Management Process During Step 3 - Active Dewatering and Mining

CalPortland DuPont South Parcel
Monitoring Plan
DuPont, Washington

Aspect CONSULTING	APR-2016	BY: OGR / RAP	FIGURE NO. 11
	PROJECT NO. 040001-014	REVISED BY: ---	

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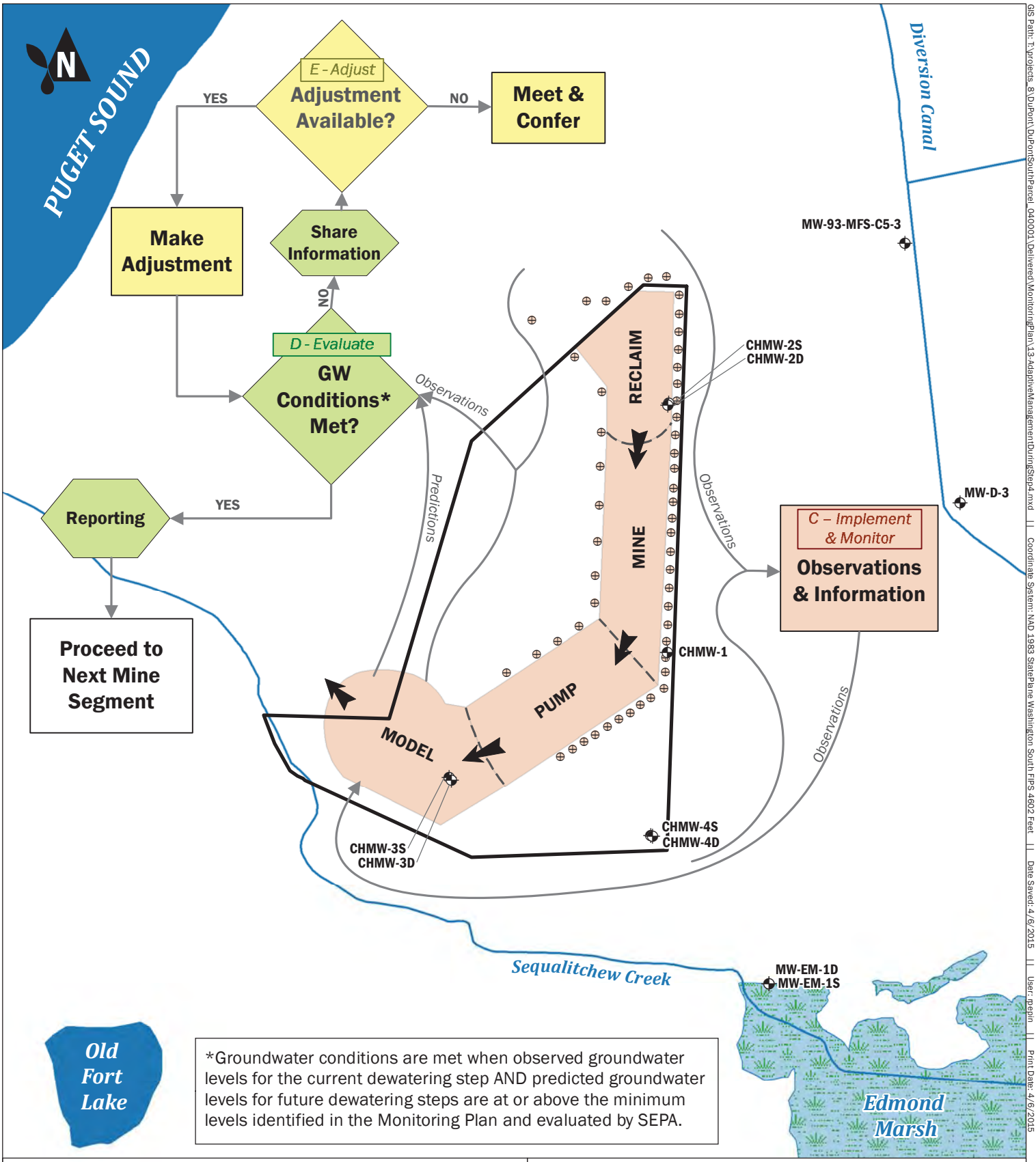


*Groundwater conditions are met when observed groundwater levels for the current dewatering step AND predicted groundwater levels for future dewatering steps are at or above the minimum levels identified in the Monitoring Plan and evaluated by SEPA.

Monitoring Well
Dewatering Well
Wetland
Lake

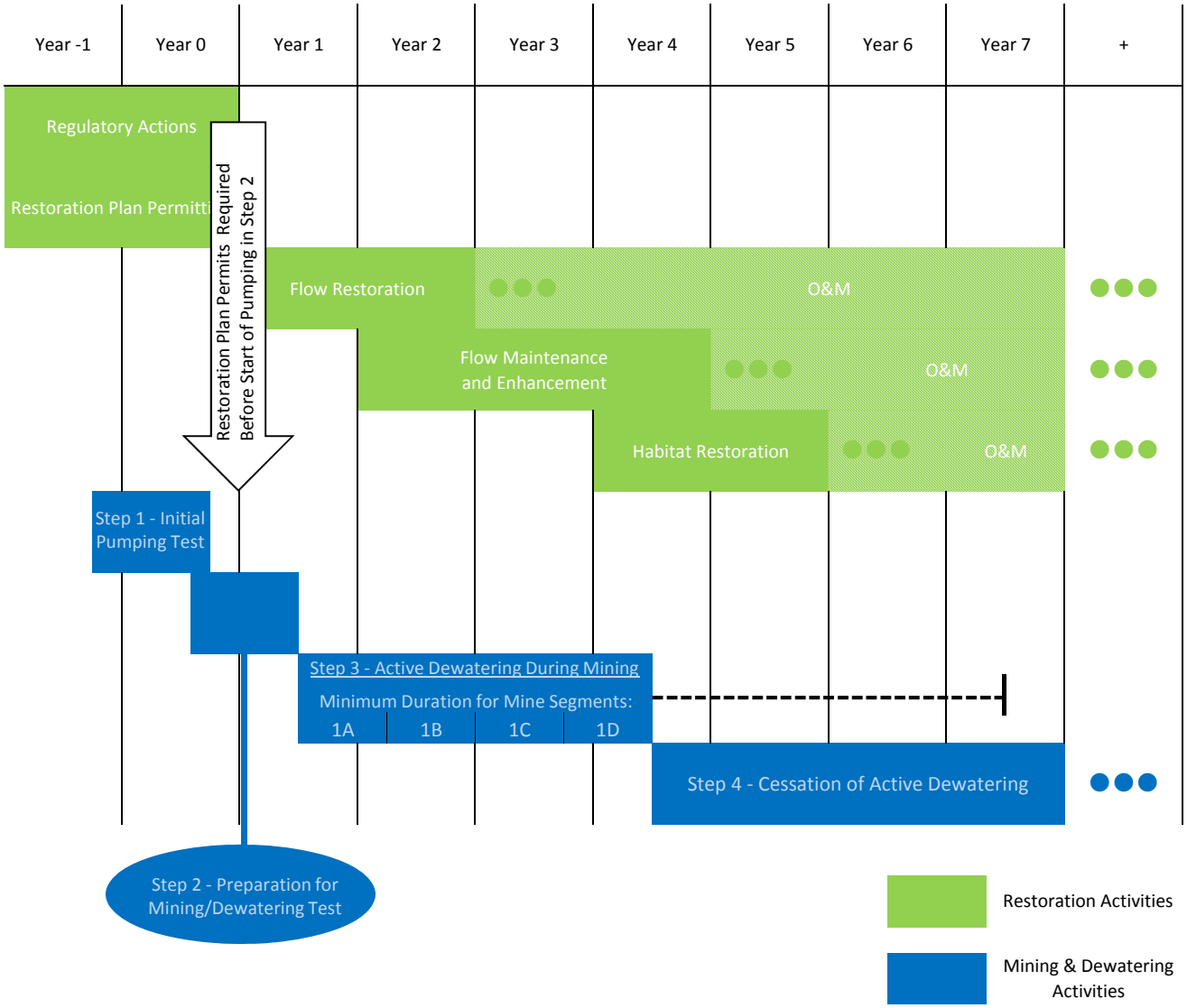
0 1,000 2,000
Feet

Adaptive Management Process During Step 4 - Cessation of Active Dewatering

CalPortland DuPont South Parcel
Monitoring Plan
DuPont, Washington

Aspect CONSULTING	APR-2016	BY: OGR / RAP	FIGURE NO. 12
	PROJECT NO. 040001-014	REVISED BY: ---	

GIS Path: T:\projects_8\DuPont\DuPontSouthParcel_040001\Delivered\MonitoringPlan\13-AdaptiveManagementDuringStep4.mxd || Coordinate System: NAD 1983 StatePlane Washington South FIPS 4602 Feet || Date Saved: 4/6/2015 || User: rpeplin || Print Date: 4/6/2015

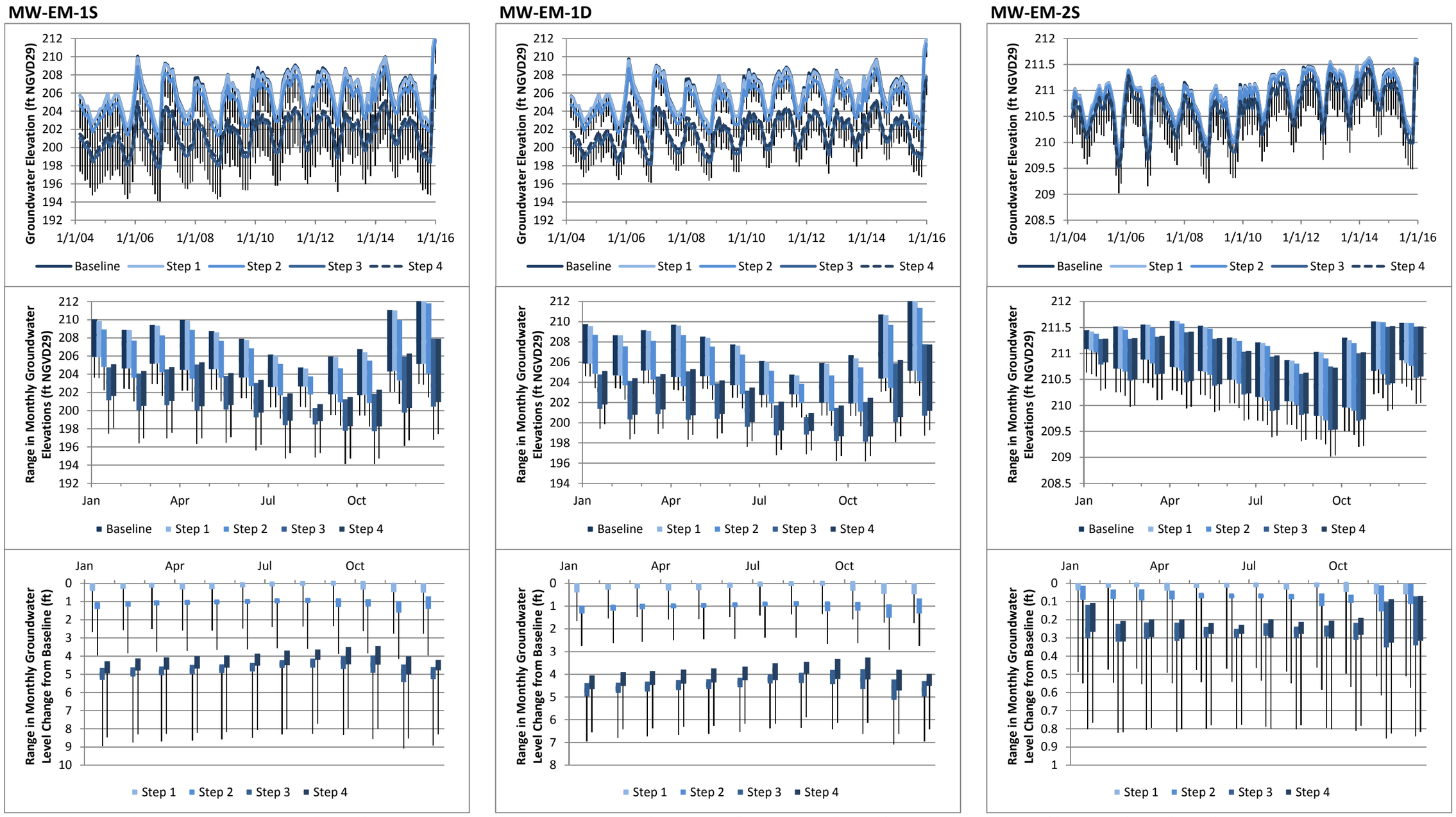


Notes:
1) Year 1 begins with the start of pumping in Step 2.
2) Mining timeline shown is based on the minimum duration of each mine segment in Step 3.
3) This figure depicts the duration of many individual actions. With few exceptions, the actual durations may be shorter or longer

Figure 13
Anticipated Timeline of Mining and Restoration Activities

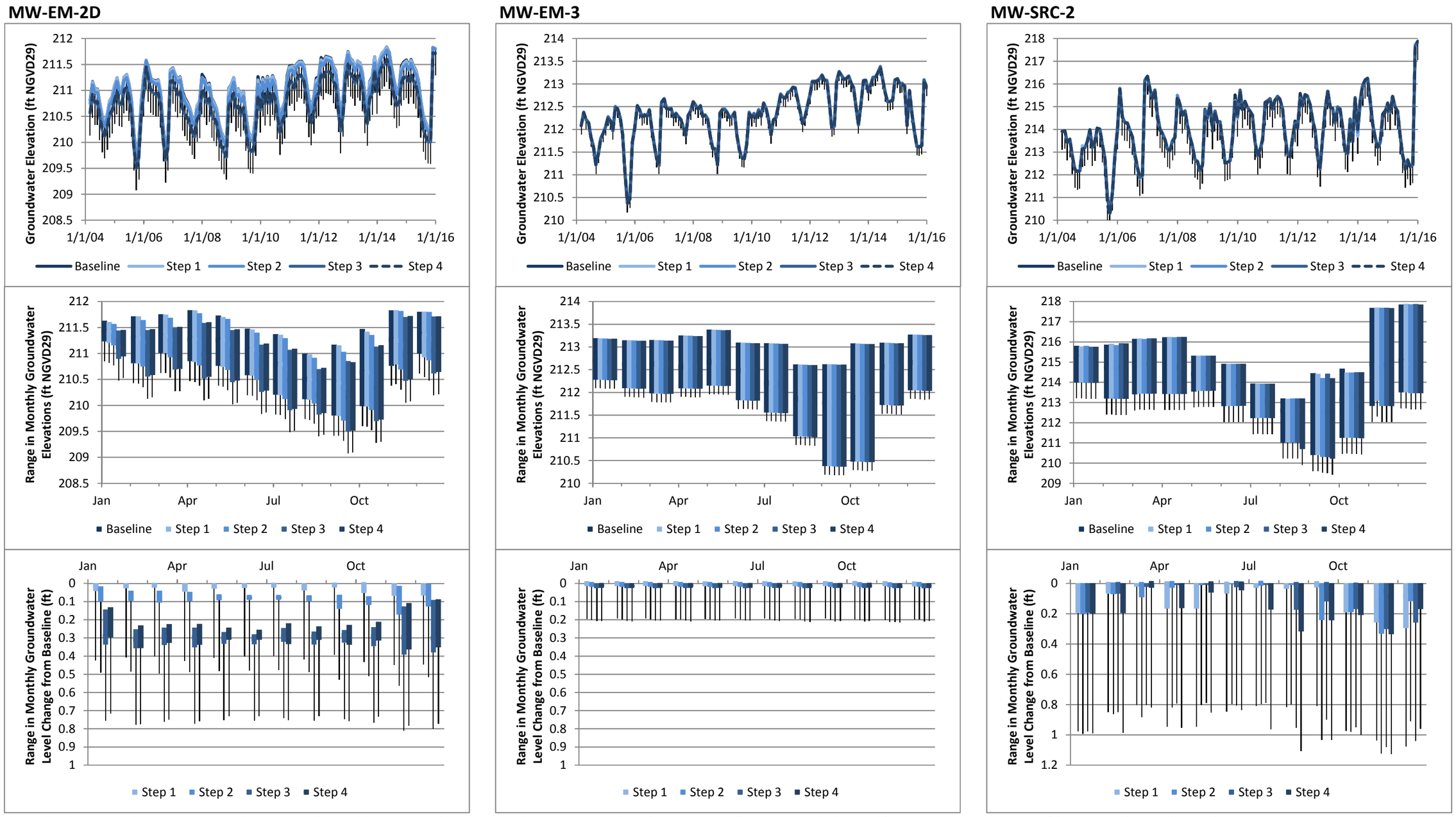
APPENDIX A

Performance Thresholds: Predicted Changes and Ranges in Groundwater Levels



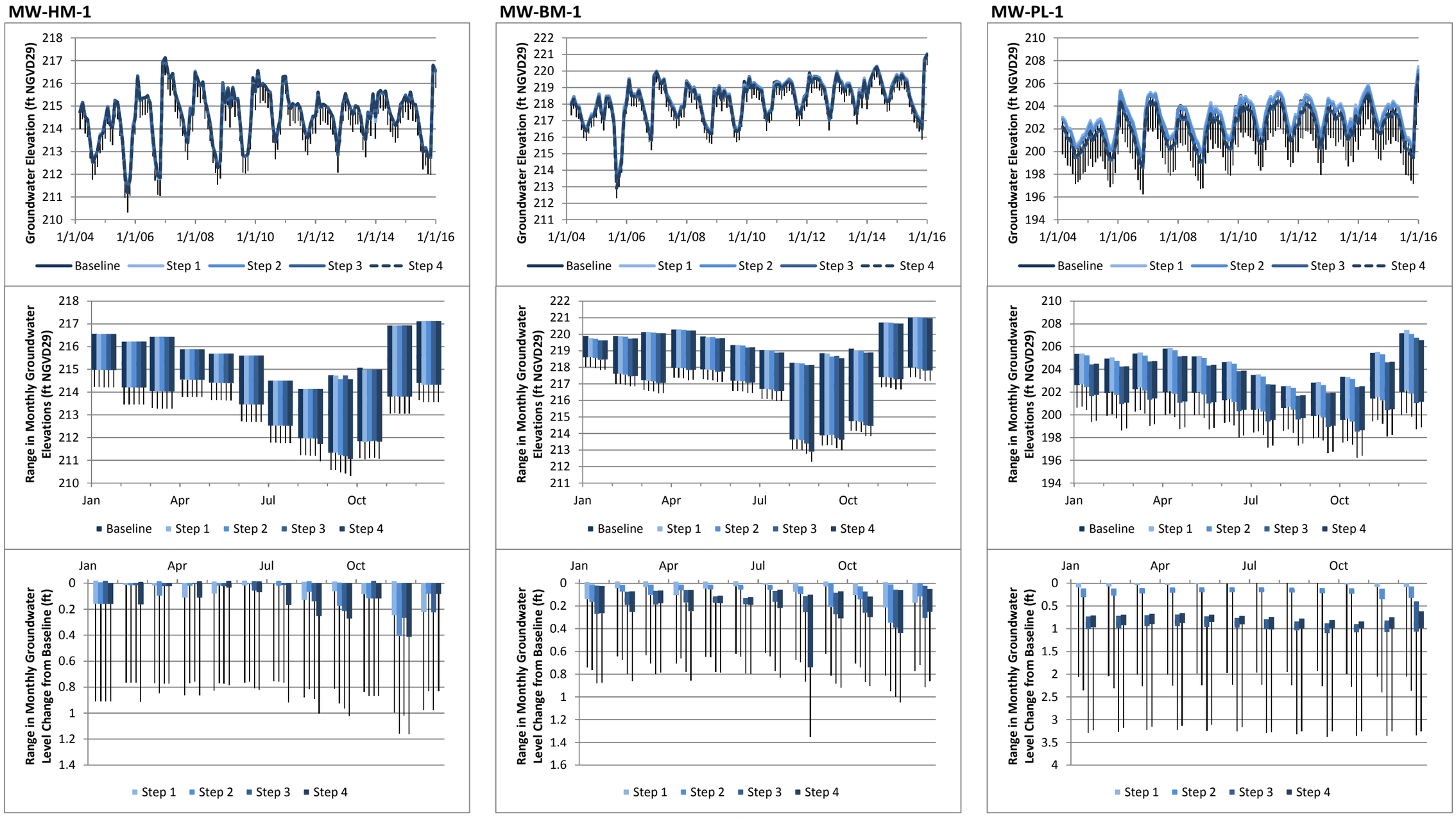
Note: Performance thresholds are the lower end of the whisker shown in each plot of groundwater elevation (top row). The lower end of the whisker represents the lower 95th-percentile confidence interval.

Figure A-1
Predicted Changes and Ranges in Groundwater Levels
Monitoring Plan



Note: Performance thresholds are the lower end of the whisker shown in each plot of groundwater elevation (top row). The lower end of the whisker represents the lower 95th-percentile confidence interval.

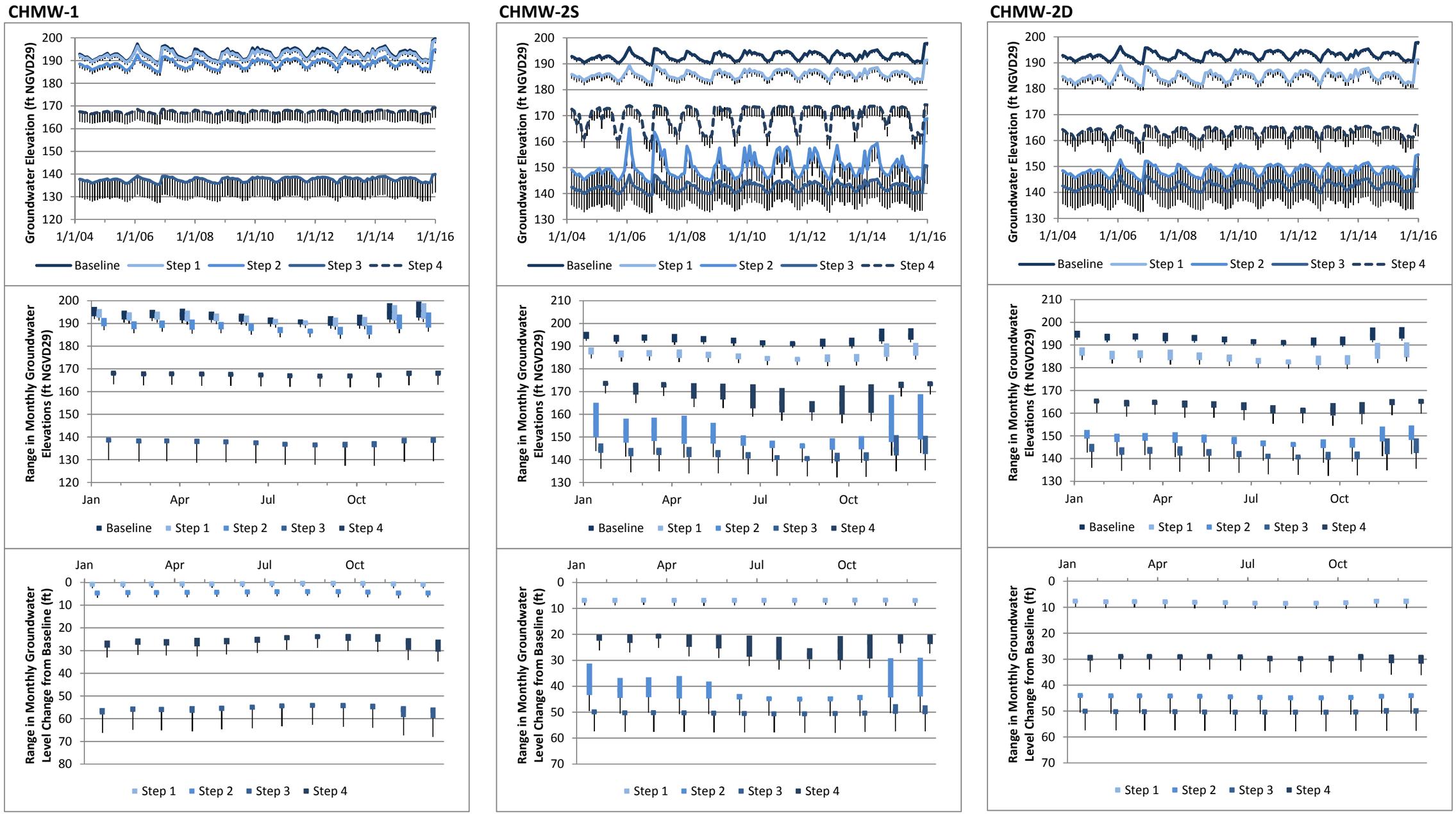
Figure A-1
Predicted Changes and Ranges in Groundwater Levels
Monitoring Plan



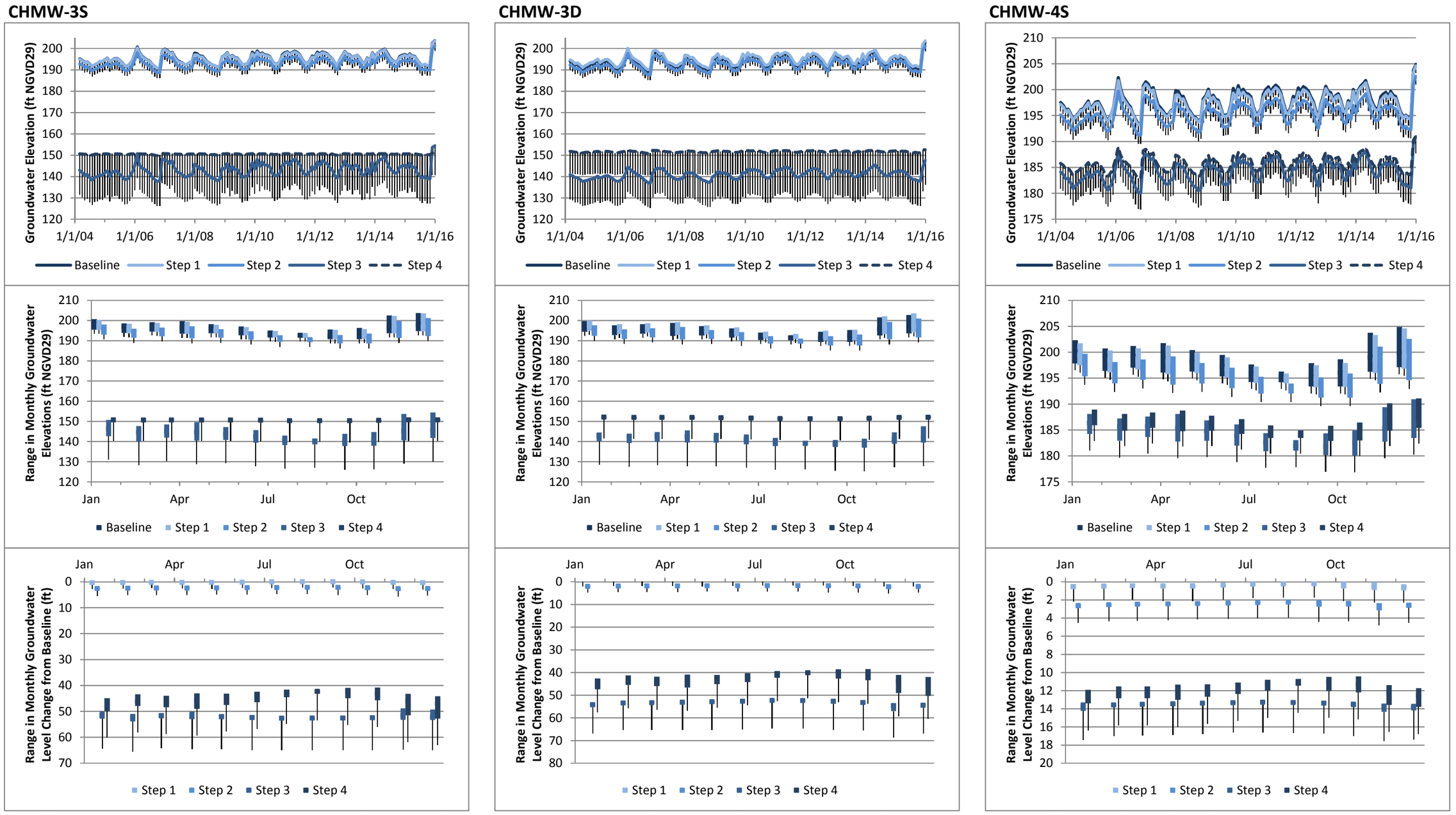
Note: Performance thresholds are the lower end of the whisker shown in each plot of groundwater elevation (top row). The lower end of the whisker represents the lower 95th-percentile confidence interval.

Figure A-1
Predicted Changes and Ranges in Groundwater Levels
Monitoring Plan

DRAFT

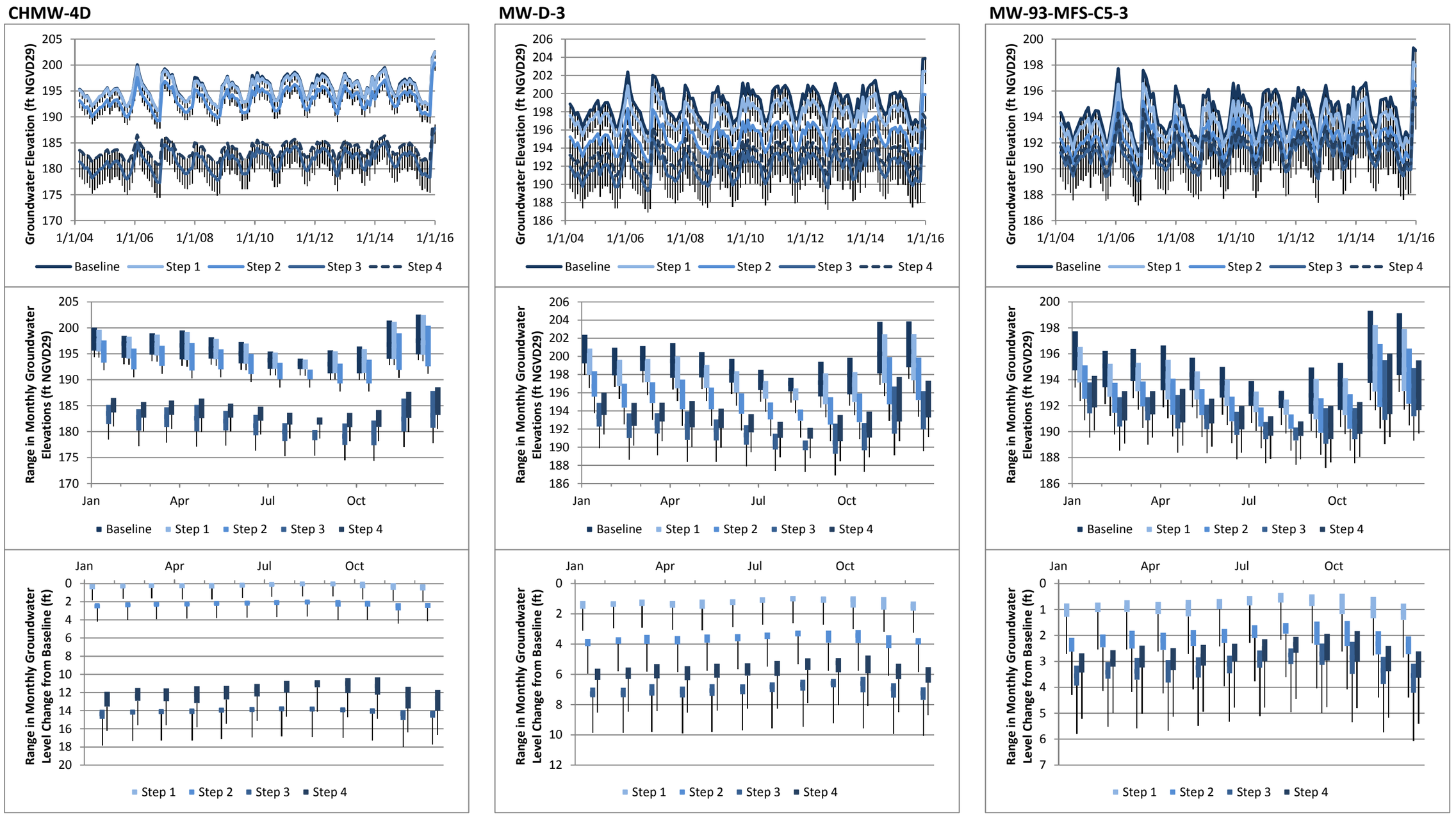


Note: Performance thresholds are the lower end of the whisker shown in each plot of groundwater elevation (top row). The lower end of the whisker represents the lower 95th-percentile confidence interval.



Note: Performance thresholds are the lower end of the whisker shown in each plot of groundwater elevation (top row). The lower end of the whisker represents the lower 95th-percentile confidence interval.

Figure A-1
Predicted Changes and Ranges in Groundwater Levels
Monitoring Plan



Note: Performance thresholds are the lower end of the whisker shown in each plot of groundwater elevation (top row). The lower end of the whisker represents the lower 95th-percentile confidence interval.

Figure A-1
Predicted Changes and Ranges in Groundwater Levels
Monitoring Plan

APPENDIX B

Sampling and Analysis Plan

Contents – Appendix B

A.1. Introduction 3

A.2. Background 3

A.2.1. Baseline Monitoring Program 3

A.2.1.1. Groundwater Level Monitoring 4

A.2.2. Surface Water Monitoring 4

A.2.2.1. Water Levels 4

A.2.2.2. Water Quality 5

A.2.2.3. Streamflow 5

A.2.2.4. Habitat Monitoring 6

Wetland Habitat 6

Stream Habitat 6

A.3. Roles and Responsibilities 7

A.4. Monitoring Approach 7

A.4.1. Groundwater levels 8

A.4.2. Surface water levels 9

A.4.3. Streamflow 9

A.4.4. Surface Water Quality 10

A.4.5. Habitat 12

A.4.6. Precipitation 13

A.5. Monitoring Procedures 13

A.5.1. Routine Station Inspections 14

A.5.2. Groundwater levels 14

A.5.3. Surface water levels 15

A.5.4. Streamflow 15

A.5.4.1. Weir-Discharge Equations 15

A.5.4.2. Stage-Discharge Rating Curve 15

A.5.5. Surface water quality 16

A.5.5.1. Equipment maintenance 17

A.5.5.2. Qualitative Observations 18

A.5.6. Habitat 19

A.5.6.1. Wetland Habitat 19

A.5.6.2. Stream Habitat 19

A.5.7. Precipitation 20

A.6. Quality Control 20

A.6.1. Field 20

A.6.2. Laboratory 21

A.7. Data Management 22
A.7.1. Hydrologic Data Collection 22
A.7.2. Hydrologic Database Structure 22
A.7.3. Database Inputs 23
A.7.3.1. Existing Data 23
A.7.3.2. New Data 23
A.7.3.3. Back-up Precipitation Data 24
A.7.4. Database Outputs 24
A.7.5. QA/QC Protocol 25
A.7.5.1. Data Collection 25
A.7.5.2. Data Entry 25
A.7.5.3. Data Reporting 25
A.7.6. Data Archival (EIM) 25
A.8. Special Studies 26
A.9. References 27

List of Tables

1 Summary of Baseline Monitoring Program
2 Monitoring Team Roles and Responsibilities *(in text)*
3 Relationship of Proposed Monitoring to Adaptive Management Thresholds
4 Water Quality Grab Sample Parameters and Methods *(in text)*
5 Field Monitoring Equipment Decontamination and Calibration Procedures *(in text)*
6 Stream Habitat Monitoring Parameters and Methods *(in text)*
7 Additional Habitat Observations *(in text)*

List of Figures

1 Monitoring Locations

List of Attachments

A Well Logs
B Field Data Forms

Sampling and Analysis Plan

A.1. Introduction

This document presents the Sampling and Analysis Plan (SAP) to collect the information necessary to support the adaptive management processes of the South Parcel Monitoring Plan and the Restoration Plan for the Sequalitchew Creek Watershed. This SAP is intended to direct collection, processing, and reporting of data by a single, reliable, and consistent source that will be used to inform both adaptive management plans.

A.2. Background

A.2.1. Baseline Monitoring Program

A baseline monitoring program of surface water and groundwater within the Sequalitchew Creek basin is currently conducted by CalPortland as a component of mine planning. The monitoring program generally consists of measuring water levels and flows on a monthly basis at multiple locations in Sequalitchew Creek and its related marshes. The hydrologic monitoring program has four basic elements:

- Groundwater elevation monitoring;
- Surface water elevation monitoring;
- Surface water streamflow monitoring; and
- Surface water quality monitoring (e.g., temperature, dissolved oxygen, and turbidity).

The monitoring program is summarized in Table 1, and monitoring locations are shown on Figure 1.

The baseline monitoring program began in 1999, then expanded significantly in 2003. Monitoring data has previously been presented in four reports (Aspect, 2004a, 2004b; Aspect and Anchor, 2007; and Appendix B of Anchor QEA and Aspect, 2010). The 2004 reports describe the surface water and groundwater systems of the Sequalitchew Creek basin and summarize the monitoring data collected through 2004. The 2007 report presents monitoring data collected in 2005 and 2006. The 2010 report provides summary hydrographs of streamflow and marsh levels, illustrating the data available at that time.

A.2.1.1. Groundwater Level Monitoring

In the baseline monitoring program, groundwater levels are monitored monthly at a network of 20 wells located throughout the watershed, including within the mine area, marshes, and upland areas:

- North Parcel mine area: OB-1
- South Parcel mine area: CHMW-1, CHMW-2S and -2D, CHMW-3S and -3D, and CHMW-4S and -4D
- Marshes and Lakes:
    - Edmond Marsh: MW-EM-1S and -1D, MW-EM-2S and -2D, and EM-3
    - Hamer and McKay Marshes: MW-HM-1
    - Sequalitchew Lake: MW-SL-1
    - Pond Lake: MW-PL-1
- Upland areas: D-3 (near Landfill #5) and SRC-MW-2 (east of Hamer Marsh)

Water levels are measured manually by measuring the depth to water from the top of the well casing. The top-of-casing elevation of each well has been surveyed relative to the National Geodetic Vertical Datum of 1929 (NGVD 29) to allow for calculation of groundwater elevations. Well logs for the existing monitoring wells are provided in Attachment A.

A.2.2. Surface Water Monitoring

A.2.2.1. Water Levels

The baseline monitoring program includes monthly measurement of surface water elevations at 15 locations in the Sequalitchew Creek watershed (Figure 1).

In many locations, staff gages are located close to monitoring wells to allow for coupled observations of surface water and groundwater levels. The following staff gages are included in the baseline monitoring program:

- Bell Marsh: SG-BM-1
- McKay Marsh: SG-MKM-1
- Hamer Marsh: SG-HM-1
- Sequalitchew Creek Marsh: SG-SCM-1 and SG-EM-3E
- East Edmond Marsh: SG-EM-3W and SG-EM-2E
- West Edmond Marsh: SG-EM-1/1A and SG-EM-2W
- Wetland 1D: SG-WL1D-1
- Pond Lake: SG-PL-1

- Diversion Canal: SG-DC-1, SG-DC-2, and SG-DC-3

The typical staff gage installed on this project is an enamel plate capable of measuring water levels in 0.01-foot increments over a 3.33-foot range. The staff gages at the west end of West Edmond Marsh (SG-EM-1/1A) are paired, with SG-EM-1 located near well MW- EM-1 and used to measure higher water levels in winter and SG-EM-1A located in a low spot behind the beaver dam at the outlet and used for measuring lower water levels in summer.

In addition, surface water levels are measured as a component of the three continuous flow monitoring stations described in Section A.2.2.3.

A.2.2.2. Water Quality

Beginning in 2009, surface water quality has been monitored monthly at three locations: the Diversion Weir, the outlet of Hamer Marsh, and the mid-ravine gage on Sequalitchew Creek. Monthly monitoring consists of field measurements of temperature, dissolved oxygen, specific conductance, oxidation reduction potential, and turbidity with a YSI Pro Plus and a Hach Turbidimeter. Several samples have been collected for laboratory analysis for select metals (iron, copper, and zinc) and total petroleum hydrocarbons.

A.2.2.3. Streamflow

The baseline streamflow monitoring program consists of continuous measurements at three stations, periodic measurements at three stations, and visual observations at five locations. The specific locations monitored are:

- Continuous streamflow monitoring at the Diversion Weir, and mid-ravine[1] and lower-ravine stations in Sequalitchew Creek.
- Periodic streamflow measurements at three locations in the Diversion Canal (SG-DC-1, SG-DC-2, SG-DC-3); and
- Visual estimates of flow at five locations:
    - Culvert from Hamer Marsh to Edmond Marsh,
    - Culvert from Sequalitchew Creek Marsh to Diversion Canal
    - Ditch at Plant Road flowing to Hamer Marsh,
    - Sequalitchew Creek at footbridge downstream of W. Edmond Marsh, and
    - Sequalitchew Creek under Center Drive.

Measurements of streamflow are made using the conventional current-meter method as described by the U.S. Geological Survey (USGS, 1982). Stream velocities are measured and discharges are calculated using a SonTek Flowtracker.

Discharge measurements are initially made at various stream stages to determine a relationship between stage and discharge. Discharge measurements are then made at

[1] The mid-ravine station was formerly known as the Upper gage or SC-Upper.

periodic intervals to verify the stage-discharge relationship or to define any change in the relationship caused by changes in channel geometry and/or channel roughness.

Rating curves, which relate water depth to flow in the channel, have been developed for each flow monitoring location based on a number of manual flow measurements collected over a range of different flows. These rating curves are used to convert observed water depths (stage) to flows.

Stream stage at each station is measured using a 4230 Bubble Flow Meter manufactured by Teledyne ISCO and powered by a 12-volt deep-cycle lead-acid battery. The meter uses an internal air compressor to force a metered amount of air through a bubble line submerged in the flow channel. The water level above the bubble line orifice is determined by measuring the pressure needed to force air bubbles out of the line. An internal data logger records the water level as bubbler pressure at 15-minute intervals. The water level is converted to a stage height by correlating the meter readings to manual measurements taken during monthly site visits from a staff gage that is installed at each station. The equipment for the stations is serviced once a month by replacing the batteries and downloading the data to a portable computer.

Flow over the Diversion Weir is monitored by continuously monitoring stage using an ISCO 4230 and calculating discharge with a standard weir equation for a fully contracted rectangular weir from the United States Bureau of Reclamation's (USBR) Water Measurement Manual (USBR, 2001). The weir equation is presented in Section A.5.4.1.

A.2.2.4. Habitat Monitoring

Wetland Habitat

Wetland monitoring conducted to date has been focused on documenting baseline (pre-project) conditions of three key variables in habitats: topography, hydrology, and vegetation. Major changes to the boundary of Edmond Marsh have been analyzed from high-resolution aerial photos, and compared to field-collected data. Twelve vegetation monitoring transects are located throughout the Sequalitchew Creek basin: in Edmond Marsh, Sequalitchew Creek Ravine, Wetland 1D, Pond Lake, and Brackish Marsh. Overall, patterns in species presence detected during the monitoring in the period from 2004–2015 have been documented by Anchor QEA (2016).

Stream Habitat

Anchor Environmental (Anchor; now Anchor QEA) has previously evaluated stream habitat in Sequalitchew Creek using toe-width and stage-discharge analysis methods as a component of the Fish Habitat Benefit Evaluation for Sequalitchew Creek (Anchor, 2004). Additional information on the methodology and background can be found in that document.

The **Toe-Width Method** applies information on active channel width to estimate the optimal flows (maximum habitat) for salmon spawning and rearing. Within Reach 2 and 3, transects were established in areas with fairly uniform depth over a gravel/cobble substrate (5 transects and 4 transects, respectively). Since Reach 1 was located in the estuary, no toe-width transects were established. Additional transects were established to represent riffle habitat in all three reaches.

The **Stage-Discharge Analysis** provides a more detailed evaluation of how habitat availability changes with incremental increases in flow by linking data on the physical relationship between water surface elevation (stage), velocity, and discharge with the biological habitat preferences of spawning and rearing salmon. Stage-discharge relationships in lower Sequalitchew Creek were developed at numerous transects that were selected to be representative of habitat conditions in the study area.

A.3. Roles and Responsibilities

The roles and responsibilities of all key members of the monitoring team are shown in Table 2 below. The monitoring team may be comprised of one or more qualified consulting firms, governmental agencies (e.g., USGS or Ecology), or nongovernmental organizations.

Table 2. Monitoring Team Roles and Responsibilities

Position	Roles and Responsibilities
Project Manager—Monitoring Team	Responsible for oversight of monitoring personnel, coordinating project tasks defined in the Consultant scope of work, tracking project progress and schedule relative to budget, and manage staff to complete project activities.
Principal-in-Charge—Monitoring Team	Responsible for oversight to project team to ensure that QC procedures are followed and project data quality objectives (DQOs) are being met. Oversight of development of project SAP, field audits, and project reports.
Data QC/Reporting Lead—Monitoring Team	Responsible for developing SAP, standard operating procedures (SOPs), and data QA/QC procedures for project. Responsible for managing project database, completing data QC on all project data, and reporting for individual events and the overall project.
Technology Lead—Hydrology/Water Quality	Responsible for the design of each monitoring station. Provide oversight for installation of each station's monitoring system. Provide oversight for monitoring station maintenance and lead equipment troubleshooting activities.
Data Collection Lead—Hydrology/Water Quality	Manages and oversees monitoring and maintenance activities that are completed in the field for hydrology and water quality data collection.
Data Collection Lead—Habitat	Manages and oversees habitat monitoring activities.

A.4. Monitoring Approach

The monitoring conducted under this SAP will collect data necessary to assess whether activities associated with the South Parcel expansion and restoration of Sequalitchew Creek are achieving the objectives of the South Parcel Monitoring Plan and the Restoration Plan for the Sequalitchew Creek Watershed. The monitoring approach is targeted at the specific performance and aspirational thresholds identified in those plans.

The monitoring program includes six components that will be implemented at key locations within the watershed: groundwater level, surface water level, stream flow, surface water quality, habitat, and precipitation monitoring. Each of these components are described below. A cross walk between specific SAP elements and the objectives of the Monitoring Plan and Restoration Plan is provided in Table 3.

In addition to the main monitoring activities, stand-alone special studies will be implemented to address specific concerns of the mine expansion and watershed restoration. These special studies will be developed further as mining and restoration planning progresses, but are described generally in Section A.8.

A.4.1. Groundwater levels

Groundwater levels will be monitored primarily for comparison with the performance thresholds of the South Parcel Monitoring Plan.

Groundwater level monitoring will use the existing network of monitoring wells (described in Section A.2.1 and shown in Figure 1) and new dewatering wells and monitoring wells that will be installed specifically for this project. Water level monitoring will include a combination of spot measurements in active dewatering wells and adjacent temporary monitoring wells, continuous monitoring at key monitoring wells adjacent to the active dewatering area and beneath West Edmond Marsh, and routine monthly or semimonthly monitoring at other wells in the network.

As described in the Monitoring Plan, active dewatering of the South Parcel will occur in three sequential steps, involving progressively more dewatering wells, from 10 wells during Step 1, up to 66 wells during Step 3. Water levels will be measured periodically in the active dewatering wells, in new observation wells located adjacent to the active dewatering wells, and in several long-term monitoring wells installed in the interior of the South Parcel. Water level monitoring at these wells will be used to assess performance of the dewatering operation and, once mining operations commence in the South Parcel, will indicate if the moisture content of the mined aggregate is at appropriately low levels for safe, efficient mining and processing.

Outside of the South Parcel, groundwater level monitoring will consist of a combination of continuous monitoring and monthly or semimonthly manual measurements. During all Dewatering Steps, water levels will be monitored continuously in key wells located along the eastern boundary of the South parcel and in the western portion of Edmond Marsh. Specifically, the following key wells will be monitored continuously: CHMW-1, CHMW-2S and -2D, CHMW-3S and -3D, CHMW-4S and -4D. MW-EM-1S and -1D and MW-EM-2S and -2D. Water levels at all other groundwater monitoring wells will be measured monthly, except during Dewatering Step 2, when twice monthly measurements will occur, and Dewatering Step 3 when twice monthly measurements will occur for 3 months once new dewatering wells start pumping.

Monitoring wells are generally one- or two-inch-diameter PVC casings protected with a locking steel surface monument. Well depths vary from 5 feet for shallow piezometers to 85 feet for wells penetrating the Vashon Outwash gravels. Monitoring well logs are provided in Attachment A.

Continuous groundwater level monitoring will be conducted using a submersible pressure transducer connected to an aboveground data logger housed in a weather-resistant enclosure. Instruments will measure and record water level at 15-minute intervals. Data loggers will be downloaded by field staff at least weekly during Dewatering Steps 1 through 3 and once each month during Step 4.

A.4.2. Surface water levels

Surface water level monitoring data will primarily be used to compare the effects of restoration efforts with the performance and aspirational thresholds specified in the Restoration Plan. Surface water monitoring will occur at 12 stations as shown on Figure 1 and listed in Table 3 (station IDs have a "SG" prefix).

Continuous surface water monitoring will occur at SG-EM-1/1A and SG-EM-2E. Continuous water level data will be useful for assessing the water level response to precipitation. Water level will be measured manually once per month at the other stations; except during Dewatering Step 2, when twice-monthly measurements will occur. More frequent spot measurements will be made during specific restoration activities, such as the installation and adjustment of flexible levelers at beaver dams. New staff gage locations may be installed and added to the monitoring program as necessary to support adaptive management of the flexible levelers.

Surface water level monitoring at the seven locations in Sequalitchew Marsh, East Edmond Marsh, and West Edmond Marsh will provide feedback for efforts to increase westward flows in Sequalitchew Creek. Surface water level monitoring at SG-HM-1 in Hamer Marsh, in concert with groundwater level measurements at MW-HM-1 and MW-EM-3, will assess the increase in subsurface flow from Hamer Marsh to East Edmond Marsh following installation of the weir at Hamer Marsh outlet.

All surface water level monitoring stations are currently equipped with staff gages; either Stevens Style A or C porcelain-enameled iron plate. Style A gages are 3.33 feet long and 4 inches wide with graduated marks every 0.02 feet. Style C gages are also 3.33 feet long and are 2.5 inches wide with graduated marks every 0.01 foot. Water levels are measured to the nearest 0.01 foot. Water level is converted to surface water elevation by subtracting the staff gage height from the surveyed top-of-staff gage elevation and then adding the measured staff gage water level. At SG-EM-1 and SG-EM-2W, continuous water level monitoring will be conducted using a pressure transducer housed in a PVC stilling well that is mounted adjacent to the staff gage. The pressure transducer will be connected to the data logger used for continuous groundwater monitoring at the adjacent groundwater monitoring wells (MW-EM-1D for SG-EM-1/1A and MW-EM-2D for SG-EM-2W).

A.4.3. Streamflow

Streamflow monitoring will include:

- Continuous streamflow monitoring at five locations: the three existing streamflow monitoring stations (i.e., the Diversion Weir, and mid-ravine and lower stations in Sequalitchew Creek) and two new gaging stations on Sequalitchew Creek at the Lake Outlet and at Center Drive.

- Visual observations at the culvert from Hamer Marsh to Edmond Marsh.

At each continuous gaging station, water level will be measured and recorded every 15 minutes using a pressure transducer housed in a PVC stilling well and connected to a data logger that is housed in a weatherproof enclosure. Each continuous stream flow gaging station will include a Stevens Style A or C porcelain-enameled iron-plate staff gage, as described previous for the water level monitoring sites. Water level measured by the pressure transducer will be calibrated to the staff gage at the site. Field staff will service and download the data loggers at least monthly.

At the Diversion Weir, flow will be calculated using a standard discharge equation for a fully contracted rectangular weir as described above in Section A.5.4.1. At the other four gaging stations, stage-discharge or rating curves will need to be developed and maintained to calculate flow. Rating curves will be developed and maintained consistent with industry standard practices, as is currently done.

Flow through the culvert from Hamer Marsh to Edmond Marsh will be visually estimated monthly. Additional locations for visual flow estimates may be added at any time to respond to conditions observed in the field or adaptive management needs.

Following installation of the weir at the outlet of Hamer Marsh, outflow from Hamer Marsh to the Diversion Canal will be determined using the appropriate weir equation, based on water level observations at SG-HM-1, whose staff gage elevation relative the top of the weir will be established.

Continuous flow data from the Diversion Weir will be used to assess achievement of the Restoration Plan performance threshold to reduce flow to the Diversion Canal.

Continuous flow data from the Sequalitchew Lake Outlet and Center Drive gages will be used to assess achievement of the performance standard to match flows at those two locations.

Flow data at Center Drive, Upper Sequalitchew Creek, and Lower Sequalitchew Creek gages will be used to assess achievement of the performance standard to eliminate flow losses in the ravine.

Spot flow measurements at the Hamer Marsh Weir, at the culvert between Hamer Marsh and East Edmond Marsh, and in the ditch under Plant Road to Hamer Marsh, in concert with surface and shallow groundwater monitoring in and around Hamer Marsh, will be used to assess efforts to increase surface and groundwater flow from Hamer Marsh into East Edmond Marsh.

Going forward, the sampling program will no longer collect spot flow measurements in the Diversion Canal, since those data are not relevant to the objectives of the South Parcel Monitoring Plan or the Restoration Plan.

A.4.4. Surface Water Quality

The evaluation of habitat suitability will include monitoring water quality conditions in the watershed restoration area. In particular, stream temperature is predicted to increase in summer as a result of the restoration and mining projects for two reasons: 1) water

temperatures in Sequalitchew Lake are warmer than the groundwater discharge that currently provides the flow in Sequalitchew Creek during summer, and 2) dewatering for mining will reduce the groundwater discharge. Prior monitoring indicates that Sequalitchew Lake temperatures can reach up to 21°C in summer, whereas Sequalitchew Creek is currently 12 to 13°C. This condition is largely natural resulting from solar radiation on the lake surface. However, it also represents the primary tradeoff of restoration—greatly increased flow and reconnection to the natural water source in exchange for higher temperatures in summer.

The water quality monitoring program has been designed to monitor for unintended consequences, primarily focused on temperature, resulting from the restoration and mining projects. Stream temperatures will be monitored continuously at the five locations in the Sequalitchew Creek watershed where flow is measured (Sequalitchew Lake Outlet, Diversion Weir, Center Drive, and mid-ravine and lower ravine Sequalitchew Creek stations), as well as at the continuous water level monitoring stations in East Edmond Marsh (SG-EM-1 and SG-EM-2). The pressure transducers used to monitor water levels will be equipped with temperature sensors and will record water temperature every 15 minutes. The monitoring data will allow for developing temperature profiles along Sequalitchew Creek from headwaters to near the mouth.

These monitoring data will inform the adaptive management components of the Restoration Plan. The Restoration Plan includes several restoration elements that either include specific components that would reduce temperatures, or include flexible elements that could be implemented adaptively in response to monitoring data that indicate unanticipated effects on stream temperature. Specifically, the following elements of the Restoration Plan have components related to temperature, beyond those aimed at increasing flow through the system:

> G – Losing Reach—restoration of riparian vegetation in the losing reach will benefit stream temperature through shading.
>
> J – Ravine Habitat—this element is intended to adapt to habitat conditions that emerge once flow is restored in the ravine. Envisioned as being used to enhance stream structure through large woody debris placement, it could also be used to address temperature issues by creating pools as refugia or shading through riparian plantings.

In addition to temperature, water quality monitoring will include periodic *in-situ* monitoring of temperature, dissolved oxygen, and turbidity at select surface water level monitoring locations.

Periodic *in-situ* water quality measurements of temperature, dissolved oxygen, and turbidity will be collected using portable water quality meters. Measurements will occur monthly, except during Dewatering Step 2, when measurements will be taken twice each month. These water quality data, used in conjunction with measurements of physical habitat characteristics, will inform the assessment of habitat conditions relative to performance thresholds in the Restoration Plan.

A special study of Hamer Marsh water quality will be developed and implemented separately as described in Section A.8.

A.4.5. Habitat

A.4.5.1. Wetland Habitat

The most important effect of the combined mining and restoration projects would be the restoration of a surface water and wetland community connection between the ravine and Edmond Marsh. Data collection discussed in this section is focused on detecting changes to vegetation and habitat structure. This will be used in conjunction with the collection of hydrology data (see section A.5.2) and topography to understand the effects of the project. Hydrology (water surface elevation) data will be used to further understand habitat changes:

- Changes in water surface elevations, particularly in East Edmond Marsh;
- Changes in the magnitude of seasonal fluctuation in water surface elevations;
- Changes in the location and amount of open-water habitat, specifically any loss of open-water habitat in East Edmond Marsh, or greater persistence (later in the growing season) of open water habitats in West Edmond Marsh; and
- The establishment of a surface water and wetland community connection between the ravine and Edmond Marsh.

The baseline wetland habitat monitoring approach (see Section A.2.2.4) will continue to be used to identify patterns in plant species presence, hydrology, and topography under changing conditions along these established transects for comparison and analysis with post-project conditions. New transects will be established between Edmond Marsh and Lower Sequalitchew Creek. Baseline data was not collected in this reach due to the lack of flow and wetland or riparian vegetation during the baseline period.

A.4.5.2. Stream Habitat

Stream habitat will be monitored by measuring physical habitat characteristics at consistent locations over time. Habitat monitoring stations will be established as cross sections of Sequalitchew Creek spaced 100 feet apart for 1,500 feet upstream of the BNSF culvert, then 200 feet apart upstream to the east end of Edmond Marsh. This will provide additional resolution in the area likely to be used for spawning by Chum.

At each section, the following physical parameters will be monitored: flow depth, velocity, substrate size and cover. Cross sections will be monitored in years 0, 1, 2, 3, 5, and 10 commencing prior to construction of the first Restoration Plan element.

Observations of fish presence and active erosion will be noted during the cross-section surveys. Surveys of large woody material will be conducted in years 5 and 10.

A.4.6. Precipitation

Precipitation will be continuously monitored with a tipping bucket rain gage to be located on or near the South Parcel (e.g., City Hall, Pioneer Middle School, or Chloe Clark Elementary). An on-site, program-operated rain gage will likely provide a more complete data set that is of known quality and will better represent precipitation occurring within the watershed than would data from the McMillin Reservoir rain gage, which has been used for prior monitoring efforts.

A continuous precipitation record will provide a context for evaluating short-term changes in surface water and shallow groundwater levels, stream flows, and water quality conditions monitored within the watershed in response to storm events. Observed seasonal precipitation patterns will be used in the analysis of seasonal groundwater and surface water levels, stream flows, and water quality conditions.

The rain gage will be installed at the top of a 1.5-inch-diameter steel pole, approximately 10 feet above the ground surface. The rain gage will be wired to a data logger that will record and totalize rainfall on a 15-minute interval. The data logger will be housed in a durable, weatherproof steel enclosure.

The rain gage will be maintained per manufacturer's recommendations (see Section A.5.7 for methods). The rain gage will be capable of measuring only liquid precipitation (i.e., rainfall or melted snow); it will not be a heated rain gage capable of melting snow. Alternate rain data from the McMillin Reservoir rain gage or PRISM estimates of gridded precipitation for the project area will be used should the project rain gage malfunction.

A.5. Monitoring Procedures

This section provides specific procedural guidelines regarding routine field measurement and maintenance activities pursuant to the monitoring objectives detailed in the previous section.

Campbell Scientific (CSI) pressure transducers and data loggers will be employed at groundwater, surface water, streamflow monitoring stations, which continually measure level and water temperature. A project rain gage will be installed at one of the central monitoring stations, and be recorded by the station data logger. Equipment specifications and installation guidelines for continual monitoring stations includes the following:

- Parameter data (e.g., level, temperature, precipitation) will be recorded at a minimum of 15-minute intervals.
- Transducers selected for each station will be designed with a PSI range and cable length that is appropriate for the range of water levels expected in the observation well or surface water environment.
- Transducer sensor diaphragms will be vented to the atmosphere; eliminating corrections regarding barometric pressure compensation.
- Groundwater pressure transducers will be suspended from a fixed reference point in each monitoring well, at a point below the lowest expected water level. Suspending

the transducer prevents corrosion/interference of benthic sediment, or level discrepancies/drift due to settling.

- Surface water pressure transducers will be installed at a fixed point within a PVC stilling well, adjacent to the station staff plate.
- All level and flow rate measurements will be reported in decimal-feet and cubic feet per second (cfs), respectively.

Water levels measurements at stations recording continuous data will be maintained within a 0.02-foot tolerance. If the difference between the level measured during site inspections and the data logger recorded level is greater than ± 0.02 feet, field personnel will calibrate the data logger recorded level during routine site inspections. Differences in level, as well as calibration points, will be recorded on field sheets. Level drift observed from either the pressure transducer, or movement of the suspension cable, will be corrected by linear interpolation within the project dataset.

A.5.1. Routine Station Inspections

Routine site inspections will occur at least monthly while the project is actively collecting water quality, level, and/or flow data. Field staff will complete a field data collection form, or electronic equivalent, when conducting station inspections (see example in Attachment B). During monthly inspections, all equipment will be maintained per manufacturer recommendation, and include the following tasks:

- Download data logger module records;
- Maintain station grounds for clear and safe access;
- Clean and maintain enclosures, sensors, and monitoring equipment;
- Change/charge station batteries; and
- Calibrate/verify the accuracy, precision, and operation of sampling and monitoring equipment.

All observed and recorded field measurements, as detailed below, will be updated within the project database following routine inspection activities.

A.5.2. Groundwater levels

Groundwater levels are measured in monitoring well stations using a 150- or 300-foot electronic water level indicator. Depth to water is measured from a black mark on the top of the well casing and recorded to the nearest 0.01 foot. The depth to water is converted to a groundwater elevation by subtracting the depth to water from the surveyed top of casing elevations. Groundwater level measurements will be conducted and recorded on field sheets, or electronic equivalents, during each routine site inspection.

The well casings are accessed by unlocking and removing the lids on the steel stick-up-style monuments protecting each well. MW-C5-3 is maintained by JBLM. A key to unlock MW-C5-3 is obtained from JBLM during each site visit.

A.5.3. Surface water levels

Surface water levels are visually observed/measured during routine site inspections from staff plate gages; measured to the nearest 0.01 foot. Water levels will be converted to surface water elevation by subtracting the staff gage height from the surveyed top-of-staff gage elevation and then adding the measured staff gage water level.

A.5.4. Streamflow

Streamflow monitoring for this project will be performed by continuously observing the water level in the stream and calculating flow using one of two methods: a standardized weir-discharge equation or a stage-discharge rating curve.

Stream water levels will be visually observed/measured during routine site inspections from staff plate gages. CSI pressure transducers at continuous-record streamflow stations will be calibrated to the correspond station staff-gage level. Spot level measurements and observations at all other stations will be recorded during routine inspections. All level measurements will be used to calculate and update discharge flow volumes from each station.

A.5.4.1. Weir-Discharge Equations

Streamflow at the Diversion Weir is calculated using a standard discharge equation for a fully contracted rectangular weir from the USBR's Water Measurement Manual (USBR, 2001). The equation relates discharge (Q) to the length of the weir (l) and depth (d) of water over the weir as follows:

$$Q = 3.33*(l - 0.2*d)*d^{(3/2)}$$

It is imperative to maintain flow through weirs free from debris and obstructions, to ensure accurate level/flow measurements. Weir discharge equations will be incorporated into the project database, to ensure precision when field personnel transcribe field observations and measurements.

A.5.4.2. Stage-Discharge Rating Curve

Open-channel streamflow monitoring stations require the development of flow rating curves, which relate observed water depths (i.e., stage) to flow volumes. Rating curves will be developed for each flow monitoring location based on manual flow measurements collected over a range of different flows.

Measurements of streamflow (in cubic feet per second [cfs]) will be made using the conventional current-meter method as described by the USGS (1982). Stream velocities will be measured and discharges are calculated using a SonTek Flowtracker, or other similar velocity meter.

In accordance with the USGS current-meter method, observations of width, depth, and velocity will be made at approximately 10 to 15 intervals in a cross section by wading the stream. The average velocity of each subsection will be taken at 0.6 of the depth below the water surface. That velocity represents the average velocity for that stream subsection, whose cross-section area will be calculated from the corresponding width and

depth measurements. A streamflow measurement is the sum of the flow in each subsection.

The recorded discharge measurements are plotted against corresponding stage heights. The stage-discharge rating (i.e., regression equation) is determined by plotting a best-fit line through a series of stage-discharge points.

Rating curves will be developed at streamflow monitoring stations during a minimum of three (3) different flow event regimes, including flows covering the low-, mid-, and high ranges of the depths expected in each channel. To measure flows at these ranges, field personnel will collect flow measurements during various intensity storm events, as well as baseflow conditions. For existing stations, the rating curves developed during baseline monitoring will be used initially.

Rating curves are evaluated by comparing sets of flow event measurements to determine if the average rating curve for each event graphs similarly on a stage-discharge plot. A change in curve shape or shift in location indicates a change in channel geomorphology and a new rating curve is developed and updated, as necessary. Manual streamflow measurements are made at periodic intervals to verify the rating curve and evaluate if there has been any change in the stage-discharge relationship caused by changes in channel geometry and/or channel roughness. Rating curves were previously developed and reported for the mid-ravine and lower Sequalitchew Creek stations (Aspect and Anchor, 2007), and have continued to evolve since. The rating curves from these stations will be evaluated against new flow-discharge measurements, to ensure updated and accurate rating curves are used.

A.5.5. Surface water quality

Surface water quality parameters, including temperature, dissolved oxygen, pH, and turbidity will be monitored at all surface water stations. Water quality parameters are measured with a YSI Pro Plus multiparameter meter and a Hach Turbidimeter or equivalent instruments.

Surface water temperature will be continually logged by integrated CSI pressure transducer temperature sensors or equivalent equipment (e.g., Onset Hobo/Tidbit© temperature loggers). Temperature sensors will have a minimum accuracy/precision range of +/- 0.2°C. Temperature sensors will be calibrated and maintained in accordance with Ecology's (2015) Standard Operating Procedure (SOP) for Continuous Temperature Monitoring of Fresh Water Rivers and Streams (EAP080). Deployment techniques for temperature sensors/loggers will follow guidance and from Ecology's SOP; however, may vary slightly based on alternative equipment specifications.

Table 4 summarizes the water quality parameters and standard methods that will be employed for the surface water quality monitoring objectives of this project.

Table 4. Water Quality Grab Sample Parameters and Methods

Sample Type	Field Collection Containers	Parameter	Holding Time	Method	Lab Sample Container	Preservative
Continuous	*In-situ* stream or surface water station	Temperature	N/A	Continually logged via CSI pressure transducer, or equivalent	*In situ* (n/a)	*In situ* (n/a)
Grab	1-liter poly	pH	15 minutes	EPA 150.1 via YSI	*In situ* (n/a)	*In situ* (n/a)
		Dissolved Oxygen	15 minutes	EPA 150.2 via YSI	*In situ* (n/a)	*In situ* (n/a)
		Turbidity	15 minutes	EPA 180.1 via YSI	*In situ* (n/a)	*In situ* (n/a)

Manual grab samples will be collected by directly filling sample bottles from the monitoring discharge point, using a “clean hands” approach. The principle of the “clean hands” technique is that field personnel wear appropriate noncontaminating, disposable, powderless gloves during the entire grab sample collection procedure; changing gloves frequently with each change in task.

In-situ measurements with the YSI multiparameter meter may be conducted by directly submerging the sensors into surface waters, so long as there is no interference from bottom sediments or debris.

A.5.5.1. Equipment maintenance

Monitoring equipment will be inspected and serviced as recommended by the manufacturer, or at least once preceding the deployment of temporary monitoring station setups. Generally, equipment maintenance includes: inspection, testing, calibration, and replacement of worn or missing components. Table 5 summarizes the water quality field equipment specifications for this project, including: parameters, decontamination, and calibration procedures.

Table 5. Field Monitoring Equipment Decontamination and Calibration Procedures

Equipment	Parameters	Decontamination Procedure	Calibration Procedures
YSI water quality multimeter, or equivalent	pH; dissolved oxygen	Rinse sensors thoroughly with DI water as needed Store sensors in KCl solution between uses.	Perform the following prior to each site inspection: • Three-point calibration of pH (4,7,10) • Dissolved oxygen using barometric pressure and/or saturation method
HACH Turbidimeter, or equivalent	Turbidity	Rinse sample vials thoroughly with DI water as needed.	Perform reference calibration before every sample period, in accordance with manufacturer specifications.
Continually logged via CSI pressure transducer, or equivalent	Temperature	Gently clean temperature loggers with a soft cloth or soft-bristled brush to remove any biofouling or sediment.	Record ten reference *in-situ* measurements using NIST field thermometer. Compare the mean absolute value of the NIST thermometer measurements against the continuous temperature logger for the same time period; ensure the mean difference isn't greater than 0.2°C.

A.5.5.2. Qualitative Observations

In addition to the quantitative observations of water quality described above, surface water stations will be qualitatively inspected for the following, where applicable:

- Channel conditions, including the presence/absence of beaver dams, downed trees, streambed composition, vegetation, and particularly fast or slow flow velocities.
- Water color, floating oil and grease, floating debris/scum, and materials that may be toxic or harmful to human or other life.

A.5.6. Habitat

Habitat data are collected for two purposes: 1) stream cross sections are measured for comparison with the performance and aspirational thresholds of Goal 2 of the Restoration Plan, and 2) wetland and additional stream habitat measurements are collected to understand the linkages between stream restoration activities and effects on habitat. The wetland and additional stream habitat measurements could inform decisions to employ additional adaptive management strategies or modify existing strategies to limit impacts and/or increase benefits. The supplemental data would not be applicable to the evaluation of performance or aspirational thresholds.

A.5.6.1. Wetland Habitat

Wetland habitat will be measured using established transects with surveyed topography that has been related to surface water monitoring stations. The protocols for point intercept methods for determination of the vegetation community will generally follow Heady et al., 1959. Vegetation data will be collected annually at the end of the growing season (September or October, typically). A tape measure will be strung between fixed points (T-stakes or rebar, typically) and all vegetation species present at each given interval (1-foot or 2-foot, depending on transect length) will be recorded along with the distance from the start of the transect for correlation to surveyed ground surface elevation and surface water elevation data collected throughout the growing season.

A.5.6.2. Stream Habitat

Habitat monitoring stations will be established as cross sections and marked with driven rebar, or similar, in the field. Stations will be spaced 100 feet apart for 1,500 feet upstream of the BNSF culvert, and will be spaced 200 feet apart upstream to the east end of Edmond Marsh. At each section, the following data will be collected, at the frequency indicated in Table 6.

Table 6. Stream Habitat Monitoring Parameters and Methods

Parameter	Method	Precision/ units	Frequency
Depth	Measured every 2 feet within the wetted width of the section using a stadia rod.	0.1 foot	Years 0,1,2,3,5,10
Velocity	Measured at least every 2 feet within the wetted width of the section with a minimum of five measurements using a current velocity meter (Swoffer 2100 or similar).	0.1 feet per second (fps) for velocities between 0.5 and 25 fps	Years 0,1,2,3,5,10
Substrate size	D50 of randomly chosen substrate at least every 2 feet within the wetted width of the section with a minimum of 10 measurements.	1 mm	Years 0,1,2,3,5,10
Cover	Densiometer	Intersects	Years 0,1,2,3,5,10

Additional observations will be collected along the creek and referenced by distance upstream from the BNSF culvert (by station), as shown in Table 7.

Table 7. Additional Habitat Observations

Parameter	Method	Precision/ units	Frequency
Large Woody Material	Repeat existing survey based on methodology by Fox and Boulton (2007).	Count	Years 5, 10
Fish Presence	Visual identification	Species/ size (approx.)/ behavior	0,1,2,3,5,10
Active erosion	Visual identification	Photo documentation with scale	0,1,2,3,5,10

All data, except large woody material, will be collected once per indicated year in November or December when flows are between 100 and 200 percent of mean monthly average flow (or as predicted during years 1 and 2). Data on large woody material can be collected at any time of year.

All data will be presented in an annual monitoring report, including summarization and analysis of the data in terms of the quantity of usable and optimal habitat for Chum spawning and salmonid rearing. Trends over monitoring years will be included along with adaptive management considerations regarding the project performance or this sampling methodology.

A.5.7. Precipitation

For this project, a Hydrological Services Model TB3, or similar, tipping bucket rain gage will be installed at the designated site on the South Parcel. This instrument measures rainfall at 0.01-inch increments. The rain gauge will be connected to a CSI data logger, recording rainfall data at 15-minute intervals. The rain gage will be downloaded at least once each month. Field staff will inspect the rain gage monthly and service as needed. Rain gage calibration checks will occur using the method and at the frequency recommended by the manufacturer.

A.6. Quality Control

This section presents the quality control (QC) requirements for field and laboratory activities associated with this project.

A.6.1. Field

Field measurement equipment, dataloggers, and pressure transducers will be maintained and calibrated every month, at a minimum, to help ensure proper monitoring station operation. Preventative maintenance of the pressure transducers and water quality multimeters will be performed as specified by the manufacturer. The pressure transducers and sensors will be calibrated to the manufacturer's recommendations.

Original field records will be maintained in designated binders for all monitoring and field-related activities using project-specific forms, and guided by the procedures outlined in this SAP. Field documentation will include monthly inspection field sheets, maintenance/calibration logs, COC forms, and other required documentation. All entries in field notebooks will be written in pencil or waterproof ink. When errors are made,

project staff cross-out the error and enter the correct information. All corrections will be initialed and dated. Electronic equivalents of field forms may be used.

Field personnel will employ the following additional field-sample collection QC procedures, as needed:

- Collect grab water quality samples in certified contaminant-free or properly decontaminated containers.
- Use "clean hands/dirty hands" sampling techniques (that is, one team member performs "dirty tasks," while the other member performs "clean tasks," such as handling sample collection bottles).
- Hold samples on ice in coolers during retrieval and delivery to analytical laboratory.
- Deliver samples to analytical laboratory with proper chain of custody, and within holding times.

A.6.2. Laboratory

An accredited laboratory will be contracted to complete additional analyses, as needed, by the inclusion of special studies. Analytical test methods will be standardized and in accordance with procedures approved under 40 Code of Federal Regulations (CFR) §136. The minimum laboratory QA/QC requirements shall also include, but may not necessarily be limited to the following:

- Calibration of analytical laboratory instruments within acceptable limits.
- Periodic inspection, maintenance/servicing, and analysis of quality indicator samples, as necessary, to determine the accuracy and precision of procedures, instruments, and operators.
- Statistical procedures, such as control charts to monitor the precision and accuracy of the analytical data and to establish acceptance ranges and control limits. These data shall be maintained with project records and available upon request or during an audit.
- A continuous review of results to identify and correct problems originating with the instrument, the methodology or the analyst.
- Thorough documentation of the performance of systems, procedures, and operators.
- Certify that electronic data deliverables will exactly match all hard copy data.
- Provide notification of all nonconforming events and conditions, including missed holding times and delays in turnaround time, potentially impacting sample analysis.

A summary of laboratory QA/QC procedures will be requested in the final analytical report deliverables.

A.7. Data Management

This section describes the data management procedures to be used for ensuring access to consistently reliable data. The data management procedure includes 1) recording measurements in the field, 2) downloading data from storage devices in the field, and 3) transferring these data into project databases. There are two separate databases, one for hydrologic data and managed by the hydrology/water quality consultant, and a second for storing vegetation information from the wetland transects and quadrats in the marshes and creek, managed by the habitat consultant. This section defines the structure, inputs, outputs, and quality assurance(QA) and quality control (QC) procedures for the hydrologic database. These data management procedures closely follow those used for current and prior monitoring activities.

A.7.1. Hydrologic Data Collection

Field measurements/observations will be recorded in the field notebook. The field notebook will include the following data sheets: field visit data sheets, field equipment calibration sheets, and the equipment maintenance activity log. Custom field data sheets will be developed for the actual equipment installed. Examples of field data sheets are in Attachment B. Electronic equivalents of field forms may be developed and used.

The Data Collection Lead is responsible for updating and storing the field notebook. The field notebook will be photocopied monthly, and the copy stored at the Consultant's offices. Data loggers will be downloaded onto a project-designated field computer using applicable software and returned to the Consultant's office for transfer to the project database, as described below. Information from field notebook is transcribed into the project database manually. The project data files and database are stored on the Consultant's server, which is to be backed up for disaster recovery purposes at least once per week.

A.7.2. Hydrologic Database Structure

Hydrologic data are stored in an existing central Microsoft Access database created for the ongoing monitoring activities, and a set of specially formatted spreadsheets for ISCO datalogger data. The database will be used to assist with the analysis of groundwater and surface water conditions, and both consolidation and dissemination of information to other parties. The database provides a central storage area for ongoing data collected by Aspect Consulting, LLC and previous data sources, and allows data to be viewed in a uniform manner.

This database is structured such that, whenever possible, user input is validated using predefined formats and common terms making data input fast and simple, while ensuring that data can be accessed reliably through predefined queries. The data management tools in the database include:

- Task/field event setup for verifying completeness of data;
- Manual data entry;
- Querying and reporting tools; and

- Output of graphs and tabulated data.

Additional features designed to protect the integrity of the data and ensure smooth operation of the database include compact on close, tag data additions and modifications with date/time stamp and user id, and "*edit guard*" function that avoids inadvertent editing errors.

Due to the volume of ISCO bubbler data collected since 2004, it is currently managed as a set of Excel spreadsheets that combine to allow storage, correction, and graphing of the raw 15-minute stage data into final analysis and figures.

A.7.3. Database Inputs

Existing hydrologic data currently reside in the database. Data from planned monitoring described in this SAP will be routinely entered into the database as described below.

A.7.3.1. Existing Data

The following types of data were previously input for existing monitoring points:

- Survey coordinates and elevation data for staff gages and well top-of-casing elevations;
- Staff gage and well water level data;
- 15-minute continuous-record stream stage data;
- Stream stage-discharge rating equations for SC-Upper and SC-Lower;
- Standard weir equation for the Diversion Weir; and
- Spot flow measurements.

Existing water quality data is stored in an EQUIS database.

A.7.3.2. New Data

Data inputs from planned data collection include:

- Survey coordinates and elevation data for new staff gages (e.g., at SC-Center Drive gaging station and Sequalitchew Lake Outlet gaging station);
- New surface water staff gage measurements;
- Depth to groundwater measurements from wells;
- Monthly 15-minute stage-height data files for continuous flow and surface water monitoring stations;
- Monthly 15-minute groundwater level data files for continuous groundwater level monitoring stations;
- Monthly 15-minute precipitation data files from on-site rain gage;
- Water quality data;
- New manual streamflow flow measurements; and

- New stream stage-discharge rating equations, as necessary.

Staff gage, depth-to-groundwater, and spot water quality measurements are manually entered directly into the database using the manual data entry form following each field visit. The form includes fields for all monitoring data to help verify completeness.

Continuous stage height, groundwater level, temperature, and precipitation data files are loaded into the database and verified against manual measurements. Manual streamflow measurements and staff gage readings for the Sequalitchew Lake Outlet, SC-Center Drive, SC-Upper, and SC-Lower gaging stations are also entered into MS Excel to evaluate the appropriateness of the current rating curves for each station. When a new rating equation is necessary, it is entered manually into the database and applied to a specific date range for the station.

A.7.3.3. Back-up Precipitation Data

In the event the project rain gage malfunctions, precipitation data from the McMillin Reservoir weather station will be used to fill data gaps, as available. The McMillin Reservoir weather station is located about 20 miles northeast of the project area. This gage was selected as the most appropriate source of back-up precipitation data because it is the closest station with a lengthy period of record, and it receives similar monthly and annual precipitation amounts (Aspect, 2004a).

The precipitation data from McMillin Reservoir are collected as a part of the National Weather Service's (NWC) Cooperative Observer Program (COOP). Electronic files of daily precipitation can be downloaded from the COOP website and imported directly into the database using automated data import routines.

A.7.4. Database Outputs

Figures and tabulated data outputs are generated by an either automated output from the database, or generated via spreadsheet through Tableau. When new figures or tables are desired, water levels and flows are recalculated and printed from their appropriate software.

Water level elevations are calculated in the database, based on the supplied reference elevations for each point. The surveyed elevation of staff gages and monitoring wells is input in the database with a timestamp of when it was measured. Old water levels can be recalculated, based on resurveyed reference elevations when new ones become available.

Raw stage data from the continuous record stream gages is processed with the supplied stage-discharge ratings. Each station has a list of correlations that are applied over a specified time frame—typically for a given year or set of years. From the processed stage data, streamflow in either hourly or 15-minute data intervals is then averaged to mean daily flow for use in graphs and tables.

Precipitation data from the site rain gage is processed to calculate daily, monthly, and annual precipitation totals. Precipitation data at the appropriate time scale is exported to Excel for display on graphs and tables. The data export includes qualifiers indicating the quantity of missing data, if any.

Water quality data are stored and processed in the database. Continuous temperature data will be aggregated to calculate daily and monthly minimum and maximum temperatures as well as the 7-day average of daily maximum temperatures (7-DADMax), which has regulatory significance. Periodic water quality observations will also be output from the database.

A standard monthly report will be developed to assist with routine sharing of information during the mining and restoration projects. The report format will present a summary of observations for the prior month, and compare the observations with relevant performance and aspirational thresholds to determine if the adaptive management processes have been triggered.

A.7.5. QA/QC Protocol

QA/QC protocol for this project fall into three categories, based on which step of data collection and entry is taking place. Data QA/QC occurs during data collection in the field, data entry, and data reporting.

Key components of each QA/QC procedure are summarized below.

A.7.5.1. Data Collection

- The task/field event setup feature identifies all current monitoring points, and organizes them in the order that the data is typically collected on preprinted field forms. This feature helps ensure the completeness of data, especially in the event of field staff turnover.
- While measurements are being collected, the field staff quickly references the previous event's field form to verify the current measurement seems reasonable, and remeasures if necessary.

A.7.5.2. Data Entry

Manual data entry utilizes real-time data verification against defined valid values, acceptable data ranges, expected parameters, and standard data formats. Entries that fall outside these defined parameters will return an error message and reject the data.

A.7.5.3. Data Reporting

After each data entry event, data is reviewed in tabulated and graphical formats. This allows the user to readily identify data outliers and missing values. Data tables and figures will be inspected each month as a final step to verify the completeness and quality of monitoring data.

A.7.6. Data Archival (EIM)

To provide long-term data preservation by a neutral party, data collected under this SAP will be uploaded annually to Ecology's Environmental Information Management (EIM) database: http://www.ecy.wa.gov/eim/. Alternately, data collected by a governmental party with a similar, publicly accessible database (e.g., USGS's Nationwide Water Information System) may be stored in that database.

A.8. Special Studies

This SAP describes the routine monitoring approaches and methods for use in implementing the mining and restoration plans. Those plans also identify several special studies—notably the 60-day pumping test proposed as Step 1 of dewatering, and a study of water quality in Hamer Marsh to determine if it is adequate for improving the connection to Sequalitchew Creek. Specific plans will be developed for these studies, and others that may arise during implementation and adaptive management of the projects.

A.9. References

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TABLES

Table 1 - Summary of Baseline Monitoirng Program

Project No.: 040001-014-03, DuPont, Washington

Station ID	Summary of Monitoring					Description
	Surface Water	Streamflow	Water Quality	Groundwater Elevation		
				Shallow	Deep	
MW-BM-1				X		Bell Marsh - Monitoring Well
SG-BM-1	X					Bell Marsh - Stage Gage
SG-MKM-1	X					McKay Marsh - Stage Gage
MW-HM-1				X		Hamer Marsh - Monitoring Well
MW-SRC-2				X		Hamer Marsh - Monitoring Well
SG-HM-1	X		X			Hamer Marsh - Stage Gage
G-Diversion Weir	X	X	X			Diversion Canal - Continuous Stage Gage and Discharge Transect
SG-DC-1	X	X				Diversion Canal - Stage Gage and Discharge Transect
SG-DC-2	X	X				Diversion Canal - Stage Gage and Discharge Transect
SG-DC-3	X	X				Diversion Canal - Stage Gage and Discharge Transect
MW-D-3				X		Diversion Canal - Monitoring Well
IW-93-MFS-C5-3				X		Diversion Canal - Monitoring Well
MW-SL-1				X		Sequalitchew Lake Outlet - Monitoring Well
SG-SCM-1	X					Sequalitchew Creek Marsh - Stage Gage
SG-EM-3E	X					Edmond Marsh - Stage Gage
SG-EM-3W	X					Edmond Marsh - Stage Gage
MW-EM-3				X		Edmond Marsh - Monitoring Well
SG-EM-2E Island	X					Edmond Marsh - Stage Gage
G-EM-2W Culvert	X					Edmond Marsh - Stage Gage
MW-EM-2(D)					X	Edmond Marsh - Monitoring Well
MW-EM-2(S)				X		Edmond Marsh - Monitoring Well
SG-WL1D-1	X					Edmond Marsh - Stage Gage
MW-WL1D-1				X		Edmond Marsh - Monitoring Well
SG-EM-1	X					Edmond Marsh - Stage Gage
SG-EM-1A	X					Edmond Marsh - Stage Gage
MW-EM-1(D)					X	Edmond Marsh - Monitoring Well
MW-EM-1(S)				X		Edmond Marsh - Monitoring Well
MW-PL-1				X		Pond Lake - Monitoring Well
SG-PL-1	X					Pond Lake - Stage Gage
CHMW-1				X		Mine Area - Monitoring Well
CHMW-2-D					X	Mine Area - Monitoring Well
CHMW-2-S				X		Mine Area - Monitoring Well
CHMW-3-D					X	Mine Area - Monitoring Well
CHMW-3-S				X		Mine Area - Monitoring Well
CHMW-4-D					X	Mine Area - Monitoring Well
CHMW-4-S				X		Mine Area - Monitoring Well
OB-1				X		Mine Area - Monitoring Well
SG-SC-Lower		X				Sequalitchew Creek - Continous Stage Gage and Discharge Transect
SG-SC-Upper		X	X			Sequalitchew Creek - Continous Stage Gage and Discharge Transect

Table 3 - Relationship of Proposed Monitoring to Adaptive Management Thresholds

DRAFT

Project No. 040001-014-03, DuPont, Washington

Plan Objectives			Sampling and Analysis Plan Elements[1]				
			Precipitation	Groundwater Level			
			on-site rain gage	Dewatering Wells	Key Wells: CHMW-1, CHMW-2S&D, CHMW-3S&D, CHMW-4S&D, MW-EM-1S&D, MW-EM-2S&D	MW-BM-1, MW-HM-1, MW-D-3, MW-93-MFS-C5-3, MW-SRC-2, MW-SL-1, MW-EM-3, MW-WLD-1, MW-PL-1	Two new monitoring wells in mine interior
South Parcel Monitoring Plan Objectives	Step 1 - Initial Pumping Test	Groundwater levels at monitoring wells near Edmond Marsh and Sequalitchew Creek are at or above predicted, approved-upon levels.	continuous		continuous	monthly	
		Moisture content of mined aggregate is at appropriately low levels for safe and efficient mining and processing.	continuous	continuous			
	Step 2 - Prep for Mining/ Dewatering Test	Groundwater levels at monitoring wells near Edmond Marsh and Sequalitchew Creek are at or above predicted, approved-upon levels.	continuous		continuous	twice monthly	
		Moisture content of mined aggregate is at appropriately low levels for safe and efficient mining and processing.	continuous	continuous			as needed
	Step 3 - Active Dewatering During Mining	Groundwater levels at monitoring wells near Edmond Marsh and Sequalitchew Creek are at or above predicted, approved-upon levels.	continuous		continuous	twice monthly for 3 months after new dewatering wells are brought on line, then monthly	
		Moisture content of mined aggregate is at appropriately low levels for safe and efficient mining and processing.	continuous	as needed			as needed
	Step 4 - Cessation of Active Dewatering	Groundwater levels at monitoring wells near Edmond Marsh and Sequalitchew Creek are at or above predicted, approved-upon levels.	continuous		continuous	monthly	
		Moisture content of mined aggregate is at appropriately low levels for safe and efficient mining and processing.	continuous	as needed			as needed
Sequalitchew Creek Restoration Plan Objectives	After Elements B, C, and D,	Achieve year-round surface water flow in Sequalitchew Creek from Sequalitchew Lake to the mouth, as climate conditions allow.	continuous				
		Minimize the flow lost to the Diversion Canal.	continuous				
	After B, C, D, and G	Increase access to suitable spawning and rearing habitat in Sequalitchew Creek	continuous				

Notes:

1) additional monitoring locations may be added through adaptive management

* Continue routine monitoring of flow and surface water stations to aid in interpretation of groundwater measurements. Flow and surface water stations do not have Monitoring Plan performance thresholds.

Table 3 - Relationship of Proposed Monitoring to Adaptive Management Thresholds

Project No. 040001-014-03, DuPont, Washington

Plan Objectives			Sampling and Analysis Plan Elements*					
			Flow			Surface Water Level		
			Sequalitchew Lake Outlet	Diversion Weir	Sequalitchew Creek gages (Center Drive, mid-ravine, and SC-Lower)	West Edmond (SG-EM-1/1A and SG-EM-2W)	East Edmond and Sequalitchew Creek Marshes (SG-SCM-1, SG-EM-3E, SG-EM-3W, SG-EM-2E)	Hamer, McKay, and Bell Marshes (SG-HM-1, SG-MKM-1, SG-BM-1)
South Parcel Monitoring Plan Objectives	Step 1 - Initial Pumping Test	Groundwater levels at monitoring wells near Edmond Marsh and Sequalitchew Creek are at or above predicted, approved-upon levels.	* continue routine monitoring			* continue routine monitoring		
		Moisture content of mined aggregate is at appropriately low levels for safe and efficient mining and processing.						
	Step 2 - Prep for Mining/ Dewatering Test	Groundwater levels at monitoring wells near Edmond Marsh and Sequalitchew Creek are at or above predicted, approved-upon levels.	* continue routine monitoring			* continue routine monitoring, but at twice monthly frequency		
		Moisture content of mined aggregate is at appropriately low levels for safe and efficient mining and processing.						
	Step 3 - Active Dewatering During Mining	Groundwater levels at monitoring wells near Edmond Marsh and Sequalitchew Creek are at or above predicted, approved-upon levels.	* continue routine monitoring			* continue routine monitoring, but at twice monthly for first three months after new dewatering wells are brought on line, then monthly		
		Moisture content of mined aggregate is at appropriately low levels for safe and efficient mining and processing.						
	Step 4 - Cessation of Active Dewatering	Groundwater levels at monitoring wells near Edmond Marsh and Sequalitchew Creek are at or above predicted, approved-upon levels.	* continue routine monitoring			* continue routine monitoring		
		Moisture content of mined aggregate is at appropriately low levels for safe and efficient mining and processing.						
Sequalitchew Creek Restoration Plan Objectives	After Elements B, C, and D,	Achieve year-round surface water flow in Sequalitchew Creek from Sequalitchew Lake to the mouth, as climate conditions allow.	continuous		continuous	continuous	monthly	monthly
		Minimize the flow lost to the Diversion Canal.		continuous				
	After B, C, D, and G	Increase access to suitable spawning and rearing habitat in Sequalitchew Creek			continuous	continuous	monthly	

Notes:

1) additional monitoring locations may be added through adaptive management

* Continue routine monitoring of flow and surface water stations to aid in interpretation of groundwater measurements. Flow and surface water stations do not have Monitoring Plan performance thresholds.

Table 3 - Relationship of Proposed Monitoring to Adaptive Management Thresholds

Project No. 040001-014-03, DuPont, Washington

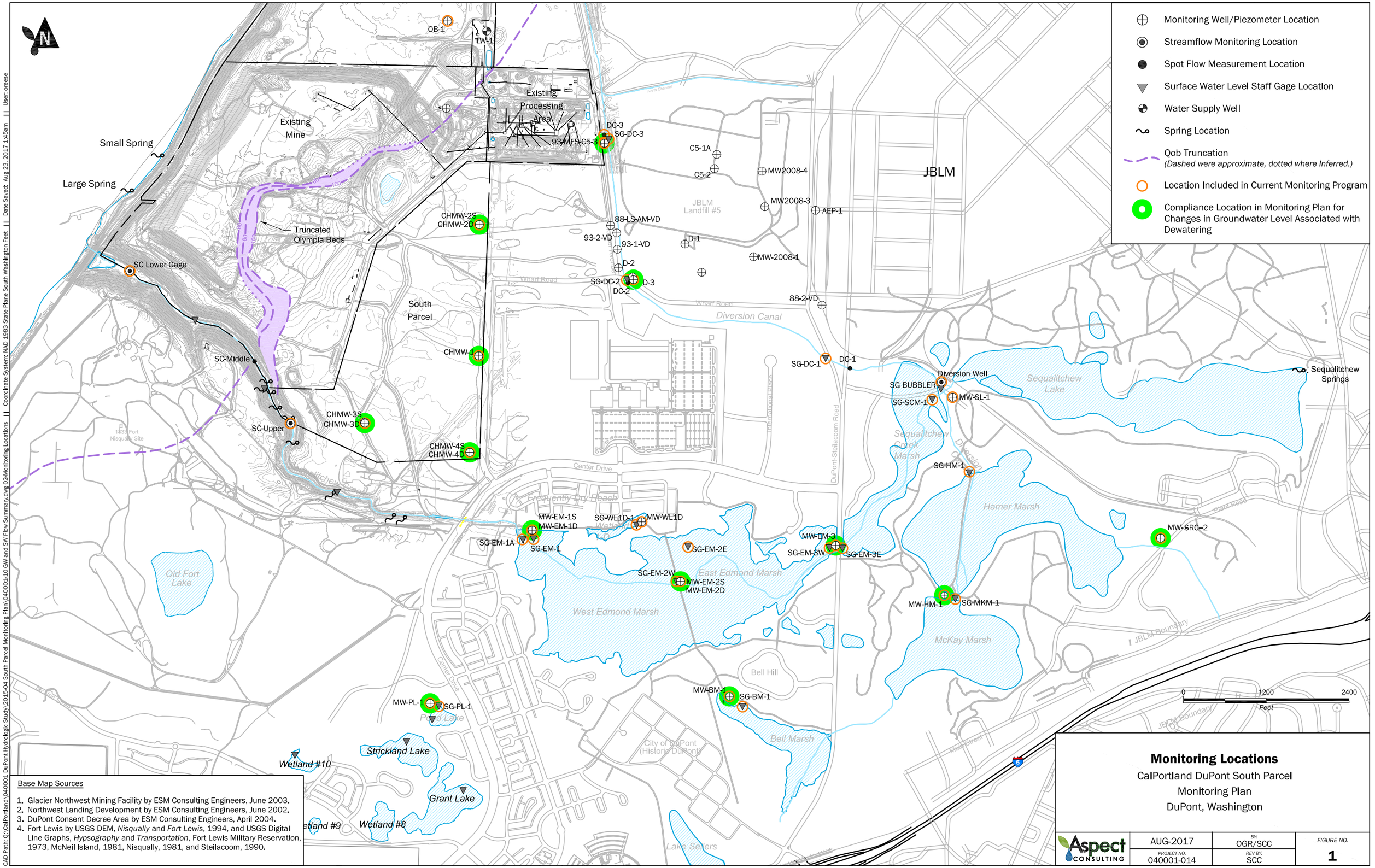
Plan Objectives			Sampling and Analysis Plan Elements*				
			Water Quality		Habitat		
			Temperature at SG-EM-1, SG-EM-2W, Diversion Weir, Sequalitchew Lake Outlet, SC-Center Drive, mid-ravine, SC-Lower	Water quality sampling for DO, turbidity, pH, Temperature at select surface water stations	Cross-section physical characteristics (depth, velocity, substrate,and cover)	Visual Observations (fish presence, active erosion)	Large Woody Material
South Parcel Monitoring Plan Objectives	Step 1 - Initial Pumping Test	Groundwater levels at monitoring wells near Edmond Marsh and Sequalitchew Creek are at or above predicted, approved-upon levels.					
		Moisture content of mined aggregate is at appropriately low levels for safe and efficient mining and processing.					
	Step 2 - Prep for Mining/ Dewatering Test	Groundwater levels at monitoring wells near Edmond Marsh and Sequalitchew Creek are at or above predicted, approved-upon levels.					
		Moisture content of mined aggregate is at appropriately low levels for safe and efficient mining and processing.					
	Step 3 - Active Dewatering During Mining	Groundwater levels at monitoring wells near Edmond Marsh and Sequalitchew Creek are at or above predicted, approved-upon levels.					
		Moisture content of mined aggregate is at appropriately low levels for safe and efficient mining and processing.					
	Step 4 - Cessation of Active Dewatering	Groundwater levels at monitoring wells near Edmond Marsh and Sequalitchew Creek are at or above predicted, approved-upon levels.					
		Moisture content of mined aggregate is at appropriately low levels for safe and efficient mining and processing.					
Sequalitchew Creek Restoration Plan Objectives	After Elements B, C, and D,	Achieve year-round surface water flow in Sequalitchew Creek from Sequalitchew Lake to the mouth, as climate conditions allow.					
		Minimize the flow lost to the Diversion Canal.					
	After B, C, D, and G	Increase access to suitable spawning and rearing habitat in Sequalitchew Creek	continuous	monthly	Years 0, 1, 2, 3, 5 and 10		Years 5 and 10

Notes:

1) additional monitoring locations may be added through adaptive management

* Continue routine monitoring of flow and surface water stations to aid in interpretation of groundwater measurements. Flow and surface water stations do not have Monitoring Plan performance thresholds.

FIGURE



Base Map Sources

1. Glacier Northwest Mining Facility by ESM Consulting Engineers, June 2003.
2. Northwest Landing Development by ESM Consulting Engineers, June 2002.
3. DuPont Consent Decree Area by ESM Consulting Engineers, April 2004.
4. Fort Lewis by USGS DEM, *Nisqually* and *Fort Lewis*, 1994, and USGS Digital Line Graphs, *Hypsography* and *Transportation*, Fort Lewis Military Reservation, 1973, McNeil Island, 1981, Nisqually, 1981, and Steilacoom, 1990.

Monitoring Locations

CalPortland DuPont South Parcel
Monitoring Plan
DuPont, Washington

Aspect Consulting	AUG-2017	BY: OGR/SCC	FIGURE NO. 1
	PROJECT NO. 040001-014	REV BY: SCC	

CAD Path: Q:\CalPortland\040001 DuPont Hydrologic Study\2015-04 South Parcel Monitoring Plan\040001-10 GW and SW Flow Summary.dwg 02-Monitoring Locations || Coordinate System: NAD 1983 State Plane South Washington Feet || Date Saved: Aug 23, 2017 1:45am || User: oreese

APPENDIX A

Boring Logs

14P1

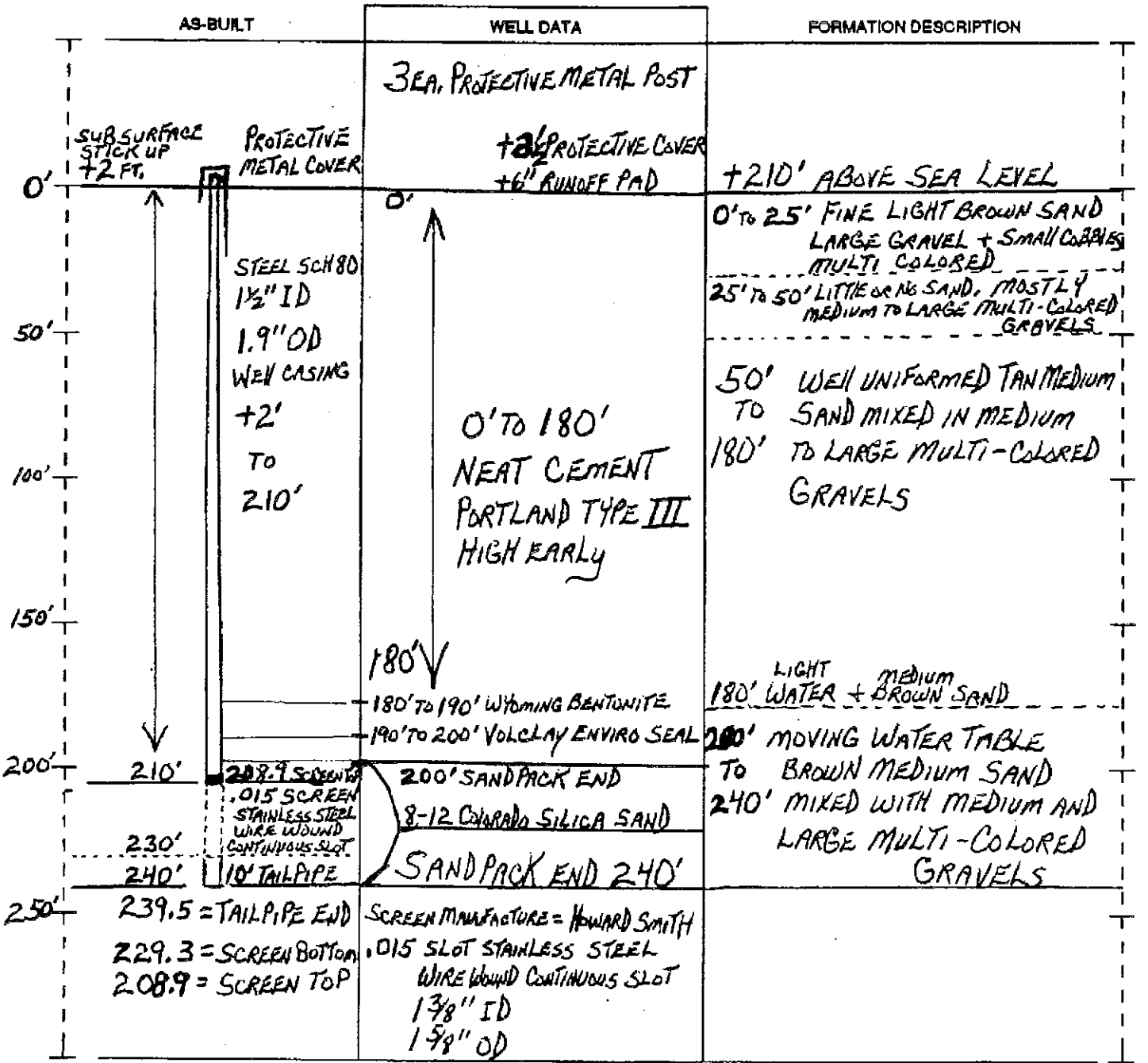
21 FEB 9

RESOURCE PROTECTION WELL REPORT

START CARD NO. 063977

PROJECT NAME: LONESTAR NW OBSERVATION WELL
WELL IDENTIFICATION NO. LONE STAR OB-1
DRILLING METHOD: REVERSE CIRCULATION ROTARY
DRILLER: DOUGLAS GRABOWSKI
FIRM: BECKER DRILLS INC.
SIGNATURE: William J. Flickey
CONSULTING FIRM: HART CROWSER
REPRESENTATIVE: TOM NOYES

COUNTY: PIERCE
LOCATION: SE¼ SW¼ Sec 14 Twn 19N R 1E
STREET ADDRESS OF WELL: NORTHWEST LANDING ANNEX DUPONT STEILACOOM ROAD DUPONT WASHINGTON
WATER LEVEL ELEVATION: 200 FT. STATIC
GROUND SURFACE ELEVATION: +210
INSTALLED: FEBRUARY 15, 1991
DEVELOPED:



SCALE: 1" = 50 FEET

PAGE 1 OF 1

ECY 050-12 (Rev. 11/89)

The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report

CH2MHILL

Well Number: CHMW-1

Sheet: 1 of 1

Client: Glacier NW
Project: N Sequalitchew Creek Aquifer Tests
Location: DuPont, Washington
Project Number: 151973.A2.AT

Driller: Hokkaido Drilling (Bill & Steve)
Drilling Method: Speedstar 15 Truck-Mounted Air Rotary
Sampling Method: Sand pump (water added)
Logged by: driller
Start/Finish Date: 9/23/99 - 9/24/99

Depth (ft)	Sample Info: Sample #	Sample Info: STP (6"-6"-6")	Soil Log	Soil Description	Depth / Elev	Well Drawing	Well Construction Notes
-5					5		
					217		Monument (not shown)-- Lockable 6" steel protective casing in concrete.
0				Ground Surface			
				Topsoil	2		
5				Sand and gravel with silt, dry, brown	210		
10							Casing - 2" sch 40 PVC pipe
15							
20					22		
				Brown silty gravel	190		
25					26		
				Brown gravel, like till	186		
30					33		
				Brown silt	179		
35				Light brown gravel, productive water-bearing zone			
40							
45							
50							
55					57		
				Dark brown gravel and sand. Note no "soupy sand" like in CHTW-1.	155		
60							Casing Seal - Hydrated medium bent
65							
70							
75					76		Filter pack - 10-20 CSSI sand
				Dark brown sand and gravel	136		Screen - 2" sch 40 PVC, 0.020-in slot
80					82		
				Gray-blue silty sand, sand and gravel.	130		
85					85		6" end cap
					127		

CH2MHILL

Well Number: CHMW-2(S)

Sheet: 1 of 1

Client: Glacier NW
Project: N Sequalitchew Creek Aquifer Tests
Location: DuPont, Washington
Project Number: 151973.A2.AT

Driller: Hokkaido Drilling (Daryl & Tom)
Drilling Method: Star 71 cable tool, 8" steel casing
Sampling Method: Sand pump (water added)
Logged by: driller
Start/Finish Date: 11/17/99 - 11/19/99

Depth (ft)	Sample Info: Sample #	Sample Info: STP (6"-6"-6")	Soil Log	Soil Description	Depth / Elev	Well Drawing	Well Construction Notes
-5					5 212		Monument (not shown)-- Lockable 6" steel protection casing in concrete.
0				Ground Surface Topsoil and gravel	3		
5				Brown silty sand and gravel	204		
10							Casing - 2" sch. 40 PVC pipe
15							Casing seal - Hydrated medium bentc
20					21		
25				Larger gravel and sand, slightly silty, very hard	186 26		
30				Brown silty sand, gravel Sandier with gravel	181		Sandy filterpack - 10-20 CSSI sand
35					36		
40				Clean sand and gravel, water	171		Screen - 2 centralizers, 2" sch 40 PV(0.020-inch slot width
45					43		6" end cap
50				End of Log	164		

CH2MHILL

Well Number: CHMW-2(D)

Sheet: 1 of 1

Client: Glacier NW
Project: N Sequalitchew Creek Aquifer Tests
Location: DuPont, Washington
Project Number: 151973.A2.AT

Driller: Hokkaido Drilling (Steve & Tom)
Drilling Method: Speedstar 15 & Star 71 Cable Tool
Sampling Method: Sand pump (water added)
Logged by: Driller
Start/Finish Date: 11/12/99 - 11/18/99

Depth (ft)	Sample Info: Sample #	Sample Info: STP (6"-6"-6")	Soil Log	Soil Description	Depth / Elev	Well Drawing	Well Construction Notes
-5					5 212		Monument (not shown): Lockable 6' steel protection casing in concrete
0				Ground Surface			
				Topsoil	4		
5				Brown silty gravel	203 9		
10				Brown gravel	198		Casing--2" sch 40 PVC pipe
15				Brown silty gravel, moist	15 192		
20					24		
25				Hard till, brown	[illegible]		
				Loose sand and gravel, water	181		
30							Casing Seal--Hydrated medium bentc
35				Brown till	35 172		
40							
45					48		
50				Loose sand and gravel, water	159		
55					58		
60				Brown silt bound sand and gravel, tight	149		
65					66		Screen - 2" sch 40 PVC, 0.020-in slot with centralizer
				no record	141		
70					73		6" end cap
75				End of Log	134		

CH2MHILL

Well Number: CHMW-3(D)

Sheet: 1 of 1

Client: Glacier NW
Project: N Sequalitchew Creek Aquifer Tests
Location: DuPont, Washington
Project Number: 151973.A2.AT

Driller: Hokkaido Drilling (Steve)
Drilling Method: Speedstar 15 Air Rotary Drill Rig
Sampling Method: Sand pump (water added)
Logged by: driller
Start/Finish Date: 11/4/99 - 11/5/99

Depth (ft)	Sample Info: Sample #	Sample Info: STP (6"-6"-6")	Soil Log	Soil Description	Depth / Elev	Well Drawing	Well Construction Notes
-5					5		Monument (not shown): Lockable 6" steel protective casing in concrete
					221		
0				Ground Surface			
				Brown topsoil	2		
5				Loose brown gravel	214		
10							Casing - 2" sch 40 PVC pipe
15					16		
				Brown silty sand and gravel	200		
20							
25					26		
				Brown silty sand and gravel (moist)	190		Casing seal - hydrated medium bento
30					31		
				Brown sand and gravel, dirty, water	185		
35							
40					41		
				Brown till	175		
45							
					48		
50				Sand and gravel, water	168		
					54		
55				Brown till	162		
				Silt, sand and gravel, brown, wet			
60							
					64		
65				Clean sand and gravel	152		
70							
							Filter pack - 10-20 CSSI sand
75							Screen - 2" sch 40 PVC, 0.020-in slot
80							
					85		6" end cap
85				End of Log	131		
90							

CH2MHILL

Well Number: CHMW-3(S)

Sheet: 1 of 1

Client: Glacier NW
Project: N Sequalitchew Creek Aquifer Tests
Location: DuPont, Washington
Project Number: 151973.A2.AT

Driller: Hokkaido Drilling (Steve)
Drilling Method: Speedstar 15 Air Rotary Drill Rig
Sampling Method: Sand pump (water added)
Logged by: driller
Start/Finish Date: 11/5/99

Depth (ft)	Sample Info: Sample #	Sample Info: STP (6"-6"-6")	Soil Log	Soil Description	Depth / Elev	Well Drawing	Well Construction Notes
-5					5 221		Monument (not shown): Lockable 6" steel protection casing in concrete
0				Ground Surface Brown topsoil	2		
				Loose gravel	214		
5							Casing - 2" sch 40 PVC pipe
10							
15					16		Casing seal - Hydrated medium bentc
				Silty brown sand and gravel	200		
20							
25					26		
				Moist silty brown sand and gravel	190		Filter pack - 10-30 CSSI sand
30					31		Screen - 2" sch 40 PVC, 0.020-in slot
				Clean sand and gravel, water	185		
35							
40					40		6" end cap
				End of Log	176		
45							

CH2MHILL

Well Number: CHMW-4(S)

Sheet: 1 of 1

Client: Glacier NW
Project: N Sequalitchew Creek Aquifer Tests
Location: DuPont, Washington
Project Number: 151973.A2.AT

Driller: Hokkaido Drilling (Steve)
Drilling Method: air rotary
Sampling Method: Sand pump (water added)
Logged by: driller
Start/Finish Date: 11/23/99

Depth (ft)	Sample Info: Sample #	Sample Info: STP (6"-6"-6")	Soil Log	Soil Description	Depth / Elev	Well Drawing	Well Construction Notes
-5					5 219		Monument (not shown): Lockable 6" steel protective casing
0				Ground Surface Topsoil with large gravel	3		
5				Brown silty sand and gravel	211		
10					11		Casing - 2" sch 40 pvc pipe w/ j-plug
				Brown silty sand and large boulders	203		
15					15		Casing seal - hydrated medium bento
				Sand and gravel with water	199 17		
				Brown silt with gravel	197		
20							
25							Filterpack - 10-20 CSSI sand
							Screen - 2" sch 40 pvc, 0.020-in slot v
30							
35							
					37		6" end cap
				End of Log	177		
40							

CH2MHILL

Well Number: CHMW-4(D)

Sheet: 1 of 1

Client: Glacier NW
Project: N Sequalitchew Creek Aquifer Tests
Location: DuPont, Washington
Project Number: 151973.A2.AT

Driller: Hokkaido Drilling (Steve)
Drilling Method: air rotary
Sampling Method: Sand pump (water added)
Logged by: diller
Start/Finish Date: 11/11/99

Depth (ft)	Sample info: Sample #	Sample info: STP (6"-6"-6")	Soil Log	Soil Description	Depth / Elev	Well Drawing	Well Construction Notes
-5					5 / 219		
0				Ground Surface			
				Topsoil	2		
5				Brown gravel	212		Monument: Lockable 6" steel protective casing in concrete
10							
15					15		
				Brown till	199		
20							
25							Casing - 2" sch 40 PVC pipe
30							
					34		
35				Sand, gravel, making water	180		Casing seal - hydrated medium bento
40							
45							
					48		
50				Brown till	166		
					53		
55				Sand, gravel, making water	161		
60							
65					66		
				Brownish orange silty gravel	148		
70				Sand, gravel, water			
75							Filter pack - 10-20 CSSI sand
							Screen - 2" sch 40 PVC, 0.020-in slot
80							
					85		6" end cap
85					129		

CH2MHILL

PROJECT NUMBER : 151973.A1.AT

WELL NUMBER : CHMW-1

WELL CONSTRUCTION/BORING LOG

PROJECT : **LONE STAR, DUPONT** LOCATION : **50' S. OF CHTW-1**

WATER LEVELS : **21'6 3/4" ATD**

DRILLING METHOD/EQUIPMENT : **SPEEDSTAR 15 TRUCK-MOUNTED AIR ROTARY**

START : **9/23/99** END : **9/24/99** LOGGER: **HOKKAIDO(BILL&STEVE)**

DEPTH BELOW SURFACE (FT)	CORE DESCRIPTION/COMMENTS
0	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.
	0-2FT Topsoil
	2-22FT Sand/gravel w/silt (dry,brown)
5	
10	
15	
20	
	22-26FT Brown silty gravel
25	
	26-33FT Brown gravel (like till)
30	

CH2MHILL

PROJECT NUMBER : 151973.A1.AT	WELL NUMBER : CHMW-1 SHEET 2 OF 3

WELL CONSTRUCTION/BORING LOG

PROJECT : **LONE STAR, DUPONT** LOCATION : **50' S. OF CHTW-1**

WATER LEVELS : **21'6 3/4" ATD**

DRILLING METHOD/EQUIPMENT : **SPEEDSTAR 15 TRUCK-MOUNTED AIR ROTARY**

START : **9/23/99** END : **9/24/99** LOGGER: **HOKKAIDO(BILL&STEVE)**

DEPTH BELOW SURFACE (FT)	CORE DESCRIPTION/COMMENTS
	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.
	33-35FT Brown silt
35	35-57FT Lt.brown gravel, productive water-bearing zone
40	
45	
50	
55	
	57-59FT Dk.brown gravel & sand NOTE: No "soupy sand" at 50' like in CHTW
60	

CH2MHILL

PROJECT NUMBER : 151973.A1.AT

WELL NUMBER : CHMW-1

WELL CONSTRUCTION/BORING LOG

PROJECT : **LONE STAR, DUPONT** LOCATION : **50' S. OF CHTW-1**

WATER LEVELS : **21'6 3/4" ATD**

DRILLING METHOD/EQUIPMENT : **SPEEDSTAR 15 TRUCK-MOUNTED AIR ROTARY**

START : **9/23/99** END : **9/24/99** LOGGER: **HOKKAIDO(BILL&STEVE)**

DEPTH BELOW SURFACE (FT)	CORE DESCRIPTION/COMMENTS
	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.
65	
70	
75	76-82FT Dk.brown sand & gravel
80	82-83FT Gray silty sand & gravel
85	83-85FT Blue sand & gravel
	WELL: STICKUP=2' (2"sch 40 pvc) SCREEN=75'-84.5' (2"sch 40 pvc, 20-slot) 6" endcap 84.5 -85 fbgs ANNULUS=15 bags 10-20 cost sand (50lb. ea) 52 bags med. bentonite chips (50lbs ea) MONUMENT=6" steel protective casing in concrete
0	

CH2MHILL

PROJECT NUMBER : 151973.A1.AT	WELL NUMBER : CHMW-2(S)
	SHEET 1 OF 2

WELL CONSTRUCTION/BORING LOG

TOC elev = 209.39 Stickup = 1.45
grd = 207.94

PROJECT : **LONE STAR, DUPONT** LOCATION : **50' N. OF TW-2(~15FT E.OF MW-2(D)**

WATER LEVELS :

DRILLING METHOD/EQUIPMENT: **STAR 71 CABLE TOOL, 8" STEEL CASING**

START : **11/17/99** END : **11/19/99** LOGGER: **HOKKAIDO(DARYL & TOM)**

DEPTH BELOW SURFACE (FT)	CORE DESCRIPTION/COMMENTS
0	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.
	0-3FT Topsoil & gravels
	3-21FT Brown silty sand and gravels
5	
10	
15	
20	
	21-26FT Larger gravels & sand slightly silty, very hard
25	
	26-27FT Brown silty sand & gravel
	27-28FT Sandier w/gravel (gravel smaller)
30	

CH2MHILL

PROJECT NUMBER : 151973.A1.AT	WELL NUMBER : CHMW-2(S) SHEET 2 OF 2

WELL CONSTRUCTION/BORING LOG

PROJECT : **LONE STAR, DUPONT** LOCATION : **50' N. OF TW-2(~15FT E.OF MW-2(D)**

WATER LEVELS :

DRILLING METHOD/EQUIPMENT: **STAR 71 CABLE TOOL, 8" STEEL CASING**

START : **11/17/99** END : **11/19/99** LOGGER: **HOKKAIDO(DARYL & TOM)**

DEPTH BELOW SURFACE (FT)	CORE DESCRIPTION/COMMENTS
	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.
35	36-43FT Clean sand & gravel w/H20 Total casing=46'-81/2" Well: Stickup=2' (2" sch 40 pvc) w/j-plug Screen=33'-421/2' bgs w/2 centralizers & 6' end (2"sch 40 pvc, 20-slot) Annulus=13 50-lb bags 10-20 cgsi sand 18 50-lb bags medium bentonite chips Monument= 6"steel protecting casing in concrete (7 bags)
40	
45	
50	
55	
60	

CH2MHILL

PROJECT NUMBER : 151973.A1.AT	WELL NUMBER : CHMW-2(D) SHEET 1 OF 3

WELL CONSTRUCTION/BORING LOG

TOC elev = 209 Stickup = 1.8 grd = 207.2

PROJECT : **LONE STAR, DUPONT** LOCATION : **50' N. OF TW-2**

WATER LEVELS :

DRILLING METHOD/EQUIPMENT: **SPEEDSTAR 15, 8" STEEL CASING(TO58") &STAR 71 CABLE TOOL, 8" CASING**

START : **11/12/99** END : **11/18/99** LOGGER: **HOKKAIDO(STEVE & TOM)**

DEPTH BELOW SURFACE (FT)	CORE DESCRIPTION/COMMENTS
0	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.
	0-4FT Dark brown topsoil
	4-9FT Brown silty gravel
5	
10	9-15FT Brown gravel
15	15-24FT Brown, silty gravel, moist
20	
25	24-26FT Hard till, brown
	26-35FT Loose sand & gravel H20
30	

CH2MHILL

PROJECT NUMBER : 151973.A1.AT	WELL NUMBER : CHMW-2(D) SHEET 2 OF 3

WELL CONSTRUCTION/BORING LOG

PROJECT : **LONE STAR, DUPONT** LOCATION : **50' N. OF TW-2**

WATER LEVELS :

DRILLING METHOD/EQUIPMENT: **SPEEDSTAR 15, 8" STEEL CASING(TO58") &STAR 71 CABLE TOOL, 8" CASING**

START : **11/12/99** END : **11/18/99** LOGGER: **HOKKAIDO(STEVE & TOM)**

DEPTH BELOW SURFACE (FT)	CORE DESCRIPTION/COMMENTS
	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.
35	35-48FT Brown till
40	
45	
50	48-58FT Loose sand & gravel H20
55	
60	58-66FT Brown tight Silt Bound sand & gravel

CH2MHILL

PROJECT NUMBER : 151973.A1.AT	WELL NUMBER : CHMW-2(D) SHEET 3 OF 3

WELL CONSTRUCTION/BORING LOG

PROJECT : **LONE STAR, DUPONT** LOCATION : **50' N. OF TW-2**

WATER LEVELS :

DRILLING METHOD/EQUIPMENT: **SPEEDSTAR 15, 8" STEEL CASING(TO58") &STAR 71 CABLE TOOL, 8" CASING**

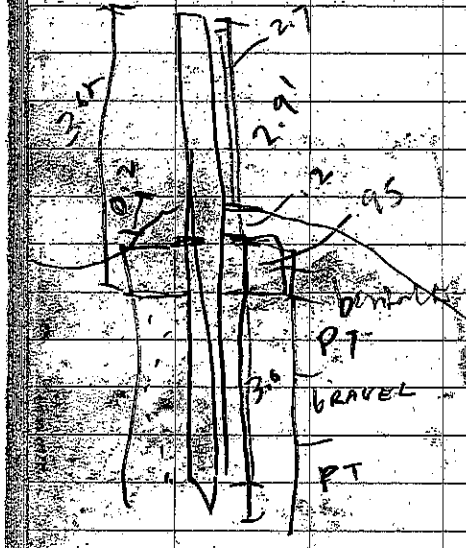
START : **11/12/99** END : **11/18/99** LOGGER: **HOKKAIDO(STEVE & TOM)**

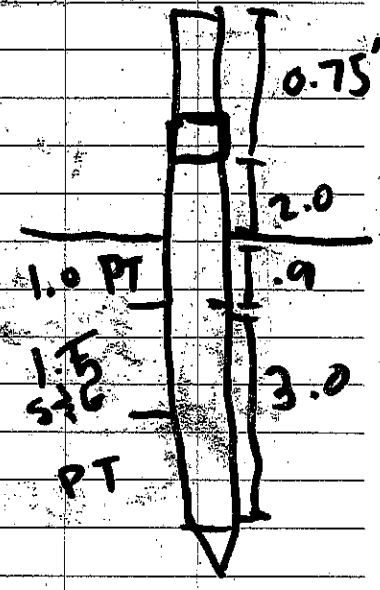
DEPTH BELOW SURFACE (FT)	CORE DESCRIPTION/COMMENTS
	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.
65	66-73FT NO RECORD
	Total Casing=72'-41/4"
	Well:
70	Stickup=2' (2"sch 40 pvc) w/j plug
	Screen= 63'-721/2' bgs (2" sch 40 pvc, 20-slot)
	w/centralizer 6"end cap 721/2-73 fbgs
	Annulus=13 50-lb bags 10-20 cssi sand
	34 50-lb bags medium bentonite chips
	Monument= 6" steel protectivecasing in concrete
75	
80	
85	
90	

CHMW- 4 (S) 18.42

4 (D) 20.81

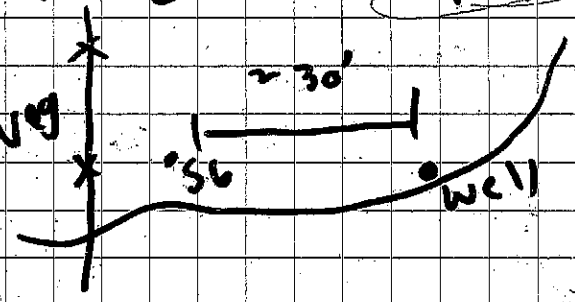
CHMW-1 19.40 14:21





Pond L. well 2.95

Pond L. SG 1.07



BM-MW-1 14.23' 12:30

BM-SG-1 2.53' 12:32

EM-1A 3.69' 12:40

Top 6.65'

SG EM1 dry Top 3.33

Aspect consulting
IN-DEPTH PERSPECTIVE

Geologic & Monitoring Well Construction Log

Project Number	Well Number	Sheet
040001	SL-1	1 of 1

Project Name: North Sequalichew Creek
Location: Fort Lewis, WA
Drilling Method: Hollow stem auger, 4" ID ; Holt Drilling
Sampling Method: 3" diameter D&M
Ground Elevation 214.94

Top of PVC Casing Elev. (ft mllw) 217.74
Depth to Water (ft BTC) 6.25
Start Date March 11, 2004
Finish Date March 11, 2004

Depth feet	Well Construction	Tests\Remarks	Blows/ 6"	Sample ID	Mtl. Graphic	Description
	5" diameter steel monument, 3' stickup; Concrete seal 0'-2'					Grass, duff
						FILL
						Gravel up to 1-1/2" diameter, to a depth of 8" below ground surface
			4 3 3	S-1		Medium stiff, moist to very moist, dark brown, gravelly SILT with SAND
		3/26/04 ▼				
5			3 3 4	S-2		•Very gravelly drilling, no recovery
			9 8 11	S-3		Medium dense, wet, gray, sandy GRAVEL; sand medium to coarse, gravel fine to coarse
			4 6 6	S-4		•Low recovery, trace gravel in sampler
			7 7 7	S-5		RECESSIONAL OUTWASH Medium dense, wet, gray, very gravelly SAND; sand predominantly coarse
10	Bentonite chips 2'-13'		7 7 9	S-6		Medium dense, wet, gray-brown, sandy GRAVEL; sand predominantly coarse
			6 7 12	S-7		
			11 10 9	S-8		•Trace silt
15	10/20 silica sand filter pack 13'-20'		10 7 7	S-9		•Trace silt
	20-slot screen 15'-20'; slip cap with SS screw 20'-20.3'		4 6 7	S-10		
20						Bottom of boring at 20 feet.

Sampler Type (ST):
- 3.25" OD D & M Split-Spoon Ring Sampler
- No Recovery
- 2" OD Split-Spoon Sampler

PID - Photoionization Detector
▼ Water Level (ATD)
▽ Static Water Level

Logged by: RRH
Approved by: LJH
Figure No. B - 2

SEQUALICHEW CREEK.GPJ July 20, 2004
MW_GEOLG

Aspect consulting
IN-DEPTH PERSPECTIVE

Geologic & Monitoring Well Construction Log

Project Number	Well Number	Sheet
040001	HM-MW-1	1 of 1

Project Name: North Sequalitchew Creek
Location: DuPont, Washington
Drilling Method: Hollow Stem Auger - 4" ID ; Holt Drilling
Sampling Method: 3" Diameter D&M

Top of Casing Elev. (ft mllw): 221.06
Ground Surfave Elev. (ft): 217.75
Depth to Water (ft bgs): 5
Start Date: August 2, 2004
Finish Date: August 2, 2004

Depth feet	Well Construction	Tests\Remarks	Blows/ 6"	Sample ID	Mtl. Graphic	Description
1						Brown, slightly silty GRAVEL; gravel, predominantly coarse and cobbles (observed from drill action and cuttings) (GP)
2	5" diameter steel monument, cement seal 0'-4'					
3		18"/5"	3 27 30	2.5-4		Brown, moist, slightly silty to trace silt, sandy GRAVEL; sand medium to coarse; gravel fine to coarse, abundant cobbles, subangular to rounded (GW)
4						
5		8/2/04 ▼ 18"/8"	11 23 23	5-6.5		Brown to olive gray, wet, very sandy GRAVEL, trace silt; sand medium to coarse, predominantly medium; gravel fine to coarse with cobbles, subangular to subround; no apparent organization.
6	Bentonite Chips 4'-7.5'					
7						
8		18"/11"	19 22 24	7.5-9		Color change to olive gray; grades to medium to coarse sand and predominantly fine gravel; increase in silt (still trace silt), less cobbles.
9						
10		18"/6"	22 28 32	10-11.5		Olive gray to gray-green, wet, SAND; trace gravel; sand medium to coarse, occasional zones of fine to medium; gravel fine (SP-SW)
11	10/20 silica sand filter pack 7.5'-20.3'					
12						
13		18"/12"	21 30 35	12.5-14		Olive gray, wet, slightly silty, very sandy GRAVEL; gravel fine to coarse; with cobbles; sand predominantly medium to coarse (GW-GM)
14						
15	20-slot screen 10'-20'; slip cap with SS screw 20'-20.3'	18"/10"	21 31 44	15-16.5		Gray-green to olive gray, wet, SAND, trace gravel; sand predominantly medium to coarse; gravel fine (SW)
16						Olive gray, wet, very sandy GRAVEL, trace silt, sand medium to coarse, occasional fine, predominantly coarse; gravel fine to coarse (GW)
17						
18		18"/10"	26 50/6"	17.5-19		Gray-green, wet SAND; trace gravel; sand predominantly medium to coarse (SW)
19						Olive-gray, wet, very sandy GRAVEL, trace silt; gravel fine to coarse; sand predominantly medium to coarse (GW)
20		18"/11"	26 50/6"	20-21.5		Gray to olive gray, wet SAND; sand medium; homogenous (SP)
21						
22						Olive gray to gray, wet, sandy GRAVEL, trace silt; gravel fine to coarse; subrounded to rounded; sand medium to coarse, predominantly medium (GW)
23						Total depth = 20' drilled, 22.5' driven.
24						
25						
26						
27						
28						
29						

Sampler Type (ST):
- 3.25" OD D & M Split-Spoon Ring Sampler
- No Recovery
- 2" OD Split-Spoon Sampler

PID - Photoionization Detector
▼ Water Level (ATD)
▽ Static Water Level

Logged by: ILE
Approved by: LJH
Figure No. A-2

APPENDIX B

MW_GEOL S CRK.GPJ November 23, 2004

Aspect consulting
IN-DEPTH PERSPECTIVE

Geologic & Monitoring Well Construction Log

Project Number	Well Number	Sheet
040001	EM-3	1 of 1

Project Name: North Sequalichew Creek
Location: Fort Lewis, WA
Drilling Method: Hollow stem auger, 4" ID ; Holt Drilling
Sampling Method: 3" diameter D&M
Ground Elevation 214.63

Top of PVC Casing Elev. (ft mllw) 217.38
Depth to Water (ft BTC) 4.96
Start Date March 11, 2004
Finish Date March 11, 2004

Depth feet	Well Construction	Tests\Remarks	Blows/ 6"	Sample ID	Mtl. Graphic	Description
	5" diameter steel monument, 3' stickup; Concrete seal 0'-2'					Sod and dark brown organic soil
						FILL
		3/26/04 ▼				Gravel, some cobbles at 0.5'
			3 7 10	S-1		Medium dense, moist, dark brown, sandy GRAVEL with SILT and ORGANICS, trace wood
			3 6 8	S-2		Medium dense, wet, gray SAND and GRAVEL
5			6 2 1	S-3		MARSH DEPOSITS
		K Test K = 1x10^{-6} cm/s	1 1 9	S-4		Soft, wet, brown, slightly fibrous PEAT, trace gravel
			8 12 14	S-5		Medium dense, wet, brown, sandy GRAVEL to GRAVEL, trace silt
10	Bentonite chips 2'-13'		2 6 6	S-6		RECESSIONAL OUTWASH
			7 8 13	S-7		Medium dense, wet, gray SAND, trace gravel; sand fine to medium; 1/4" silt seam
			1 12 25	S-8		No recovery, coarse gravel in shoe of sampler
15			16 17 16	S-9		Dense, wet, brown, gravelly SAND to sandy GRAVEL
	10/20 silica sand filter pack 13'-20'		11 16 32	S-10		Dense, wet, sandy GRAVEL
	20-slot screen 15'-20'; slip cap with SS screw 20'-20.3'		15 25 35	S-11		
20						Bottom of boring at 20 feet.

Sampler Type (ST):
- 3.25" OD D & M Split-Spoon Ring Sampler
- No Recovery
- 2" OD Split-Spoon Sampler

PID - Photoionization Detector
▼ Water Level (ATD)
▽ Static Water Level

Logged by: RRH
Approved by: LJH

Figure No. B - 1

SEQUALICHEW CREEK.GPJ 7/29/04

Aspect consulting
IN-DEPTH PERSPECTIVE

Geologic & Monitoring Well Construction Log

Project Number	Well Number	Sheet
040001	BM-MW-1	1 of 1

Project Name: North Sequalitchew Creek
Location: DuPont, Washington
Drilling Method: Hollow Stem Auger - 4" ID ; Holt Drilling
Sampling Method: 3" Diameter D&M

Top of Casing Elev. (ft mllw): 232.32
Ground Surfave Elev. (ft): 229.37
Depth to Water (ft bgs): 12.5
Start Date: August 3, 2004
Finish Date: August 3, 2004

Depth feet	Well Construction	Tests\Remarks	Blows/ 6"	Sample ID	Mtl. Graphic	Description
1	5" diameter steel monument, cement seal 0'-1.5'					Brown, dry, GRAVEL, trace silt; gravel fine to coarse, predominantly coarse; abundant cobbles, subrounded to rounded (GW)
2						
3						(Road fill)
4	Natural Fill 1.5'-5'					
5		18"/4"	11	5-6.5		Brown to tan, moist sandy GRAVEL, trace silt; gravel fine to coarse, subrounded to rounded; sand predominantly medium to coarse.
6			12			
7			10			
8		18"/12"	4	7.5-9		Brown to reddish brown, moist, slightly gravelly SAND, trace silt; sand fine to coarse, predominantly medium; gravel fine, subangular to rounded (SP)
9	Bentonite Chips 5'-12'		10			
10			16			
11		18"/5"	9	10-11.5		Occasional coarse gravel and grades medium to coarse sand.
12		8/3/04 ▼	15			
13		18"/6"	19			
	10/20 silica sand filter pack 12'-26.5'		8	12.5-14		Brown to red-brown, wet, gravelly SAND, trace silt; sand predominantly coarse; gravel fine to coarse, predominantly fine.
15		18"/10"	14			
16			15			
17			9	15-16.5		
18		18"/8"	10			Yellowish-green to brown, highly oxidized, wet, slightly to trace silt; sandy GRAVEL; gravel fine to coarse; sand predominantly coarse (GW-GM)
19			16			
20	20-slot screen 15'-25'; slip cap with SS screw 25'-25.3'	18"/12"	5	17.5-19		Yellow brown, highly oxidized, wet, slightly gravelly SAND, trace silt; sand medium to coarse, predominantly coarse; gravel predominantly fine (SP)
21			8			Grades to slightly silty and gravelly in shoe (SP-SM)
22			8			
23		18"/14"	9	20-21.5		Gray olive, wet, SAND; trace gravel; trace to no silt; sand predominantly medium to coarse (SP)
24			11			
25		18"/3"	13			Gray green, wet, slightly silty to trace silt, sandy GRAVEL; gravel fine to coarse, subrounded to rounded; sand medium to coarse. (GP-GM)
26			13	22.5-24		Gray green, wet, SAND; sand medium (SP)
27			25			
28			24			Gray olive, wet, sandy GRAVEL, trace silt; gravel fine to coarse, sand predominantly medium to coarse (GP)
29			28	25-26.5		Gray olive, wet, slightly silty sandy GRAVEL; gravel fine to coarse; sand medium to coarse (GP-GM)
			19			
			17			Total depth = 25' drilled; 26.5' driven.

Sampler Type (ST):
- 3.25" OD D & M Split-Spoon Ring Sampler
- No Recovery
- 2" OD Split-Spoon Sampler

PID - Photoionization Detector
▼ Water Level (ATD)
▽ Static Water Level

Logged by: ILE
Approved by: LJH
Figure No. A- 1

APPENDIX B

MW_GEOL S CRK_SEQ CRK.GPJ November 23, 2004

CH2MHILL

GS elev = 212.1'

PROJECT NUMBER: 151973.A4.WL BORING NUMBER: EM-2
Sheet: 1 of 3

SOIL BORING LOG

PROJECT: N. Sequalitchew Creek Wetland **LOCATION:** ~10' S. of Edmond Marsh Trail
ELEVATION: **DRILLING CONTRACTOR:** Cascade Drilling
DRILLING METHOD AND EQUIPMENT: CME 75 nodwell track rig, HSA, Dames & Moore, 140lb hammer
WATER LEVELS: See log **START:** 12/12/02 0934 **FINISH:** 12/12/02 1228 **LOGGER:** S. McGinnis

DEPTH BELOW GROUND SURFACE	WELL INSTALLATION	SAMPLE TYPE	SAMPLE RECOVERY (IN)	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION
0					Ground Surface	
		DM	12	2-5-5 (10)	SILTY SAND WITH ORGANICS (SM) Dark brown, moist, loose, fine grained sand, trace fine to medium round to subround gravel, est. 30-40% fines, 20% organics (TOPSOIL)	Two piezometers installed in separate monuments. EM-2(S) is the shallow piezometer, and EM-2(D) is the deep piezometer
		DM	6	5-6-6 (12)	SANDY SILTY GRAVEL (GM) Dark brown, moist to wet, medium dense, well graded round to subround gravel, est. 20% fines, 30-40% sand, trace organics (FILL)	3': Driller states in gravel and a little water
		DM	18	3-1-1 (2)	SILTY SAND WITH GRAVEL (SM) Light brown, moist, medium dense, fine to medium grained sand, fine to medium round to subround gravel, est. 15-20% gravel, 20% fines, trace organics (FILL)	
5		DM	18	6-16-18 (34)		5': Driller states drilling in gravel
					PEAT (PT) Dark brown, wet, very soft, fiberous	
					SANDY SILTY GRAVEL (GM) Gray, moist, medium dense, well graded round to subround gravel, fine to medium grained sand, est. 20% fines, 30% sand	8': Sampled, then loaded hole with water
		DM	12	18-21-15 (36)	SILTY SAND WITH GRAVEL (SM) Gray, wet, medium dense, fine to medium grained sand, fine to coarse round to subround gravel, est. 20-30% fines, 20-30% gravel, not compacted, soupy	
10						
		DM	12	18-22-18 (40)	GRAVELLY WELL GRADED SAND (SW) Gray, wet, medium dense, round to subround sand and gravel, fine to medium gravel, trace coarse gravel, est. <5% fines, 30-40% gravel	13': Driller states from 8-13' pretty sandy, not much gravel 14': Sampler wet
15						
		DM	10	44-50/6" (50/6")	GRAVELLY WELL GRADED SAND (SW) Gray, moist to wet, very dense, fine to coarse grained sand, fine round to subround gravel, est. 30-35% gravel	18': Top of sample was heave
20						

CH2MHILL

PROJECT NUMBER: 151973.A4.WL BORING NUMBER: EM-2
Sheet: 2 of 3

SOIL BORING LOG

PROJECT: N. Sequalitchew Creek Wetland **LOCATION:** ~10' S. of Edmond Marsh Trail
ELEVATION: **DRILLING CONTRACTOR:** Cascade Drilling
DRILLING METHOD AND EQUIPMENT: CME 75 nodwell track rig, HSA, Dames & Moore, 140lb hammer
WATER LEVELS: See log **START:** 12/12/02 0934 **FINISH:** 12/12/02 1228 **LOGGER:** S. McGinnis

DEPTH BELOW GROUND SURFACE	WELL INSTALLATION	SAMPLE TYPE	SAMPLE RECOVERY (IN)	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION
		DM	12	24-26-30 (56)	GRAVELLY WELL GRADED SAND (GW) Gray, moist to wet, medium dense, fine to coarse grained sand, fine to coarse round to subround gravel, est. 30-40% gravel	20.5': Heave in sampler
		DM	12	34-50/6" (50/6")	SANDY WELL GRADED GRAVEL (GW) Gray, moist to wet, very dense, well graded sand, round to subround gravel, est. 30-35% sand	
25		DM	12	23-36-50/6" (86/12")	SANDY WELL GRADED GRAVEL (GW) -Similar to above, gray, moist to wet, dense to very dense, well graded sand, est. 30-40% sand, becomes siltier toward bottom of sample, est. up to 10% silt toward bottom of sample	25.5': Driller drained water out of samples before opening split spoon. Driller loads hole with water, difficult to determine if samples are wet from drilling water or groundwater. All heave in sample from 25.5'. Resampled.
30		DM	12	32-40-50/6" (90/12")	GRAVELLY WELL GRADED SAND (SW) Gray, moist to wet, very dense, fine to coarse grained sand, fine round to subround gravel, "clean"-little to no fines	
		DM	12	36-44-50/6" (94/12")	GRAVELLY WELL GRADED SAND (SW) -Similar to above	
35		DM	2	44-50/3" (50/3")	WELL GRADED SAND (SW) Gray, moist to wet, very dense, fine to coarse round to subround sand	
		DM	6	36-50/6" (50/6")	SANDY WELL GRADED GRAVEL (GW) Gray, moist to wet, very dense, well graded sand, round to subround gravel, est. 30-40% sand, est. 5% silt	
40		DM	3	33-40-50/6" (90/12")	POORLY GRADED SAND WITH GRAVEL (SP) Gray, moist to wet, very dense, fine to medium grained sand, coarse round to subround gravel, est. 15-20% gravel	38': 3" of heave in sampler

CH2MHILL

PROJECT NUMBER: 151973.A4.WL BORING NUMBER: EM-2
Sheet: 3 of 3

SOIL BORING LOG

PROJECT: N. Sequalitchew Creek Wetland **LOCATION:** ~10' S. of Edmond Marsh Trail
ELEVATION: **DRILLING CONTRACTOR:** Cascade Drilling
DRILLING METHOD AND EQUIPMENT: CME 75 nodwell track rig, HSA, Dames & Moore, 140lb hammer
WATER LEVELS: See log **START:** 12/12/02 0934 **FINISH:** 12/12/02 1228 **LOGGER:** S. McGinnis

DEPTH BELOW GROUND SURFACE	WELL INSTALLATION	SAMPLE TYPE	SAMPLE RECOVERY (IN)	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION
		DM	10	16-38-50/6" (88/12")	**WELL GRAED SAND WITH GRAVEL (SW)** Gray, moist to wet, very dense, fine round to subround gravel, "clean", grades to **WELL GRADED SAND WITH SILT AND GRAVEL (SW-SM)** 42' Gray, moist to wet, very dense, fine round to subround gravel, est. 15% gravel, 10-15% silt	
		DM	12	18-28-30 (58)	**POORLY GRADED SAND (SP)** Gray, moist to wet, fine to medium grained sand, trace fine to coarse round to subround gravel, est. 5% or less gravel	
45		DM	12	29-36-42 (78)	**POORLY GRADED SAND (SP)** -Similar to above, some gravels have brown staining surrounding the gravel and within the fine grained sand, fine gravel	
Qvr		DM	12	36-50/6" (50/6")	**POORLY GRADED SAND WITH GRAVEL (SP)** Gray, moist, very dense, fine to medium grained sand, fine to coarse round to subround gravel, gravel was packed in "tight", trace dark organics?, pockets/lenses of fine sand at 48'	48': Driller states it felt more compacted Bottom of boring at 51.7' at 1228 on 12-12-02
50		DM	6	(100/6")	**SILTY WELL GRADED SAND WITH GRAVEL (SM)** Gray, moist to wet, very dense, some is compact where the sand is finer grained, est. 20-25% gravel	**Deep Piezometer Construction (EM-2(D))** +2.55-0' Steel riser, locking monument 0-2' Concrete 2-36' Quick grout 36-38' Bentonite chips 38-51.7' Lapis Lustre 2/12 silica sand 0-40' Blank pvc 40-50' 0.020 machine slot screen and cap
Qvt		SS	6	(100/8")	**SILTY SAND WITH GRAVEL (SM)** Gray, moist, very dense, fine grained sand, fine round to subround gravel, est. 20-25% gravel, compacted looking	
55					BOTTOM OF BORING	**Shallow Piezometer Construction (EM-2(S))** Drilled and installed in a separate monument about 3 feet east of deep well 0-1' Concrete and riser 1-2' Bentonite chips 2-5' Lapis Lustre 2/12 silica sand 0-2.5' Blank pvc 2.5-5' 0.020 machine slot screen and cap
60						

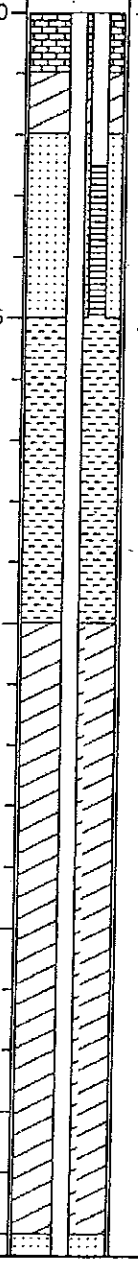
CH2MHILL

PROJECT NUMBER: 151973.A4.WL BORING NUMBER: EM-1
Sheet: 1 of 2

SOIL BORING LOG

GS elev = 207.3

PROJECT: N. Sequalitchew Creek Wetland **LOCATION:** ~100' S. of Edmond Marsh Trail
ELEVATION: **DRILLING CONTRACTOR:** Cascade Drilling
DRILLING METHOD AND EQUIPMENT: CME 75 nodwell track rig, HSA, Dames & Moore, 140lb hammer
WATER LEVELS: See log **START:** 12/11/02 1544 **FINISH:** 12/11/02 1620 **LOGGER:** S. McGinnis

DEPTH BELOW GROUND SURFACE	WELL INSTALLATION	SAMPLE TYPE	SAMPLE RECOVERY (IN)	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION
0					Ground Surface	Drilled down to 24 feet bgs before first sample. Two piezometers installed in one monument. EM-1(S) is the shallow piezometer, and EM-1(D) is the deep piezometer 4': Driller states in gravel and a little water 12': Sounded gravelley to 14' while drilling, rig stopped in gravel 14': Loaded hole with water 14-16': Gravelly, smoother drilling below 16' 17': Driller states cobbles about 4" in diameter, then smaller sized gravels below 17' 17-24': Smooth drilling, loaded hole with water
5						
10						
15						
20						

CH2MHILL

PROJECT NUMBER: 151973.A4.WL BORING NUMBER: EM-1
Sheet: 2 of 2

SOIL BORING LOG

PROJECT: N. Sequalitchew Creek Wetland LOCATION: ~100' S. of Edmond Marsh Trail
ELEVATION: DRILLING CONTRACTOR: Cascade Drilling
DRILLING METHOD AND EQUIPMENT: CME 75 nodwell track rig, HSA, Dames & Moore, 140lb hammer
WATER LEVELS: See log START: 12/11/02 1544 FINISH: 12/11/02 1620 LOGGER: S. McGinnis

DEPTH BELOW GROUND SURFACE	WELL INSTALLATION	SAMPLE TYPE	SAMPLE RECOVERY (IN)	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION
25		DM	12	16-20-25 (45)	POORLY GRADED SAND WITH GRAVEL (SP) Gray, wet, medium dense, fine to medium grained sand, fine to coarse round to subround gravel, est. 15-20% gravel	
		DM	0	39-50/4" (50/4")	POORLY GRADED SAND WITH GRAVEL (SP) -similar to above but fine to medium gravel	Bottom of boring at 33.5' at 1620 on 12/11/02.
30		DM	12	34-35-35 (70)	No recovery -Slough	Measured groundwater at 6.10' (EM-1(S)) and 7.47' (EM-1 (D)) below top of steel on 12/11/02
		DM	6	50/6" (50/6")	POORLY GRADED SAND WITH SILT AND GRAVEL (SP-SM) Gray, wet, very dense, fine to medium grained sand, fine to coarse gravel, gets siltier toward bottom of sample, grades to SILTY SAND WITH GRAVEL (SM) at 32' Gray, wet, very dense, fine to medium grained sand, fine to medium round to subround gravel, est. 10-20% silt, 20-25% gravel	Piezometer Construction (EM-1(S) and EM-1(D)) +3.65-0' Steel riser, locking monument 3.xx-2.5' Blank PVC (EM-1(S)) 3.xx-22' Blank PVC (EM-1(D)) 0-1' Concrete 1-2' Bentonite chips 2-5' Lapis Lustre 2/12 silica sand 2.5-5' 0.020 machine slot screen and cap (EM-1(S)) 5-10' Cuttings 10-20' Bentonite chips 20-33.5' Lapis Lustre 2/12 silica sand 22-32' 0.020 machine slot screen and cap (EM-1(D)) Note: Both piezometers are in one steel, riser monument
35					BOTTOM OF BORING	
40						

CH2MHILL

PROJECT NUMBER: 151973.A4.WL BORING NUMBER: EM-1A
Sheet: 1 of 5

SOIL BORING LOG

PROJECT: N. Sequalitchew Creek Wetland **LOCATION:** ~100' S. of Edmond Marsh Trail
ELEVATION: **DRILLING CONTRACTOR:** Cascade Drilling
DRILLING METHOD AND EQUIPMENT: CME 75 nodwell track rig, HSA, Dames & Moore, 140lb hammer
WATER LEVELS: See log **START:** 12/11/02 **FINISH:** 12/11/02 **LOGGER:** S. McGinnis

DEPTH BELOW GROUND SURFACE	WELL INSTALLATION	SAMPLE TYPE	SAMPLE RECOVERY (IN)	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION
0					Ground Surface	
		DM	18	1/12"-1/6" (2)	ORGANICS Dark brown, moist, very soft	
		DM	18	5-7-12 (19)	PEAT (PT) Dark brown, moist, very soft, fiberous	
		DM	8	43-40-40 (80)	SANDY SILTY GRAVEL (SM) Light brown, wet, loose, fine to coarse grained sand, coarse round to subround gravel	3': Driller states in gravel and a little water
5		DM	8	35-37-39 (76)	PEAT (PT) Dark brown, moist, very soft, fiberous, trace gravel mixed in	4.5': Sampler very wet, large gravel/small cobble jammed in shoe
					SANDY SILTY GRAVEL (GM) -Similar to above, light brown, wet, dense, fine to coarse grained sand, coarse round to subround gravel	6': Drilled in gravel from 4.5-6'.
					SILTY SAND WITH GRAVEL (SM) Gray, wet, dense, fine to coarse grained sand, fine to coarse round to subround gravel, trace round cobbles (TILL-LIKE)	
10		DM	10	28-35-39 (74)	SILTY GRAVEL WITH SAND (SM) Gray, wet, dense, fine to coarse gravel, fine to coarse grained sand, est. 30% silt, 20% sand (TILL-LIKE) In shoe: SANDY SILT (ML) Gray, moist, hard, fine to medium grained sand, est. 20-30% sand	
15		DM	12	42-35-38 (73) ?	SANDY WELL GRADED GRAVEL WITH SILT (GW-GM) Gray, wet, medium dense, fine to coarse round to subround gravel, fine to coarse sand, est. 30% sand, 10-15% fines	14': Sampler wet 17': Driller states not as much rock, large gravel 19': Water poured out of sampler 19.5': Measured groundwater through augers at 1406 on 12/11/02. Augers may be acting as a barrier.
20		DM	4	21-25-27 (52)		

CH2MHILL

PROJECT NUMBER: 151973.A4.WL **BORING NUMBER:** EM-1A
Sheet: 2 of 5

SOIL BORING LOG

PROJECT: N. Sequalitchew Creek Wetland **LOCATION:** ~100' S. of Edmond Marsh Trail
ELEVATION: **DRILLING CONTRACTOR:** Cascade Drilling
DRILLING METHOD AND EQUIPMENT: CME 75 nodwell track rig, HSA, Dames & Moore, 140lb hammer
WATER LEVELS: See log **START:** 12/11/02 **FINISH:** 12/11/02 **LOGGER:** S. McGinnis

DEPTH BELOW GROUND SURFACE	WELL INSTALLATION	SAMPLE TYPE	SAMPLE RECOVERY (IN)	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION
					GRAVELLY SAND (SW) Gray, wet, medium dense, fine to coarse grained sand, fine to coarse round to subround gravel, est. 30-40% gravel	
25		DM	10	42-33-30 (63)	**POORLY GRADED SAND WITH GRAVEL (SP** Gray, wet, medium dense, fine to medium grained sand, fine to coarse round to subround gravel, trace fine cobbles, est. 15-20% gravel	
30		DM	12	24-35-38 (73)	**WELL GRADED SAND WITH GRAVEL (SW)** Gray, wet, medium dense, fine to coarse grained sand, fine to medium round to subround gravel, trace fines, increased fines toward bottom of sampler, est. 20-30% gravel	
35		DM	6	50/6" (50/6")	**POORLY GRADED SAND WITH SILT AND GRAVEL TO SILTY SAND WITH GRAVEL (SP-SM/SM)** Gray, wet, very dense, fine to medium grained sand, fine to medium round to subround gravel, est. 10-20% fines, 20-25% gravel (TILL??)	34': Driller states back into a few cobbles
40		DM	4	50/4" (50/4")		

Qvt
Dof
d
Boring

CH2MHILL

PROJECT NUMBER: 151973.A4.WL BORING NUMBER: EM-1A
Sheet: 3 of 5

SOIL BORING LOG

PROJECT: N. Sequalitchew Creek Wetland **LOCATION:** ~100' S. of Edmond Marsh Trail
ELEVATION: **DRILLING CONTRACTOR:** Cascade Drilling
DRILLING METHOD AND EQUIPMENT: CME 75 nodwell track rig, HSA, Dames & Moore, 140lb hammer
WATER LEVELS: See log **START:** 12/11/02 **FINISH:** 12/11/02 **LOGGER:** S. McGinnis

DEPTH BELOW GROUND SURFACE	WELL INSTALLATION	SAMPLE TYPE	SAMPLE RECOVERY (IN)	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION
					POORLY GRADED SAND WITH SILT AND GRAVEL (SP-SM) Gray, wet, very dense, fine to medium grained sand, fine to coarse round to subround gravel, est. 10% fines, 10-15% gravel	
45		DM	4	50/5" (50/5")	POORLY GRADED SAND (SP) Gray, wet, very dense, fine to medium grained sand, trace fines	
50		DM	4	50/4" (50/4")	GRAVELLY WELL GRADED SAND WITH SILT (SW-SM) Gray, wet, very dense, fine to coarse round to subround gravel, est. 5-10% fines, 30-40% gravel	
55		DM	6	50/6" (50/6")	POORLY GRADED SAND (SP) Gray, wet, very dense, fine to medium grained sand	
60		DM	6	50/6" (50/6")		59': Driller states a little more gravel

CH2MHILL

PROJECT NUMBER: 151973.A4.WL BORING NUMBER: EM-1A
Sheet: 4 of 5

SOIL BORING LOG

PROJECT: N. Sequalitchew Creek Wetland **LOCATION:** ~100' S. of Edmond Marsh Trail
ELEVATION: **DRILLING CONTRACTOR:** Cascade Drilling
DRILLING METHOD AND EQUIPMENT: CME 75 nodwell track rig, HSA, Dames & Moore, 140lb hammer
WATER LEVELS: See log **START:** 12/11/02 **FINISH:** 12/11/02 **LOGGER:** S. McGinnis

DEPTH BELOW GROUND SURFACE	WELL INSTALLATION	SAMPLE TYPE	SAMPLE RECOVERY (IN)	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION
					POORLY GRADED SAND WITH SILT AND GRAVEL (SP-SM) Gray, wet, very dense, fine to medium grained sand, fine to medium round to subround gravel, est. 10-15% fines, 5-10% gravel	
65		DM	5	50/5" (50/5")	WELL GRADED SAND WITH GRAVEL TO WELL GRADED SAND WITH SILT AND GRAVEL (SW/SW-SM) Gray, wet, very dense, fine to coarse grained sand, fine to medium round to subround gravel, est. 5-10% fines, 20-30% gravel	
70		DM	5	50/5" (50/5")	POORLY GRADED SAND (SP) Gray, wet, very dense, medium to coarse grained round to subround sand, fine to medium round to subround gravel, est. <5% fines, 5-10% gravel	
75		DM	6	50/6" (50/6")	WELL GRADED SAND WITH GRAVEL TO WELL GRADED SAND WITH SILT AND GRAVEL (SW/SW-SM) Gray, wet, very dense, fine to coarse grained sand, fine round to subround gravel, est. 5-10% fines, 10-15% gravel	
80		DM	5	50/5" (50/5")		

CH2MHILL

PROJECT NUMBER: 151973.A4.WL BORING NUMBER: EM-1A
Sheet: 5 of 5

SOIL BORING LOG

PROJECT: N. Sequalitchew Creek Wetland LOCATION: ~100' S. of Edmond Marsh Trail
ELEVATION: DRILLING CONTRACTOR: Cascade Drilling
DRILLING METHOD AND EQUIPMENT: CME 75 nodwell track rig, HSA, Dames & Moore, 140lb hammer
WATER LEVELS: See log START: 12/11/02 FINISH: 12/11/02 LOGGER: S. McGinnis

DEPTH BELOW GROUND SURFACE	WELL INSTALLATION	SAMPLE TYPE	SAMPLE RECOVERY (IN)	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION
					POORLY GRADED SAND WITH SILT AND GRAVEL (SP-SM) Gray, wet, very dense, fine grained sand, fine to medium round to subround gravel, est. 10-15% fines, 20-30% gravel	
						83': Driller states into silts
85		DM	4	50/4" (50/4")	SILT (ML) Gray, moist to wet, hard	
90		DM	4	50/4" (50/4")	SILT (ML) -Similar to above, gray, moist to wet, hard, fine to medium sand seams	Bottom of boring at 89.3' at 1300 on 12/11/02.
					BOTTOM OF BORING	Driller states not much heave while drilling
						Backfilled boring with grout. Could not install piezometer in this boring. Had to move 3' north and redrill to the bottom of the piezometer installation.
95						
100						

RESOURCE PROTECTION WELL REPORT

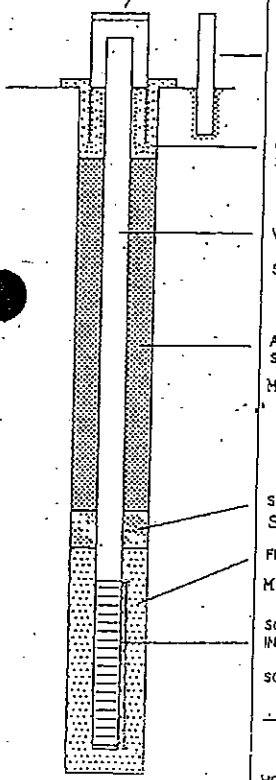
Close Demolition Waste Area - Ft. Lewis

START CARD NO. 17224

PROJECT NAME: Fort Lewis Public Works
WELL IDENTIFICATION NO. D-3
DRILLING METHOD: reverse circ. w/air
DRILLER: Charles E. Shorey, Jr.
FIRM: Layne Christensen Company
SIGNATURE:
CONSULTING FIRM: IMCO General Construction
REPRESENTATIVE: Roger Dudley

COUNTY: Pierce
LOCATION: ___ ¼ ___ ¼ SEC 26 TWN 19N R 1E
STREET ADDRESS OF WELL: Fort Lewis, WA 98433-9500
WATER LEVEL ELEVATION: 11' BGS
GROUND SURFACE ELEVATION: 216
DATE INSTALLED: 8-5-96
DATE DEVELOPED: 8-12-96, 8-14-96

AS-BUILT



OF BORING 24 FT.

WELL DATA

STEEL SURFACE MONUMENT
W/LOCK 3 FT. ABOVE G.L.
PROTECTIVE POSTS no
CONCRETE SURFACE SEAL 2' TO +4" FT.
WELL CASING 14 TO +3 FT.
SCHEDULE 80 TFJ PVC 2"
ANNULAR SEALANT 8 TO 2 FT.
Material: Cement
SEAL 10 TO 8 FT.
Silica sand 12'-10'
FILTER PACK 24 TO 12 FT.
Material: 10-20 sand
SCREEN INTERVAL 24 TO 14 FT.
SCHEDULE 80 TFJ PVC 2"
.02 FACTORY SLOTTED
HOLE DIAMETER
9 IN. 24 TO 0 FT.
___ IN ___ TO ___ FT.

FORMATION DESCRIPTION

0'-5' Coarse sand with medium gravel, brown in color

5'-10' Coarse to medium sand, with large and medium cobbles

10'-15' Fine silty sand, wet, light brown

11' Static water level

15'-20' Fine, dense sand with silt and uniform cobbles

20'-24' Fine silty sand, dense with uniform cobbles

WELL DEVELOPMENT DATA

8-12-96 Bailed 15 gallons from well to remove sediments
Temperature: 60 degrees F
pH: 6.0 Very silty, brown

8-14-96 Pumped 150 gallons from well to stabilize.
Temperature: 60 degrees F
pH; 6.0 Clear, no sediment

Layne Christensen Company
1401 E 26th Street - Tacoma WA 98421 (206) 572-4222 FAX (206) 572-4223

WELL COMPLETION REPORT

Project CELL 5, LFS, FT. LEWIS
Completion date 2/25/93
Contractor ANDREW WELL DRILLING SERVICE
Rig INGERSOLL RAND T-4W
Operator BOB DEWILD/MATT GILBERT
Inspector RICHARD SMITH
Depth 35.0 Datum GROUND SURFACE

HOLE DATA
Size: 6" in. to 35' ft.
____ in. to ____ ft.
____ in. to ____ ft.

CASING
Type 6" DIAMETER, 5' LONG STEEL SURFACE CASING
Mfr.
Ht. above gnd. surf. 3.0'
Drive shoe NO
Size: 6" in. to 3' AGS ft.
6" in. to 3' BGS ft.
____ in. to ____ ft.

SCREEN - 20' -30' (10') THREADED
Type PVC SCH 80 MONOFLEX 20 SLOT
Mfr. CAMPBELL
Composition PVC Dia. 2" ID

Fittings:	Length	Dia.
Riser	22.8'	2" ID
Tailpipe	0.2'	2" ID

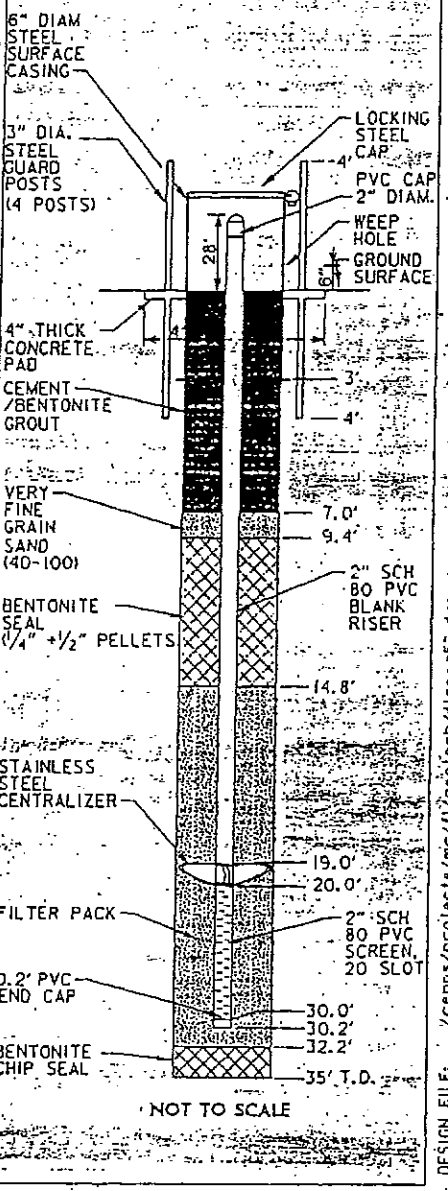
Centralizer- S.S. mounted on outside of PVC Riser 19' -20' BGS

FILTER
Source CSSI - ENVIRONMENTAL MEDIA
Composition SILICA SAND
Gradation 10-20
Inst. method POUR FROM SURFACE
Volume used 4 SACS (100 LB SAC)
Depth 14.8' to 32.2' ft.

GROUT
Composition CEMENT/BENT 5%/H20
Volume used 2-94 LBS BAGS CEMENT (12GAL)
Inst. method POUR DOWNHOLE W/BUCKET
Depth 0' to 7' ft.
____ to ____ ft.

REMARKS: BOTTOM PLUG BENT. CHIPS ½, 50 LB BAG
UPPER PLUG: BENT. PELLETS (⅜"), 2 - 50 LB
BUCKETS, VERY FINE SAND: ½ - 50 LB BAG.
FILLED CASING W/POTABLE WATER TO GROUND
SURFACE PRIOR TO INSTALLATION TO PREVENT
HEAVING AND AID IN PLACING BENT. PLUG.
GROUT RATIO: -1 SAC CEMENT (94 LBS)
6 GAL H20 - 5% BENT. BY WT

WELL DETAIL (AS BUILT)
93-MFS-C5-3



NOT TO SCALE

DESIGN FILE: /cenps/projects/mc/112geotech/11geoc53.dgn DATE AND TIME PLOTTED: 06-MAY-1993

DRILLING LOG	DIVISION NPO	INSTALLATION FORT LEWIS	SHEET 1 OF 1 SHEETS
1. PROJECT RCRA WELLS, CS, LF5		10. SIZE AND TYPE OF BIT 6" ODEX/6" ID TEMP CASING	
2. LOCATION (COORDINATES OR STATION) N 659,446.7 E 1,468,392.9		11. DATUM FOR ELEVATION SHOWN (TBM OR MSL) MSL	
3. DRILLING AGENCY ANDREW WELL DRILLING SERVICE		12. MANUFACTURER'S DESIGNATION OF DRILL INGERSOLL RAND T-4W	
4. HOLE NO. (AS SHOWN ON DRAWING TITLE AND FILE NUMBER) 93-WFS-CS-3		13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED 7; UNDISTURBED -0-	
5. NAME OF DRILLER BOB DEWILD, MATT GILBERT		14. TOTAL NUMBER CORE BOXES	
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.		15. ELEVATION GROUND WATER 195.5	
7. THICKNESS OF OVERBURDEN +35'		16. DATE HOLE STARTED 930CT24 COMPLETED 930CT24	
8. DEPTH DRILLED INTO ROCK -0-		17. ELEVATION TOP OF HOLE 216.9	
9. TOTAL DEPTH OF HOLE 35'		18. TOTAL CORE RECOVERY FOR BORING	
		19. NAME AND SIGNATURE OF INSPECTOR BILL GOSS	

ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (DESCRIPTION)	% CORE RECOV-ERY	BOX OR SAMPLE NO.	REMARKS (DRILLING TIME, WATER LOSS, DEPTH OF WEATHERING, ETC., IF SIGNIFICANT)
	0		GP; POORLY GRADED SANDY GRAVEL; UNCONSOLIDATED, DRY, BROWN		A	DRILLED W/6; ODEX, 6" DRILLING CONCURRENT W/CASING, BIT LEADS CASING BY 6"
	10				B	SAMPLES TAKEN FROM DISCHARGE AT 5' INTERVALS
					C	AIR MONITORING WITH CGI AND PID - NO DETECT
	20		SWL 21.4'		D	
195.5			GP; POORLY GRADED SANDY GRAVEL; UNCONSOLIDATED, WET, BROWN		E	
	30				F	
	35		T.D. 35'		G	

ENG FORM 1836 PREVIOUS EDITIONS ARE OBSOLETE. PROJECT RCRA WELLS, CS, LF5 HOLE NO. 93-WFS-CS-3

MAR 71
SEP 90 MODIFIED FOR CADD BY CEHQ

DRILLING LOG (Cont Sheet) | ELEVATION TOP OF HOLE 218.9 | Hole No. 93-MFS-CS-3

PROJECT RCRA WELLS, CS, LF5 | INSTALLATION FT LEWIS | SHEET 2 OF 4 SHEETS

ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (DESCRIPTION)	% CORE RECOVERY	BOX OR SAMPLE NO.	REMARKS (DRILLING TIME, WATER LOSS, DEPTH OF WEATHERING, ETC., IF SIGNIFICANT)
	10		GP: POORLY GRADED SANDY GRAVEL; UNCONSOLIDATED, SAND FINE - COARSE, ROUNDED GRAVEL TO 1", DRY, BROWN		B	SAMPLE B @ 10'
	11					AIR MONITORING 10-15' PID (-0.8) PPM CGI 20.8%, 0.0.0
	12					
	13					
	14					
	15		GP: POORLY GRADED SANDY GRAVEL; UNCONSOLIDATED, SAND FINE - COARSE, ROUNDED GRAVEL TO 1½" - DRY, TO SLT. MOIST, BROWN		C	SAMPLE C @ 15'
	16					AIR MONITORING 15'-17' PID (-0.8)PPM CGI 20.8.0.0.0 - 1 9:25 - 10:15 @ 17' WELD CASING
	17					AIR MONITORING 17'-20' PID (-0.4)PPM CGI 21.0.1.0.0
	18					
	19					
	20					

ENG FORM 1836-A PREVIOUS EDITIONS ARE OBSOLETE. SEP 80 MODIFIED FOR CADD BY CEMPS

PROJECT RCRA WELLS, CS, LF5 | HOLE NO. 93-MFS-CS-3

DRILLING LOG	DIVISION: NPD	INSTALLATION: FORT LEWIS	SHEET 1 OF 4 SHEETS
1. PROJECT: RCRA WELLS, C5, LF5		10. SIZE AND TYPE OF BIT: 6" ODEX/6" ID TEMP. CASING	
2. LOCATION (COORDINATES OR STATION): N 659,446.7 E 1,368,392.9		11. DATUM FOR ELEVATION SHOWN: MSL	
3. DRILLING AGENCY: ANDREW WELL DRILLING SERVICE		12. MANUFACTURER'S DESIGNATION OF DRILL: INGERSOLL RAND T-4W	
4. HOLE NO. (AS SHOWN ON DRAWING) TITLE AND FILE NUMBER: 93-WFS-C5-3		13. TOTAL NO. OF OVERBURDEN & BEDROCK SAMPLES TAKEN: DISTURBED 7; UNDISTURBED -0-	
5. NAME OF DRILLER: BOB DEWILD, MATT GILBERT		14. TOTAL NUMBER CORE BOXES	
6. DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.		15. ELEVATION GROUND WATER: 195.5	
7. THICKNESS OF OVERBURDEN: ±35'		16. DATE HOLE: STARTED 930CT24; COMPLETED 930CT24	
8. DEPTH DRILLED INTO ROCK: -0-		17. ELEVATION TOP OF HOLE: 218.9	
9. TOTAL DEPTH OF HOLE: 35'		18. TOTAL CORE RECOVERY FOR BORING: 1	
		19. NAME AND SIGNATURE OF INSPECTOR: BILL GOSS	

ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (DESCRIPTION)	% CORE RECOVERY	BOX OR SAMPLE NO.	REMARKS (DRILLING TIME, WATER LOSS, DEPTH OF WEATHERING, ETC., IF SIGNIFICANT)
	0		GP: POORLY GRADED SANDY GRAVEL; UNCONSOLIDATED. SAND FINE -COARSE ROUNDED GRAVEL TO 3". DRY. BROWN. OCCASIONAL COBBLE TO 6"			DRILLED W/6" ODEX, 6" CASING CONCURRENT W/DRILLING. BIT LEADS CASING BY 6" SAMPLES TAKEN FROM DISCHARGE LINE AT 5' INTERVALS AIR MONITORING W/PID & CGI AIR MONITORING @ 5' PID 1-0.4 PPM CGI 20,9,0,0,0
	5		GP: POORLY GRADED SANDY GRAVEL; UNCONSOLIDATED. SAND FINE - COARSE. ROUNDED GRAVEL TO 1". SLT. MOIST. BROWN		(1)	SAMPLE (1) @ 5'
	10					

ENG FORM 1836 PREVIOUS EDITIONS ARE OBSOLETE. SEP 90 MODIFIED FOR CADD BY CEMPR

PROJECT: RCRA WELLS, C5, LF5 HOLE NO. 93-WFS-C5-3

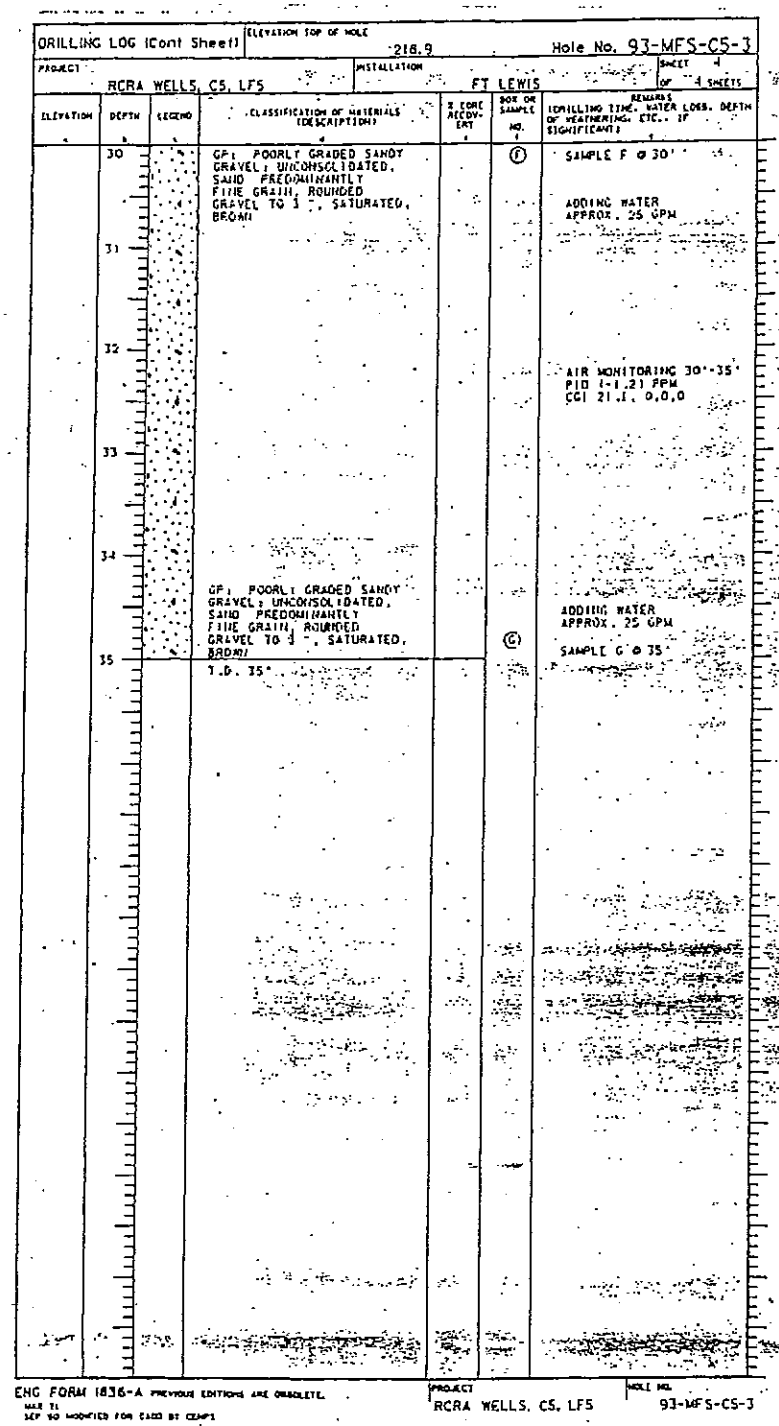
DRILLING LOG (Cont Sheet) | ELEVATION TOP OF HOLE 216.9 | Hole No. 93-MFS-C5-3

PROJECT: RCRA WELLS, C5, LF5 | INSTALLATION: FT LEWIS | SHEET 3 OF 4 SHEETS

ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (DESCRIPTION)	% CORE RECOVERY	BOX OR SAMPLE NO.	REMARKS (DRILLING TIME, WATER LOSS, DEPTH OF WEATHERING, ETC. - IF SIGNIFICANT)
	20		GP: POORLY GRADED SAND & GRAVEL; UNCONSOLIDATED, SAND FINE - COARSE, ROUNDED GRAVEL TO 1½", DRY, BROWN		(D)	SAMPLE D @ 20'
	21		@ 21' SAMPLE MOIST			AIR MONITORING 20'-25' PID (-0.4)PPM CGI 21, 1.0, 0
195.5			SWL 21.4			
	22					
	23					
	24					
	25		GP: POORLY GRADED SAND & GRAVEL; UNCONSOLIDATED, SAND FINE - COARSE, ROUNDED GRAVEL TO 1½", MOIST, BROWN		(E)	SAMPLE E @ 25'
						@ 25' ADD POTABLE WATER WHILE DRILLING APPROX. 2GPM
	26					FOOTEM LOSE FROZEN HOSE THAW HOSE & ADD WATER
	27					
	28					AIR MONITORING 25'-30' PID (-1.0) PPM CGI 21.0.0.0.1
	29		GP: AS ABOVE W/SAND PREDOMINANTLY FINE GRAIN			
	30					

ENG FORM 1836-A PREVIOUS EDITIONS ARE OBSOLETE. MAR 77 SEP 90 MODIFIED FOR CADD BY CEMPS

PROJECT: RCRA WELLS, C5, LF5 | HOLE NO. 93-MFS-C5-3



DRILLING LOG (Cont Sheet) | ELEVATION TOP OF HOLE 218.9 | Hole No. 93-MFS-CS-3

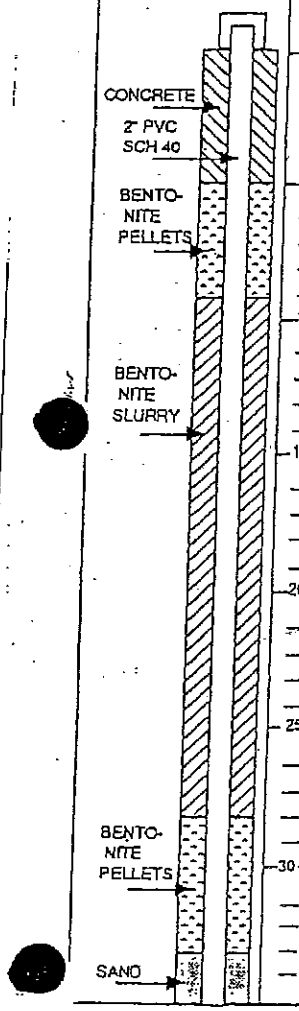
PROJECT: RCRA WELLS, CS, LF5 | INSTALLATION: FT LEWIS | SHEET 4 OF 4 SHEETS

ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (DESCRIPTION)	% CORE RECOVERY	BOX OR SAMPLE NO.	REMARKS (DRILLING TIME, WATER LOSS, DEPTH OF WEATHERING, ETC., IF SIGNIFICANT)
	30		GP: POORLY GRADED SANDY GRAVEL; UNCONSOLIDATED, SAND PREDOMINANTLY FINE GRAIN, ROUNDED GRAVEL TO 3", SATURATED, BROWN		(F)	SAMPLE F @ 30'
						ADDING WATER APPROX. 25 GPM
	31					
	32					AIR MONITORING 30'-35' PID (-1.2) PPM CGI 21.1, 0.0,0
	33					
	34					
			GP: POORLY GRADED SANDY GRAVEL; UNCONSOLIDATED, SAND PREDOMINANTLY FINE GRAIN, ROUNDED GRAVEL TO 3", SATURATED, BROWN			ADDING WATER APPROX. 25 GPM
	35		T.D. 35'		(G)	SAMPLE G @ 35'

ENG FORM 1836-A PREVIOUS EDITIONS ARE OBSOLETE. MAR 71 SEP 80 MODIFIED FOR USED BY CEMP1

PROJECT: RCRA WELLS, CS, LF5 | HOLE NO. 93-MFS-CS-3

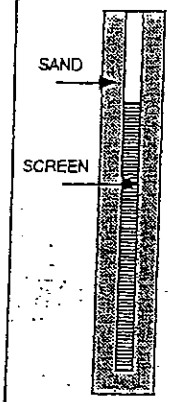
DRILLING LOG	PROJECT FT. LEWIS	PROJECT NUMBER 8820072A	SHEET 1 OF 2 SHEETS
LOCATION	LANDFILL #5	TOTAL NUMBER SAMPLES 0 (Sample Collected in Adjacent Hole)	
DRILLING AGENCY	HOLT	DEPTH TO WATER BELOW GRD SURFACE 22.06 FT	
HOLE NO.	88-2-VD	DATE HOLE STARTED 11/16/88	COMPLETED 11/17/88
NAME OF DRILLER	RANDY HOLT	ELEVATION AT REFERENCE POINT 220.03 FT	
TOTAL DEPTH OF HOLE	49.0 FT	SIGNATURE OF INSPECTOR	Warren Perkins William Deutsch



OPT (FT)	S T	B/FT	SAMP. NO.	% REC.	CLASSIFICATION OF MATERIALS (DESCRIPTION)	REMARKS Gals water added	
					Gravel with Sand		5
							5
					Yellow-gray, angular fragments	Bailed Material	5
							5
							5
							5
							5
					Yellow-gray, coarse sand with angular fragments, few 1-2" pebbles	Bailed Material	5
					Yellow-gray gravel with coarse sand fragments of some large cobbles to 5"	Bailed Material 11'10"	
					Yellow-gray gravel with some pebbles, not as many angular fragments	Bailed Material	5
					Yellow-gray pebbly gravel	Bailed Material	5
					Same as above, except more large angular fragments	Bailed Material	5
					As above, drilling harder at @ 18 ft similar to 88-1-SS	Bailed Material	
					Sandy gravel, yellow-gray, few 3-4" rock fragments; no pebbles	Vashon Recessional Gravel	5
						Bailed Material	5
					Sandy gravel, some silt, still hard drilling	Bailed Material	5
					As above		5
					Yellow-gray, sandy gravel, some silt; easier drilling	Water at 25' Bailed Material	5
					as above; drilling fairly hard	Bailed Material	2
					Yellow-gray, sandy gravel, angular fragments with some broken cobbles	Water bubbling into hole; drilling easier, able to drive casing ahead	
					Yellow-gray angular fragments	Vashon Till	7
					as above	Bailed sample; bailer full of water	7
					Sand/gravel, some silt	Hole making some water, not a lot	10
					as above	Hole making a little water	5

DRILLING LOG (Cont. Sheet) | HOLE NO. 88-2-VD

DIVISION | INSTALLATION FT. LEWIS | SHEET 2 OF 2 SHEETS



DPT (FT)	S T	B/FT	SAMP NO.	% REC.	CLASSIFICATION OF MATERIALS (DESCRIPTION)	REMARKS
						Water coming into
40					Well rounded coarse sand and gravel Some silt and crushed cobbles	hole in good quantity Vashon Advance Gravel Bailed sample
45					Slow drilling, large cobbles; cuttings all pulverized	Water at 28' below ground
					Heaving sand bottom 1 foot	
50					TOTAL DEPTH = 49 FT	

Woodward-Clyde Consultants

APPENDIX B

Field Data Sheets

DuPont Sampling and Analysis Plan

CalPortland -- Dupont, WA

Project Site/Location:	

Routine Station Maintenance			
Personnel:	Weather:	Arrival Date/Time:	
Station Battery Voltage:		Battery Changed? (Y/N -- New Voltage)	
Data Logger Desiccant OK? (Y/N)		Sensor(s) Cleaned & Secure? (Y/N)	
Flow Meter Desiccant OK? (Y/N)		Staff Plate Cleaned & Secure? (Y/N)	
Data Downloaded? (Y/N)		Rain Gage Cleaned & Secure? (Y/N)	
Water Level & Flow		**Water Quality Measurements & Observations (*In-Situ*)**	
Flow Meter Battery Voltage:		Data Logger Recorded Temp (°C) :	
Battery Changed? (Y/N -- New Voltage)		YSI Measured Temp (°C) :	
Date/time correct? (Y/N)		DO (mg/l) :	
Data Logger(s) Desiccant OK? (Y/N)		DO (% saturation) :	
Flow Meter Data Downloaded? (Y/N)		Salinity (ppt) :	
Staff Plate/Well Level (decimal-feet):		pH :	
Data Logger/Meter Recorded Level:		Turbidity (NTU) :	
Velocity (feet per second):		Water Color? (e.g., yellow, brown, grey)	
Flow Rate (CFS):		Floating Oil/Grease? (Y/N)	
Level Calibrated? (Y/N)		Floating Debris/Scum? (Y/N)	
Level Offset (Post-Calibration)		Potentially Harmful Materials? (Y/N)	
Level Offset (Post-Calibration)			

Notes, observations, and maintenance items for future visits. Include observations regarding channel/site conditions, such as: presence/absence of beaver dams; downed trees; streambed composition (e.g., embedded with sediment); vegetation; and particularly fast or slow flow velocities.

DuPont Sampling and Analysis Plan

CalPortland -- Dupont, WA

YSI Professional Handheld Multimeter Calibration Record	
CONDUCTIVITY and PH CALIBRATION*	DO CALIBRATION*
1. Press the Cal key. **2. Highlight the parameter you wish to calibrate and press enter. For Conductivity, a second menu will offer the option of calibrating Specific Conductance, Conductivity, or Salinity. Calibrating one automatically calibrates the other two. An additional sub-menu will require you to select the calibration units. For pH, auto-buffer recognition will determine which buffer the sensor is in and it will allow you to calibrate up to 6 points.** **3. Place the correct amount of calibration standard into a clean, dry or pre-rinsed container.** **4. Immerse the probe into the solution, making sure the sensor and thermistor are adequately immersed. Allow at least one minute for temperature to stabilize.** **5. For any of parameters, enter the calibration solution value by highlighting Calibration Value, pressing enter, and then using the alpha/numeric keypad to enter the known value. Once you have entered the value of the calibration standard, highlight <<<ENTER>>> and press enter.** **6. Wait for the readings to stabilize, highlight Accept Calibration and press enter to calibrate.** **7. For pH, continue with the next point by placing the probe in a second buffer and following the on-screen instructions or press Cal to complete the calibration.**	The Pro Plus offers four options for calibrating dissolved oxygen. The first is an air calibration method in % saturation. The second and third calibrates in mg/L or ppm to a solution with a known DO concentration (usually determined by a Winkler Titration). Calibration of any option (% or mg/L and ppm) will automatically calibrate the other. The fourth option is a zero calibration. If performing a zero calibration, you must perform a % or mg/L calibration following the zero calibration. For both ease of use and accuracy, YSI recommends performing the following 1-point DO % calibration: 1. Moisten the sponge in the cal/transport sleeve with a small amount of water and install it on the probe. The cal/transport sleeve ensures venting to the atmosphere. Disengage a thread or two to ensure atmospheric venting. Make sure the DO and temperature sensors are not immersed in the water. 2. Turn the instrument on. 3. Press the Cal key, highlight DO and press enter. 4. Highlight DO%, then press Enter. 5. Verify the barometric pressure and salinity displayed are accurate. Once DO and temperature are stable, highlight Accept Calibration and press enter.
*Additional calibration information can be found at: http://www.ysi.com/media/pdfs/605595-YSI-Pro-Plus-Quick-Start-Guide-RevB.pdf	

Date:	
Time:	
Staff:	

pH		
7	Initial	
	Calibration	
	Final	
4	Initial	
	Calibration	
	Final	
10	Initial	
	Calibration	
	Final	

Conductivity (Includes Salinity)		
Initial (µS/cm)	Calibration (µS/cm)	Final (µS/cm)

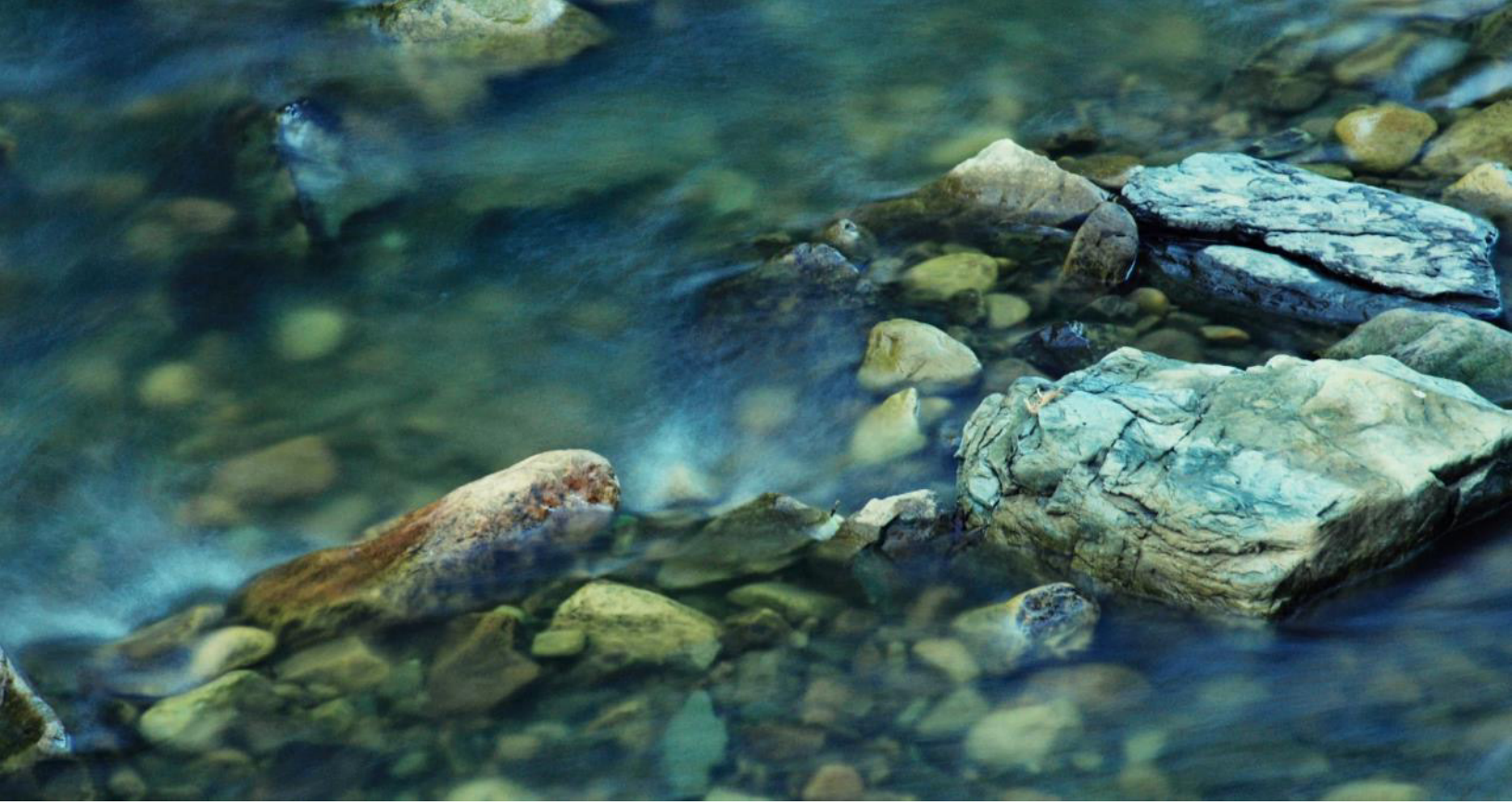
Dissolved Oxygen (1-Point DO Saturation Method)		
Initial (%)	Calibration (%)	Final (%)

Appendix G

Fisheries Technical Report

Appendix G

Fisheries Technical Report



June 2023
Pioneer Aggregates South Parcel Project

ANCHOR QEA

Fisheries Technical Report

Prepared for CalPortland

June 2023
Pioneer Aggregates South Parcel Project

Fisheries Technical Report

Prepared for
CalPortland
3450 South 344th Way, Suite 201
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Prepared by
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Seattle, Washington 98101

TABLE OF CONTENTS

1 Introduction 1

1.1 Description of the Proposed Action 1

1.2 Existing Mine 2

1.3 Description of No Action Alternative 3

2 Affected Environment 5

2.1 Sequalitchew Creek 5

2.1.1 Sequalitchew Creek Watershed 5

2.1.2 Physical Habitat Characteristics of Upper Sequalitchew Creek 6

2.1.3 Physical Habitat Characteristics of Lower Sequalitchew Creek 6

2.1.4 Biological Habitat Characteristics of Sequalitchew Creek 8

2.2 Marine Shoreline Description 10

2.2.1 Physical Habitat Characteristics of the Marine Shoreline 10

2.2.2 Biological Habitat Characteristics of the Marine Shoreline 12

3 Impacts of the Proposed Action and No Action Alternative 15

3.1 Impacts of the Proposed Action 15

3.1.1 Direct Impacts of the Proposed Action 15

3.1.2 Indirect Impacts of the Proposed Action 15

3.2 Impacts of the No Action Alternative 16

4 Cumulative Effects of Proposed Action and Restoration Plan 17

4.1 Benefits 17

4.3.1 Water Quality 20

4.3.2 Water Quantity 21

4.3.3 Edmond Marsh 23

4.3.4 Nearshore Habitat 23

5 Monitoring and Mitigation Measures 24

6 Significant Unavoidable Adverse Impacts 25

6.1 Proposed Action 25

6.2 No Action Alternative 25

7 References 26

TABLES

Table 1 Parcels, Zoning, and Development Potential of the South Parcel....4
Table 2 Average Flows in Sequalitchew Creek Watershed....7

FIGURES

Figure 1 Vicinity Map
Figure 2 Project Components
Figure 3 WDFW SalmonScape Maps of All Species Present
Figure 4 Aquatic Resources
Figure 5 Predicted Water Surface Elevations and Flows
Figure 6 Stream Temperature in Sequalitchew Creek

ABBREVIATIONS

ASTM	ASTM International
cfs	cubic feet per second
DMC	City of DuPont Municipal Code
Ecology	Washington State Department of Ecology
EDT	Ecosystem Diagnosis and Treatment
EIS	Environmental Impact Statement
I-5	Interstate 5
JBLM	Joint Base Lewis-McChord
mg/L	milligram per liter
MLLW	mean lower low water
MRP	Manufacturing and Research Park
OS	Open Space
Project	Pioneer Aggregates South Parcel Project
R-4	Residential-4
Report	Fisheries Technical Report
RM	river mile
RR	Residential Reserve
SEPA	State Environmental Policy Act
South Parcel Project	Pioneer Aggregates South Parcel Project
WDFW	Washington Department of Fish and Wildlife

1 Introduction

Glacier Northwest, Inc. dba CalPortland is seeking regulatory approvals for the Pioneer Aggregates South Parcel Project (South Parcel Project or Project), which proposes to extend sand and gravel mine operations to the southeast of existing activities at the Pioneer Aggregates Mine in DuPont, Washington. This Fisheries Technical Report (Report) has been prepared in support of the South Parcel Project. Figure 1 provides an overview map of the South Parcel Project.

This document evaluates the environmental conditions and potential impacts of the South Parcel Project (Proposed Action) and No Action Alternative on fisheries resources. These analyses are being conducted as a component of the State Environmental Policy Act (SEPA) evaluation for the South Parcel Project.

The following Report describes existing conditions of fisheries (affected environment) and potential impacts from the Proposed Action. In addition, proposed monitoring and mitigation measures for the Proposed Action are presented. The Sequalitchew Creek Restoration Plan, developed by CalPortland and the Environmental Caucus in accordance with the 2011 Settlement Agreement, includes a commitment from CalPortland for funding, monitoring data, and advocacy. The plan also requires coordination between the Environmental Caucus, South Puget Sound Salmon Enhancement Group (SPSSEG), and Joint Base Lewis-McChord (JBLM). In the absence of CalPortland, the advocate and sponsor for the Sequalitchew Creek Restoration Plan under the No Action Alternative would be SPSSEG.

1.1 Description of the Proposed Action

Consistent with 2012 Settlement Agreement discussed later, the South Parcel Project includes horizontal expansion of mining into approximately 188 acres previously undisturbed by mining, and vertical expansion of approximately 125 acres where re-mining will deepen a portion of the existing mine. The South Parcel Project would extend mining at the current rate for approximately 14 additional years.

The Proposed Action activities would be focused southeast of the existing Pioneer Aggregates Mine in DuPont, southwestern Pierce County, Sections 22, 23, and 26, Township 19 North, Range 1 East, of the Willamette Meridian (Figure 1). The Project is bordered to the north and west by the existing Pioneer Aggregates Mine; to the east by industrial and distribution facilities including Amazon, Dania, Pier 1 Imports, and FedEx; and to the south by Sequalitchew Creek and the Creekside Village residential development. The Project would occur on lands owned by Weyerhaeuser Company and leased to CalPortland.

The South Parcel Project includes mining within areas previously undisturbed by mining (termed the "Expansion Area") and mining deeper within a portion of the existing mine, referred to as the "Re-Mine Area." The Expansion Area is approximately 188 acres composed of three subareas (see Figure 2). The Kettle Area is a 10.8-acre previously undisturbed area. The 9.2-acre Buffer Strip is a

strip of vegetation that was retained along the inside of the originally permitted mine bordering the South Parcel. The South Parcel is 168 acres located southeast of the original mine and inside the Mineral Resource Overlay in the City of DuPont's adopted Comprehensive Plan.

The Re-Mine Area consists of 125 acres in the southeastern portion of the existing mine where current conditions limit the depth of mining activities. Lowering of the groundwater elevation would allow vertical expansion of the mine.

The South Parcel Project was developed consistent with a 2012 Settlement Agreement between CalPortland, the City of DuPont, the Washington State Department of Ecology (Ecology), and a coalition of environmental groups collectively referred to as the Environmental Caucus. The Settlement Agreement describes a process for a Restoration Plan for the Sequalitchew Creek watershed to be permitted and implemented contemporaneously with mining of the South Parcel. The Restoration Plan is designed "to help restore and enhance the Sequalitchew Creek watershed, including flows along the entire length of the Creek." The Restoration Plan is not intended solely as mitigation for the South Parcel Project, but the benefits of implementing the Restoration Plan will mitigate for the impacts of the mine. The Restoration Plan is described in Section 4.

1.2 Existing Mine

CalPortland's original sand and gravel mine was permitted in 1997 (355 acres). As provided under the Settlement Agreement, CalPortland applied for permits in 2013 for the North Parcel Mine Expansion to allow mining of approximately 142 acres within the North Parcel. Following the publication of a Final Environmental Impact Statement (EIS) in June 2013, the North Parcel mining expansion was permitted in 2014.

Mining activities at the existing site include mining, processing, transport of sand and gravel, and manufacturing of concrete. The processing area is located adjacent to the mine site on a 52-acre parcel owned by Glacier. Sand and gravel is removed from the mine by bull dozers and wheel loaders and transferred to the processing area by conveyor belts. At the processing facility, the material from the mine is crushed, washed, and separated into different size gradations. Aggregate products are stored in stockpiles in the processing area for distribution.

After completion of the production process, the majority of the finished aggregate products are transported from the plant area by conveyors and placed onto barges (approximately 80%) at Glacier's dock and barge loading facility at Tatsolo Point. The remainder (approximately 20%) is sold as aggregate or used to make concrete on-site; in both cases it is transported by truck.

Water used to wash gravel during processing is recycled through a clarifying process to remove silt and clay. This fine material is then run through a belt press to remove excess water and transported by truck and placed in holding cells in the mine, where it is allowed to dry for up to 3 years.

After drying, fines may be used to raise the floor of the mine by placing the material in cells separated by rock curtains to facilitate drainage. The material is placed in approximately 6-inch lifts and compacted to a material dry density of 90% (ASTM International [ASTM]:D-1557) or greater. Once filled to the desired height with fines from the belt press in this manner, a gravel cap of not less than 10 feet is placed over the compacted fines to mitigate potential for settlement and facilitate drainage.

1.3 Description of No Action Alternative

This document also evaluates the No Action Alternative. A No Action Alternative is required by SEPA. "No action" is interpreted to mean that the City would take no action on the mining proposal, but it does not necessarily mean that nothing would happen on the subject site.

Under the No Action Alternative, the South Parcel would not be mined but the property could be developed for manufacturing and research and residential uses under existing land use and zoning designations.

Portions of the South Parcel are zoned for Manufacturing and Research Park (MRP; 136.2 acres), Residential-4 (R-4; 16.1 acres), Residential Reserve (RR; 22.3 acres), and Open Space (OS; 3.8 acres). The MRP zoned areas are subject to restrictive covenants related to the Former DuPont Works Cleanup Site. These covenants restrict use of the property to industrial uses and, barring further remediation activities, would prevent re-zoning of the MRP areas.

The extent of development could vary considerably depending on zoning, density, and Project-specific and regulatory elements such as setbacks, open space, and critical areas. Areas zoned MRP would be available for development of up to 112 acres of light manufacturing and research. Buildings may be up to 65 to 70 feet tall, and there are no maximum lot coverage requirements other than those necessary to meet required setbacks (25 feet on the front property line, 15 feet on the sides and rear) and landscaping requirements (20% of lot area). Provision of 0.3 to 1 parking space per employee working at maximum shift is required.

Under the No Action Alternative, development would occur consistent with the City of DuPont Municipal Code (DMC) critical areas chapter (DMC 25.105), which could allow for development near the top of the Sequalitchew Creek ravine with a setback to be determined by a geotechnical engineer or engineering geologist.

The areas of the South Parcel zoned R-4 can be developed at a density of up to 4.5 single-family residences per gross acre,[1] resulting in a total of approximately 76 residences. An additional 4 single-

1 "Gross acre" means land designated for residential purposes in the Comprehensive Plan, inclusive of related streets and neighborhood parks (DMC 25.10.040).

family residences could be developed in the smaller portion zoned for RR density (one dwelling unit per 5 gross acres).

There would be no changes in the use of the areas of the South Parcel zoned for OS. These areas currently include the naturally vegetated slope of the Sequalitchew Creek ravine and the Sequalitchew Creek pedestrian trail.

A summary of the parcels, zoning, and development potential of the South Parcel is presented in Table 1.

Table 1
Parcels, Zoning, and Development Potential of the South Parcel

Parcel No.	Zoning	Parcel Area in Acres	Potential Development
0119262015	MRP	21.0	16.8 acres MRP
	OS	3.8	None
	Total	**24.7**	**16.8 acres MRP**
0119262016	MRP	34.1	27.3 acres MRP
0119233016	MRP	20.0	16.0 acres MRP
0119233017	MRP	20.3	16.3 acres MRP
0119233014	MRP	20.3	16.3 acres MRP
0119233015	MRP	20.5	16.4 acres MRP
0119233011	R-4	16.1	72 residences
	R-R	22.3	4 residences
	Total	**38.4**	**76 residences**

Note:
Potential development for MRP areas includes buildings, parking lots, and access roads, but not vegetated areas.

Under the No Action Alternative scenarios, there would be no change in use of the areas within the existing mine. However, once the Re-Mine Area is reclaimed, it would likely be redeveloped according to its underlying zoning, similar to the South Parcel.

The Kettle Wetland is within the existing mine and would remain intact, the buffers would remain vegetated, and mining operations would continue in other portions of the existing mine. The Kettle Wetland and its buffer would be subject to local and state wetland protection statutes, but other mine-related buffers could potentially be removed once the existing mine is reclaimed and redeveloped for future uses.

2 Affected Environment

The affected environment for the fisheries analysis is focused on the lower 1.4 miles of Sequalitchew Creek, and the estuary and brackish marsh near the mouth of the creek. Other affected environments addressed in this analysis include the Puget Sound nearshore north of the Nisqually flats to Tatsolo Point and potential fish habitat in the Edmond Marsh Complex. These areas are all outside the footprint of the South Parcel Project but are subject to potential indirect effects from Project-related changes to the Vashon Aquifer and the Restoration Plan.

The fisheries resources that exist within the proposed mine expansion area have been previously described in the *Pioneer Aggregates Mining Facility and Reclamation Plan Final EIS* (City of DuPont 1993). Additional sources of fisheries information consulted for this analysis include the following:

- *Summary of Cumulative Effects of DuPont Mining and Restoration Projects on Aquatic Habitat, Surface Water and Groundwater* (Aspect 2016)
- *Pioneer Aggregates Mining Expansion and North Sequalitchew Project Surface Water and Geomorphology Technical Report* (Herrera Environmental Consultants 2005a)
- *Fish Habitat Benefit Evaluation for Sequalitchew Creek: Pioneer Aggregates North Sequalitchew Creek Project* (Anchor Environmental 2004a)
- *Supplemental Report: North Sequalitchew Creek Project* (Anchor Environmental 2004b)
- *Salmonid Habitat Limiting Factor Analysis: Chambers-Clover Creek Watershed WRIA 12* (Runge et al. 2003)
- *A Twentieth Century History of Sequalitchew Creek* (Andrews and Swint 1994)

2.1 Sequalitchew Creek

A description of the Sequalitchew Creek watershed and the physical and biological habitat characteristics of Sequalitchew Creek is presented in the following sections. Additional description of the historical, existing, and predicted conditions of water quality and quantity records in this document can be found in the *Earth and Water Resources Report, DuPont Mine South Parcel Project* (Aspect 2022).

2.1.1 Sequalitchew Creek Watershed

Sequalitchew Creek (Water Resource Inventory Area 12-0019) drains a watershed covering approximately 38.4 square miles that discharges into Puget Sound (Runge et al. 2003). Figure 1 illustrates the characteristics of the Sequalitchew Creek drainage basin. Above the headwaters of Sequalitchew Creek is a cryptorheic[2] basin with headwaters located at river mile (RM) 9.6 in Kinsey Marsh on the east side of Interstate 5 (I-5). Kinsey Marsh flows drain to Murray Creek which flows 3.8 miles to American Lake on the west side of I-5. American Lake (1,162 surface acres) has no

[2] A crytorheic basin is a watershed that terminates where flow goes entirely subsurface.

defined outflow channel; however, there is a weir that maintains the maximum elevation of the lake water. On rare occasions, runoff from American Lake flows into Sequalitchew Lake (81 surface acres) but the frequency of surface flow is too low to form a defined channel between the two waterbodies (CH2M Hill 2003). A regional groundwater table maintains the water level in American Lake and Sequalitchew Lake (Andrews and Swint 1994).

2.1.2 Physical Habitat Characteristics of Upper Sequalitchew Creek

Sequalitchew Creek is largely an artificial channel from its source at the Lake Sequalitchew weir to the west end of West Edmond Marsh. This channel is excavated within the existing wetland complex and has extremely low velocity where it flows in a culvert under DuPont Steilacoom Road. Except under extreme high flow conditions, all flow that passes through that culvert either infiltrates or evaporates within the Edmond Marsh Complex. The Edmond Marsh Complex is described in detail in the *Plants and Animals Technical Report, DuPont Mine South Parcel Project* (Anchor QEA 2022). Descriptions of direct, indirect, and cumulative impacts to the Edmond Marsh related to the alternatives can also be found in that document.

2.1.3 Physical Habitat Characteristics of Lower Sequalitchew Creek

Sequalitchew Creek above RM 1.0 and below Edmond Marsh is typically dry. Only rarely is there a surface water connection between Edmond Marsh and Lower Sequalitchew Creek. There are no gage data for this reach, but analysis of the mid-ravine and lower ravine gages suggests that they are infrequent (maybe a handful over 19 years) and short lived (approximately 1 to 5 days). Most appear related to storm events, but some are from humans removing or altering the beaver dam at the west end of Edmond Marsh. The source of water in the lower mile of the creek is groundwater discharged from the Vashon Aquifer as springs in the Sequalitchew Creek ravine, below elevations of approximately 195 feet down to the top elevation of the Olympia Bed deposits at elevations between approximately 100 and 120 feet, spanning a creek reach of approximately 0.7 mile. Based on stream gaging data, this groundwater discharge to the creek varies between approximately 0.5 cubic feet per second (cfs) in the summer to 2.5 cfs in the winter. Progressing downstream past the Olympia Bed Truncation, Sequalitchew Creek becomes a losing stream as the water table drops through the outwash to near sea level (Aspect 2022).

The slope of the thalweg[3] ranges from about 2% to 3% in the ravine and the width of the stream varies from about 12 to 20 feet. Pebble counts of the streambed material were conducted at 21 stations. At 15 stations, the median gravel size (D_{50}) was between 0.5 and 1.5 inches. At the remaining 6 sites, the gravel was finer.

[3] The thalweg is the line connecting the lowest points of successive cross-sections along the course of a stream.

Sequalitchew Creek in the lower ravine has average annual flow of 2.8 cfs. The flows rises to between 3 and 4 cfs during the spawning periods for the salmonid species using the creek (Figure 5). During summer, flows drop and sometimes the creek dries up completely, leaving only small pools wetted (Runge et al. 2003). As a result, fish are unable to use the creek throughout the year, and aquatic invertebrate prey production is reduced (Bell 1991).

Comparison of recent flow monitoring results with earlier gaging efforts in 1977 to 1978 (Thut et al. 1978) and 1984 to 1987 (Firth 1991) indicates that the streamflow is about 38% to 55% lower now than it was in those periods. Average monthly flow rates near the mouth of Sequalitchew Creek are shown in Table 2.

Table 2
Average Flows in Sequalitchew Creek Watershed

	Average Flow in cfs				
	Diversion Weir	Mid-Sequalitchew Creek Ravine	Lower Sequalitchew Creek Ravine		
Month	2003 to 2021	2004 to 2021	1977 to 1978	1984 to 1987	1999 to 2021
January	15.6	2.5	9.7	5.9	4.0
February	19.6	2.6	12.8	8.5	4.2
March	21.5	2.2	12.2	8.7	3.8
April	19.8	2.0	0.7	9.4	3.2
May	12.7	1.6	1.6	7.8	2.7
June	7.4	1.2	1.5	3.7	1.9
July	3.2	0.9	0.2	1.3	1.3
August	2.8	0.8	0.1	1.0	1.1
September	2.4	0.8	0.1	1.0	1.1
October	3.7	0.8	0.1	1.4	1.4
November	7.1	1.3	2.4	3.7	2.6
December	10.9	1.9	10.5	5.1	3.5
Mean annual flow	10.5	1.6	4.3	4.8	2.7

Note:
All results are in cfs.

This change in flows in Lower Sequalitchew Creek was the result of actions upstream in Edmond Marsh. The Washington Department of Fish and Wildlife (WDFW) created a channel through Edmond Marsh around 1976. The purpose of the channel was to facilitate the use of Lake Sequalitchew in a fish augmentation program. The channel was maintained to prevent beaver dams and vegetation from raising water levels in the marsh. With higher water levels in Edmond Marsh, more water flows out the Diversion Canal and less flows toward Lower

Sequalitchew Creek. Maintenance of the channel was necessary to attract juvenile fish to migrate to Puget Sound via Edmond Marsh and the Sequalitchew Creek Ravine rather than the Diversion Canal. The route of migration through the marsh and ravine would have a much larger rate of survival as it would provide opportunities for growth and acclimation in the estuary. It is assumed that any fish migrating via the Diversion Canal would be killed or stunned by the drop to Tatsolo Point.

2.1.4 Biological Habitat Characteristics of Sequalitchew Creek

The Sequalitchew Creek drainage basin contains both anadromous and resident fish that occur at different times of the year and use different portions of the creek. Figure 3 shows the extent of documented anadromous fish use reported for Sequalitchew Creek within the Project area including coho salmon (*Oncorhynchus kisutch*), chum salmon (*O. keta*), and cutthroat trout (*O. clarkii*) (Runge et al. 2003; WDFW 2022). The U.S. Fish and Wildlife Service also identifies bull trout (*Salvelinus confluentus*), a threatened species, as occurring in the Project vicinity (USFWS 2003, 2022). Native bull trout populations are known to be present in the Nisqually River, whose mouth is located approximately 1 mile south of Sequalitchew Creek (Runge et al. 2003; SalmonScape 2022). Although suitable habitat for bull trout does not exist within Lower Sequalitchew Creek, it is likely that this species is present in the nearshore habitat and could enter Lower Sequalitchew Creek estuary to forage during salmon smolt out-migration.

Resident fish reported or expected to occur in Sequalitchew Creek within the Project area include cutthroat trout (*O. clarkii*), rainbow trout (*O. mykiss*), sculpins (*Cottus* sp.), and western brook lamprey (*Lampetra richardsonii*) (City of DuPont 1992; Wydoski and Whitney 1979). Other resident fish reported to occur in the Sequalitchew Creek drainage basin, but outside the Project area, include kokanee salmon (*O. nerka*) and spiny ray fish in American Lake and Sequalitchew Lake (Pierce County 1996). Chum salmon have been reported to spawn in the lower 650 feet of Sequalitchew Creek in the past (City of DuPont 1993).

2.1.4.1 Historical Augmentation of the Fishery

WDFW augmented the fishery of Sequalitchew Creek intermittently from 1980 to 2001. Coho salmon smolts were released into Sequalitchew Creek from 1980 to 1994 and again in 2001. The annual number of coho salmon smolts released ranged from 2,280 to 987,480 with an average annual release of 238,477. These smolts were released in the spring (March 25 to May 31) between 1980 and 1994, and during the winter (December 11) in 2001. Fall Chinook salmon (O. *tshawytscha*) smolts were also released into Sequalitchew Creek in 1990 and 1991. These smolts were released in the spring (April 2 to 16) in numbers that ranged from 19,800 to 42,800 with an average annual release of 27,533. Coho salmon, chum salmon, and cutthroat trout are currently reported to utilize Sequalitchew Creek according to the most recent information from WDFW (SalmonScape 2022) and the *WRIA 12 Salmonid Habitat Limiting Factors Report* (Runge et al. 2003).

Coho salmon spawning survey records for Sequalitchew Creek indicate sporadic observations have been made by WDFW in 1962, and between 1982 and 1985. These surveys conducted in the winter (November 6 to December 27) extended from the mouth to RM 1.6. These data indicate that the annual number of adult coho salmon observed ranged from 0 to 145 with an annual average of 22. These surveys occurred during the period when smolts were released in the watershed, and flows were maintained by cutting a channel through Edmond Marsh.

The time of year when anadromous fish are reported to occur in Sequalitchew Creek within the Project area is as follows: Coho salmon smolts out-migrate from March to May, while returning adults spawn from late November to early January. Chum salmon spawn between December and February, and the fry out-migrate immediately after emerging from the gravels, which is usually between March and June (WDF 1975). Resident and sea-run cutthroat trout reside in Sequalitchew Creek throughout the entire year. Adults typically spawn in the spring and summer (February to August) and the fry emerge in late summer. Adult bull trout can potentially be present in the lowest portions of Sequalitchew Creek at any time of the year but are most likely to enter the stream to forage on out-migrating salmon smolts between March and June. Bull trout are not expected to use Sequalitchew Creek for spawning purposes due to the limited known distribution in the vicinity and the lack of spawning conditions that bull trout require (Runge et al. 2003).

2.1.4.2 Fish Habitat Under Existing Flows

Anchor Environmental (2004a, 2004b) completed an analysis of salmonid spawning and passage in Sequalitchew Creek based on water depth and flow. The analysis was conducted for coho salmon, chum salmon, and cutthroat trout. The Toe-Width Method and the Stage Discharge Analysis methods were combined to characterize the existing stream habitat. The Toe-Width Method provides a calculation for optimal flow conditions in cfs for the stream and uses data on the physical characteristics of the stream channel to estimate the streamflow that provides the maximum habitat for salmonid spawning and rearing. The Stage Discharge Analysis provides an analysis of minimum flow conditions for a given life stage. Both approaches utilize WDFW-developed and approved formulas.

The Toe-Width Method results indicate that optimal flows for both spawning and rearing in Sequalitchew Creek would be higher than current flows (Anchor Environmental 2004a). A discharge of 2.5 cfs was used in the analysis. This flow is representative of flows in a drier-than-average year during coho and chum salmon spawning. Based on a period of record from 2000 to 2001, the measured average flow during November, December, and January was 3.4 cfs (standard deviation of 2.0 cfs). At a discharge of 2.5 cfs, the lower reaches of Sequalitchew Creek provide unsuitably low depths for adult chum salmon passage and spawning, and unsuitably low depths for adult coho salmon passage and spawning. At a discharge of 2.5 cfs, depths are generally adequate to support resident cutthroat trout rearing and spawning. The monthly mean of flows for the driest month in each year (2000 to 2021)

averaged approximately 1 cfs, and there were many months when the average flow was 0.3 cfs or less. Cutthroat trout habitat would be severely limited during these periods.

A later study was conducted by ICF International (ICF 2013) using the Ecosystem Diagnosis and Treatment (EDT), a fish life-cycle habitat model that characterizes the aquatic environment temporally (monthly) and spatially (stream reaches). The model was run for both chum and coho salmon. This study found that, "habitat potential for the current condition suggests that Sequalitchew Creek could support a small quantity of natural chum salmon. However, the number of fish and productivity suggests the stream cannot support an independent population and is likely not self-sustaining" (ICF 2013). For coho salmon, the study found that the under current conditions, "adult capacity and abundance is essentially zero" (ICF 2013).

2.2 Marine Shoreline Description

Fish habitat along the marine shoreline at the mouth of Sequalitchew Creek and the barge loading facility has been previously described (City of DuPont 1993, 1995). A description of these physical and biological habitat characteristics, along with additional information collected for this study, are presented in the following sections.

2.2.1 Physical Habitat Characteristics of the Marine Shoreline

2.2.1.1 Mouth of Sequalitchew Creek

The Puget Sound shoreline at the mouth of Sequalitchew Creek is characterized by an armored slope above a gravel beach with minimal estuarine habitat. Farther offshore, a shallow soft sediment bench extends from the Nisqually River delta to just north of the mouth of Sequalitchew Creek. The BNSF railroad tracks paralleling the shoreline in this area are perched on a steep riprap berm. On the Case Inlet side of the railroad there are gravel deposits on either side of the mouth of Sequalitchew Creek that extend above the high tide line. These create more complete nearshore habitats, with beach grasses, drift logs, and low angle beaches extending into the subtidal zone. The railroad berm bisects the mouth of Sequalitchew Creek and influences tidal currents, wave action, and sediment deposition along the marine shoreline. There is a brackish marsh associated with Sequalitchew Creek on the upstream side of the railroad berm. Wind waves and tidal flows in the marsh are limited by a culvert under the railroad berm. The culvert draining Sequalitchew Creek through this railroad berm influences tidal exchanges, deltaic sediment deposition, and fish passage. There is limited rearing habitat in the brackish marsh on the upstream side of the railroad berm because this berm does not allow the channel to meander and otherwise naturally braid into multiple tidal channels. The loss of these natural processes limits the quantity and quality of fish habitat in this estuary.

2.2.1.2 Marine Shoreline West of the Existing Mine

The shoreline on the Puget Sound side of the railroad berm also has limited fish habitat because the steep slope influences wave action, sediment deposition, and estuarine vegetation. Waves formed by the predominant wind direction (from the southwest) break on the riprap-lined slope during high tides and do not allow for the deposition of fine-grained substrate in most areas. Substrate along the shoreline that is influenced by high-energy waves and wave reflection scouring is dominated by cobbles and gravel. In addition, the steep riprap embankment does not allow estuarine vegetation to grow above the high tide line. This limits the organic export of nutrients and benthic invertebrates that juvenile salmonids need during their acclimation to estuarine conditions. Within about a quarter mile on either side of the mouth of Sequalitchew Creek there is an accretionary sand bar at the shoreline. This sandbar reduces wave energy and scour. The sandier substrate off shore of the bar supports patches of eelgrass (*Zostera marina*; Ecology 2022). The bottom substrate farther offshore that is not influenced by wave scouring consists of fine-grained sediment overlying cobbles.

2.2.1.3 Barge Loading Facility

The Puget Sound shoreline at the Pioneer Aggregates barge loading facility near Tatsolo Point has previously been described in the Pioneer *Aggregates Barge Loading Facility and DuPont Shoreline Master Program Amendment—Supplemental EIS* (City of DuPont 1995). This shoreline is located where the BNSF railroad tracks also parallel the shoreline. The railroad tracks are perched on a steep berm composed of riprap that occupies the intertidal zone to nearly mean lower low water (MLLW) meaning there is little intertidal beach present. This railroad berm influences tidal currents, wave action, and sediment deposition along the marine shoreline. Although there is a gravel beach adjacent to the railroad berm approximately 200 feet north of the dock, the area has minimal nearshore habitat value.

The shoreline on the Puget Sound side of the railroad berm has limited fish habitat because the steep slope influences wave action, sediment deposition, and estuarine vegetation. Waves formed by the predominant wind direction (from the southwest) break on the riprap-lined slope and do not allow for the deposition or effective transport of fine-grained substrate. Substrate along the shoreline is influenced by high-energy waves and wave reflection, which scour away finer material leaving only cobbles and coarse gravel above -4 feet MLLW. In addition, the steep riprap embankment does not allow estuarine vegetation to grow above the high tide line. This limits the organic export of nutrients and benthic invertebrates that juvenile salmonids need during their acclimation to estuarine conditions. The bottom substrate farther offshore that is not influenced by wave scouring consists of coarse, sandy sediment overlying cobbles. Fine sand and silt gradually replace the coarser sediment until about -25 to -35 feet MLLW. Below this depth the sediment is predominantly silt and fine sandy mud (City of DuPont 1995).

2.2.2 Biological Habitat Characteristics of the Marine Shoreline

The reach of Case Inlet west of the existing mine and the nearshore from the mouth of Sequalitchew Creek are habitat for numerous species of fish and marine invertebrates. WDFW Priority Habitats and Species mapping documents the presence of key habitats for cutthroat trout, coho salmon, and chum salmon migration and rearing; and Pacific sand lance (*Ammodytes hexapterus*) and surf smelt (*Hypomesus pretiosus*) breeding. The reach is used by Dungeness crab (*Cancer magister*) and various genera of pandalid shrimp. Kelp and algae beds are present in the shallow subtidal, and there have been limited observations of eelgrass in the vicinity.

2.2.2.1 Mouth of Sequalitchew Creek

Although fish habitat along the marine shoreline at the mouth of Sequalitchew Creek is influenced by the railroad berm, this area is still used by a variety of species (City of DuPont 1993). These include plants and invertebrates in the intertidal and subtidal zones, as well as the marine and diadromous fish species described below.

Prior studies indicate that 75 plant species were found growing on the bottom substrate in the intertidal area (0 to 9 feet above MLLW). Of these intertidal plants, more than half were red algae (Rhodophytes) and green algae (Chlorophytes). The majority of the subtidal plants were found between 0 and -16 feet below MLLW. Small patches of eelgrass in sparse densities were observed near the mouth of Sequalitchew Creek (City of DuPont 1993).

Prior studies also identified 270 species of invertebrates in the intertidal area, with the majority of these species occurring near 0 feet MLLW (City of DuPont 1993). Several species of limpets, barnacles, and periwinkles were the dominant molluscan groups. The most productive area was the lower intertidal area near the mouth of Sequalitchew Creek. Subtidal invertebrates found in this area include snails (gastropods), worms (polychaetes), sea stars, and amphipod crustaceans.

Marine fish observed along the shoreline in this area include 31 species of bottomfish, 26 species of bottom-dwelling (demersal) fish, and 11 water-column (pelagic) species (City of DuPont 1993). The predominant bottomfish include English sole (*Parophrys vetulus*), rock sole (*Lepidosetta bilineata*), and starry flounder (*Platichthys stellatus*). The dominant demersal fish include buffalo sculpin (*Enophrys bison*), Pacific tomcod (*Microgadus proximus*), staghorn sculpin (*Leptocottus armatus*), rockfish species (*Sebastes* spp.), cabezon (*Scorpaenichthys marmoratus*), painted greenling (*Oxylebius pictus*), and pipefish (*Syngnathus griseolineatus*). The pelagic fish are represented by shiner perch (*Cymatogaster aggregate*), surfperches (Embiotocidae), and tubesnout (*Aulorhynchus flavidus*).

Salmonid species observed along the marine shoreline include coho, chum, Chinook, and pink salmon (City of DuPont 1993). Adult coho salmon were found along the shoreline at the Sequalitchew Creek mouth in September and October, but most of these fish were returning to

spawn in the Chambers Creek, McAllister Creek, and Nisqually River watersheds. Returning chum salmon are found along the shoreline at the Sequalitchew Creek mouth in December and January, but most of these fish spawn in the Nisqually River. Chinook and pink salmon observed along the marine shoreline are mainly migrating to the Nisqually River system.

Juvenile salmonids are found along the shoreline at the Sequalitchew Creek mouth during the spring out-migration, but many of these fish originate in the Nisqually River. Juvenile coho salmon are typically found between May and June. The peak migration of juvenile chum salmon occurred between mid-February and late July. Juvenile Chinook salmon were observed migrating from late May to July.

As noted previously, a native population of bull trout is known to inhabit the Nisqually River system (Runge et al. 2003; SalmonScape 2022). Fish from this population may utilize the nearshore environment near the mouth of Sequalitchew Creek and may also enter the lowest portion of the creek to forage on juvenile salmonids.

2.2.2.2 Barge Loading Facility

Habitat along the marine shoreline at the barge loading dock has previously been described in the *Pioneer Aggregates Barge Loading Facility and DuPont Shoreline Master Program Amendment—Supplemental EIS* (City of DuPont 1995). Like the area described at the mouth of Sequalitchew Creek, both areas are influenced by the railroad berm. However, the barge loading dock area has less diversity than the mouth of Sequalitchew Creek. The following provides a summary of the plants and invertebrates in the intertidal and subtidal zones; marine fish; and salmonids found in this area.

An intertidal flora and fauna survey conducted approximately 200 yards south of the barge loading dock in 1978 found little macroalgae above +6 feet MLLW. Only rockweed (*Fucus gardneri*) was present at +6 feet MLLW. At lower elevations, several species of red and green algae were common, and at 0 feet MLLW, several species of kelp dominated. Periodic bathymetric surveys have not detected significant material spills.

Subtidal plants are distributed at various depths and include macroalgae and kelp at around -8 feet MLLW. A narrow band of bull kelp (*Nereocystis leutkeana*) extends along the shoreline in both directions from the barge loading dock. Algae species are restricted to the area above -20 to -30 feet MLLW, and the most prevalent algae species was sea lettuce (*Ulva lactuca*). Ribbon kelp (*Laminaria saccharina*) was the second most common algae in this area. A variety of filamentous and foliose red algae species are present; the most common is *Sarcodiotheca gaucichaudii*. The cumulative percent cover of these algae ranged from 100% in the shallow subtidal zone to less than 5% at -20 to -30 feet MLLW. No eelgrass beds were observed in the vicinity of the dock.

Subtidal animals living within (infauna) and on top (epifauna) of the sea bed are present at various depths. The most common infauna group is polychaete worms, while the epifauna is dominated by shrimp and crab species. Larger animals included cockles (*Clinocardium nuttallii*), sea cucumbers (*Parastichopus californicus*), several species of sea stars, Dungeness crab (*Cancer magister*), rock crab (*Cancer productus*), and geoducks (*Panope abrupta*).

Marine fish observed along the shoreline in this area include shiner perch, Pacific herring (*Clupea harengus pallasi*), sand dab (*Citharichthys sordidus*), English sole, and starry flounder. Four salmon species (coho, chum, chinook, and pink) are expected to occur in this area. However, this area is less productive for juvenile salmon rearing and adult migration than the mouth of Sequalitchew Creek due to its greater distance from the Nisqually River. As noted previously, a native population of bull trout is known to inhabit the Nisqually River system (Runge et al. 2003). Fish from this population may utilize the nearshore environment in the vicinity of Sequalitchew Creek, including the barge loading facility.

3 Impacts of the Proposed Action and No Action Alternative

3.1 Impacts of the Proposed Action

This section is divided into two parts: direct impacts, which are directly related to the actions in the South Parcel Project Area; and indirect impacts, which are associated with aquifer drawdown outside the South Parcel Project Area (see Figure 2).

3.1.1 Direct Impacts of the Proposed Action

The Proposed Action would directly affect fish habitat by extending the operation of the marine barge loading dock within the marine shoreline. This would prolong shading beneath the facility, which can inhibit macroalgae growth and epibenthic productivity. These would have a small effect on the overall availability of nutrients for fish. The proposed mine expansion would extend by about 14 years the period when the barge loading dock continues to be used to transport aggregate to market. Fisheries impacts (e.g., shading, spill risk) associated with use of this barge loading dock have previously been described in the *Pioneer Aggregates Barge Loading Facility and DuPont Shoreline Master Program Amendment—Supplemental EIS* (City of DuPont 1995) and a previous *Fisheries Technical Report* (Herrera 2005).

Potential fisheries impacts to the marine shoreline include direct and indirect effects from the spillage of sand and gravel from the conveyor, overturning of barges during loading, accidental spills of pollutants, shading, and lighting, and are summarized as follows:

- Sand and gravel spilled in sufficient quantities could smother the benthic community where the spill occurs.
- Accidental spills of petroleum products (diesel) and other pollutants (hydraulic oil) could potentially occur during barge loading and maintenance activities.
- Extending the life of the conveyor and barge loading dock by about 14 years would extend any impacts to areas directly beneath the dock by shading the shallow water, as well as impacts associated with dock lighting. These impacts would occur until the dock is eventually removed.
- Ecology maintains a record of all reported oil spills of 1 gallon or more. These records go back to 2015. There were no recorded spills in the vicinity during that time (Ecology 2023).

3.1.2 Indirect Impacts of the Proposed Action

The Proposed Action would not directly affect Sequalitchew Creek, but the drawdown of the Vashon Aquifer would indirectly reduce flow in Lower Sequalitchew Creek. Lower Sequalitchew Creek is entirely spring fed (as described in Section 2.1.3). Groundwater discharge to Sequalitchew Creek during active dewatering is predicted to be 79% less than baseline conditions, on average, resulting

in a decrease in average flow in Sequalitchew Creek from 1.6 cfs to 0.34 cfs at the mid-ravine gage. The greatest decrease would occur during the wet season.

Without restoration, these indirect impacts would reduce flows during the spawning life stage of chum salmon and the spawning and rearing life stages of coho salmon and cutthroat trout. Impacts during the spawning season would be severe: seriously limiting the amount of habitat for resident cutthroat trout and eliminating spawning habitat for anadromous species. This would reduce the spatial extent of habitat available and reduce the portion of the year when fish habitat is accessible.

3.2 Impacts of the No Action Alternative

Under the No Action Alternative, the condition of the Sequalitchew Creek fish populations and fish habitat would remain similar to existing conditions. Suitable and accessible habitat for all species of fish currently and historically present would continue to be a fraction of what they were a few decades ago. Surface flows from Edmond Marsh into Lower Sequalitchew Creek would continue to occur during extreme precipitation events and would not contribute meaningfully to habitat. The creek would continue be unused or used very little by chum and coho salmon and cutthroat trout.

4 Cumulative Effects of Proposed Action and Restoration Plan

The South Parcel Project, described in Section 1.2, includes implementation of the Restoration Plan, reflected in the 2012 Settlement Agreement and developed by CalPortland and the Environmental Caucus. The Restoration Plan, which is a related action, seeks to restore and enhance streamflow and ecological functions from Sequalitchew Lake through Edmond Marsh into Sequalitchew Creek ravine. The Restoration Plan is intended to sequentially restore diverted flows back to the creek, improve the sustainability of flows through the system, and restore aquatic habitat by removing flow-related fish passage barriers and increasing the habitat available to aquatic species.

This section identifies what is currently known about the cumulative effects of the Proposed Action and the Restoration Plan. The Restoration Plan is being designed and permitted independently, and the specific impacts of the plan will be evaluated in those documents. Since the effects of the restoration will be evaluated in a subsequent SEPA document, these conclusions should be framed as general and preliminary. A cumulative effects analysis is an evaluation of the combined effects on biological resources for the Proposed Action, including the effects of reasonable and foreseeable development projects in the vicinity of the study area. One such set of reasonable and foreseeable effects would be from the cumulative impacts of continued growth in the region. These will occur regardless of whether or not the Project occurs. The other set of reasonable and foreseeable effects on Sequalitchew Creek, the marine nearshore, and wetlands is the impacts of the Restoration Plan. This analysis of impacts is based on the current understanding of the Restoration Plan actions being carried out by JBLM, SPSSEG, or others. These actions may change as they are being further designed and permitted. Therefore, much of this analysis is based on the restoration targets of the plan, such as increased flows in Sequalitchew Creek.

4.1 Benefits

The cumulative effects of the mining and full implementation of the Restoration Plan for the Sequalitchew Creek watershed would reverse many of the adverse impacts to the watershed and creek that have occurred over decades. The benefits would be noticeable over a large portion of the stream and wetland habitats in the basin and would largely restore lost and reduced ecosystem functions including the movement of water, sediment, nutrients, biota, and dissolved gasses through the watershed from the headwater springs on Sequalitchew Lake to Puget Sound. The reconnection of Sequalitchew Creek to its historical primary source of flow, Sequalitchew Lake, would address the root cause of the primary historical impacts to the system.

These projects cumulatively have the potential to restore an annual average of 10.8 cfs to a 1,200-foot reach of Sequalitchew Creek that currently experiences little to no consistent flow. Seasonally, the flows in this reach following restoration are predicted to be between 2.2 cfs in August up to just over 22 cfs in March. Flows of this magnitude would re-establish a functioning stream in the now frequently dry

channel, providing new aquatic and riparian habitat and a connection between the Sequalitchew Creek ravine and the marshes. This would provide a corridor for both aquatic and terrestrial species and would provide new opportunities for species expansion and recovery.

In the Sequalitchew Creek ravine, the restoration and mining projects would result in a seven-fold increase in flow on an annual average basis, from the current 1.6 cfs up to 11.2 cfs. Peak flows could reach up to 60 cfs, sufficient to restore the natural channel-forming processes necessary to improve habitat conditions in the ravine. Currently, the flows in the ravine are inadequate to move sediment effectively, create pools, or scour finer-grained materials from the substrate to create conditions suitable for spawning. Peak flows could be adaptively managed by adjusting the weir at the Diversion Canal and limiting flow through Edmond Marsh to prevent flooding or detrimental effects to the wetlands or the stream channel.

The restoration project would also restore fish passage from Sequalitchew Creek to East and West Edmond Marshes. Two fish barrier culverts will be replaced by fish-passable structures, which in combination with increased flows will allow migratory access above the ravine springs and into Edmond Marsh. Restoration would affect the conditions sufficiently to allow establishment of emergent vegetation in the western extent of the complex where inundation will persist through more of the growing season, providing excellent rearing habitat for juvenile coho salmon and cutthroat trout. These effects would increase the size, diversity, and complexity of available fish habitat types.

The greatly increased flow through Edmond Marsh would also improve water quality conditions by increasing dissolved oxygen concentrations and diluting and flushing an area of elevated iron concentrations in the center of the marsh.

4.2 Impacts

The greatest potential impacts to fish associated with restoring the natural flow regime to the Sequalitchew Creek watershed would be increased summer stream temperatures, and increased frequency of periods of high flow in winter and spring. These impacts will be mitigated through adaptive management by the restoration implementation team. These same impacts would occur with or without the change in groundwater elevation resulting from mining. Summer low flows below the Sequalitchew Creek Ravine Springs would be reduced during prolonged dry summers. At all other times, the benefits of increased flow would not be affected by lower groundwater.

The implementation of the Restoration Plan would result in water levels in Sequalitchew Creek Marsh and Edmond Marsh that are more consistent with conditions when the Diversion Canal only flowed during severe precipitation events. That change would also result in a loss of current wetland area

and, likely, a return to the shape and extents of the marsh in the 1970s. See the accompanying *Plants and Animals Technical Report* (Anchor QEA 2022) for more discussion of wetland impacts.

The flow from Sequalitchew Lake is also warmer in summer than the current flow in the ravine. The Project effects would represent a return to a more natural, surface-flow-dominated condition, but one with warmer stream temperatures. Sequalitchew Creek would experience temperatures up to 21°C in June, July, and August and cool temperatures down to 5°C in winter. The seasonal pattern of average monthly temperatures in Sequalitchew Creek with mining and restoration are shown in Figure 4. The predicted stream temperatures would be considerably warmer than the current spring discharge in the creek for most of the year. The surface water quality criterion for temperature applicable to Sequalitchew Creek is 16°C for the 7-day average of daily maximums. The analysis based on grab samples suggests this threshold may be exceeded from May through September.

Finally, there are predicted to be infrequent periods when the mining and restoration projects would result in streamflows that are lower than currently occur. This condition would occur during extended dry periods, when outflow from Sequalitchew Lake is naturally low or non-existent. Streamflows would be lower than existing conditions about 10% of the time, typically in August and September of particularly dry years. Existing flows during these periods currently average 0.83 cfs and do not provide aquatic habitat for anadromous fish; mining and restoration would further reduce these flows during these periods (to 0.44 cfs). This means that fish in the system below Edmonds Marsh will have less habitat as the population moves downstream to the remaining channel area.

4.3 Cumulative Effects for Fish Habitat in the Watershed

The combined effects of the mining and restoration projects on stream habitat would include a re-establishment of flow from Sequalitchew Lake to flow through the marshes and into Sequalitchew Creek ravine. The projects would also result in re-establishing ecosystem processes, specifically, the movement of water, sediment, nutrients, biota, and dissolved gasses through the watershed from the headwater springs on Sequalitchew Lake to Puget Sound. The increase in hydrology and stream energy would increase aquatic ecosystem productivity and create and maintain habitat diversity.

Re-establishment of peak flows and the associated sediment movement is key to restarting the arrested habitat-forming processes downstream of Edmond Marsh and is a key objective of the Restoration Plan. Currently, even where flows persist perennially, they are inadequate to move sediment effectively, create pools, or scour finer-grained materials from the substrate to create conditions suitable for spawning. The input of sediment and organic matter will stimulate biological productivity and develop greater resources at the lower trophic levels. Restoration would also result in pool and riffle habitat formation over time.

This habitat and development of lower trophic productivity are key to developing conditions sufficient to restore target species such as chum salmon and cutthroat trout in the system. Chum salmon will also benefit from the restoration of a more varied hydrograph. Puget Sound stocks typically spawn in freshwater systems in November and December as flows rise in response to winter rains. This effect has been limited in the system due to the current lack of surface water connectivity.

Previous studies by Anchor Environmental (2004a) and ICF (2013) showed that additional flow would result in increased capacity of the stream to support spawning and rearing of coho and chum salmon. These studies pre-date the completion of the Restoration Plan, but both approaches used predicted flow restoration scenarios similar to flows resulting from the cumulative effects of mining and restoration. The Anchor Environmental (2004a) study analyzed the effects of higher flows in the lower ravine within the lower 3,600 feet of the stream (not the upper ravine). The report concluded that additional flow in the lower reaches of Sequalitchew Creek would "provide significantly enhanced habitat conditions to support coho and chum salmon and cutthroat trout. Existing conditions in Lower Sequalitchew Creek indicate the habitat potential is significantly suppressed, and opportunities for salmon to access and use stream habitat is also very limited. Habitat features exist (e.g., appropriate spawning gravel, LWD and SWD, limited physical barriers) that will provide conditions important for coho and chum salmon and cutthroat trout spawning and rearing with more water present in the stream channel." The ICF (2013) study found that restoring chum access to lower gradient reaches of Sequalitchew Creek near the midpoint of the ravine "is predicted to improve overall productivity and nearly double abundance from the current condition."

4.3.1 Water Quality

The mining and restoration projects would introduce surface water from the upper watershed to the creek. Water passing through Edmond Marsh has low levels of turbidity and pollutants (Aspect Consulting 2022). The projects will affect stream temperature in the Sequalitchew Creek ravine by restoring the flow of surface water in the system which has a different temperature. The effects would vary seasonally as the volume of water from Sequalitchew Lake and its associated temperature vary. In summer, the outflow from Sequalitchew Lake is warmer than Sequalitchew Creek; in winter, it is colder.

Sequalitchew Creek would experience warm temperatures in June, July, and August, with temperatures reaching up to 21°C (70°F) and cool temperatures in winter, down to 5°C to 6°C (41°F to 43°F) as shown in Figure 6. The predicted stream temperatures would be considerably warmer than the current spring discharge in the creek for most of the year. The surface water quality criterion for temperature applicable to Sequalitchew Creek is 16°C for the 7-day average of daily maximums. The analysis based on grab samples suggests that this threshold may be exceeded from May to September.

This temperature increase may have the potential to alter habitat for juvenile fish present. Increased stream temperatures have been shown to decrease time to emergence in several salmonid species, including coho salmon (Quinn 2005). Cutthroat trout, which spawn and rear later in the season, have been shown to hatch earlier as temperatures increase (Quinn 2005). Although sub-lethal, this temperature increase may impact growth and survival, with juveniles potentially competing for resources earlier in the year (Anlauf-Dunn et al. 2022; Leach 2012; Quinn 2005).

Historically, the stream temperatures in Sequalitchew Creek were likely closer to those observed today in the lake outflow. The steady, cool temperatures currently observed in the ravine reflect the proportionally greater input of groundwater resulting from diversion of the lake outflow from the system.

The dissolved oxygen levels in Lake Sequalitchew and Lower Sequalitchew Creek are high (>9 milligrams per liter [mg/L]). Water quality in the marshes is more typical of stagnant waterbodies exposed to the life cycle of aquatic plants. Dissolved oxygen concentrations are lower (typically <4 mg/L) and are predicted to be raised with the addition of water flowing more rapidly through the system.

4.3.2 Water Quantity

The cumulative effect of the mining and restoration projects on streamflow was evaluated and streamflows were predicted at two locations (Aspect 2022). These locations are the dry reach near Center Drive, and in Sequalitchew Creek at the mid-ravine gage.

4.3.2.1 Flows in the Dry Reach

Under existing conditions, the dry reach currently experiences no consistent flow passing through the entire reach. The bottom of the dry reach is above the current groundwater levels, so ground infiltration in the dry reach would not be affected by lowering of groundwater with mining.

The mining and restoration projects are predicted to result in an average flow of 12.6 cfs in the dry reach. The flow would vary seasonally from a monthly average of 2.5 cfs in August to 25.7 cfs in March as shown in Figure 5. Peak flows could be as high as 65 cfs if all water is routed through the wetlands during peak flow events. To avoid flooding during peak flows, the highest flows could be directed to the Diversion Canal or detained in the marshes. The results presented here do not account for the diversion of peak flows or detention in the marshes.

Modeling indicates there would be periods when there would be no outflow from West Edmond Marsh, and thus no flow in the dry reach. These occur on 401 days of the 19-year period of record (or 7.7% of the time) and typically occur in July and August. These periods last for multiple weeks and occurred in 5 of the 19 years simulated (2004, 2005, 2015, 2017, and 2018). The occurrence of these dry periods could be reduced or eliminated if beaver management structures are built to store water and release it slowly and consistently during periods when there is no flow from Sequalitchew

Lake. Should flow be disrupted, it would temporarily disrupt the habitat and migratory functions of the stream reach between the Sequalitchew ravine springs and Edmond Marsh.

4.3.2.2 Flows in Sequalitchew Creek at Mid-Ravine Gage

After passing through the dry reach, streamflows would enter the Sequalitchew Creek ravine. The vast majority of flow would originate from Sequalitchew Lake, but there would be contribution from springs within the ravine, although the contribution from these springs would be lower than it is under existing conditions.

Spring flow in the upper reaches of the Sequalitchew Creek ravine would be affected by the lowered groundwater levels associated with mining. The groundwater model results for active dewatering, and the long-term condition that would persist after active dewatering has ceased, predict a reduction in spring flow of 79%, varying from 73% in January to 86% in summer.

On average, flow in Sequalitchew Creek at the mid-ravine gage would generally be similar to but slightly higher than the flows in the dry reach (i.e., 0.4 cfs greater), reflecting the input of spring flow. The annual average flow at the mid-ravine gage would be 12.9 cfs. Monthly average flows would range from 2.5 cfs in August to 26.3 cfs in March as shown in Figure 6. Peak flows would be generally the same magnitude (approximately 65 cfs) as in the dry reach.

There would be periods when the cumulative effects of the mining and restoration projects would result in a reduction in flows at the mid-ravine gage when compared with the existing condition. Of the 19 years evaluated, flows would be lower with the projects during 45 periods, lasting a total of 475 days, or about 10.% of the time. Included in this tally are 24 days when there would be no flow at the mid-ravine gage. Under existing conditions, there were 7 days with no measurable flow at the gage. As noted previously, these effects could be mitigated in part or in whole by careful implementation of the beaver management actions called for in the Restoration Plan.

The median duration of a period when flows would be lower with mining and restoration (hereafter referred to as a "lower flow event") was 3 days, but there were seven lower flow events lasting more than 2 weeks. The longer events occurred in 6 of the 19 years simulated (2004, 2005, 2015, 2016, 2017, and 2018). The longest single lower flow event was 98 days, ending in October 2017. However, lower flow events dominated the summer and fall of 2005, when there were four lower flow events between July 20 and December 23 lasting a total of 134 days. Lower flow events occurred most commonly in July, August, and September, but occasionally occurred all months except March. The average streamflow during lower flow events was 0.83 cfs under existing conditions and would be 0.44 cfs with mining and restoration. The decrease in streamflow during lower flow events ranged from 0.1 cfs up to 1.6 cfs. Again, these effects could be mitigated in part or in whole by careful implementation of the beaver management actions called for in the Restoration Plan.

4.3.3 Edmond Marsh

An aspirational goal of the Restoration Plan is to reintroduce a sustainable population of coho salmon. If successful, the aquatic area of West Edmond Marsh will provide excellent rearing habitat for juveniles. Juvenile coho salmon typically stay in freshwater wetlands and small streams for 2 years or more after spawning.

4.3.4 Nearshore Habitat

The additional flow in Sequalitchew Creek will transport more nutrients and fine sediment to the nearshore. The mouth of the creek is near the south end of a drift cell with net transport to the north. The additional sediment would benefit the nearshore by replacing some of the sediment that would naturally come from the exposed bluffs above the railroad. Currently this sediment cannot cross the tracks, and the lower shoreline is heavily armored, preventing erosive forces from recruiting sediment below the railroad. Additional nutrients and sediment will also increase biotic productivity on the Puget Sound shoreline at the mouth of the creek, increasing prey resources for fish. Conditions in the brackish marsh are expected to remain stable. Although salinity at the surface may drop, the saltwater wedge that enters the marsh at high tide will still cover the entire vegetated surface of the marsh.

5 Monitoring and Mitigation Measures

Specific mitigation measures associated with dewatering and other aspects of the mining project are discussed in the Groundwater Section of the Earth and Water Resources Report (Aspect 2022).

Existing mitigation measures at the barge loading facility at Tatsolo Point will continue. The facility is designed in accordance with adopted federal, state, and local regulations and guidelines to reduce the likelihood of spills of lubricants, fuels, and chemicals employed in the processing and manufacturing processes proposed for the site. The overwater portion of the conveyor shall be enclosed to prevent spillage of gravel. The dock is not used for the delivery of supplies, or chemical or other materials by water; a spill plan has been prepared for all elements and operations of the facility (marine and upland). Appropriate oil spill containment equipment is available at the dock site.

Mining operations will continue to manage fugitive dust, and forested buffers around Sequalitchew Creek will remain to protect water quality. Site water and stormwater is recycled and/or infiltrated in the mine, eliminating turbid runoff. During construction of the mitigation wetland and other excavation of soils, construction best management practices will be used to prevent erosion of soils.

The restoration and mining projects both include monitoring and adaptive management programs aimed at ensuring the projects achieve their objectives. A main purpose of ongoing monitoring and adaptive management is to look for detrimental cumulative effects and, if identified, adaptively respond to minimize them.

The adaptive management process is built around the following five steps:

1. Assess
2. Design
3. Implement and monitor
4. Evaluate
5. Adjust

The process is iterative and would continue throughout the projects. Adaptive management plans are in development for each project and will be incorporated into the Restoration Plan and Monitoring Plan.

Monitoring will include continued collection of groundwater and surface water observations at the existing monitoring network, as well as the installation of new monitoring locations and focused monitoring efforts associated with the implementation of the projects. Monitoring data would be shared between the project implementers to allow both adaptive management processes to proceed with the best available information.

6 Significant Unavoidable Adverse Impacts

6.1 Proposed Action

The cumulative impacts of the Project and restoration would generally improve all aspects of the freshwater fish habitat in the Sequalitchew Creek watershed. However, the cumulative impacts of the Project and restoration would permanently and unavoidably reduce the flow of the Sequalitchew Creek springs. This could reduce flows in the creek during drought years when surface water flow from Edmond Marsh is extremely low. Increased water temperature in the summer will create sub-lethal conditions that would reduce fish movement and growth until temperatures are reduced again in the fall. The overall effect of beaver management in storing winter water for summer release is not yet fully quantified, but the dry reach could still go dry and flows below the Sequalitchew Creek springs could be reduced during those periods.

6.2 No Action Alternative

Under the No Action Alternative, the dry reach would remain dry and Edmond Marsh would remain inaccessible to fish downstream. Lower Sequalitchew Creek would continue to have only a fraction of its historical flow and would remain unlikely to support spawning of chum and coho salmon. Rearing habitat for coho salmon and cutthroat trout would remain limited to just a few specific areas within the system.

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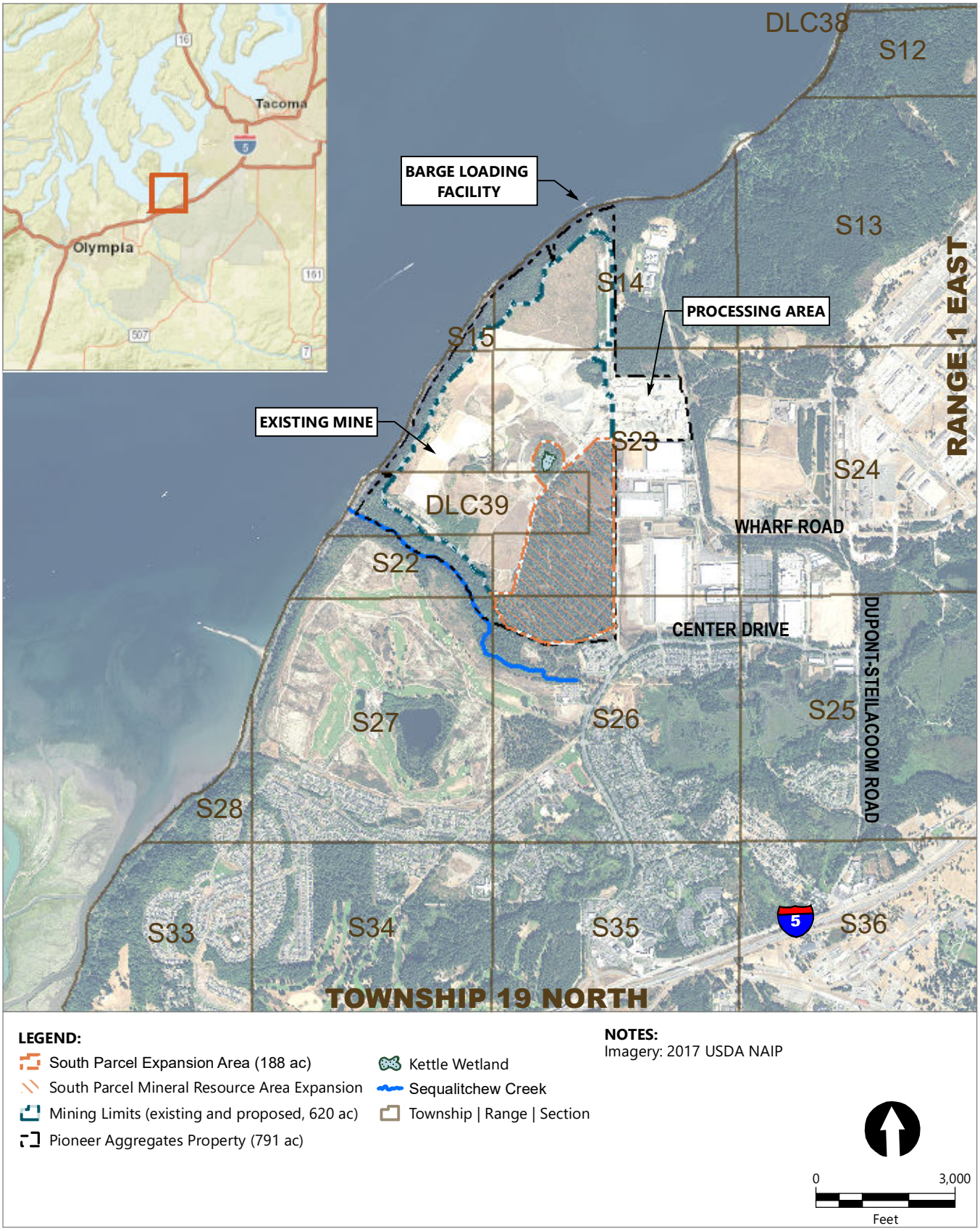
Figures



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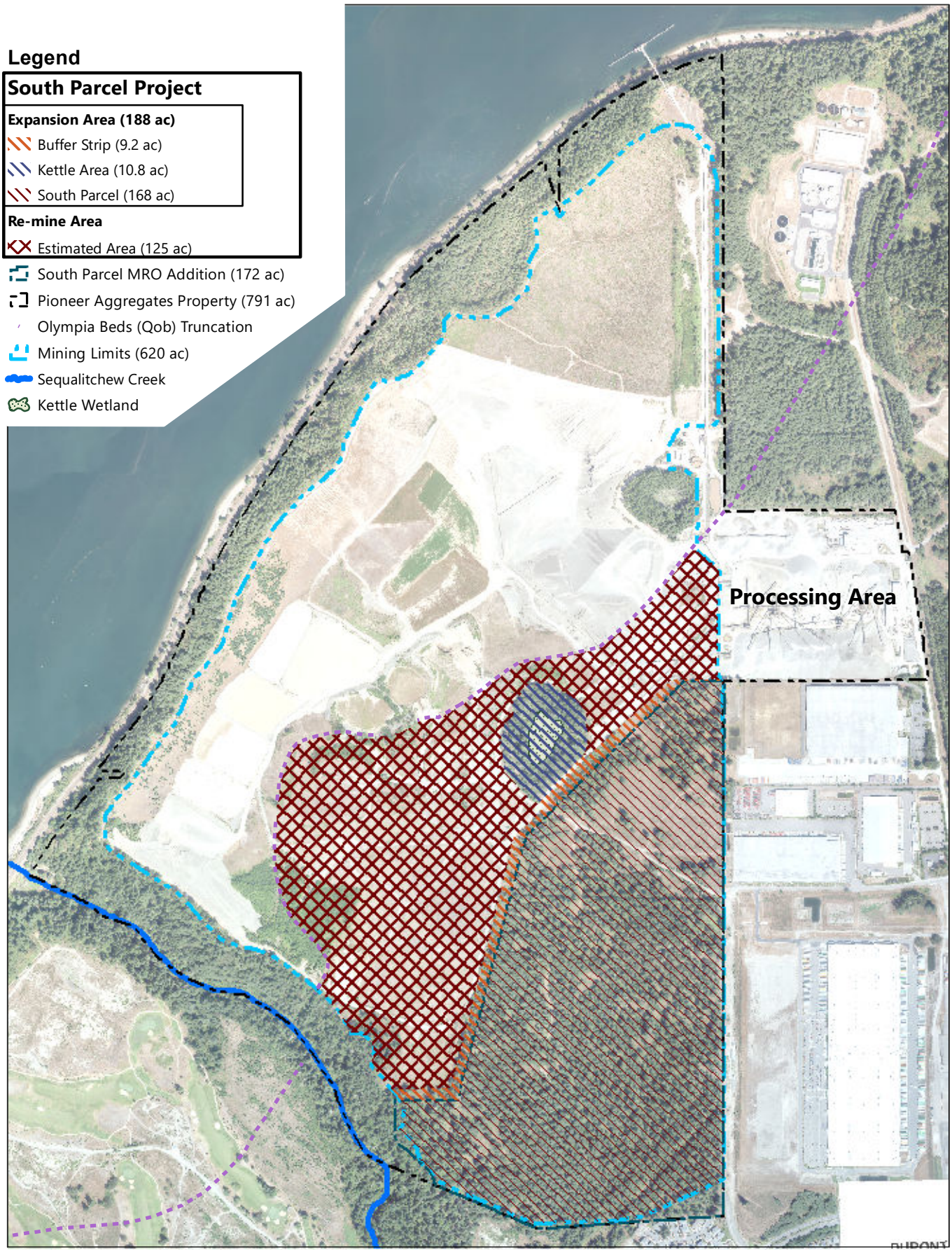
ANCHOR QEA

Figure 1
Vicinity Map
Fisheries Technical Report
Pioneer Aggregates South Parcel Project



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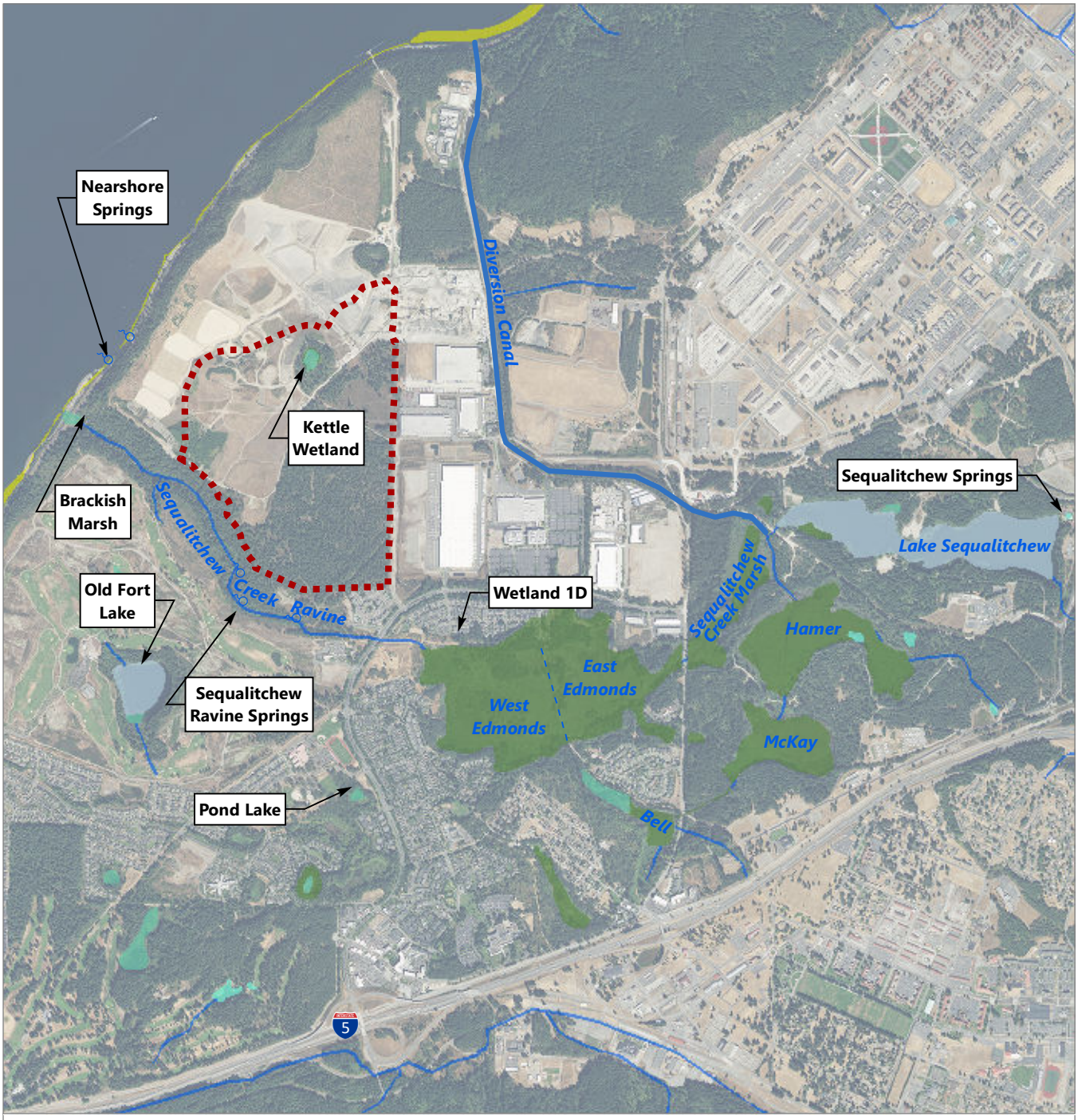
ANCHOR QEA

Figure 2
Project Components
Fisheries Technical Report
Pioneer Aggregates South Parcel Project



LEGEND:

- South Parcel Project

Aquatic Resources

- Stream/ Canal
- Freshwater Pond
- Spring
- Lake
- Estuarine and Marine Wetland
- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland

NOTES:
This map was created by modifying the USFWS National Wetland Inventory to correct inaccuracies and add additional detail

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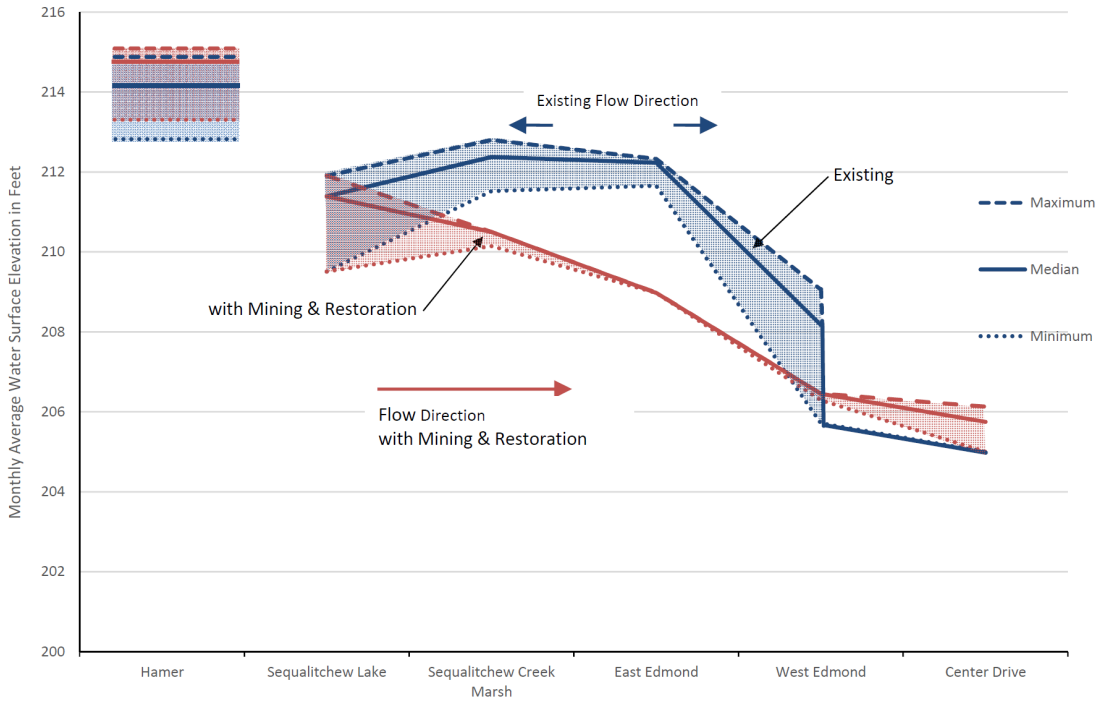
Figure 3
Aquatic Resources
Fisheries Technical Report
Pioneer Aggregates South Parcel Project

Predicted Surface Elevations in the Sequalitchew Creek Watershed



Predicted Annual Average Hydrograph in Sequalitchew Creek

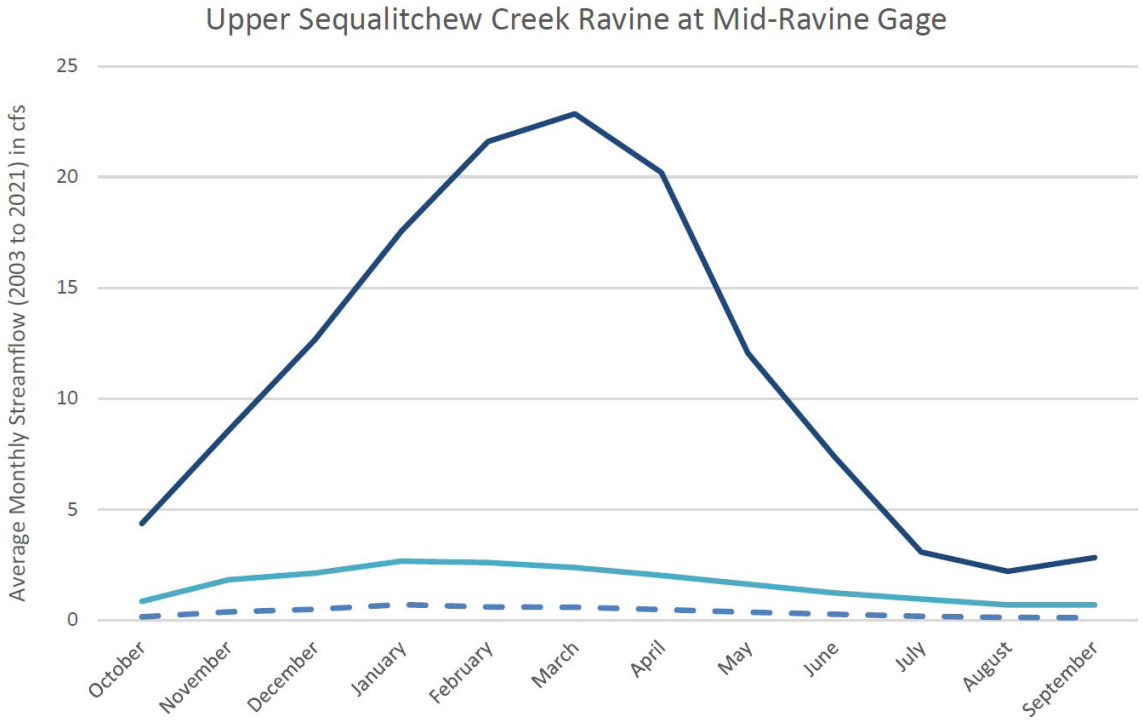


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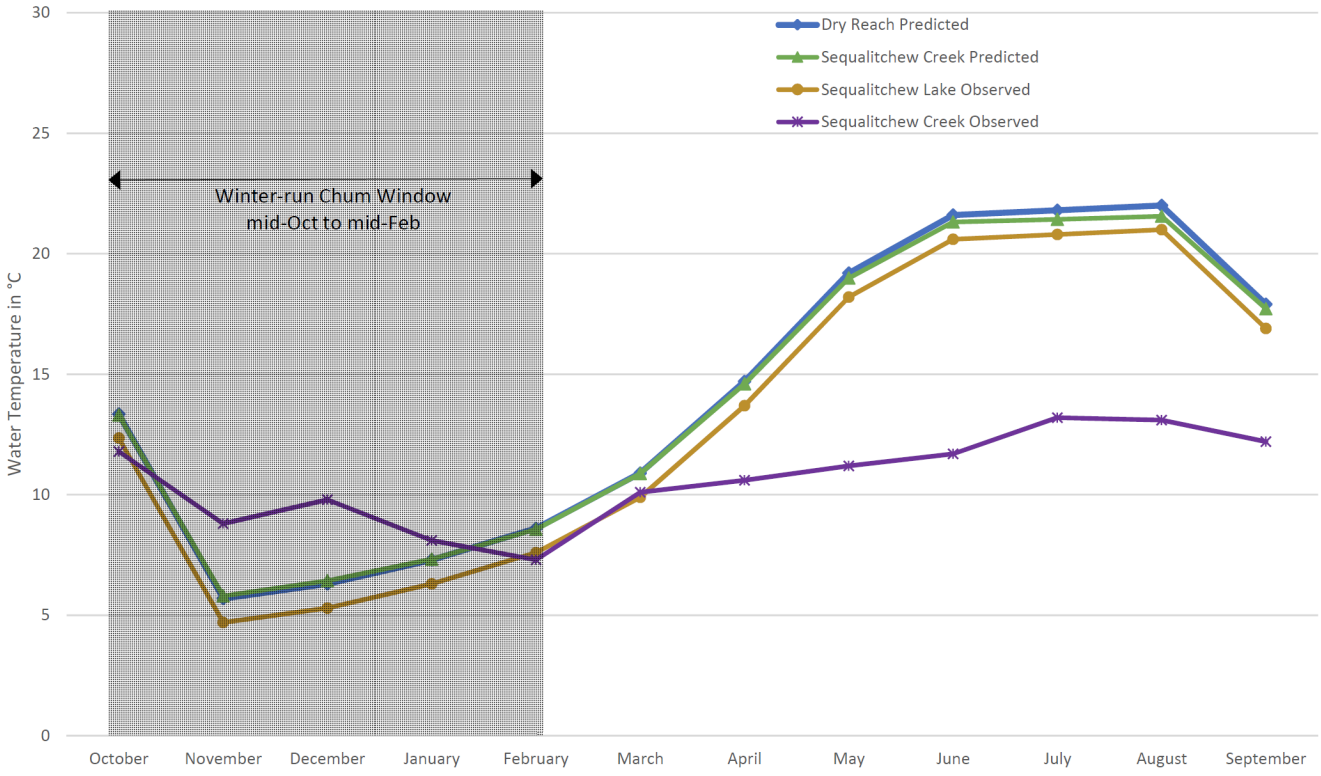
Figure 4
Predicted Water Surface Elevations and Flows
Fisheries Technical Report
Pioneer Aggregates South Parcel Project

Predicted Effects on Stream Temperature in Sequalitchew Creek Before and After Mining and Restoration



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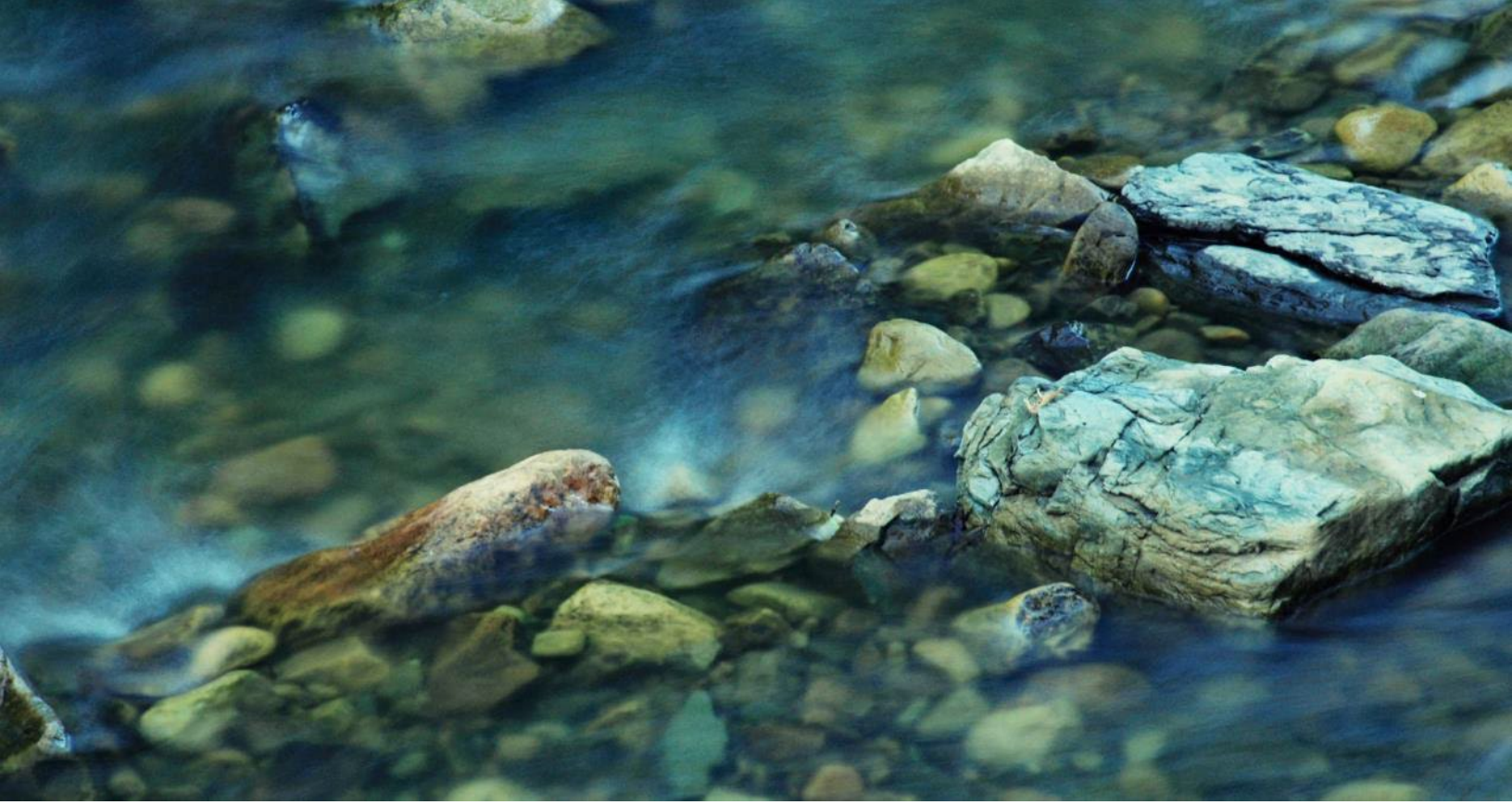
Appendix H

Plants and Animals Report



June 2023 Revised March 2025
Pioneer Aggregates South Parcel Project

ANCHOR QEA

Plants and Animals Technical Report

Prepared for CalPortland

June 2023
Pioneer Aggregates South Parcel Project

Plants and Animals Technical Report

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TABLE OF CONTENTS

1 Introduction 1

1.1 Description of the Proposed Action 1

1.1.1 Existing Mine 2

1.1.2 South Parcel Project 3

1.2 Description of the Restoration Plan 8

1.3 Description of the No Action Alternative 8

2 Affected Environment 11

2.1 Plants and Habitat 12

2.1.1 Conifer Forests 12

2.1.2 Shrublands 13

2.1.3 Aquatic Resources 14

2.1.4 Rare Plants and Plant Communities 19

2.2 Animals 21

2.2.1 Birds 21

2.2.2 Mammals 22

2.2.3 Amphibians 22

2.2.4 Washington Department of Fish and Wildlife Priority Species 22

2.2.5 Threatened and Endangered Species 23

3 Impacts of the Proposed Action and No Action Alternative 26

3.1 Direct Impacts of the Proposed Action on Plants and Habitat 26

3.1.1 Conifer Forests 26

3.1.2 Landmark Trees 26

3.1.3 Shrublands and Grasslands 26

3.1.4 Aquatic Resources 27

3.1.5 Rare Plants and Plant Communities 27

3.2 Animals 27

3.2.1 Birds 27

3.2.2 Mammals 28

3.2.3 Amphibians and Reptiles 28

3.2.4 Washington Department of Fish and Wildlife Priority Species 28

3.2.5 Threatened and Endangered Species 28

3.3 Indirect Impacts of the Proposed Action on Plants and Habitat 29

3.3.1 Conifer Forests 29

3.3.2 Shrublands and Grasslands 29
3.3.3 Aquatic Resources 29
3.3.4 Animals 33
3.4 Impacts of the No Action Alternative 34
3.4.1 Direct Impacts of the No Action Alternative to Plants and Habitat 34
3.4.2 Indirect Impacts of the No Action Alternative to Plants and Habitat 34
3.4.3 Direct Impacts of the No Action Alternative to Animals 34
3.4.4 Indirect Impacts of the No Action Alternative to Animals 35
3.5 Monitoring and Mitigation Measures 35
3.6 Significant Unavoidable Adverse Impacts 36
3.6.1 Proposed Action 36
3.6.2 No Action Alternative 37
3.6.3 Monitoring of Dewatering Operations 37
3.6.4 Monitoring of the Restoration Plan 38
4 Cumulative Effects of the Proposed Action and Restoration Plan 39
4.1 Restoration Plan Benefits 39
4.2 Impacts of Restoration 40
4.3 Cumulative Effects 41
4.3.1 Sequalitchew Creek 41
4.3.2 Wetlands 45
4.4 Cumulative Impacts to Specific Resources 48
4.4.1 Cumulative Impacts to Conifer Forests 48
4.4.2 Cumulative Impacts to Landmark Trees, Shrublands, and Grasslands 48
4.4.3 Cumulative Impacts to Aquatic Resources 48
4.4.4 Cumulative Impacts to Birds 50
4.4.5 Cumulative Impacts to Mammals 50
4.4.6 Cumulative Impacts to Amphibians and Reptiles 50
5 References 51

TABLES

Table 1 Land Use Change as a Result of the South Parcel Project After Reclamation 7

Table 2 Estimated Annual Quantities and Timing of Aggregate Mining 8

Table 3 Parcels, Zoning, and Development Potential of the South Parcel 9

Table 4 Summary of Landmark Trees Within the Expansion Area and Re-Mine Area 13

Table 5 Federally Listed Plant Species that May Occur in the South Parcel or Areas Subject to Changes in Groundwater Levels, with Their Endangered Species Act and Critical Habitat Status 20

Table 6 Federally Listed Species that May Occur in the South Parcel or Areas Subject to Changes in Groundwater Level, with Their Endangered Species Act and Critical Habitat Status 23

FIGURES

Figure 1 Vicinity Map

Figure 2 Project Components

Figure 3 Aquatic Resources

Figure 4 Predicted Water Surface Elevations and Flows

Figure 5 Stream Temperature in Sequalitchew Creek

APPENDICES

Appendix A Washington Department of Fish and Wildlife Priority Habitats and Species in the Project Area

Appendix B Tables of Plant and Animal Species Surveyed in the Project Area

ABBREVIATIONS

ASTM	ASTM International
cfs	cubic feet per second
cy	cubic yard
DMC	City of DuPont Municipal Code
DNR	Washington State Department of Natural Resources
Ecology	Washington State Department of Ecology
ESA	Endangered Species Act
JBLM	Joint Base Lewis-McChord
PHS	Priority Habitats and Species
Project	Pioneer Aggregates South Parcel Project
Report	Plants and Animals Technical Report
SEPA	Washington State Environmental Policy Act
South Parcel Project	Pioneer Aggregates South Parcel Project
USFWS	U.S. Fish and Wildlife Service
WDFW	Washington State Department of Fish and Wildlife

1 Introduction

Glacier Northwest, Inc. dba CalPortland is seeking regulatory approvals for the Pioneer Aggregates South Parcel Project (South Parcel Project or Project), which proposes to extend sand and gravel mine operations to the southeast of existing activities at the Pioneer Aggregates Mine in DuPont, Washington. This Plants and Animals Technical Report (Report) has been prepared in support of the South Parcel Project. Figure 1 provides an overview map of the South Parcel Project.

This document evaluates the environmental conditions and potential impacts of the South Parcel Project, and potential alternative actions, on plant and animal resources. These analyses are being conducted as a component of the State Environmental Policy Act (SEPA) evaluation for the South Parcel Project.

The following Report describes existing conditions of plants and animals (affected environment), as well as analyzes potential impacts to plants and animals, including aquatic resources, from the proposed Project. In addition, proposed monitoring and mitigation measures for the proposed Project are presented. The proposed Project includes implementation of a Restoration Plan, a related project that will undergo separate environmental review, to mitigate and offset potential Project impacts and improve aquatic resource habitat within the South Parcel Project Area.

1.1 Description of the Proposed Action

The South Parcel Project includes horizontal expansion of mining into approximately 188 acres previously undisturbed by mining, and vertical expansion of approximately 125 acres where re-mining will deepen a portion of the existing mine. The South Parcel Project would extend mining at the current rate for approximately 14 additional years.

The proposed Project activities will be focused southeast of the existing Pioneer Aggregates Mine in the City of DuPont, southwestern Pierce County, Sections 22, 23, and 26, Township 19 North, Range 1 East of the Willamette Meridian (Figure 1). The Project is bordered to the north and west by the existing Pioneer Aggregates Mine; to the east by industrial/distribution facilities including Amazon, Dania, Pier 1 Imports, and FedEx; and to the south by Sequalitchew Creek and the Creekside Village residential development. The Project would occur on lands owned by Weyerhaeuser Company and leased to CalPortland.

The South Parcel Project includes mining within areas previously undisturbed by mining (termed the "Expansion Area") and mining deeper within a portion of existing mine, referred to as the "Re-Mine Area." The Expansion Area is approximately 188 acres and is comprised of three subareas (see Figure 2). The Kettle Area is a 10.8-acre previously undisturbed area. The 9.2-acre Buffer Strip is a strip of vegetation that was retained along the inside of the originally permitted mine bordering the South Parcel. The South Parcel Project is located southeast of the original mine and all portions of

the South Parcel Project are within the Mineral Resource Overlay in the City of DuPont's current adopted Comprehensive Plan.

The Re-Mine Area consists of 125 acres in the southeastern portion of the existing mine where groundwater limits the depth of current mining activities.

The South Parcel Project has been developed consistent with a 2012 Settlement Agreement between CalPortland, the City of DuPont, the Washington State Department of Ecology (Ecology) and a coalition of environmental groups collectively referred to as the Environmental Caucus. The Settlement Agreement describes a process for a Restoration Plan for the Sequalitchew Creek watershed to be permitted and implemented contemporaneously with mining of the South Parcel. The Restoration Plan is designed "to help restore and enhance the Sequalitchew Creek watershed, including flows along the entire length of the Creek." The Restoration Plan would provide substantial regional benefits and is not intended solely as mitigation for the South Parcel Project. The Restoration Plan is described in Section 4.4.3.

1.1.1 Existing Mine

CalPortland's original sand and gravel mine was permitted in 1997 (355 acres). As provided under the 2012 Settlement Agreement, CalPortland applied for permits in 2013 for the North Parcel Mine Expansion to allow mining of approximately 142 acres within the North Parcel. Following the publication of a Final EIS in June 2013, the North Parcel mining expansion was permitted in 2014.

Mining activities at the existing site include mining, processing, transport of sand and gravel, and manufacturing of concrete. The processing area is located adjacent to the mine site on a 52-acre parcel. Sand and gravel is removed from the mine by bull dozers and wheel loaders and transferred to the processing area by conveyor belts. At the processing facility, the material from the mine is crushed, washed, and separated into different size gradations. Aggregate products are stored in stockpiles in the processing area for distribution.

After completion of the production process, the majority of the finished aggregate products are transported from the plant area by conveyors and placed onto barges (approximately 80%) at Glacier's dock and barge-loading facility at Tatsolo Point. The remainder (approximately 20%) is sold as aggregate or used to make concrete on-site; in both cases it is transported by truck.

Water used to wash gravel during processing is recycled through a clarifying process to remove silt and clay. This fine material is then run through a belt press to remove excess water and transported by truck and placed in holding cells in the mine where it is allowed to dry for up to 3 years.

After drying, fines may be used to raise the floor of the mine by placing the material in cells separated by rock curtains to facilitate drainage. The material is placed in approximately 6-inch lifts and

compacted to a material dry density of 90% (ASTM International [ASTM]:D-1557) or greater. Once filled to the desired height with fines from the belt press in this manner, a gravel cap of not less than 10 feet is placed over the compacted fines to mitigate potential for settlement and facilitate drainage.

1.1.2 South Parcel Project

The proposed South Parcel Project includes expansion of the mine footprint by approximately 188 acres and extension of the existing rate of mining for an additional approximate 14-year period (depending on market conditions), increasing the available sand and gravel resources by 30 to 40 million tons. The entire South Parcel Project, including the Expansion Area, is located within a Mineral Resource Overlay applied by the City of DuPont's Comprehensive Plan. The purpose of the overlay is to conserve mineral resources of long-term commercial significance for future extraction, as required by the Growth Management Act. The South Parcel Project would involve six primary activities: logging, clearing and topsoil removal, groundwater management, mining, processing and transport, and reclamation. These activities would overlap, with multiple actions occurring at any one time.

1.1.2.1 Logging

Timber was logged from the South Parcel several years ago, but tree cutting would still be needed prior to clearing and mining in the Expansion Area. A substantial portion of the proposed mining would occur within previously reclaimed areas of the existing mine (i.e., the Re-Mine Area) or in previously unmined areas where the non-native invasive shrub species Scot's broom (*Cytisus scoparius*) dominates the landscape. The Expansion Area would be logged at a single time prior to initiating mining.

1.1.2.2 Clearing and Topsoil Removal

Clearing and topsoil removal would occur in the mine area, in segments as mining advances into the Expansion Area, over the life of the Project. Prior to mining, excavators would be used to remove stumps and vegetation. This material would then be processed through a portable tub grinder and used to amend topsoil for use in reclamation.

The Expansion Area is located downwind of the former Asarco copper smelter and refinery in Ruston, Washington. Airborne pollution emitted from the former smelter has resulted in a 1,000-square-mile, area-wide plume of arsenic- and lead-contaminated soil known as the Tacoma Smelter Plume. Surficial soils in the Expansion Area that have been undisturbed since the mid-1980s may contain arsenic and lead at concentrations above cleanup levels. These soils would be cleaned up under an approved plan developed in consultation with Ecology through the Voluntary Cleanup Program. The plan will incorporate the same process that is being successfully implemented on the North Parcel.

1.1.2.3 Groundwater Management

A portion of an existing aquifer is present in the sands and gravels to be mined under the South Parcel Project. Wells will be installed and pumped in advance of mining to intercept groundwater and dry out the gravels for mining. The mining plan is designed to minimize the amount of time that active dewatering by pumping wells is required.

Mining under the South Parcel Project will proceed slowly from the north to the south, extracting gravel to create a broad trough along the eastern property boundary, over a period of 5 to 8 years. Once mining of each section of the trough is completed, the adjacent wells can be turned off, allowing groundwater to passively seep from the stable mine slope and flow by gravity to an infiltration facility on the floor of the existing mine. After mining the trough along the perimeter, gravel will be extracted from the interior area.

A detailed dewatering plan has been developed and is described in detail in the Monitoring Plan. The dewatering plan involves four steps, occurring over different time scales. The four steps are:

- **The initial step** is a 60-day pumping test that is completely reversible (i.e., no gravel would be extracted during the test). The results of that test would be analyzed to confirm predictions from the groundwater drawdown model and used to adjust the dewatering plan (well spacing, well screening, etc.) as necessary prior to commencing the next phase.
- **The second step** involves installing and pumping additional dewatering wells to lower water levels in the first mine segment in preparation for mining. This step would last about 6 months and functions as a greatly expanded pumping test. As with the initial step, it is also completely reversible. Groundwater observations during pumping would be compared to model predictions in order to confirm that actual changes in groundwater are within the range predicted during Project planning, when potential impacts from the Project are evaluated. This step will confirm model predictions before any gravel is removed from the Expansion Area.
- **The third step**—active dewatering during mining—involves mining the trough described above. Additional dewatering wells will be installed and pumped as mining progresses. Mining would begin at the location farthest from the Edmond Marsh and Sequalitchew Creek and proceed slowly south. Completing the trough would require 5 to 8 years depending on market conditions and the success in meeting predicted groundwater levels. The potential impact on groundwater levels builds slowly over time as wells are added and mining progresses south. This allows ample opportunity to monitor, confirm model predictions, and adapt to the conditions observed before mining proceeds into each dewatered segment.
- **The final step**—passive dewatering—begins when mining of the trough described above is complete and the last dewatering well is turned off. Passive dewatering represents the groundwater condition that will continue in perpetuity. Groundwater, no longer intercepted

by wells, would form seeps at the toe of the eastern mine slope. It would flow by gravity through a conveyance ditch to newly created wetlands on the bottom of the existing mine and eventually to an infiltration pond. Once this step has begun, further mining activities in the interior of the South Parcel would not affect groundwater.

1.1.2.4 Mining

The method of mining for the South Parcel Project will be identical to that currently used in the permitted mine areas. A dozer would push excavated material from the top of the mine face to two front-end loaders working on the mine floor. The front-end loaders would scoop-up the sand and gravel and dump it into portable hoppers that feed conveyors leading to the processing area.

The mine face of each sequence area will be a maximum of 80 feet high and will decrease as mine activities progress. During reclamation, the graded side slopes and mine areas will be revegetated and stabilized in accordance with the mine reclamation plan.

A conveyor will start at the north end of the Expansion Area and will be extended south as mining progresses. The conveyor is comprised of a 48-inch-wide rubberized belt that is supported by a series of rollers, called idlers, mounted on steel framed segments that support the conveyor about 5 feet off the ground.

As mentioned above, clearing of the Expansion Area will occur in a sequence of segments, with one segment being cleared approximately each year, in coordination with mining and construction activities. Mass clearing of the site will not occur.

A 20-foot-high noise berm would be constructed along the southern boundary of the South Parcel. It would be located behind vegetation retained in a buffer. The berm will also be vegetated and would help reduce potential noise associated with mining for adjacent land uses. The berm will be constructed at the beginning of the Project prior to clearing in the adjacent portion of the South Parcel.

The Project will directly impact an approximately 1.78-acre Kettle Wetland located within the existing mine just west of the South Parcel. The Kettle Wetland will be impacted by dewatering in preparation for mining, then removed during the initial phases of mining of the South Parcel Project. Impacts to the Kettle Wetland will be mitigated by creation of a larger wetland within the existing mine. Detailed analysis of the wetland impacts and mitigation are described in the Wetland Mitigation Plan (Anchor QEA 2021a).

1.1.2.5 Processing and Transport

Material mined under the South Parcel Project would be conveyed from the mine to the existing processing facility and would be processed in the same general manner as at present. The material extracted under the South Parcel Project is anticipated to have a higher moisture content and fines

content than the aggregate currently being extracted. As a result, there may be minor adjustments to some of the equipment used in the processing area, but the overall process and most of the equipment would remain unchanged.

Water is used to wash the raw material conveyed from the mine to remove silt and clay. Sand and gravel smaller than 1.5 inches pass through a screening and classifying process that separates and conveys the material to a series of stockpiles sorted by size and stacked on the south side of the processing plant. Stones larger than 1.5 inches are crushed, sorted by size and conveyed to a series of crushed-rock stockpiles sorted by size north of the processing plant. Screening equipment, rock crushers and other processing equipment are located between the stockpiles of sorted rock products. Custom blended rock products are also made to customer specifications.

More than 95% of water used to process the mined material is recycled through a treatment system where silt and clay is removed so the water can be reused to process more raw material from the mine.

The mode and extent of transporting aggregate products from the site would not change relative to existing operations. Approximately 80% of the product would be loaded onto barges at the existing dock at Tatsolo Point and transported to the Puget Sound regional market by barges.

Approximately 20% of the product would be transported to the local market by truck. Some material would continue to be incorporated into concrete at the existing on-site concrete batch plant serving the local market.

1.1.2.6 Reclamation

As mining progresses, completed mine segments would be reclaimed. The reclamation plan will be reviewed by the Washington State Department of Natural Resources (DNR) for consistency with the Surface Mining Act (Revised Code of Washington 78.44). In general, reclamation will consist of regrading, replacement of topsoil, and revegetation, Glacier is in the process of preparing an application to revise the existing reclamation plan incorporated into the surface mine reclamation permit. The DNR cannot approve the revised reclamation permit until after the City's permits are issued. The proposed reclamation plan will be similar to the plan approved by the DNR for the existing mine.

A summary of the change in land uses that would occur as a result of the South Parcel Project after completion of mine reclamation is presented in Table 1. Table 1 also presents information about the portions of the existing mine where no changes are proposed as a result of the South Parcel Project, such as the North Parcel and Processing Area.

Table 1
Land Use Change as a Result of the South Parcel Project After Reclamation

Land Use	Area [1] in Acres									
	Existing Conditions					Proposed Action - Post-Reclamation				
	Expansion Area			Re-Mine Area	Total	Expansion Area			Re-Mine Area	Total
	South Parcel	Kettle Area	Buffer Strip			South Parcel	Kettle Area	Buffer Strip		
Built Areas										
Buildings	--	--	--	--	0.00	--	--	--	--	0.00
Roads, Access, and Parking	--	--	0.4	9.2	9.55	--	--	--	--	0.00
Processing Areas	--	--	0.2	17.9	18.08	--	--	--	--	0.00
Active Mining	--	--	--	--	0.00	--	--	--	--	0.00
Active Reclamation	--	--	0.2	20.5	20.62	--	--	--	--	0.00
Cleared for Mining	--	--	--	--	0.00	--	--	--	--	0.00
Water Management Ponds	--	--	--	--	0.00	--	--	--	--	0.00
Total Built Areas	0	0	0.8	47.5	48.26	0	0	0.00	0.00	0.00
Natural & Reclaimed Areas										
Areas Reclaimed as Forest	--	--	--	3.3	3.3	29.4	0.6	0.6	35.8	66.3
Areas Reclaimed as Grass	--	--	--	68.5	68.5	138.2	10.2	8.6	89.4	246.4
Wooded Areas	146.2	5.6	7.4	5.8	165.1	--	--	--		0.0
Grass Areas	21.3	--	1.0	0.21	22.5	--	--	--		0.0
Wetland	--	1.8	--		1.8	--	--	--		0.0
Wetland Buffer	--	3.4	--		3.4	--	--	--		0.0
Total Natural & Reclaimed Areas	167.5	10.8	8.4	77.7	264.5	167.5	10.8	9.2	125.2	312.7
Total	167.5	10.8	9.2	125.2	312.7	167.5	10.8	9.2	125.2	312.7

Notes:
-- Indicates no area of this type.
1) Totals may not exactly equal the sum of their components due to rounding.

As shown in Table 1, the primary change occurring as a result of the South Parcel Project is the conversion of existing wooded areas into areas reclaimed as forest and as grass. Generally, the steeper slope areas will be reclaimed as forest and flat and gently sloping areas will be reclaimed as grass lands to support future redevelopment. This is true for areas within the South Parcel as well as the Kettle and Buffer Area and the Re-Mine Area.

1.1.2.7 Estimated Volume and Extraction Rates

Based on past market demand, material would be extracted at an average rate of approximately 2.8 million cubic yards per year. An estimated 30 to 40 million cubic yards of material would be extracted as part of the Project, which would extend the life of the current operation by about 14 years. The actual extraction rate and life of the mine will depend on the market demand for materials. Estimated mining quantities are shown in Table 2.

Table 2
Estimated Annual Quantities and Timing of Aggregate Mining

Timing	Existing Mine[1]	South Parcel Project
Years 1 through 14	1.4 million cy	1.4 million cy
Years 14 through 19	0	2.8 million cy

Note:
Existing Mine includes North Parcel

1.2 Description of the Restoration Plan

The Restoration Plan, developed by CalPortland and the Environmental Caucus, seeks to restore and enhance streamflow and ecological functions from Sequalitchew Lake through Edmond Marsh into Sequalitchew Creek ravine. The Restoration Plan is a related action and is undergoing separate, contemporaneous SEPA review as part of the permitting for the actions specified in the plan. Restoration of Sequalitchew Creek is necessary because of almost two centuries of human manipulation. Today, portions of Sequalitchew Creek are dry, and the majority of what would be the natural flow in the creek is diverted out of the system. The Restoration Plan is intended to sequentially restore diverted flows back to the creek, improve the sustainability of flows through the system, and restore aquatic habitat by removing flow-related fish passage barriers and increasing the habitat available to aquatic species.

1.3 Description of the No Action Alternative

This document also evaluates the No Action Alternative. A No Action Alternative is required by SEPA. "No action" is interpreted to mean that the City would take no action on the mining proposal, but it does not necessarily mean that nothing would happen on the subject site.

Under the No Action Alternative, the South Parcel would not be mined and the property could be developed for manufacturing and research and residential uses under existing land use and zoning designations.

Portions of the South Parcel are zoned for Manufacturing and Research Park (MRP; 136.2 acres), Residential-4 (R-4; 16.1 acres), Residential Reserve (RR; 22.3 acres), and Open Space (3.8 acres) uses. The MRP zoned areas are subject to restrictive covenants related to Former DuPont Works Cleanup Site. These covenants restrict use of the property to industrial uses and, barring further remediation activities, would prevent re-zoning of the MRP areas.

The extent of development could vary considerably depending on zoning/density, and Project-specific and regulatory elements such as setbacks, open space, and critical areas. Areas zoned MRP would be available for development of up to 112 acres of light manufacturing and research. Buildings may be up to 65 to 70 feet tall and there are no maximum lot coverage

requirements other than necessary to meet required setback (25 feet on the front property line, 15 feet on the sides and rear) and landscaping (20% of lot area) requirements. Provision of 0.3 to 1 parking space per employee working at maximum shift is required.

Under the No Action Alternative, development would occur consistent with the City of DuPont Municipal Code (DMC) Critical Areas chapter (DMC 25.105), which could allow for development near the top of the Sequalitchew Creek ravine with a setback to be determined by a geotechnical engineer or engineering geologist. Development would also occur consistent with stream and wetland buffers and setbacks in DMC 25.105.

The areas of the South Parcel zoned R-4 can be developed at a density of up to 4.5 single-family residences per gross acre,[1] resulting in a total of approximately 76 residences. An additional four single-family residences could be developed in the smaller portion zoned for Residential Reserve density (one dwelling unit per 5 gross acres).

There would be no changes in the use of the areas of the South Parcel zoned for Open Space; these areas currently include the naturally vegetated slope of the Sequalitchew Creek ravine and the Sequalitchew Creek pedestrian trail. A summary of the parcels, zoning, and development potential of the South Parcel is presented in Table 3.

Table 3
Parcels, Zoning, and Development Potential of the South Parcel

Parcel No.	Zoning	Parcel Area in Acres	Potential Development
0119262015	MRP	21.0	16.8 acres MRP
	OS	3.8	None
	Total	24.7	16.8 acres MRP
0119262016	MRP	34.1	27.3 acres MRP
0119233016	MRP	20.0	16.0 acres MRP
0119233017	MRP	20.3	16.3 acres MRP
0119233014	MRP	20.3	16.3 acres MRP
0119233015	MRP	20.5	16.4 acres MRP
0119233011	R-4	16.1	72 residences
	R-R	22.3	4 residences
	Total	38.4	76 residences

Note:
Potential development for MRP areas includes buildings, parking lots, access roads, but not vegetated areas.

[1] "Gross acre" means land designated for residential purposes in the comprehensive plan, inclusive of related streets and neighborhood parks. DMC 25.10.040.

Under the No Action Alternative scenarios there would be no change in use of the areas within the existing mine. However, once the Re-Mine Area is reclaimed it would likely be redeveloped according to its underlying zoning, similar to the South Parcel.

The Kettle Wetland is within the existing mine and would remain intact, the buffers would remain vegetated, and mining operations would continue in other portions of the existing mine. The Kettle Wetland, its buffer, and other mine-related buffers would potentially be removed once the existing mine is reclaimed and redeveloped for future uses. Parcels, zoning, and potential development under the No Action Alternative are shown in Table 3.

2 Affected Environment

The affected environment for the plants and animals analysis includes the geographic areas that could be affected (directly and indirectly or cumulatively) by the proposed Project, including the South Parcel Project Area and the Restoration Plan Area. The South Parcel Project Area includes the approximately 125-acre Re-Mine Area and the approximately 188-acre Expansion Area (Figure 2). The Re-Mine Area is where re-mining will deepen a portion of the existing mine. This area contains a mixture of bare ground and patches of vegetation and no aquatic resources.

The Expansion Area is composed of three areas previously undisturbed by mining: the 168-acre South Parcel, the 10.8-acre Kettle Area, and the 9.2-acre Buffer Strip between the existing mine and the South Parcel. The Kettle Area includes the Kettle Wetland and forested wetland buffer. The Buffer Strip is a strip of vegetation that was retained along the inside of the originally permitted mine bordering the South Parcel. The South Parcel is a mixture of coniferous forest and shrubland habitat.

The Restoration Area includes the aquatic resources of Sequalitchew Creek and the following four wetland systems: East Edmond Marsh, West Edmond Marsh, Sequalitchew Creek Riparian Wetlands, and the Brackish Marsh (Figure 3). These aquatic resources are also within the area that could be affected by changes to groundwater levels (City of DuPont 2007; Herrera Environmental Consultants 2005a).

Three additional aquatic resources could be indirectly affected because they are within the area in which a change in groundwater levels is predicted. These areas include Sequalitchew Creek Ravine Seep Wetlands, Pond Lake, and Wetland 1D (Figure 3). Sequalitchew Creek Ravine Seep Wetlands, Pond Lake, and Wetland 1D are identified in this Report as Nearby Wetlands.

To identify and assess plants and animals, information was gathered from a variety of sources including existing literature, agency information, resource maps, and aerial photographs and site visits performed in 2017, 2019, and 2021 (Anchor QEA 2017, 2019, 2021a). A variety of extensive studies have been performed for this Project and previously proposed projects to mine the South Parcel. The analysis in this Report is based substantially on the information in the following existing documents and information from these documents are included by reference in this Report:

- *Glacier Northwest DuPont Mining Area Expansion and North Sequalitchew Creek Project Final Supplemental Environmental Impact Statement* (City of DuPont 2007)
- *Pioneer Aggregates Mining Facility and Reclamation Plan—Draft Environmental Impact Statement* (City of DuPont 1992)
- *CalPortland DuPont North Parcel Mining Project Final Supplemental Environmental Impact Statement* (City of DuPont 2013)
- *Pioneer Aggregates Mining Expansion and North Sequalitchew Project Surface Water and Geomorphology Technical Report* (Herrera Environmental Consultants 2005a)

- *Pioneer Aggregates Mining Expansion and North Sequalitchew Project Plants and Animals Technical Report* (Herrera Environmental Consultants 2005b)
- *Pioneer Aggregates South Parcel Project Landmark Tree Inventory Report* (Anchor QEA 2021a)
- *Pioneer Aggregates Mine Expansion* (*South Parcel*) *Project Wetland Mitigation Plan* (Anchor QEA 2021b)
- *Addendum to the 2007 North Sequalitchew Creek Project Impact Area Wetland Delineation Report* (Anchor QEA 2018)
- Kettle Wetland Delineation Verification, October 22 and December 5, 2019 (Anchor QEA 2019)
- *Pioneer Aggregates Mine Expansion (South Parcel) Kettle Wetland Delineation Report* (Anchor QEA 2021c)
- *Supplemental Analysis of Sequalitchew Creek Area Wetlands Wetland Evaluations, Ratings, and Field Data* (Wetland Science Applications and Anchor Environmental 2005)

2.1 Plants and Habitat

Dominant plant communities and habitats within the South Parcel Project Area, the Restoration Area, and the areas subject to changes in groundwater levels include coniferous forests, shrublands, grassland, and aquatic resources (streams and wetlands). Rare plants and plant communities are also described.

2.1.1 Conifer Forests

Conifer forests cover most of the Expansion Area (Figure 4), including approximately 135 acres of the approximately 188 acres that would be cleared for mining (Figure 2). Second-growth conifer forests are interspersed with young regenerating stands as a result of previous timber harvest practices. Douglas-fir (*Pseudotsuga menziesii*) dominates the canopy and regeneration in most areas. Western red cedar (*Thuja plicata*) and Oregon white oak (*Quercus garryana*) also occur in smaller numbers within the conifer forest (Anchor QEA 2021a).

Common understory shrub species include beaked hazelnut (*Corylus cornuta*), snowberry (*Symphoricarpos albus*), trailing blackberry (*Rubus ursinus*), Scot's broom, and salal (*Gaultheria shallon*). Other species include twin flower (*Linnea borealis*), low Oregon grape (*Mahonia nervosa*), sword fern (*Polystichum munitum*), bald-hip rose (*Rosa gymnocarpa*), red huckleberry (*Vaccinium parvifolium*), ocean spray (*Holodiscus discolor*), black-cap raspberry (*Rubus leucodermis*), kinnikinnick (*Arctostaphylos uva-ursi*), bracken fern (*Pteridium aquilinum*), St. John's wort (*Hypericum perforatum*), western and hairy honeysuckles (*Lonicera ciliosa* and *L. hispidula*, respectively), wild strawberry (*Fragaria vesca*), yarrow (*Achillea millefolium*), yerba buena (*Satureja douglasii*), wood rush (*Luzula parviflora*), velvet grass (*Holcus lanatus*), and colonial bentgrass (*Agrostis capillaris*) (City of DuPont 2007, 2013; Herrera Environmental Consultants 2005b).

The Re-Mine Area is an active mining area dominated with grassland, with patches of shrubland and young stands of red alder (*Alnus rubra*). An approximately 5-acre patch of conifer forest located at the south end of the Re-Mine Area with similar species composition as the Expansion Area (Figure 2).

Forest vegetation within the Restoration Area includes riparian habitat associated with Sequalitchew Creek and wetland buffer habitat of wetlands within the Restoration Area. These forested areas are a mixture of coniferous and deciduous trees with a diverse shrub and herbaceous understory. Sequalitchew Creek, wetlands within the Restoration Area, and nearby wetlands are described in Section 2.1.3, Aquatic Resources.

2.1.1.1 Landmark Trees

A landmark tree survey was performed within the Expansion Area and Re-Mine Area per DMC Critical Area Chapter 25.10.120.005 criteria (Anchor QEA 2021a). Five species and a total of 116 landmark trees were identified during the survey. Landmark tree species include Douglas-fir, Oregon white oak, Pacific madrone, (*Arbutus menziesii*) Pacific yew (*Taxus brevifolia*), and western red cedar. The species and number of landmark trees within the Expansion Area and Re-Mine Area are shown in Table 4.

Table 4
Summary of Landmark Trees Within the Expansion Area and Re-Mine Area

Common Name	Scientific Name	Expansion Area Total Trees[1]	Re-Mine Area Total Trees
Douglas-fir	*Pseudotsuga menziesii*	81	1
Oregon white oak	*Quercus garryana*	17	2
Pacific madrone	*Arbutus menziesii*	2	0
Pacific yew	*Taxus brevifolia*	2	0
Western red cedar	*Thuja plicata*	10	1
Total		**112**	**4**

Note:
1. Includes adjacent buffer.

2.1.2 Shrublands

Shrublands within the Expansion Area are dominated by the non-native invasive species Scot's broom (Figure 2). This non-native invasive plant community covers approximately 42 acres of the approximately 188 acres proposed for clearing under the Project. Plant coverage beneath this layer is restricted to mosses and small patches of colonial bentgrass. Native shrub species are mostly absent and are present in only a few areas adjacent to patches of native tree species. The native herbaceous species include Idaho fescue (*Festuca idahoensis*), chocolate lily (*Fritillaria lanceolata*), early blue

violet (*Viola adunca*), and Pacific sanicle (*Sanicula crassicaulis*) (City of DuPont 2007, 2013; Herrera Environmental Consultants 2005b).

The Re-Mine Area is an active mining area dominated with grassland areas that were hydroseeded during reclamation. The presence of the non-native invasive species Scot's broom and the native species red alder are controlled as part of the reclamation process (Figure 2).

Shrublands within the Restoration Area and associated with the nearby wetlands include wetland buffer habitat that is a mixture of native and non-native shrub species. Sequalitchew Creek, wetlands within the Restoration Area, and nearby wetlands are described in Section 2.1.3, Aquatic Resources.

2.1.3 Aquatic Resources

Aquatic resources include Sequalitchew Creek, Puget Sound shoreline nearshore springs, and eight wetland communities. No aquatic resources are located within the Re-Mine Area. One aquatic resource, the Kettle Wetland, is located within the Expansion Area (Figure 2). Sequalitchew Creek and the East Edmond Marsh, West Edmond Marsh, Sequalitchew Creek Riparian Wetlands, and the Brackish Marsh wetland systems are located outside of the mine footprint but within the Restoration Area and within the area where changes in groundwater levels are predicted. Three nearby wetlands located within the area that could potentially be affected by changes in groundwater levels are Sequalitchew Creek Ravine Seep Wetlands, Pond Lake, and Wetland 1D (Figure 3).

No change is predicted to groundwater quantity or quality that feeds the nearshore springs located along the Puget Sound shoreline, and no changes to the nearshore springs are identified (Aspect 2022).

2.1.3.1 Expansion Area Wetlands

2.1.3.1.1 Kettle Wetland

The 1.78-acre Kettle Wetland is located within the Expansion Area (Figure 2). This wetland would be removed by proposed mining on the South Parcel. It contains persistent emergent, non-persistent emergent, aquatic bed, and scrub-shrub wetland communities (City of DuPont 2007, 2013; Anchor QEA 2021c). The dominant hydrologic source for the wetland is the aquifer system. Water levels within the wetland are determined by the seasonal fluctuation in the elevation of the Vashon Aquifer.

The emergent communities consist of common mare's tail (*Hippuris vulgaris*), creeping spike rush (*Eleocharis palustris*), giant bur-reed (*Sparganium eurycarpum*), water parsnip (*Sium suave*), reed canarygrass (*Phalaris arundinacea*), water ladysthumb (*Polygonum amphibium*), mild waterpepper (*Polygonum hydropiperoides*), skunk cabbage (*Lysichiton americanus*), inflated sedge (*Carex vesicaria*), and northern bugleweed (*Lycopus uniflorus*). Aquatic species observed include pondweed

(*Potamogeton* sp.), lesser duckweed (*Lemna minor*), arrowleaf bur-reed (*Sparganium angustifolium*), and floating-leaved pondweed (*Potamogeton natans*).

Along the wetland boundary, the scrub-shrub community consists of Pacific willow (*Salix lasiandra*), Scouler's willow (*Salix scouleriana*), sitka willow (*Salix sitchensis*), red-osier dogwood (*Cornus sericea*), and hardhack (*Spiraea douglasii*). Other vegetation along the wetland boundary consists of stinging nettle (*Urtica dioica*), blue elderberry (*Sambucus caerulea*), beaked hazelnut, and Henderson sedge (*Carex hendersonii*).

Buffer vegetation bordering the Kettle Wetland includes tree, shrub, grass, and herbaceous species. Dominant tree species include big-leaf maple (*Acer macrophyla*), red alder, black cottonwood (*Populus trichocarpa*), western red cedar, bitter cherry (*Prunus emarginata*), Douglas hawthorne (*Crataegus Douglasii*), blue elderberry, and Pacific madrone. Dominant shrub species include trailing blackberry, salal, snowberry, Scot's broom, Oregon grape, bald-hip rose, ocean spray, sword fern, Saskatoon serviceberry (*Amelanchier alnifolia*), red huckleberry, and bracken fern. Herbaceous species include velvet grass, western wild-rye (*Elymus glaucus*), and colonial bentgrass (*Agrostis capillaris*). Vine species include manroot (*Marah oreganus*).

The Kettle Wetland is classified as a Category III wetland using the City's rating system (DMC 25.105.050) and the Ecology rating system (Anchor QEA 2021c; Hruby 2014). This wetland is not regulated by the U.S. Army Corps of Engineers because it lacks a surface water connection to waters of the U.S. (Corps 2019).

2.1.3.2 Restoration Area Wetlands

These resources are discussed generally here and will be evaluated fully in a separated environmental review. The following is intended to provide context of the effects of the related action (restoration) in comparison to the Proposed Action (mining).

2.1.3.2.1 West Edmond Marsh

West Edmond Marsh is the portion of Edmond Marsh located west of Robinson Trail, a former railroad grade that bisects Edmond Marsh and east of Center Drive (Figure 3). West Edmond Marsh occupies approximately 80 acres. It has a hydrologic regime dominated by surface water inputs entering East Edmond Marsh to the east and smaller inputs from stormwater infiltration ponds along the north and south. Sequalitchew Creek follows a relatively straight path near the northern boundary of the marsh that results from historical efforts to drain and channelize the marsh.

Water levels in West Edmond Marsh are controlled by multiple beaver dams, the most significant of which is a large beaver dam at the western boundary just upstream of the normally dry reach of Sequalitchew Creek under Center Drive.

Seasonal high water levels in West Edmond Marsh range from about 210 feet elevation in the westernmost portion to 211.8 feet elevation just downstream of Robinson Trail. The westernmost portion has seasonal variation in water levels of 4 to 5 feet and typically dries up in summer. The portion near Robinson Trail retains water year-round and typically experiences a seasonal range in water levels of 1 to 1.5 feet. Water levels in West Edmond Marsh exhibited an increasing trend from 2004 to 2014 and have since appeared to stabilize at the higher level.

Vegetative communities include scrub-shrub, emergent, and aquatic bed wetland types (City of DuPont 2007, 2013; Herrera Environmental Consultants 2005b; Wetland Science Applications and Anchor Environmental 2005). The eastern portion of the marsh is shallow to deeply inundated, due to impoundment by beaver dams. Dominant vegetation includes black cottonwood, willows (*Salix* sp.), spiraea (*Spirea douglasii*), water parsley (*Oenanthe sarmentosa*), yellow pond lily (*Nuphar luteum* var. *polysepala*), pond weed (*Lemna minor*), cattails (*Typha latifolia*), and reed canarygrass (*Phalaris arundinacea*). The area includes upland islands that are forested with mature Douglas-fir, black cottonwood, and other native species. The dense, layered vegetation within the marsh, upland islands, and patches of open water provide high-quality wildlife habitat and offer a substantial habitat base for native wetland plant and animal species.

West Edmond Marsh is classified as a Category II wetland using the City's rating system (DMC 25.105.050) and the Ecology rating system (Hruby 2014). Over time, the hydrology of West Edmond Marsh has been affected by various efforts to maintain an open water channel through dense scrub-shrub wetland. The construction and periodic maintenance of this channel through the marsh maintained water levels that were lower than currently exist. Subsequent impoundment of water by beaver dams across this channel and elsewhere in the marsh has resulted in water levels of the marsh steadily increasing in recent decades, as is evidenced by the drowning of some mature upland trees (Anchor QEA 2022 and aerial imagery).

2.1.3.2.2 East Edmond Marsh

East Edmond Marsh occupies approximately 55 acres (Figure 3) between the Robinson Trail on the west and DuPont-Steilacoom Road on the east. East Edmond Marsh continues to the east of DuPont-Steilacoom on Joint Base Lewis-McChord. This segment of the Marsh is not evaluated in this Report but will be evaluated as part of separate environmental review required for the Restoration Plan.

Historically, the primary source of water to East Edmond Marsh was the surface water of Sequalitchew Creek flowing out of Sequalitchew Lake. The creek followed a meandering channel through the marsh that was been excavated and cleared by human activity. However, beaver activity has resulted in water levels in East Edmond Marsh that are higher than in Sequalitchew Lake, and now the hydrology of East Edmond Marsh is dominated by groundwater inflows from multiple

sources including regional groundwater, shallow subsurface flow from nearby Bell, Hamer, and McKay marshes, and stormwater from nearby infiltration ponds.

The water level in East Edmond Marsh is controlled by a large beaver dam located just upstream of the primary culvert under Robinson Trail and is relatively uniform throughout the marsh segment. Seasonal high water levels are typically about 212.5 to 213 ft NGVD 29. East Edmond Marsh retains water year-round, with a typical water level fluctuation of 1 to 1.5 feet seasonally

Vegetative communities include forested, scrub-shrub, emergent, and aquatic bed wetland types. Dominant vegetation includes black cottonwood, red alder, Oregon ash (*Fraxinus latifolia*), willows, red-osier dogwood, spiraea, sedges (*Carex* spp.), bulrushes (*Scirpus* spp.), water smartweed (*Polygonum amphibium*), water parsley, cattails, and reed canarygrass. Floodwater storage, sediment sequestering, nutrient filtration, and biological support are strong functions of East Edmond Marsh. The area includes upland islands that are forested with mature Douglas-fir, black cottonwood, and other native species. The dense, layered vegetation within the marsh, upland islands, and patches of open water provide high-quality wildlife habitat and offer a habitat base for native wetland plant and animal species (City of DuPont 2007, 2013; Herrera Environmental Consultants 2005b; Wetland Science Applications and Anchor Environmental 2005).

East Edmond Marsh is classified as a Category II wetland using the City's rating system (DMC 25.105.050) and the Ecology rating system (Hruby 2014).

2.1.3.2.3 Sequalitchew Creek Ravine Riparian Wetlands

The riparian forest wetland that borders Sequalitchew Creek west of Center Drive (Figure 3) includes many areas of braided flow and side-channels, flood terraces, and well-established forested riparian wetland vegetation communities. The canopy species include red alder, big-leaf maple, and western red cedar. Common shrub species include vine maple (*Acer circinatum*), salmonberry (*Rubus spectabilis*), red elderberry (*Sambucus acemose*), black gooseberry (*Ribes lacustre*), and cascara (*Rhamnus purshiana*). Common herbaceous species include mannagrass (*Glyceria elata*), giant horsetail (*Equisetum telmatiea*), American brooklime (*Veronica americana*), slough sedge (*Carex obnupta*), stinging nettle, Cooley's hedge-nettle (*Stachys coolyeii*), and water parsley (City of DuPont 2007, 2013; Herrera Environmental Consultants 2005b; Wetland Science Applications and Anchor Environmental 2005).

The Sequalitchew Creek riparian forest wetlands are considered Category II wetlands using the City's rating system (DMC 25.105.050) and the Ecology rating system (Hruby 2014).

2.1.3.2.4 Brackish Marsh

Near its mouth, Sequalitchew Creek passes through a concrete box culvert (5 feet wide by 5 feet high and 240 feet long) under the BNSF Railway Company rail line before discharging into Puget Sound.

Upstream of this culvert is a brackish marsh (Figure 3). The brackish marsh occupies a series of terraces dissected by dendritic channels. Common species include Lyngby's sedge (*Carex lyngbeyi*), seacoast bulrush (*Scirpus maritimus*), seashore saltgrass (*Distichlis spicata*), marsh cinquefoil (*Potentilla anserina*), and gumweed (*Grindelia integrifolia*). Significant patches of colonial bentgrass occur along the margins of the brackish marsh (City of DuPont 2007, 2013; Herrera Environmental Consultants 2005b; Wetland Science Applications and Anchor Environmental 2005).

The Sequalitchew Creek brackish marsh is classified as a Category II wetland using the City's rating system (DMC 25.105.050) and the Ecology rating system (Hruby 2014).

2.1.3.3 Nearby Wetlands

2.1.3.3.1 Sequalitchew Creek Ravine Seep Wetlands

The ravine containing Sequalitchew Creek contains seeps and springs that surface from mid-slope to the toe of slope. These seeps and springs provide base flow to Sequalitchew Creek and contribute to species diversity within the area by supporting plant species that require more moisture than is available in surrounding upland areas. A 0.13-acre seep wetland complex consisting of two long, very narrow, and non-contiguous wetlands is located just above the trail along Sequalitchew Creek at about river mile 0.75 to 0.85. The wetland hydrology emanates from seep heads just above the trail and is dominated by groundwater. Dominant vegetation species include willow herb (*Epilobium ciliatum*) and lady fern (*Athyrium filix-femina*) (City of DuPont 2007), and the ravine includes plant species identified in Section 2.1.3.2.3.

These forested Seep Wetlands are classified as Category IV wetlands using the City's rating system (DMC 25.105.050) and the Ecology rating system (Hruby 2014).

2.1.3.3.2 Wetland 1D

Wetland 1D is located immediately north of West Edmond Marsh and south of Center Drive (Figure 3). The wetland covers approximately 2.1 acres and is dominated by scrub-shrub vegetation including Pacific willow, spiraea, western crabapple *(Malus fusca*), and red-osier dogwood. Wetland 1D is shallow and permanently inundated (City of DuPont 2007, 2013; Herrera Environmental Consultants 2005b; Wetland Science Applications and Anchor Environmental 2005).

Water levels in Wetland 1D range seasonally from 208.6 to 211 feet NGVD 29 and track closely with nearby groundwater levels.

Wetland 1D is considered a Category II wetland using the City's rating system (DMC 25.105.050) and the Ecology rating system (Hruby 2014).

2.1.3.3.3 Pond Lake

Pond Lake is located approximately 0.5 mile south of the proposed Expansion Area (Figure 3). The water level in Pond Lake typically exhibits a seasonal range of about 4 feet and tracks closely with nearby groundwater levels. It is a shallow pond dominated by herbaceous species, with a forested upland edge dominated by red alder and big-leaf maple. The dominant species in the wetland is reed canarygrass. Small pockets of native species including sedges and water-plantain (*Alisma plantago-aquatica*) occur in the wetland (City of DuPont 2007, 2013; Herrera Environmental Consultants 2005b; Wetland Science Applications and Anchor Environmental 2005).

Pond Lake is considered a Category III wetland using the City's rating system (DMC 25.105.050) and the Ecology rating system (Hruby 2014). Due to a lack of a surface water connection with other waters of the U.S., this wetland is not regulated by the Corps.

2.1.3.4 Nearshore Springs

Nearshore springs located on the forested hillside of Puget Sound flow directly into Puget Sound (Figure 3). These springs express from the hillside and there is no surface flow associated with these features within the South Parcel Project Area.

2.1.4 Rare Plants and Plant Communities

2.1.4.1 Washington Department of Fish and Wildlife Plants and Priority Habitats

No rare plants are identified by Washington Department of Fish and Wildlife (WDFW) in locations where mining could occur in the South Parcel Project Area or within the areas subject to changes in groundwater levels (WDFW 2022a). No populations of white-topped aster (*Sericocarpus rigidus*), a state sensitive species, have been documented within the limits of the South Parcel Project Area, although populations do occur in Pierce County (WDNR 2022) and in oak forests adjacent to the South Parcel Project Area (City of DuPont 2007; Herrera Environmental Consultants 2005b).

A patch of forested habitat at the south end of the Re-Mine Area where mining is proposed is mapped by WDFW as priority habitat biodiversity areas and corridor, but the physical characteristics within the small portion where mining is planned do not meet WDFW's stated criteria. Specifically, this area is flat, developable land and is not part of the steep, undevelopable ravine side slope. The forested riparian habitat of Sequalitchew Creek and the forested hillside of Puget Sound near where mining is proposed are also mapped as priority habitat biodiversity areas and corridor. The habitat of East and West Edmond Marsh are mapped by WDFW as waterfowl concentration areas (WDFW 2022a). The Priority Habitats and Species (PHS) database does not include any white oak woodlands in or around the Project area, or within the City of DuPont. Where white oak exist within the Project area, they are interspersed in a primarily coniferous forest within the Expansion Area and account for less than 5% of the canopy. WDFW defines priority Oregon white oak woodlands as

stands of pure oak or oak/conifer associations where canopy coverage of the oak component of the stand is 25%; or where total canopy coverage of the stand is less than 25%, but oak accounts for at least 50% of the canopy coverage present. The latter is often referred to as an oak savanna. In non-urbanized areas west of the Cascades, priority oak habitat consists of stands 0.4 hectare (1 acre) in size (Larsen and Morgan 1998). Therefore, the oak stand on the Project site does not meet WDFW criteria for priority habitat.

Important habitats in the larger vicinity of the South Parcel include the Nisqually Delta, a large, high-quality wetland complex with regionally rare intact estuarine functions and native plant populations, abundant wildlife habitat, and high utilization by wildlife.

2.1.4.2 Threatened and Endangered Plants

The U.S. Fish and Wildlife Service (USFWS) identifies Endangered Species Act (ESA)-listed plant species and critical habitats under USFWS jurisdiction that occur or may occur within a specific location where a project is proposed on the agency's website (USFWS 2021a). The status of federally listed plant species and critical habitats protected under the ESA that occur or may occur where mining could occur in the South Parcel or within the area subject to changes in groundwater levels is presented in Table 5.

Table 5
Federally Listed Plant Species that May Occur in the South Parcel or Areas Subject to Changes in Groundwater Levels, with Their Endangered Species Act and Critical Habitat Status

Species	Status	Critical Habitat
Golden paintbrush (*Castilleja levisecta*)	Threatened	None designated
Marsh sandwort (*Arenaria paludicola*)	Endangered	None designated

Potential habitat for the plant species golden paintbrush (*Castilleja levisecta*; USFWS 2021b) and marsh sandwort (*Arenaria paludicola*; USFWS 2021c) is not located in or within the vicinity of the South Parcel Project Area or within the area subject to changes in groundwater level.

2.2 Fungi

Species of mushroom in the project area are likely consistent with the variety of mushroom species that thrive in the Pacific Northwest's temperate conditions. These include species that associate with coniferous trees (ectomycorrhizal fungi), those that decompose organic material (saprotrophic fungi), and generalists found in multiple ecosystems. There are no records of the presence of rare or endangered species of moss, lichen, nor fungi in DuPont, no surveys specific to the project area have been conducted. Species likely to occur in the project area include: the Ectomycorrhizal species

2.3 king bolete (*Boletus edulis*), fy agaric (*Amanita muscaria var. flavivolvata*), Pacific golden chanterelle (*Cantharellus formosus*), saffron milk cap (*Lactarius deliciosus*); and the saprotrophic species, turkey tail (*Trametes versicolor*), oyster mushroom (*Pleurotus ostreatus*), shaggy mane (*Coprinus comatus*), and honey mushroom (*Armillaria solidipes*).Animals

Animal species are described based on the animal types: birds, mammals, and amphibians. Additional information on the wide variety of common species that use habitats within the Project vicinity is also described in the Pioneer Aggregates Draft EIS (City of DuPont 1992). Several federally and state-listed species occur within the Project vicinity. Their status and use of the Project vicinity are described in subsequent sections of this Report.

2.3.1 Birds

The South Parcel Project Area and Restoration Area provides a range of habitat features that can provide breeding, foraging, resting, and overwintering habitat to support a wide range of bird species (Johnson and O'Neil 2001; Hamer et al. 2018). Forested habitats provide foraging and nesting habitat for a wide variety of songbird species such as song sparrow (*Melospiza melodia*), bushtit (*Psaltriparus minimus*), Bewick's wren (*Thryomanes bewickii*), Steller's jay (*Cyanocitta stelleri*), spotted towhee (*Pipilo erythrophthalmus*), Swainson's thrush (*Catharus ustulatus*), winter wren (*Troglodytes hiemalis*), varied thrush (*Ixoreus naevius*), black-capped chickadee (*Parus atricapillus*), dark-eyed junco (*Junco hyemalis*), chestnut-backed chickadee (*Parus rufescens*), golden-crowned kinglet (*Regulus satrapa*), and red-breasted nuthatch (*Sitta canadensis*).

Upland shrublands and herbaceous habitats are used by species like barn swallow (*Hirundo rustica*), tree swallow (*Tachycineta bicolor*) and white-crowned sparrow (*Zonotrichia leucophrys*). Predatory birds like red-tailed hawk (*Buteo jamaicensis*) commonly hunt in these habitat types. Other raptors such as northern harrier (*Circus cyaneus*) and bald eagle (*Haliaeetus leucocephalus*) occur in forested areas near waterbodies. Snags and downed trees in forested habitat and along the forest edges also provide perch sites for these species. Snags in forested habitats also provide potential nest sites for cavity-nesting birds such as great horned owl (*Bubo virginianus*), and species of woodpeckers including downy woodpecker (*Picoides pubescens*), northern flicker (*Colaptes auratus*), and pileated woodpecker (*Dryocopus pileatus*).

Aquatic habitats and wetland habitats provide a variety of habitat for terrestrial birds, waterbirds, and waterfowl. Open water sections of wetlands can be expected to provide habitat for belted kingfisher (*Megaceryle alcyon*) and wintering and migratory waterfowl, including gadwall (*Anas strepera*), American widgeon (*Mareca americana*), mallard (*Anas platyrhynchos*), ring-necked duck (*Aythya collaris*), and American coot (*Fulica americana*). Wetland areas with grass and herbaceous vegetation

provide habitat for red-winged blackbird (*Agelaius phoeniceus*), song sparrow, and marsh wren (*Cistothorus palustris*), among other species including waterfowl. Forested and scrub-shrub wetlands are commonly used by similar species as well as wood duck (*Aix sponsa*). Waterbird species such as great blue heron (*Ardea herodias*) also use many of these habitats.

2.3.2 Mammals

Small mammal species associated with forested habitats include shrew mole (*Neurotrichus gibbsii*), Townsend's vole (*Microtus townsendii*), masked shrew (*Sorex cinereus*), and striped skunk (*Mephitis mephitis*). Larger mammals such as black-tailed deer (*Odocoileus hemionus columbianus*) and coyote (*Canis latrans*) also occur throughout the site.

Wetlands and riparian areas provide habitat for North American beaver (*Castor canadensis*), water shrew (*Sorex palustris*), and raccoon (*Procyon lotor*). Beavers are well documented in the wetland habitats of East and West Edmond Marsh. The non-native species Virginia opossum (*Didelphis virginiana*) also occurs in these habitat types. These and similar species depend on water for foraging, breeding, and sometimes, overwintering habitats.

2.3.3 Amphibians

Wetlands and streams provide habitat for amphibian species such as northern red-legged frog (*Rana aurora*), northwestern salamander (*Ambystoma gracile*), Pacific treefrog (*Pseudacris regilla*), roughskin newt (*Taricha granulosa*), and western red-backed salamander (*Plethodon vehiculum*).

2.3.4 Washington Department of Fish and Wildlife Priority Species

Three species are mapped by WDFW as occurring or habitat presence within the South Parcel Project Area and the area subject to changes in groundwater level: big brown bat (*Eptesicus fuscus*), little brown bat (*Myotis lucifugus*), and Yuma myotis bat (*Myotis yumanensis*). These bat species occur in forested habitats, typically occupying mature trees (WDFW 2022a). These bat species are not state or federally listed.

Western gray squirrel (*Sciurus griseus*), a state threatened species, is documented within the Project vicinity (Herrera Environmental Consultants 2005b) but is not currently identified by WDFW as occurring within the South Parcel Project Area and the area subject to changes in groundwater level. This species favors Garry oak (*Quercus garryana*) woodlands as prime habitat. This habitat occurs within areas adjacent to the South Parcel Project Area, in patches throughout the City of DuPont, and also within the Fort Lewis Military Reservation. This species also forages within coniferous forests that occur near Garry oak woodlands.

The western gray squirrel was listed as threatened in Washington State in 1993 (WAC 323.12.011), and as endangered in 2023 (WAC 220-601-010). There are three known populations in Washington:

the southern Puget Trough, north-central Washington, and south-central Washington (Vander Haegen and Orth 2011). Typical western gray squirrel habitat in the Puget Trough includes a Douglas-fir-Oregon white oak woodland with an understory dominated by snowberry (*Symphoricarpos albus*), California hazelnut (*Corylus cornuta* var. *californica*), Indian plum (*Oemleria cerasiformis*), and sword fern (*Polystichum munitum*) (Ryan and Carey 1995). Ryan and Carey continue to describe the typical characteristics of oak woodlands that are important to western gray squirrels as consisting of a mix of Douglas-fir (53% on average) with oaks comprising 34% on average. These characteristics were not observed within the South Parcel Project Area.

One of the primary limiting factors in western gray squirrel success in the Puget Trough is the lack of genetic diversity through habitat fragmentation (Linders and Stinson 2007). The South Parcel is separated from the primary western gray squirrel population at Joint Base Lewis-McChord (JBLM) by Interstate 5, as well as several other heavily used roadways. While a small amount of canopy connectivity to JBLM property exists across the Puget Sound Bluff and up Sequalitchew Creek ravine, the lack of connectivity to confirmed squirrel-populated sites contributes to the overall lack of habitat potential on the South Parcel for gray squirrels.[2]

Based on the above discussion, the South Parcel does not provide primary (nesting, breeding) habitat for western gray squirrel. While the site does possess marginal characteristics of secondary squirrel habitat (conifer-dominated, moderate canopy and shrub coverage), several identified factors make the possibility of use of the South Parcel by western gray squirrel remote.

2.3.5 Threatened and Endangered Species

USFWS identifies ESA-listed species and critical habitats under USFWS jurisdiction that occur or may occur within a specific location where a project is proposed on the agency's website (USFWS 2021a). The status of federally listed species and critical habitats protected under the ESA that USFWS identify as occurring or may occur in the South Parcel or within the area subject to changes in groundwater level is presented in Table 6. None of the species listed in Table 6 have been identified to be present within the Project area during field studies or database review conducted by Anchor QEA.

Table 6
Federally Listed Species that May Occur in the South Parcel or Areas Subject to Changes in Groundwater Level, with Their Endangered Species Act and Critical Habitat Status

Species	Status	Critical Habitat
Birds		

[2] WDFW's PHS on the web (https://geodataservices.wdfw.wa.gov/hp/phs/) shows only one observation of a western gray squirrel between the Nisqually Delta and University place. It was made over 3 miles from the project area in 1977. All more recent observation have been on the other side of Interstate 5.

Species	Status	Critical Habitat
Northern spotted owl (*Strix occidentalis caurina*)	Threatened	Designated (not present)[1]
Marbled murrelet (*Brachyramphus marmoratus*)	Threatened	Designated (not present)[1]
Streaked horned lark (*Eremophila alpestris strigata)*	Threatened	Designated (not present)[1]
Yellow-billed Cuckoo (*Coccyzus americanus)*	Threatened	Designated (not present)[1]
Mammals		
Roy Prairie Pocket Gopher (*Thomomys mazama glacialis*)	Threatened	Designated (not present)[1]
Amphibians		
Oregon spotted frog (*Rana pretiosa*)	Threatened	Designated (not present)[1]

Note:

1. No records of the observed presence of this species utilizing the Project area have been found, and no observations have been made during field studies of the Project area.

Potential habitat for northern spotted owl (*Strix occidentalis caurina*) and marbled murrelet (*Brachyramphus marmoratus*), mature and old growth forest communities, is not located in or within the vicinity of the South Parcel or within the areas subject to changes in groundwater level. The WDFW PHS database records no species occurrence for northern spotted owl or marbled murrelets in or near the Project area (WDFW 2022a).

The species streaked horned lark (*Eremophila alpestris strigata*) and yellow-billed cuckoo (*Coccyzus americanus*) are generally considered to have a low tolerance to human activity. Potential habitat for streaked horned lark, yellow-billed cuckoo, and Roy prairie pocket gopher (*Thomomys mazama glacialis*) is not located within or near the South Parcel or the areas subject to changes in groundwater level. The WDFW PHS database records no species occurrence for these species in or near the Project area (WDFW 2022a).

Oregon spotted frog (*Rana pretiosa*) is highly aquatic and rarely found away from water. Within a watershed, most breeding populations are small, and many are isolated from other breeding populations. They require breeding sites in shallow water with short vegetation and full sun exposure. Only six watersheds are currently known to be occupied in Washington: Sumas River, South Fork Nooksack River, Samish River, upper Black River, lower Trout Lake Creek, and at Conboy Lake and Camas Prairie in the Outlet Creek drainage. The WDFW PHS database records no species occurrence for this species in or near the Project area (WDFW 2022a).

There are no state or federally listed fish species documented to occur in Sequalitchew Creek (WDFW 2022b; Anchor QEA 2022). The estuary and marine nearshore are potentially used by federally listed Chinook salmon and bull trout.

3 Impacts of the Proposed Action and No Action Alternative

This section describes the potential direct, indirect, and cumulative impacts to plants and habitat and animals from the Proposed Action (in Sections 3.1, 3.2, and 3.3, respectively). The direct and indirect impacts of the No Action Alternative are discussed in Sections 3.4 and 3.5, respectively). Section 3.6 identifies monitoring and mitigation measures that could avoid, minimize, or reduce potential impacts. Significant unavoidable adverse impacts are identified in Section 3.7.

Potential impacts to plants and habitat and animals from the proposed South Parcel Project include the following:

- Direct impacts related to logging, land clearing, mining activities, and reclamation in the proposed Re-Mine Area and the Expansion Area. Direct impacts include proposed activities within the South Parcel Project Area.
- Indirect impacts related to project-related changes in groundwater levels and restoration activities that could occur outside the South Parcel Project Area.
- Cumulative impacts include those resulting from South Parcel mining and additional actions implemented within the watershed pursuant to the Restoration Plan, including beaver management in Edmond Marsh and flow restoration in Sequalitchew Creek. Cumulative impacts are described in Section 4.

3.1 Direct Impacts of the Proposed Action on Plants and Habitat

3.1.1 Conifer Forests

All existing coniferous forests within the South Parcel Project Area would be logged prior to initiating mining. The total area of coniferous forest within the Re-Mine Area is approximately 15 acres, and the Expansion Area is approximately 135 acres. Revegetation would occur throughout the South Parcel Project Area according to the details of the reclamation plan developed for both the existing and proposed mining areas. Reclamation would include the establishment of mixed species and conifer dominant forests along the slopes of the mine.

3.1.2 Landmark Trees

Ninety landmark trees have been identified as being located within the areas that would be cleared under the proposed Project including Douglas-fir (74), Garry oak (13), Pacific madrone (1), Pacific yew (1), and western red cedar (1) (Anchor QEA 2021a).

3.1.3 Shrublands and Grasslands

All shrublands and grasslands within the South Parcel Project Area would be cleared in conjunction with logging activities. The total area of shrublands and grasslands within the Re-Mine Area is

approximately 60 acres, with most of that area comprised of grassland habitat associated with hydroseeding during reclamation activities. The total area of shrublands and grasslands within the Expansion Area is approximately 42 acres. The dominant shrublands species is the non-native invasive species Scot's broom. Scot's broom has been controlled in the Re-Mine Area during reclamation activities and would likewise be controlled throughout the site during mining and reclamation. This would benefit the existing adjacent native habitats and the riparian corridor of North Sequalitchew Creek by reducing invasive species pressure.

3.1.4 Aquatic Resources

The 1.8-acre Kettle Wetland is the only aquatic resource located within the South Parcel Project Area and is therefore the only aquatic resource that would potentially be disturbed by direct impacts associated with the proposed Project.

3.1.4.1 Kettle Wetland

The Kettle Wetland and its buffer would be cleared as part of the surface vegetation clearing. Thus, the entire wetland area (1.8 acres) would be eliminated. The Kettle Wetland relies on groundwater to sustain wetland vegetation so even if the Kettle Wetland were left in place within the Project area, the change in groundwater levels would eventually alter the hydrology of the Kettle Wetland, converting the wetland vegetation to upland plant species. Proposed mitigation for these wetland impacts is discussed in Section 3.4.

3.1.5 Rare Plants and Plant Communities

The Project would not directly impact rare plants or rare plant communities.

3.2 Fungi

The Proposed Action could reduce, fragment, and degrade existing habitat for mushrooms within the South Parcel and Kettle wetland buffer. The clearing of vegetation would remove decaying wood from the project area until trees in the reclaimed areas and wetland mitigation buffers reach maturity. The habitat conditions of the South Parcel are very similar to second growth forest common to the area, and this reduction in habitat would be considered an impact, but not a significant impact.

3.3 Animals

3.3.1 Birds

The Proposed Action could reduce and degrade existing foraging and breeding habitat for some bird species that use habitats within the South Parcel Project Area. The clearing of vegetation would increase the fragmentation and isolation of remaining habitats. The Project components with the

greatest potential impact on bird habitats are the clearing of vegetation from the South Parcel Project Area.

The clearing of currently vegetated areas would eliminate the existing foraging and breeding habitats for birds. In addition to direct loss of habitats, the clearing of vegetation could increase the fragmentation and isolation of remaining habitats. Reclamation of the mine slopes will continue to progress. The proposed Project will increase the acreage of reclaimed and reforested areas on the mine slopes by 177 acres.

The removal of the Kettle Wetland could disrupt bird habitat and reduce breeding, wintering, and migration habitat for bird species until habitat in the mitigation wetland is fully functional. Restored forests on reclaimed slopes are already maturing and would continue to provide new habitat to offset this impact.

3.3.2 Mammals

The proposed Project could alter habitat for mammal species within the Project area for reasons similar to those described for impacts to birds. The majority of species would disperse into adjoining habitats. The proximity of the Project area to similar intact habitats will provide dispersal routes as construction begins.

3.3.3 Amphibians and Reptiles

Within the Kettle Wetland, any existing amphibians would perish during the clearing of the surface vegetation and soils. New habitat with similar hydrology would be created in the mitigation wetland to compensate for these impacts.

3.3.4 Washington Department of Fish and Wildlife Priority Species

Removal of mature trees in the coniferous forest could reduce habitat for big brown bat, little brown bat, and Yuma myotis bat species. Clearing of forested areas within the South Parcel Project Area would reduce habitat that is thought to have once been within the historical range of gray squirrels but is unlikely to be occupied by the current population.

3.3.5 Threatened and Endangered Species

No ESA-listed species habitat would be altered directly as a result of the Proposed Action. See Anchor 2022 for more detailed analysis of the potential effects on fish species.

3.4 Indirect Impacts of the Proposed Action on Plants and Habitat

3.4.1 Conifer Forests

No potential indirect impacts to coniferous forest habitats outside the South Parcel Project Area associated with the proposed Project are anticipated.

3.4.2 Shrublands and Grasslands

No potential indirect impacts to shrublands and grasslands habitats outside the South Parcel Project Area associated with the proposed Project are anticipated.

3.4.3 Aquatic Resources

The aquatic resources of Sequalitchew Creek and the four wetland systems within the Restoration Area: East Edmond Marsh, West Edmond Marsh, and the Sequalitchew Creek Riparian Wetlands are within the area where wetland hydrology could be affected by changes in groundwater levels. The wetland hydrology of aquatic resources identified as Nearby Wetlands with the exception of the Seep Wetlands (Sequalitchew Creek Ravine Pond Lake, and Wetland 1D) could also be affected by changes in groundwater levels, but any effects are anticipated to be minor. The indirect effects of the Project on the Seep Wetlands are anticipated to be more severe. Groundwater seeps that support the hydrology of these wetlands would be reduced, resulting in a reduction or loss of wetland hydrology. The brackish marsh would not be affected by changes in groundwater levels due the dominance of tidal hydrology on that resource.

3.4.3.1 West Edmond Marsh and Wetland 1D

West Edmond Marsh and Wetland 1D are the two resources that are most likely to be affected by the proposed groundwater drawdown without implementation of the Restoration Plan. Due to the greater magnitude of the change in groundwater levels in these areas and the degree of connectivity between ground and surface water within these wetlands (City of DuPont 2007; Herrera Environmental Consultants 2005b; Aspect 2022). An analysis of the effects on these wetlands without mitigation indicates that the average water level in West Edmond Marsh would be 1.9 feet lower than under existing conditions. In wetter years, West Edmond Marsh would refill in the fall to similar elevations as under existing conditions but would dry up a month or two earlier in spring (see Figure F-6 in Appendix F of Aspect 2022). In drier years, the wetland seasonal high water levels would be 2 to 3 feet lower than under existing conditions, and in the driest years (e.g., 2005) the West Edmond Marsh is predicted to remain dry year-round. Earlier drying of saturated and inundated areas could have detrimental effects on the existing plant community. Wetland plant communities (and soils) are shaped by saturated and inundated conditions during the growing season (averages from March 1 to October 31) (Ecology 1997). Exotic plant invasion (particularly reed canarygrass)

favors this type of alteration when winter saturation and inundation are not sufficient to maintain existing plant communities or preclude noxious weed invasion.

Change of wetland areas along the margins of both wetlands (now saturated in the early spring) is unlikely. The jurisdictional wetland boundary is indicated by the presence of subsurface (within 12 inches below the soil surface) saturated conditions for 12.5% (approximately 30 or more consecutive days) of the growing season, as well as wetland soils and wetland plants (Ecology 1997). The high water levels in the marsh are currently controlled by the beaver dams in the system. Changes in groundwater elevation without mitigation would result in changes to surface water levels, which vary from year to year. In the wettest years, the wetland would still refill but would go dry one or two months earlier than under existing conditions. In drier years, the wetland would only partially refill, and the dry season would be extended. In the driest years, the wetland could remain dry year-round. These changes in reaching peak water levels are not anticipated to result in a loss of subsurface saturation for 30 days of the growing season within the current wetland boundary. The result of these hydrology changes to West Edmond Marsh during the spring would be changes in vegetation: Reed canarygrass would be expected to encroach farther into the wetland, whereas now it is limited to the wetland edge. Wetland shrubs would also be expected to advance toward slightly deeper areas of the wetland. The wetland boundary may or may not change, but in most areas the slopes are relatively steep, and any change would be relatively minimal. In a few areas where the wetland boundary is on flatter terrain it is possible that upland species could establish, thus reducing the size of the wetland in those locations. Typically, the wetland would still fill sufficiently to maintain hydrophytic vegetation at around the same elevation and meet the wetland hydrology criteria (Ecology 1997). It is more likely that a slow conversion of wetland habitats would occur; the changes could result in some conversion of aquatic wetland habitat to emergent wetland habitat and emergent wetland habitat to shrub-scrub wetland habitat.

3.4.3.2 East Edmond Marsh

An analysis of the drawdown effects on East Edmond Marsh indicates that there would be an average decrease in water level of 1.2 inches (Aspect 2022). The decrease would be greatest in June at about 1.5 inches and lowest in February at less than 0.1 inch. East Edmond Marsh would continue to follow the same seasonal pattern of fluctuation with the highest water levels in January through March and seasonal lows in August and September. It is unlikely that this change will have any measurable effect on the wetland given that this decrease would occur within a seasonal fluctuation in water level of more than 20 inches. Ultimately, continued beaver activity would have a far greater impact on water levels in the marsh.

3.4.3.3 Pond Lake

Pond Lake is an isolated water body, hydrologically connected to groundwater with little surface water inflow and no outflows. With the Proposed Action, the surface water level in Pond Lake is

conservatively projected to decrease by about 2 feet, the amount of groundwater drawdown in its vicinity. The surface water level in Pond Lake currently varies seasonally by up to 8 feet but more typically around 4 feet. Pond Lake goes dry in summer. With the Proposed Action, the seasonal variation would be 2 feet, and it would go dry a month earlier and rewet slightly later. Herbaceous vegetation in Pond Lake varies from year to year depending on when the water levels recede. With the Proposed Action the conditions observed during driest years would become common, with more emergent vegetation and less aquatic vegetation establishing. A sustained reduction in peak water levels could allow establishment of scrub-shrub wetland species along the wetland boundary and greater cover of reed canarygrass within the higher parts of the wetland. The relatively steep slopes around the wetland would prevent the wetland size from changing significantly.

3.4.3.4 Sequalitchew Creek and Riparian Forest Wetlands

Without restoration, Sequalitchew Creek west of Center Drive would experience reduced base flows as a result of reduction in seep and spring discharge caused by the drawdown of the Vashon Aquifer. A reduction of aquatic life would be expected to occur in the upper ravine without implementation of the Restoration Plan activities. More information on these effects is included in the *Fisheries Technical Report* (Anchor QEA 2022).

Without implementation of the Restoration Plan activities, the change in groundwater levels would eliminate the hydrologic support provided to the Sequalitchew Creek riparian forest wetlands, and some loss of the existing wetland vegetation would occur.

With implementation of the Restoration Plan activities, increased flows within Sequalitchew Creek are likely to cause changes to the existing stream morphology as a result of more energetic channel-forming processes more consistent with natural historical conditions. Current annual average flow rates in Sequalitchew Creek in the middle of the ravine are 1.0 to 1.6 cubic feet per second (cfs), with peaks near 5 cfs. Predicted flow rates of Sequalitchew Creek following implementation of the Restoration Plan are expected to average 11.2 cfs with peak flow during storm events that could reach near 60 cfs. These effects may cause some areas of existing wetland to be altered, although a net gain in water discharged to the riparian forest wetland is predicted to maintain or increase the total existing wetland area and increase hydrologic support throughout the growing season. The potential wetland alterations include conversion of wetland areas on the floodplain to active stream channels, loss of wetland vegetation nearer the existing channel and new wetland vegetation establishing farther from the existing channel. Some trees at the margins of the floodplain could fall due to increased inundation and the undermining of root systems, although fallen trees are also likely to contribute to large woody material in the stream which serves multiple ecological functions.

3.4.3.5 Sequalitchew Creek Ravine Seep Wetlands

With or without implementation of the Restoration Plan activities, dewatering of the aquifer is likely to indirectly impact the Seep Wetlands along the Sequalitchew Creek trail by disrupting the hydrology of these wetlands. These indirect impacts would result in the loss of wetland vegetation and function of the wetlands. The resulting loss in wetland area could be up to 0.13 acre of wetland habitat being converted to upland habitat due to insufficient saturation during the growing season.

Indirect impacts from changes in the aquifer would also affect the springs in the Sequalitchew Creek bed. These impacts could be mitigated by restoration. The effects on Sequalitchew Creek flow are described in Aspect 2022.

3.4.3.6 Brackish Marsh

The reduction in flows in Sequalitchew Creek resulting from dewatering of the Vashon Aquifer without implementation of the Restoration Plan are estimated at 1.3 cfs (Aspect 2022). While this is a significant fraction of the freshwater in the marsh, it would have little impact to the Brackish Marsh. The reduction in freshwater input would result in only a negligible increase in salinity in the marsh during high tides. Saltwater is denser than freshwater and the spatial extent of tidal flooding by saltwater would not be affected. Less freshwater input could result in changes in vegetation near the primary stream channel to more salt tolerant species. These changes would be subtle and may be difficult to detect. Alterations to the salinity elsewhere within the brackish marsh are predicted to be minor and would result in salinity values that are within the tolerance ranges for the existing plant communities documented in Anchor Environmental 2004a. No effect on the existing wetland is anticipated as a result of salinity alterations.

Increased flows associated with the implementation of the Restoration Plan would increase the rate of sediment transport to the lower ravine and brackish marsh. Historical alterations to the marsh including channelization of the stream and installation of a box culvert under the railway would direct sediment toward Puget Sound. Some fine sediment would continue to accumulate in the upper elevations of the intertidal marsh, which is part of the natural process of marsh formation and provides resiliency to sea level rise and episodic erosion.

3.4.3.7 Nearshore Springs

The springs that flow directly into Puget Sound express from the hillside near the toe of slope at the beach and there is no surface flow associated with these features within the South Parcel Project Area. No measurable change in groundwater flow from these springs is expected, and no impacts to these springs are expected as a result of the Proposed Action.

3.4.4 Animals

3.4.4.1 Birds

The alteration of wetland systems within the area subject to changes in groundwater level without restoration, particularly East and West Edmond Marsh, could disrupt bird habitat and reduce breeding, wintering, and migration habitat for bird species. These areas are documented to regularly attract concentrations of waterfowl (WDFW 2022a). However, the potential impacts to wetland area associated where changes in groundwater level is expected to be minor relative to the size of the wetland systems and in combination with the Restoration Plan activities.

3.4.4.2 Mammals

The alteration of Edmond Marsh and other wetland systems that could be modified by the changes in groundwater without mitigation could disrupt the existing wetland mammal habitat by removing existing water and food sources and sheltering vegetation, thereby reducing the available breeding and foraging habitat for aquatic habitat dependent mammal species (beaver). However, the potential reduction in wetland areas where changes in groundwater level are expected to be minor relative to the size of the wetland systems and in combination with the Restoration Plan activities. Use of the Seep Wetlands by mammals is unlikely, and a reduction in the size or the loss of the Seep Wetlands would have minimal effect due to the proximity of the much larger Sequalitchew Creek and its associated riparian areas, which provide superior mammalian habitat.

3.4.4.3 Amphibians and Reptiles

Loss of wetland area, alterations to seasonal inundation patterns, and subsequent changes in plant communities would reduce the area of habitats that support amphibians. These changes could indirectly disrupt amphibian habitat and reduce breeding, wintering, and foraging habitat for amphibian species.

The early drying of normally inundated areas could adversely affect amphibian breeding by lowering surface water levels during the breeding and rearing seasons. This could result in the loss of available habitat, leading to exposure of egg masses and rearing juveniles from reduced water levels. Tadpoles, juveniles, and adults may disperse to areas that remain inundated during early drying periods. However, the existing amphibian population likely uses all available habitats. Thus, unoccupied amphibian habitats are likely to be unavailable to individuals dispersing from drying portions of the wetlands. However, the potential reduction in wetland area associated with the changes in groundwater level is expected to be minor relative to the size of the wetland systems and in combination with the proposed Restoration Plan activities.

Proposed Restoration Plan activities would improve aquatic resource habitats within the Restoration Area compared to existing conditions that provide habitat for amphibian species.

3.5 Impacts of the No Action Alternative

3.5.1 Direct Impacts of the No Action Alternative to Plants and Habitat

Under the No Action Alternative, the South Parcel would not be mined and the property could be developed for manufacturing and research and residential uses under existing land use and zoning designations. The extent of development under the No Action Alternative projected is based on current zoning. The ultimate density of development would be controlled by Project-specific and regulatory elements such as setbacks, open space, and critical areas.

Under the No Action Alternative, development would occur consistent with the DMC Critical Areas chapter (DMC 25.105), which could allow for development withing 50 feet of the top of the Sequalitchew Creek ravine. Existing coniferous forest within the Expansion Area could be cleared under future development with landmark trees retained in accord with DMC requirements. There would be no changes in the use of the areas of the South Parcel zoned for Open Space; these areas currently include the naturally vegetated slope of the Sequalitchew Creek ravine and the Sequalitchew Creek pedestrian trail.

There would be no change in use of the areas within the existing mine. However, once the Re-Mine Area is reclaimed, it would likely be redeveloped according to its underlying zoning, similar to the South Parcel. The Kettle Wetland is within the existing mine and would remain intact, the buffers would remain vegetated, and mining operations would continue in other portions of the existing mine. The Kettle Wetland, its buffer, and other mine-related buffers could be reduced to the minimum width in the DMC.

3.5.2 Indirect Impacts of the No Action Alternative to Plants and Habitat

The Restoration Plan would not receive funding without the proposed Project and would not occur as part of the No Action Alternative. Under the No Action Alternative, the improvements and benefits to aquatic resource habitat proposed in the Restoration Area would not occur. Similarly, the impacts to groundwater associated with the Proposed Action would not occur.

3.5.3 Direct Impacts of the No Action Alternative to Animals

As described in Section 3.3.1, under the No Action Alternative, development could occur in the South Parcel Project Area resulting in clearing of forested and shrub habitat, reducing habitat for wildlife species that use these habitats. Direct impacts to animals would be similar to those described under Section 3.1.2.

3.5.4 Indirect Impacts of the No Action Alternative to Animals

Within the Restoration Area, wildlife species would not benefit from improved aquatic resource habitat conditions proposed under the Restoration Plan. The South Parcel would not undergo remediation from Tacoma Smelter Plume impacts leaving high concentrations of lead and arsenic in the soils.

3.6 Monitoring and Mitigation Measures

The Project proposes to mitigate for potential impacts to plants and animals and to monitor effects on surface water features and vegetation in areas that could potentially be affected. The Restoration Plan will be permitted and implemented contemporaneously with mining of the South Parcel. Among other things, the Restoration Plan will mitigate for the impacts of the mine. Monitoring and mitigation measures, including specific timeframes for monitoring and mitigation efforts, are defined in the Restoration Plan. The goal of the Restoration Plan is to offset potential impacts to aquatic resources within the area subject to changes in groundwater level.

Mitigation for impacts for the removal of the Kettle Wetland are identified in the Project *Wetland Mitigation Plan* (Anchor QEA 2021c). The design of the mitigation wetland complex is intended to create aquatic, wetland, riparian, and upland forest habitat by using groundwater intercepted within the mine. Specific Kettle Wetland mitigation goals include the following:

- Create a constructed palustrine depressional wetland complex consisting of forested, scrub-shrub, emergent, and aquatic bed wetland areas at least 3.56 acres in size.
- Provide adequate wetland acreage, functions, and values to mitigate all Project-related wetland impacts to the Kettle Wetland.
- Construct a vegetated buffer at least 100 feet around the boundary of the wetland.

Hydrologic changes will indirectly impact the Seep Wetlands; however, there will be no direct impacts (clearing, cut, or fill) to the wetland or its buffer. These changes will also not impact groundwater quality. The mitigation plan addresses these impacts through the creation of a larger complex of seep wetlands and springs within the mine. Springs and seeps will generally emanate on the eastern and southeastern slopes of the proposed mine in the South Parcel. Generally, seeps and springs will form within the lower one-third of the mine slope, approximately 20 to 30 vertical feet above the Olympia Beds.

Groundwater discharge will be greatest along the central and southern portion of the eastern slope and northeastern portions of the benches and will taper off to the north as the mine area approaches the Olympia Bed cutoff and to the south as the benches in the southeast corner get closer to the Sequalitchew Creek ravine. The specific locations of seeps and springs will depend on local variations in the outwash deposits related to silt content or areas of coarser materials. We can expect that there

will be localized areas of greater discharge and other areas with more distributed seepage or even little to no discharge.

This new seep wetland complex will be supported by approximately 7 cfs of groundwater expression through the slope. Quantitatively this is well over an order of magnitude more water than supports the ravine seeps. Within 1 year after active dewatering ends, the areas of the mine face that meet the criteria for wetland hydrology will be delineated. These areas will be colonized or planted with pioneer wetland species, such as horsetail *(Equisetum* sp.), buttercup (*Ranunculus* sp.), and miner's lettuce (*Montia fontana*). Additional species would be introduced later, once the soils have developed sufficiently to support seral grasses such as foxtails, rushes, sedges etc.

The buffers around these new seeps will be subject to the City of DuPont's Critical Areas Ordinance (DMC 25.105.050) and protected. The minimum buffer size is 50 feet. These buffers would be planted in accordance with the mine reclamation plan and monitored in accordance with the Wetland Mitigation Plan. Control of Scot's broom, reed canarygrass, Himalayan blackberry (*Rubus armeniacus*), and other noxious weeds within areas affected by the proposed Project would also be included as part of the Project mitigation activities.

3.7 Significant Unavoidable Adverse Impacts

3.7.1 Proposed Action

3.7.1.1 Direct Impacts

Significant unavoidable adverse direct impacts associated with the proposed South Parcel Project would be associated with the following Project elements:

- Drawdown of the Vashon Aquifer
- Clearing of vegetation from the proposed Re-Mine Area and Mine Expansion Area, including the removal of the Kettle Wetland and its buffer, and the removal of coniferous forest vegetation communities
- The clearing of currently vegetated areas would eliminate the existing foraging and breeding habitats for birds, mammals, and amphibian species. In addition to direct loss of habitats, the clearing of vegetation could increase the fragmentation and isolation of remaining habitats.

3.7.1.2 Indirect Impacts

Significant unavoidable adverse indirect impacts associated with the proposed South Parcel Project would be associated with the following Project elements:

- Drawdown of the Vashon Aquifer
- Loss of existing Seep Wetlands

Without restoration, drawing down the aquifer would reduce flows in Sequalitchew Creek to the extent that some flow would be subsurface. Changes in groundwater level could indirectly reduce the wetland area in Sequalitchew Creek riparian forest wetlands, West Edmond Marsh and Wetland 1D, and degrade wetland habitat in these wetlands due to early season loss of surface inundation and saturation in the early growing and breeding season. Aggradation of the brackish marsh could reduce the size and function of this wetland. The goal of the Restoration Plan is to offset potential impacts to these aquatic resources within the area subject to changes in groundwater level.

3.7.2 No Action Alternative

Future development consistent with underlying zoning could occur in the South Parcel Project Area resulting in clearing of coniferous forested and wetland habitat and reducing habitat for wildlife species that use these habitats. The clearing of currently vegetated areas could eliminate the existing foraging and breeding habitats for birds, mammals, and amphibian species. In addition to direct loss of habitats, the clearing of vegetation could increase the fragmentation and isolation of remaining habitats.

The Restoration Plan would not occur as part of the No Action Alternative. Under the No Action Alternative, the improvements and benefits to aquatic resource habitat proposed in the Restoration Area would not occur.

Drawdown of the Vashon Aquifer would not occur as part of the No Action Alternative. Under the No Action Alternative, the loss of the 0.15 acre of Seep Wetlands would not occur.

3.7.3 Monitoring of Dewatering Operations

A Monitoring Plan (Aspect 2017) has been prepared to observe and respond to changes in groundwater levels. The goals of that plan include the following:

1. Maintain groundwater at or above predicted levels beneath Edmond Marsh and Sequalitchew Creek.
2. Maintain groundwater conditions conducive to safe and efficient mining and processing of the South Parcel aggregates.

The document also includes a detailed adaptive management plan and a description of the relationship to the Adaptive Management Process for the Restoration Plan.

3.7.4 Monitoring of the Restoration Plan

Monitoring and adaptive management of the Restoration Plan are described within the plan (Aspect 2018). This plan includes performance thresholds that are tied to specific goals and objectives. The goals of that plan include the following:

1. Restore year-round flows in Sequalitchew Creek from Sequalitchew Lake to the mouth to support natural life history stages of native salmonid species that use the system.
2. Improve habitat conditions for native salmonid populations in the Sequalitchew Creek watershed.

Potential response actions are called out if specific performance thresholds are not met. In addition, there are aspirational thresholds identified that, if achieved, would indicate the plan's continued success.

4 Cumulative Effects of the Proposed Action and Restoration Plan

The South Parcel Project, described in Section 1.1, assumes implementation of the Restoration Plan, developed by CalPortland and Environmental Caucus, as a separate but related action. This Plan seeks to restore and enhance streamflow and ecological functions from Sequalitchew Lake through Edmond Marsh into Sequalitchew Creek ravine. The Restoration Plan is intended to sequentially restore diverted flows back to the creek, improve the sustainability of flows through the system, and restore aquatic habitat by removing flow-related fish passage barriers and increasing the habitat available to aquatic species.

Predicted water surface elevations and flows have been prepared to understand the specific cumulative impacts of mining and restoration. A thorough discussion of this analysis can be found in the Earth and Water Resources Report (Aspect 2022). The effect of these predicted changes on plants and animals is discussed below.

4.1 Restoration Plan Benefits

The restoration is a separate but related action, and its benefits and impacts will be evaluated comprehensively in a separate environmental review document. The assessment here is preliminary and provided to give context to the cumulative effects to the watershed. The mining and restoration projects would reverse many of the adverse impacts related to diversion of water from the Sequalitchew Creek watershed and creek that have occurred over many decades. The benefits would be noticeable over a large portion of the stream and wetland habitats in the basin and would largely restore lost and reduced ecosystem functions including the movement of water, sediment, nutrients, biota, and dissolved gasses through the watershed from the headwater springs on Sequalitchew Lake to Puget Sound. The reconnection of Sequalitchew Creek to its historical primary source of flow, Sequalitchew Lake, would address the root cause of the primary historical impacts to the system.

These projects have the potential to restore an annual average of 12.6 cfs to a 1,200-foot reach of Sequalitchew Creek that currently experiences little to no consistent flow (Aspect 2022). Seasonally, the flows in this reach are predicted to be between 2.5 cfs in August up to just over 25.7 cfs in March. Flows of this magnitude would re-establish a functioning stream in the now frequently dry channel, providing new aquatic and riparian habitat and a connection between the Sequalitchew Creek ravine and the marshes. This would provide a corridor for both aquatic and terrestrial species and would provide new opportunities for species expansion and recovery.

In the Sequalitchew Creek ravine, the restoration and mining projects would result in a seven-fold increase in flow on an annual average basis, from the current 1.6 cfs up to 12.9 cfs. Peak flows could reach up to 65 cfs, sufficient to restore the natural channel-forming processes necessary to improve

habitat conditions in the ravine. Currently, the flows in the ravine are inadequate to move sediment effectively, create pools, or scour finer-grained materials from the substrate to create conditions suitable for spawning. Peak flows could be adaptively managed by adjusting the weir at the Diversion Canal and limiting flow through Edmond Marsh to prevent flooding or detrimental effects to the wetlands or the stream channel.

The restoration project would also have some direct benefits to the wetlands. Specifically, it would raise the water level in Hamer Marsh, expanding its size; remove fill and improve aquatic habitat conditions at the Lake Outlet Area; and reconnect East and West Edmond marshes by replacing a portion of the Robinson Trail separating the marshes with a bridge. Conditions in much of the marsh today favor a scrub-shrub plant community. Restoration would also reduce fluctuation in water surface through the growing season near the railroad grade allowing enlargement of the forested wetland community. Restoration would affect the conditions sufficiently to allow establishment of emergent vegetation in the western extent of the complex where inundation will persist through more of the growing season and could result in the formation of forested wetlands in East Edmond Marsh where water levels would be reduced and fluctuate less throughout the year. These effects would increase the diversity and complexity of habitats.

The greatly increased flow through Edmond Marsh would also improve water quality conditions by increasing dissolved oxygen concentrations and diluting and flushing an area of elevated iron concentrations in the center of the marsh.

4.2 Impacts of Restoration

Restoring the natural flow regime to the Sequalitchew Creek watershed, in combination with lower groundwater levels resulting from mining, would result in several impacts: a reduction in wetland area, increase in summer stream temperatures, and increased frequency of periods of high flow in winter and spring.

Water levels in Eastern East Edmond Marsh and Edmond Marsh would return to water levels more consistent with recent history but would result in a loss of current wetland area. At present the East Edmond Marsh wetlands are larger and deeper than they have been in the past several decades as a result of beaver activity and the secondary outlet for flow provided by the Diversion Canal. Water surface elevations in East Edmond Marsh are currently higher than in Sequalitchew Creek. Lowering the water levels in some areas of the marshes is necessary to restore flow from Sequalitchew Lake, as the marsh water levels are currently higher than the lake forcing water to flow into the Diversion Canal instead of Sequalitchew Creek.

The flow from Sequalitchew Lake is also warmer in summer than the current flow in the ravine. The Project would represent a return to a more natural, surface-flow-dominated condition, but one with

warmer stream temperatures that could approach or exceed biological criteria for coho salmon (*Oncorhynchus* kisutch) during much of the spring and summer months. Water originating from Sequalitchew Lake is warmer than groundwater because it is warmed by the sun in the lake and this water would be further warmed as it slowly flows through the marshes.

Finally, there are predicted to be infrequent periods when the mining and restoration projects would result in streamflows that are lower than currently occur. This condition would occur during extended dry periods, when outflow from Sequalitchew Lake is naturally low or non-existent. Streamflows would be lower than existing conditions about 10% of the time, typically in August and September of particularly dry years. Existing flows during these periods currently average 0.83 cfs and do not provide aquatic habitat for anadromous fish; mining and restoration would further reduce these flows by more than half during these periods (to 0.44 cfs).

4.3 Cumulative Effects

This section identifies cumulative effects on biological resources for the Proposed Action and implementation of the Restoration Plan. Cumulative effects analysis is an evaluation of the combined effects on biological resources for the Proposed Action and present and reasonable and foreseeable projects in the vicinity of the study area. This analysis is focused on Sequalitchew Creek and the wetlands. Potential restoration activities of stream and wetland habitats in the Sequalitchew Creek watershed upstream of the Restoration Plan area at the JBLM would not occur without the proposed Restoration Plan activities downstream of the JBLM. Upland areas would be only minimally affected by restoration. Each section is organized to discuss aquatic habitat first, followed by water quantity, then water quality.

4.3.1 Sequalitchew Creek

The combined effects of proposed mining and restoration plan projects on stream habitat would include a re-establishment of flow from Sequalitchew Lake to flow through the marshes and into Sequalitchew Creek ravine. The projects would also result in re-establishing the ecosystem process, specifically, the movement of water, sediment, nutrients, biota, and dissolved gasses through the watershed from the headwater springs on Sequalitchew Lake to Puget Sound. The increase in hydrology and stream energy would increase aquatic ecosystem productivity and create and maintain habitat diversity.

Re-establishment of peak flows and the associated sediment movement is key to restarting the arrested habitat-forming processes downstream of Edmond Marsh and a key objective of the Restoration Plan. Currently, even where flows persist perennially, they are inadequate to move sediment effectively, create pools, or scour finer-grained materials from the substrate to create conditions suitable for spawning. The input of sediment and organic matter will stimulate biological productivity and develop greater resources at the lower trophic levels. Restoration would also result

in pool and riffle habitat formation over time. This habitat and development of lower trophic productivity are key to developing conditions sufficient to restore target species such as chum (*Oncorhynchus keta*) and cutthroat trout (*O. clarkii*) in the system. Chum will also benefit from the restoration of a more varied hydrograph. Puget Sound stocks typically spawn in freshwater systems in November and December as flows rise in response to winter rains. This effect has been limited in the system due to the current lack of surface water connectivity. The *Dupont Aggregates South Parcel Project Fisheries Technical Report* (Anchor QEA 2022) contains additional information and assessment of the impacts to fisheries from the Proposed Action and the No Action Alternative.

4.3.1.1 Flow

The cumulative effect of the mining and restoration projects on streamflow was evaluated by predicting streamflows at two locations: in the dry reach between West Edmond Marsh and Sequalitchew Creek ravine, and in Sequalitchew Creek at the mid-ravine gage.

4.3.1.1.1 Dry Reach

Under existing conditions, the dry reach currently experiences no consistent flow passing through the entire reach. The bottom of the dry reach is above the current groundwater levels, so ground infiltration in the dry reach would not be affected by lowering of groundwater with mining.

The mining and restoration projects are predicted to result in an average flow of 12.6 cfs in the dry reach. The flow would vary seasonally from a monthly average of 2.5 cfs in August to 25.7 cfs in March as shown in Figure 5. Peak flows could be as high as 65 cfs if all water is routed through the wetlands during peak flow events. To avoid flooding during peak flows, the highest flows could be directed to the Diversion Canal or detained in the marshes. The results presented here do not account for the diversion of peak flows or detention in the marshes.

Streamflow in the dry reach was calculated by adjusting the daily average outflows from Sequalitchew Lake from 2003 to 2021 by the estimates of the gains or losses that would occur in the wetlands based on the results of the water balance model summarized in the Section 4.3.2, Wetlands, and presented in detail by Aspect Consulting (Aspect 2022). The dry reach was assumed to have a sealed bed under restored conditions (either naturally or through contingent actions), so no gains or losses were assumed to occur in the dry reach.

Modeling indicates there would be periods when there would be no outflow from West Edmond Marsh, as thus no flow in the dry reach. Water balance model results, based on hydrologic conditions observed over the 19-year period of record, indicate that water would not flow through the dry reach due to dry conditions on 401 days (or 7.7% of the time). These dry periods were predicted to last for multiple weeks to several months and occurred in five of the 19 years simulated by the model (2004, 2005, 2015, 2017, and 2018). The occurrence of these dry periods could be reduced or eliminated if

beaver management structures are built to store water and release it slowly and consistently during periods when there is no flow from Sequalitchew Lake.

4.3.1.1.2 Sequalitchew Creek at Mid-Ravine Gage

After passing through the dry reach, streamflows would enter the Sequalitchew Creek ravine. The vast majority of flow would originate from Sequalitchew Lake, but there would be contribution from springs within the ravine. Spring contribution related solely to the Vashon Aquifer would be reduced by approximately 79% (Aspect 2022). This flow would be augmented by the addition of new hyporheic input from streamflow restoration in the dry reach. Aquitards at the existing springs would force both sources of water in the aquifer to the existing springs.

Streamflows in Sequalitchew Creek ravine were predicted at the mid-ravine gage location (formerly known as the "upper gage") for comparison with the existing gage record. Streamflows were predicted by starting with the flows predicted for the dry reach, as described above, and adding in spring flow occurring in the upper portion of the Sequalitchew Creek ravine.

Spring flow in the upper reaches of the Sequalitchew Creek ravine would be affected by the lowered groundwater levels associated with mining. The groundwater model results for Step 4 of dewatering, the long-term condition that would persist after active dewatering has ceased, predict a reduction in spring flow of 79%, varying from 73% in January to 86% in summer. The reduction in spring flow was accounted for by scaling the average daily flow records from the mid-ravine gage record by the corresponding monthly percent reductions in spring flow. The scaled-down spring flow was then added to the predicted dry reach flow to create the predicted flow at the upper gage with mining and restoration.

On average, flow in Sequalitchew Creek at the mid-ravine gage would generally be similar to but slightly higher than the flows in the dry reach (i.e., 0.4 cfs greater), reflecting the input of spring flow. The annual average flow at the upper gage would be 12.9 cfs. Monthly average flows would range from 2.5 cfs in August to 26.3 cfs in March as shown in Figure 5. Peak flows would be generally the same magnitude (approximately 60 cfs) as in the dry reach.

There would be periods when the cumulative effects of the mining and restoration projects would result in a reduction in flows at the mid-ravine gage when compared with the existing condition. Of the 19 years evaluated, flows would be lower with the projects during 45 periods, lasting a total of 475 days, or about 10% of the time. Included in this tally are 24 additional days when there would be no flow at the mid-ravine gage. Under existing conditions, there were 7 days with no measurable flow at the gage. As noted above, these effects could be mitigated in part or in whole by careful implementation of the beaver management actions called for in the Restoration Plan

The median duration of a period when flows would be lower with mining and restoration (hereafter referred to as a "lower flow event") was 3 days, but there were seven lower flow events lasting more than 2 weeks long. The longer events occurred in 6 of the 19 years simulated (2004, 2005, 2015, 2016, 2017, and 2018). The longest single lower event was 98 days ending in October 2017. However, lower flow events dominated the summer and fall of 2005, when there were four lower flow events between July 20 and December 23 lasting a total of 134 days. Lower flow events occurred most commonly in July, August and September, but occasionally occurred all months except March. The average streamflow during lower flow events was 0.83 cfs under existing conditions and would be 0.44 cfs with mining and restoration. The decrease in streamflow during lower flow events ranged from 0.1 cfs up to 1.6 cfs. Again, these effects could be mitigated in part or in whole by careful implementation of the beaver management actions called for in the Restoration Plan.

4.3.1.2 Sequalitchew Creek Temperature

The mining and restoration projects would affect stream temperature in the Sequalitchew Creek ravine by introducing a large quantity of water from a source with a different temperature. The effects would vary seasonally as the volume of water from Sequalitchew Lake and its associated temperature varies. In summer, the outflow from Sequalitchew Lake is warmer than Sequalitchew Creek; in winter, it is colder.

Sequalitchew Creek would experience warm temperatures in June, July and August, with temperatures reaching up to 21°C (70°F) and cool temperatures in winter, down to 5°C to 6°C (41°F to 43°F) as shown in Figure 6. The predicted stream temperatures would be considerably warmer than the current spring discharge in the creek for most of the year. The surface water quality criterion for temperature applicable to Sequalitchew Creek is 16°C for the 7-day average of daily maximums. The analysis based on grab samples suggests that this threshold may be exceed from May to September.

Historically, the stream temperatures in Sequalitchew Creek were likely closer to those observed today in the lake outflow, and the steady, cool temperatures currently observed in the ravine reflect the proportionally greater input of groundwater resulting from diversion of the lake outflow from the system.

The change in stream temperature was evaluated quantitatively on a monthly basis by using a linear mixing equation with the observed temperatures for Sequalitchew Lake (with 1°C added to account for warming in the marshes) and Sequalitchew Creek, and the estimated future flow rates from each source. A discussion of the impacts of these changes in stream temperature on fisheries can be found in the *Dupont Aggregates South Parcel Project Fisheries Technical Report* (Anchor QEA 2022).

4.3.2 Wetlands

The Sequalitchew Marsh wetland complex has increased in size by more than 30 acres since the late 1990s when efforts to maintain a channel through the system were abandoned, and beaver dams began to raise water levels, preventing flow from reaching the ravine and redirecting nearly all flow to the Diversion Canal (Figure 3). A fundamental goal of the Restoration Plan is to direct flows from the Diversion Canal back down Sequalitchew Creek. This requires restoring the historical gradient from the outlet of Sequalitchew Lake to the top of the ravine. This will necessarily require a lowering of water levels in some parts of the wetland complex resulting in a reduction of wetland acreage.

During the Restoration Plan stakeholder process, the tradeoff between wetland impacts and creek flow was considered, and the stakeholders recommended an aggressive approach to increasing gradient to improve creek flows over a less aggressive approach to maintain wetland acreage and potentially sacrifice some creek flow (SPSSEG 2014). The restoration of flow using flexible levelers in beaver dams would limit the losses of wetland area and wetland function relative to the approach used in the 1980s when an open channel was maintained through the system. Wetland conditions in the 1980s are representative of a more aggressive approach to maintain the gradient and flow through the system. Aerial imagery and wetland delineations from around that period are useful in understanding the habitat conditions at the extreme of effects that could occur as a result of the restoration project. Flexible levelers can also be designed in such a way as to limit high flows by storing water behind beaver dams and release more water during periods when flows from upstream (Sequalitchew Lake) are low.

Some wetland and lake fringe habitats would be gained. Raising water levels in Hamer Marsh would compensate for some wetland loss. Removing fill from Edmond Marsh would compensate for some wetland loss and more importantly improve connectivity and function in the wetland.

Wetland functions and values have been quantified using metrics developed by Ecology. These include wetland rating scores and a hydrogeomorphic assessment methodology. Predictions of the effects on habitat, water quality, and hydrology were reviewed against the scoring criteria. In general, the changes related to the cumulative effects of mining and restoration were not sufficient to change scores. Of note is that the restoration of flow between Edmond Marsh and the ravine provides the opportunity to improve wetland functions and values to existing habitats in the ravine, brackish marsh and stream delta.

Cumulatively, the wetland restoration project and mine project would result in a significant but unavoidable loss of wetland acreage. Comparing existing wetland acreage to conditions in the 1980s, when every effort was made to channelize the wetlands to improve flows and no effort was made to maintain wetland acreage in the system, likely provides a conservative estimate of potential wetland loss that could result from the projects. Careful management of flexible levelers would minimize the

lost wetland acreage, allow for a greater diversity of wetland habitats in the complex, and most importantly develop greater ecosystem connectivity.

4.3.2.1 Marsh Water Levels

As outlined in the Restoration Plan, reconnecting flow from Sequalitchew Lake to the Sequalitchew Creek ravine will require lowering water levels in some areas of the marshes in order to establish a consistent downhill gradient. Currently, the water levels in Eastern East Edmond Marsh and East Edmond Marsh are higher than the typical lake level of about 211.5 feet, preventing any outflow from the lake from reaching the marshes. Restoration would create a gradient in Eastern East Edmond Marsh and in Edmond Marsh from elevation 2010.5 to 206.5 feet (North American Vertical Datum of 1988).

These target elevations are significantly lower than the current water levels in these marshes. A comparison of the existing and future marsh water levels is shown in Figure 5. The target water levels of the mining and restoration scenario achieve a difference in water surface elevations of 5 feet between the lake (typically 211.5 feet) and West Edmond Marsh (target elevation 206.5 feet). Over the 8,700-foot flow path through the marshes, these water levels would result in a hydraulic gradient of 0.0006%. This is a very low gradient, and streams in systems with similar gradients are often characterized by containing broad shallow channels, or multiple threaded channels. One or more broad (more than 20 feet), shallow (less than 2 feet) channels at this gradient would have sufficient capacity to convey the peak outflows from Sequalitchew Lake. Peak flow velocities in this system would be low (less than 1 foot per second).

The results of a water balance model, developed for the marshes to evaluate the combined effects of the restoration and mining projects, was developed based on an assumption that there would be little variation in wetland water levels with the projects, as there would almost always be more than enough flow from Sequalitchew Lake to keep the wetlands full to their target elevations. However, there are several summers during the simulation period when water levels in Eastern East Edmond Marsh would dip below the target elevations for a month or more. East and West Edmond Marshes would also experience occasional dips below the target elevation, but of lesser magnitude and much less frequently. These impacts could be reduced or eliminated by managing water level behind the beaver dams to store water and release it slowly during periods of low flow. The hydraulic gradient through the marshes would always be maintained, however, as the water level in Eastern East Edmond Marsh never dips below the water level in East Edmond Marsh allowing water stored in the marsh to flow downstream to the ravine.

A second key output of the water balance model is an understanding of the gains or losses in flow that would occur as it passes through the marshes. As water travels through the marshes, it would

still be subject to potential gains from precipitation, stormwater inflows, or discharge from groundwater, and losses to evapotranspiration or infiltration.

Model results indicate that most months of the year (March through October), the wetland system would experience the loss of a small amount of the flow from Sequalitchew Lake, ranging from a 1% loss in October up to 24% in loss in July. However, in the wetter months (November through February) some flow would be gained in the wetlands from surface water and groundwater inflows. Gains range from 2% in February up to 9% in December. These monthly average losses were used in the predictions of streamflow in the dry reach and Sequalitchew Creek ravine described above. The water balance model simulates the individual hydrologic processes that effect the wetlands, including precipitation, evaporation, surface inflows and outflows, subsurface flows, and groundwater recharge and discharge. The model predicts water level conditions on a monthly basis from 2004 to 2021, representing a range of climate conditions. The model was calibrated to observed water levels over that period and was able to closely reproduce the water levels, typically matching the observed water levels within 2 to 3 inches. For all wetlands, the model was able to reproduce the seasonal pattern of water levels and capture differences between wetter and drier years (e.g., the model accurately simulated years where West Edmond Marsh was completely dry in summer versus years where some water remained). Generally, the model fit is best for Hamer, East and West Edmond Marshes and weakest for Eastern East Edmond Marsh. Additional details about the development and use of the water balance model are presented in Aspect Consulting (Aspect 2022).

4.3.2.2 Wetland Water Quality

The proposed mining and restoration projects would benefit the water quality in Eastern East Edmond Marsh and Edmond Marsh by providing a high volume of high-quality water. The anticipated changes were evaluated qualitatively by comparing the water quality conditions in the outflow from Sequalitchew Lake with water quality conditions in the marshes.

With the mining and restoration projects, the residence time in the wetlands would reduce significantly, decreasing from weeks or months to days. Water quality in the wetlands would be dominated by the input from Sequalitchew Lake. As a result, dissolved oxygen would be higher, and the pH would be slightly more neutral. Temperature and turbidity have been about the same in the lake and marshes, so little change would be anticipated.

It is anticipated that the elevated iron concentrations observed in the center of Edmond Marsh would be resolved through flushing and dilution with Sequalitchew Lake water. The iron concentration in the outflow from Sequalitchew Lake has been measured on only one occasion (at 0.13 milligrams per liter [mg/L]), at a concentration below the elevated levels of 3 to 5 mg/L observed in Edmond Marsh near the railroad trail bridge and related seeps. While there is no state water quality criterion for iron in surface waters, British Columbia has established a water quality guideline for total iron of 1 mg/L

in surface water (Phippen et al. 2008). The marshes receiving flow from Sequalitchew Lake could be expected to have future iron concentrations near, but slightly above, the concentration in the lake, which based on the single observation, would be below 1 mg/L.

4.4 Cumulative Impacts to Specific Resources

The Restoration Plan, developed by CalPortland and the Environmental Caucus, seeks to restore and enhance streamflow and ecological functions from Sequalitchew Lake through Edmond Marsh into Sequalitchew Creek ravine. Restoration of Sequalitchew Creek seeks to address almost two centuries of human manipulation. The principal goals of the Restoration Plan are to restore flows in Sequalitchew Creek, portions of which are now dry. This goal will be achieved by implementing a series of actions in a coordinated and adaptively managed project. The Restoration Plan is intended to sequentially restore diverted flows back to the creek, improve the sustainability of flows through the system, and restore aquatic habitat by removing flow-related fish passage barriers and increasing the habitat available to aquatic species.

4.4.1 Cumulative Impacts to Conifer Forests

The restoration of the watershed would allow the re-establishment of conifer forests around the perimeter of Edmond Marsh. These forests have been recently lost to raising water levels, particularly on the northern boundary of East Edmond Marsh. Other impacts would be similar to those described in Sections 3.1.1 and 3.3.1.

4.4.2 Cumulative Impacts to Landmark Trees, Shrublands, and Grasslands

The implementation of the Restoration Plan would not further affect landmark trees, shrublands, or grasslands in the Project area or Project vicinity.

4.4.3 Cumulative Impacts to Aquatic Resources

The four Restoration Area Wetlands would be affected by implementation of the Restoration Plan. West Edmond Marsh and East Edmond Marsh would both experience changes in wetland hydrology. As the hydraulic gradient between Sequalitchew Lake and the west end of West Edmond Marsh is restored, the area of jurisdictional wetland and seasonal inundation will decrease in most locations. This is necessary to restore flows and reverse the effects of water diversion and beaver activity that has occurred since the 1990s. The creation of a gradient will allow flows out of Edmond Marsh, provide fish passage through the majority of the watershed, and improve water quality in the system.

4.4.3.1 West Edmond Marsh

West Edmond Marsh will be more frequently and continuously inundated in the deeper areas of the wetland, and seasonal fluctuations in water levels will decrease. This will occur as a lower and more

stable outlet hydrology is established in place of the existing beaver dam. The beaver dam currently prevents flow out of West Edmond Marsh, but it is occasionally breached.

Reducing or eliminating these rapid changes in hydrology will help to stabilize the vegetation communities which are currently susceptible to hydrologic fluctuations. Currently scrub-shrub wetland vegetation establishes in the marsh over several years only to be killed off when water levels rise. Emergent vegetation is not able to establish under the dead woody material before changes in water levels once again favor a scrub-shrub community.

4.4.3.2 East Edmond Marsh

Water levels in East Edmond Marsh are currently higher than in Eastern East Edmond Marsh and West Edmond Marsh. This reverses the gradient of Sequalitchew Creek preventing surface flow to the ravine from West Edmond Marsh. The restoration will lower water levels in East Edmond Marsh to restore a gradient from Lake Sequalitchew to the ravine. This will impact habitats, particularly along fringes of the wetland where forested areas will be able to re-establish. Forested wetland and wetland buffer has been lost over the past decades as water levels have risen. Rising water levels have also been responsible for the loss of scrub-shrub vegetation and detritus from those communities has prevented establishment of an emergent vegetation community.

4.4.3.3 Sequalitchew Creek Ravine Wetlands

The Sequalitchew Creek Ravine Wetlands will be affected as flows in the creek are restored. This will cause a change in the bankfull width of Sequalitchew Creek as well as the sediment load being actively transported downstream. Over the subsequent several decades the riparian and floodplain wetland communities will be affected by deposition of new floodplain terraces, channel migration, increased wet season flows and other natural stream processes.

4.4.3.4 Brackish Marsh

Due to the increased base and peak flows in Sequalitchew Creek, the brackish marsh at the mouth of Sequalitchew Creek are likely to be affected by increased sediment inputs and decreased salinity due to increased volumes of fresh water discharging into the wetland.

Increased sediment inputs into the brackish marsh due to increased flows in Sequalitchew Creek could modify the existing wetland topography, and as a result, the existing vegetation. Sedimentation would be minimized by controlling the discharge into Sequalitchew Creek during implementation of the Restoration Plan to prevent a rapid mobilization of sediments in the stream reaches upstream of the brackish marsh. Water discharge would be slowly increased to allow the channel and stream bank vegetation to adapt to the increased flow rates. The existing condition of sediments in the brackish marsh (dominance of cobbles and gravels in the channels) indicate that the existing input of fine-textured sediments is flushed during ebb tides. With appropriate upstream

mitigation, changes in sediment loading to the brackish marsh are expected to be minimal and would be further minimized by tidal flushing.

Salinity in the marsh will continue to be driven by tidal inflows and decreases in salinity associated with freshwater flows would only be expected during high flow events in winter months. Increased flow in Sequalitchew Creek with the Restoration Plan activities is not expected to affect existing brackish marsh vegetation or functions.

4.4.3.5 Other Wetlands

Restoration is not expected to have significant effects on the Nearshore Springs or Nearby Wetlands.

4.4.4 Cumulative Impacts to Birds

Implementation of the Restoration Plan will reverse the changes in bird habitat in East and West Edmond Marsh that have occurred over the last three decades. This will include a reorganization of some specific habitats include scrub-shrub wetlands and forested wetlands. It will increase the area of forested wetland buffer as water levels in some areas of East Edmond Marsh drop and increase the amount of and persistence of emergent wetland habitat in the west end of West Edmond Marsh.

4.4.5 Cumulative Impacts to Mammals

Beaver in the Edmond Marsh complex will be actively managed as part of the Restoration Plan. The intent is to maintain the beaver population while managing water levels to restore flow. Other mammal species are expected to see increases in available habitat, particularly where water levels drop providing additional denning opportunities in the wetland banks and increasing the size of upland islands within the wetland complex.

4.4.6 Cumulative Impacts to Amphibians and Reptiles

Amphibian reproduction can be adversely affected by sudden, non-seasonal changes in water levels. This occurs in West Edmond Marsh when the large beaver dam above the dry reach is breached. Amphibian eggs attached to the stalks of emergent vegetation will suddenly be above water, causing complete mortality. Areas of reduced wetland area in the Edmond Marsh complex could reduce the area of habitat for some amphibian species, while others would benefit from the re-establishment of the forested riparian buffer.

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Figures

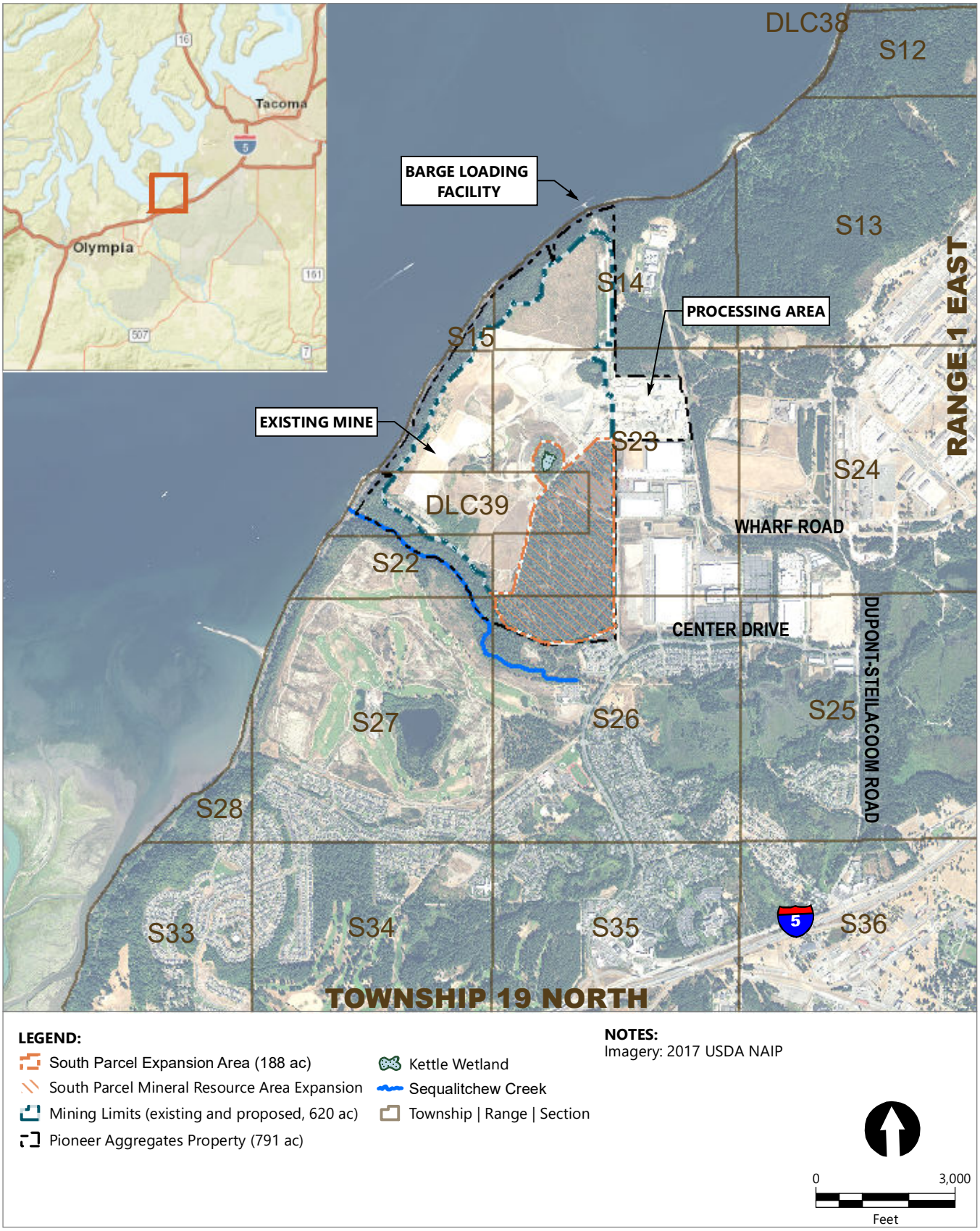

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Figure 1
Vicinity Map
Plants and Animals Technical Report
Pioneer Aggregates South Parcel Project

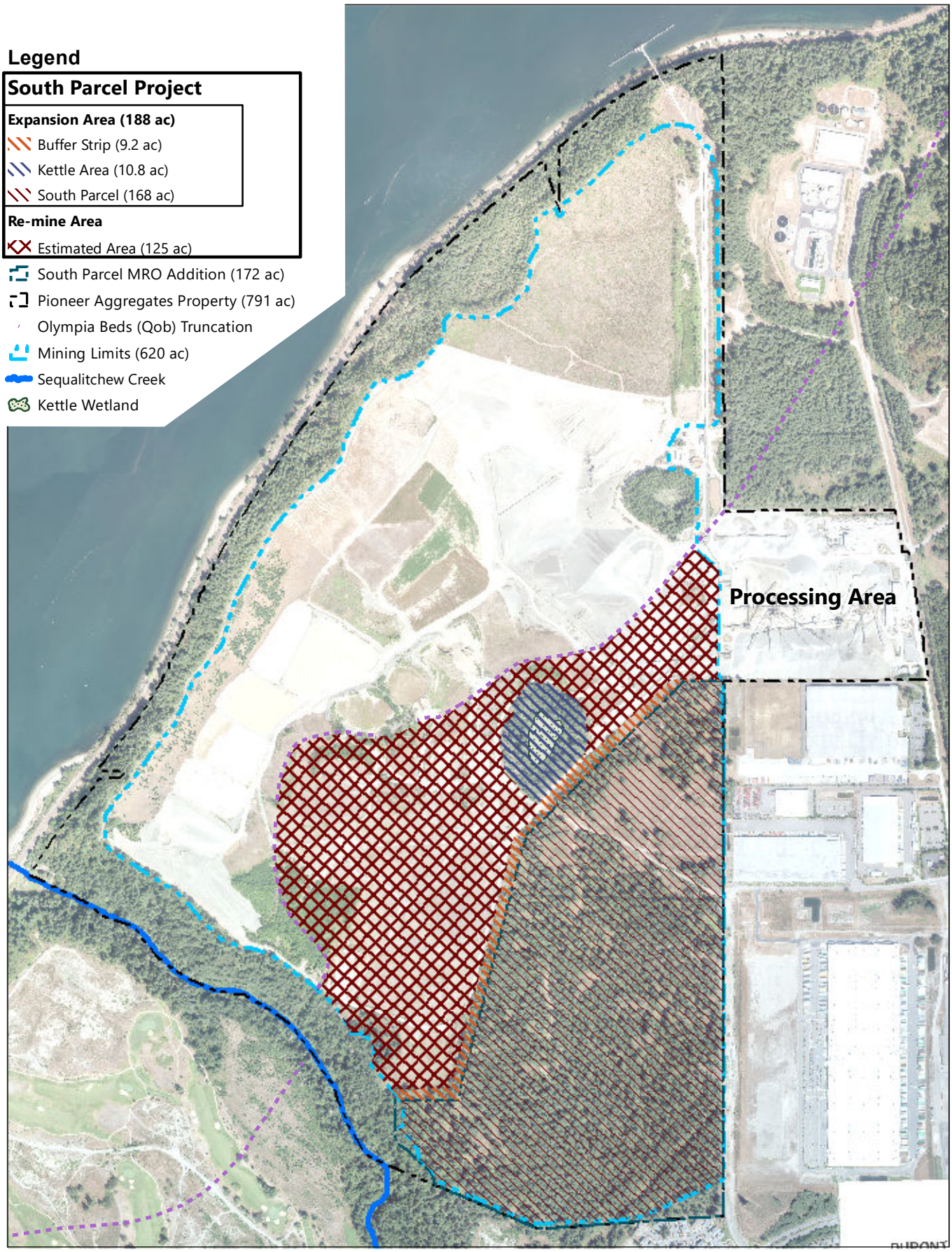

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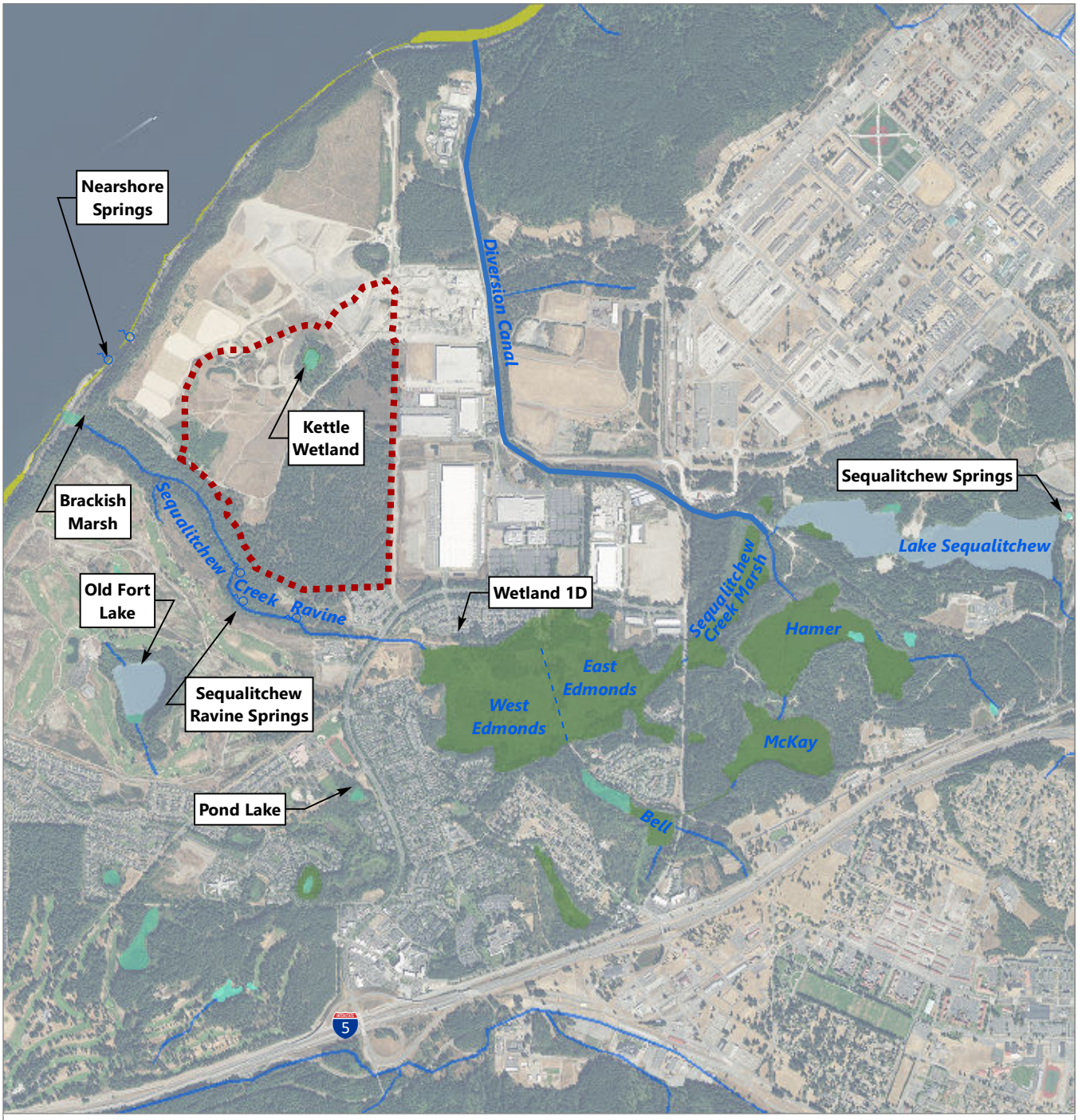
Figure 2
Project Components
Plants and Animals Technical Report
Pioneer Aggregates South Parcel Project



LEGEND:

- South Parcel Project

Aquatic Resources

- Stream/ Canal
- Freshwater Pond
- Spring
- Lake
- Estuarine and Marine Wetland
- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland

NOTES:
This map was created by modifying the USFWS National Wetland Inventory to correct inaccuracies and add additional detail

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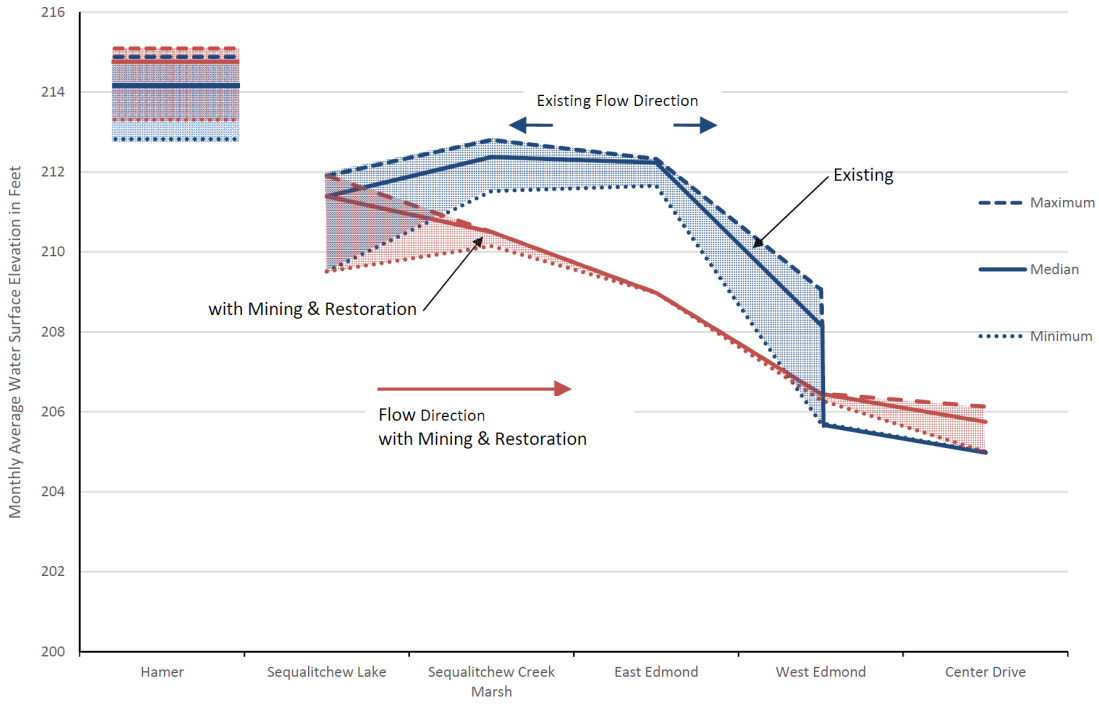
Figure 3
Aquatic Resources
Plants and Animals Technical Report
Pioneer Aggregates South Parcel Project

Predicted Surface Elevations in the Sequalitchew Creek Watershed



Predicted Annual Average Hydrograph in Sequalitchew Creek

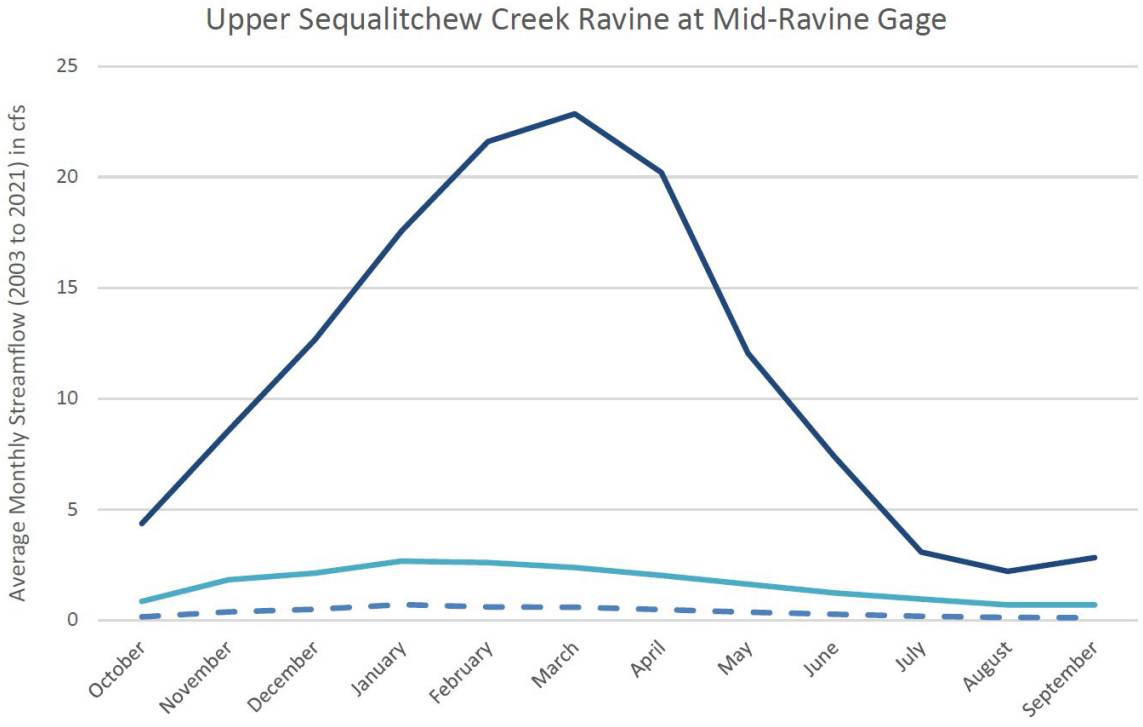


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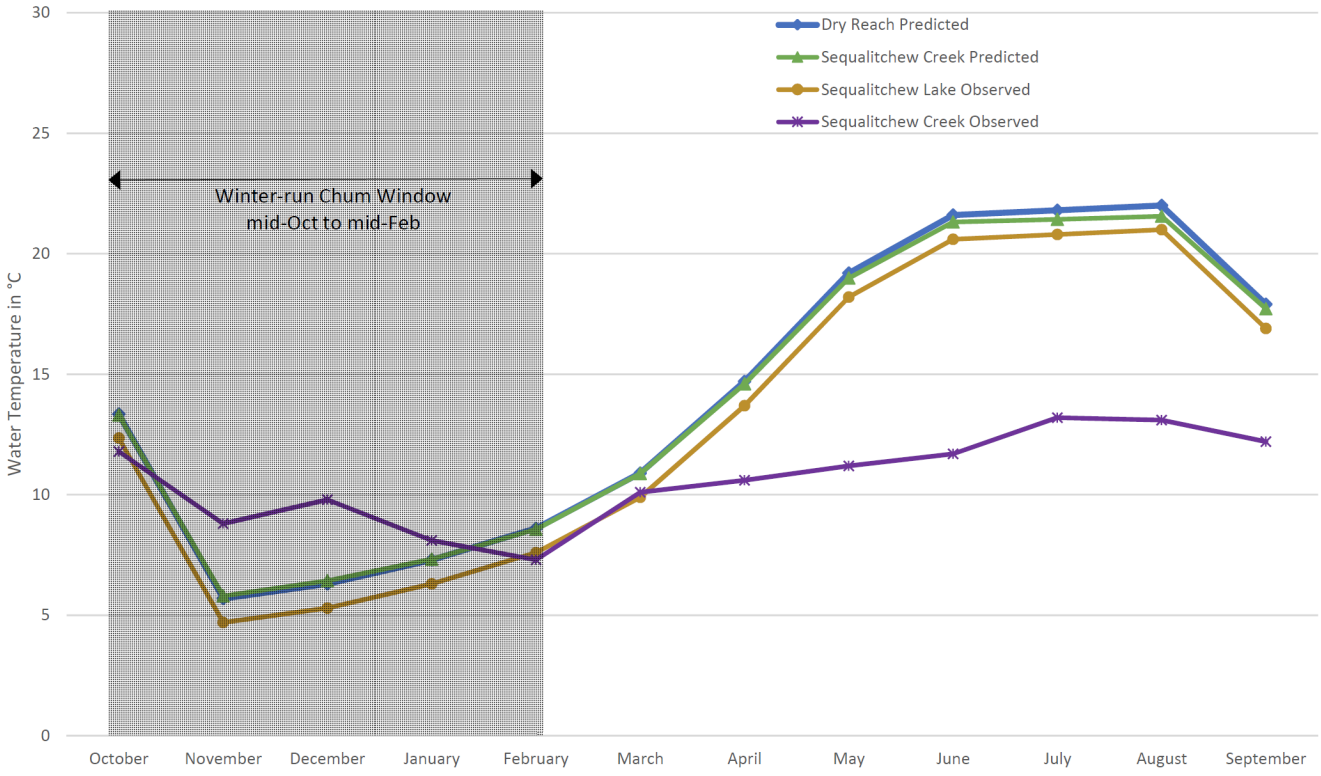
Figure 4
Predicted Water Surface Elevations and Flows
Plants and Animals Technical Report
Pioneer Aggregates South Parcel Project

Predicted Effects on Stream Temperature in Sequalitchew Creek Before and After Mining and Restoration

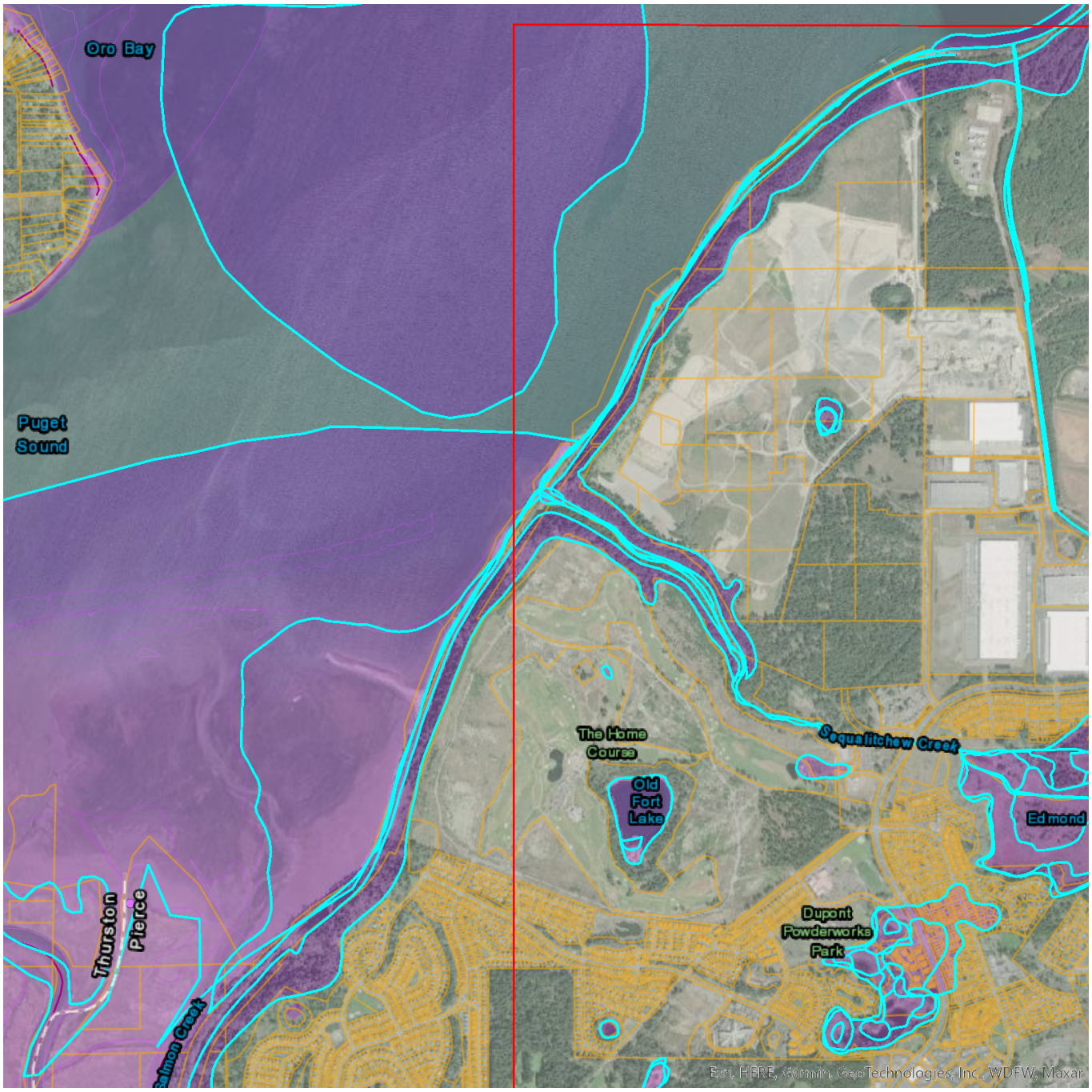


Adapted from Aspect 2016

Filepath: I:\Projects\Cal Portland\Dupont Aggregate\SEPA\SEIS 2022\Plants and Animals\Figures\Figure5.docx

Appendix A
Washington Department of Fish and Wildlife Priority Habitats and Species in the Project Area

Priority Habitats and Species on the Web



Report Date: 09/19/2022

User Comments/Notes:

WDFW Priority Habitats and Species in the Vicinity of the Project Area.

PHS Species/Habitats Overview:

Occurence Name	Federal Status	State Status	Sensitive Location
Western gray squirrel	N/A	Threatened	No
Coho	N/A	N/A	No
Surf Smelt	N/A	N/A	No
Resident Coastal Cutthroat	N/A	N/A	No
Summer Chum	N/A	N/A	No
Pacific Sand Lance	N/A	N/A	No
Cutthroat	Not Warranted	N/A	No
Pandalid Shrimp	N/A	N/A	No
Dungeness crab	N/A	N/A	No
Wetlands	N/A	N/A	No
Biodiversity Areas And Corridor	N/A	N/A	No
Waterfowl Concentrations	N/A	N/A	No
Estuarine and Marine Wetland	N/A	N/A	No
Freshwater Emergent Wetland	N/A	N/A	No
Lake	N/A	N/A	No
Freshwater Forested/Shrub Wetland	N/A	N/A	No
Big brown bat	N/A	N/A	Yes
Little Brown Bat	N/A	N/A	Yes
Yuma myotis	N/A	N/A	Yes

PHS Species/Habitats Details:

Western gray squirrel	
Scientific Name	*Sciurus griseus*
Priority Area	Occurrence
Site Name	JBLM
Accuracy	GPS
Notes	WESTERN GRAY SQUIRREL NEST IN PIPO
Source Record	113567
Source Dataset	WS_OccurPoint
Source Date	WS_OccurPoint
Source Name	UNKNOWN/WDFW
Source Entity	WA Dept. of Fish and Wildlife
Federal Status	N/A
State Status	Threatened
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	Y
Display Resolution	AS MAPPED
ManagementRecommendations	http://wdfw.wa.gov/publications/pub.php?id=00027
Geometry Type	Points

Coho	
Scientific Name	*Oncorhynchus kisutch*
Priority Area	Occurrence/Migration
Site Name	Sequalitchew Creek
Accuracy	NA
Notes	LLID: 1226656471169, Fish Name: Coho Salmon, Run Time: Unknown or not Applicable, Life History: Anadromous
Source Record	50424
Source Dataset	SWIFD
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
More Info	http://wdfw.wa.gov/wlm/diversty/soc/soc.htm
Geometry Type	Lines

Surf Smelt	
Scientific Name	*Hypomesus pretiosus*
Priority Area	Breeding Area
Site Name	Station Number: 7
Accuracy	NA
Source Record	20585
Source Dataset	Forage_Fish_Survey
Source Date	Forage_Fish_Survey
Source Name	Not Given
Source Entity	WDFW
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Species or Habitat
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
Geometry Type	Lines

Resident Coastal Cutthroat	
Scientific Name	*Oncorhynchus clarki*
Priority Area	Occurrence/Migration
Accuracy	NA
Notes	LLID: 1226135471088, Fish Name: Cutthroat Trout, Run Time: Unknown or not Applicable, Life History: Unknown
Source Record	49272
Source Dataset	SWIFD
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
More Info	http://wdfw.wa.gov/wlm/diversty/soc/soc.htm
Geometry Type	Lines

Coho	
Scientific Name	*Oncorhynchus kisutch*
Priority Area	Occurrence/Migration
Accuracy	NA
Notes	LLID: 1226157471128, Fish Name: Coho Salmon, Run Time: Unknown or not Applicable, Life History: Anadromous
Source Record	49328
Source Dataset	SWIFD
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
More Info	http://wdfw.wa.gov/wlm/diversty/soc/soc.htm
Geometry Type	Lines

Resident Coastal Cutthroat	
Scientific Name	*Oncorhynchus clarki*
Priority Area	Occurrence/Migration
Accuracy	NA
Notes	LLID: 1226220470981, Fish Name: Cutthroat Trout, Run Time: Unknown or not Applicable, Life History: Unknown
Source Record	49447
Source Dataset	SWIFD
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
More Info	http://wdfw.wa.gov/wlm/diversty/soc/soc.htm
Geometry Type	Lines

Resident Coastal Cutthroat	
Scientific Name	*Oncorhynchus clarki*
Priority Area	Occurrence/Migration
Site Name	Sequalitchew Creek
Accuracy	NA
Notes	LLID: 1226656471169, Fish Name: Cutthroat Trout, Run Time: Unknown or not Applicable, Life History: Unknown
Source Record	50422
Source Dataset	SWIFD
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
More Info	http://wdfw.wa.gov/wlm/diversty/soc/soc.htm
Geometry Type	Lines

Resident Coastal Cutthroat	
Scientific Name	*Oncorhynchus clarki*
Priority Area	Occurrence/Migration
Accuracy	NA
Notes	LLID: 1226157471121, Fish Name: Cutthroat Trout, Run Time: Unknown or not Applicable, Life History: Unknown
Source Record	49326
Source Dataset	SWIFD
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
More Info	http://wdfw.wa.gov/wlm/diversty/soc/soc.htm
Geometry Type	Lines

Summer Chum	
Scientific Name	*Oncorhynchus keta*
Priority Area	Occurrence/Migration
Site Name	Sequalitchew Creek
Accuracy	NA
Notes	LLID: 1226656471169, Fish Name: Chum Salmon, Run Time: Summer, Life History: Anadromous
Source Record	50423
Source Dataset	SWIFD
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
More Info	http://wdfw.wa.gov/wlm/diversty/soc/soc.htm
Geometry Type	Lines

Pacific Sand Lance	
Scientific Name	*Ammodytes hexapterus*
Priority Area	Breeding Area
Site Name	Station Number: 5
Accuracy	NA
Source Record	20583
Source Dataset	Forage_Fish_Survey
Source Date	Forage_Fish_Survey
Source Name	Not Given
Source Entity	WDFW
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Species or Habitat
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
Geometry Type	Lines

Cutthroat	
Scientific Name	*Oncorhynchus clarki*
Priority Area	Occurrence
Site Name	Sequalitchew Creek
Accuracy	NA
Notes	LLID: 1226656471169, Stock Name: West South Sound Coastal Cutthroat, Run: Unspecified, Status: Unknown
Source Record	7020
Source Dataset	SASI
Source Name	Not Given
Source Entity	WDFW Fish Program
Federal Status	Not Warranted
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
More Info	http://wdfw.wa.gov/wlm/diversty/soc/soc.htm
Geometry Type	Lines

Resident Coastal Cutthroat	
Scientific Name	*Oncorhynchus clarki*
Priority Area	Occurrence/Migration
Accuracy	NA
Notes	LLID: 1226157471128, Fish Name: Cutthroat Trout, Run Time: Unknown or not Applicable, Life History: Unknown
Source Record	49327
Source Dataset	SWIFD
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
More Info	http://wdfw.wa.gov/wlm/diversty/soc/soc.htm
Geometry Type	Lines

Pacific Sand Lance	
Scientific Name	*Ammodytes hexapterus*
Priority Area	Breeding Area
Site Name	Station Number: 6
Accuracy	NA
Source Record	20584
Source Dataset	Forage_Fish_Survey
Source Date	Forage_Fish_Survey
Source Name	Not Given
Source Entity	WDFW
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Species or Habitat
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
Geometry Type	Lines

Pandalid Shrimp	
Priority Area	Presence
Site Name	Not Given
Accuracy	NA
Notes	Not Given
Source Dataset	Shellfish_Summary
Source Name	Not Given
Source Entity	WDFW
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
Geometry Type	Polygons

Dungeness crab	
Scientific Name	*Cancer magister*
Priority Area	Presence
Site Name	Not Given
Accuracy	NA
Notes	Not Given
Source Dataset	Shellfish_Summary
Source Name	Not Given
Source Entity	WDFW
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
Geometry Type	Polygons

Wetlands	
Priority Area	Aquatic Habitat
Site Name	SEQUALICHEW CREEK WETLANDS
Accuracy	1/4 mile (Quarter Section)
Notes	WETLANDS ASSOCIATED WITH SEQUALICHEW CREEK DRAINAGE WHICH PROVIDE SIGNIFICANT WINTERING WATERFOWL HABITAT AND GENERAL WILDLIFE HABITAT.
Source Record	902594
Source Dataset	PHSREGION
Source Name	NAUER, DON, WDW
Source Entity	WA Dept. of Fish and Wildlife
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
ManagementRecommendations	http://www.ecy.wa.gov/programs/sea/wetlands/bas/index.html
Geometry Type	Polygons

Biodiversity Areas And Corridor	
Priority Area	Terrestrial Habitat
Site Name	PUYALLUP STEEP OPEN SPACES
Accuracy	1/4 mile (Quarter Section)
Notes	UNDEVELOPED STEEP SLOPES WITH NATIVE VEGETATION-UNSUITABLE FOR DEVELOPMENT BUT STILL PROVIDE WILDLIFE HABITAT.
Source Record	902552
Source Dataset	PHSREGION
Source Name	NAUER, DON WDW
Source Entity	WA Dept. of Fish and Wildlife
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
ManagementRecommendations	http://wdfw.wa.gov/publications/pub.php?id=00023
Geometry Type	Polygons

Waterfowl Concentrations	
Priority Area	Regular Concentration
Site Name	PIERCE COUNTY - NON FARM
Accuracy	1/4 mile (Quarter Section)
Notes	SMALL WATERFOWL CONCENTRATION AREAS, NON AGRICULTURAL.
Source Record	902564
Source Dataset	PHSREGION
Source Name	NAUER, DON WDW
Source Entity	WA Dept. of Fish and Wildlife
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS LISTED OCCURRENCE
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
ManagementRecommendations	http://wdfw.wa.gov/publications/pub.php?id=00026
Geometry Type	Polygons

Waterfowl Concentrations	
Priority Area	Regular Concentration
Site Name	PIERCE COUNTY - NON-AGRICULTURAL
Accuracy	1/4 mile (Quarter Section)
Notes	LARGE REGULAR WATERFOWL CONCENTRATION AREAS, NON AGRICULTURAL IN PIERCE COUNTY.
Source Record	902562
Source Dataset	PHSREGION
Source Name	NAUER, DON
Source Entity	WA Dept. of Fish and Wildlife
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS LISTED OCCURRENCE
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
ManagementRecommendations	http://wdfw.wa.gov/publications/pub.php?id=00026
Geometry Type	Polygons

Estuarine and Marine Wetland	
Priority Area	Aquatic Habitat
Site Name	N/A
Accuracy	NA
Notes	Wetland System: Estuarine and Marine Wetland - NWI Code: E2AB/USN
Source Dataset	NWIWetlands
Source Name	Not Given
Source Entity	US Fish and Wildlife Service
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
ManagementRecommendations	http://www.ecy.wa.gov/programs/sea/wetlands/bas/index.html
Geometry Type	Polygons

Estuarine and Marine Wetland	
Priority Area	Aquatic Habitat
Site Name	N/A
Accuracy	NA
Notes	Wetland System: Estuarine and Marine Wetland - NWI Code: E2USN
Source Dataset	NWIWetlands
Source Name	Not Given
Source Entity	US Fish and Wildlife Service
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
ManagementRecommendations	http://www.ecy.wa.gov/programs/sea/wetlands/bas/index.html
Geometry Type	Polygons

Freshwater Emergent Wetland	
Priority Area	Aquatic Habitat
Site Name	N/A
Accuracy	NA
Notes	Wetland System: Freshwater Emergent Wetland - NWI Code: PEM1C
Source Dataset	NWIWetlands
Source Name	Not Given
Source Entity	US Fish and Wildlife Service
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
ManagementRecommendations	http://www.ecy.wa.gov/programs/sea/wetlands/bas/index.html
Geometry Type	Polygons

Freshwater Emergent Wetland	
Priority Area	Aquatic Habitat
Site Name	N/A
Accuracy	NA
Notes	Wetland System: Freshwater Emergent Wetland - NWI Code: PEM1/UBF
Source Dataset	NWIWetlands
Source Name	Not Given
Source Entity	US Fish and Wildlife Service
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
ManagementRecommendations	http://www.ecy.wa.gov/programs/sea/wetlands/bas/index.html
Geometry Type	Polygons

Freshwater Emergent Wetland	
Priority Area	Aquatic Habitat
Site Name	N/A
Accuracy	NA
Notes	Wetland System: Freshwater Emergent Wetland - NWI Code: PEM1/UBF
Source Dataset	NWIWetlands
Source Name	Not Given
Source Entity	US Fish and Wildlife Service
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
ManagementRecommendations	http://www.ecy.wa.gov/programs/sea/wetlands/bas/index.html
Geometry Type	Polygons

Freshwater Emergent Wetland	
Priority Area	Aquatic Habitat
Site Name	N/A
Accuracy	NA
Notes	Wetland System: Freshwater Emergent Wetland - NWI Code: PEM1/UBF
Source Dataset	NWIWetlands
Source Name	Not Given
Source Entity	US Fish and Wildlife Service
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
ManagementRecommendations	http://www.ecy.wa.gov/programs/sea/wetlands/bas/index.html
Geometry Type	Polygons

Freshwater Emergent Wetland	
Priority Area	Aquatic Habitat
Site Name	N/A
Accuracy	NA
Notes	Wetland System: Freshwater Emergent Wetland - NWI Code: PEM1/UBF
Source Dataset	NWIWetlands
Source Name	Not Given
Source Entity	US Fish and Wildlife Service
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
ManagementRecommendations	http://www.ecy.wa.gov/programs/sea/wetlands/bas/index.html
Geometry Type	Polygons

Freshwater Emergent Wetland	
Priority Area	Aquatic Habitat
Site Name	N/A
Accuracy	NA
Notes	Wetland System: Freshwater Emergent Wetland - NWI Code: PEM1A
Source Dataset	NWIWetlands
Source Name	Not Given
Source Entity	US Fish and Wildlife Service
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
ManagementRecommendations	http://www.ecy.wa.gov/programs/sea/wetlands/bas/index.html
Geometry Type	Polygons

Freshwater Emergent Wetland	
Priority Area	Aquatic Habitat
Site Name	N/A
Accuracy	NA
Notes	Wetland System: Freshwater Emergent Wetland - NWI Code: PEM1A
Source Dataset	NWIWetlands
Source Name	Not Given
Source Entity	US Fish and Wildlife Service
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
ManagementRecommendations	http://www.ecy.wa.gov/programs/sea/wetlands/bas/index.html
Geometry Type	Polygons

Freshwater Emergent Wetland	
Priority Area	Aquatic Habitat
Site Name	N/A
Accuracy	NA
Notes	Wetland System: Freshwater Emergent Wetland - NWI Code: PEM1A
Source Dataset	NWIWetlands
Source Name	Not Given
Source Entity	US Fish and Wildlife Service
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
ManagementRecommendations	http://www.ecy.wa.gov/programs/sea/wetlands/bas/index.html
Geometry Type	Polygons

Lake	
Priority Area	Aquatic Habitat
Site Name	N/A
Accuracy	NA
Notes	Wetland System: Lake - NWI Code: L2ABH
Source Dataset	NWIWetlands
Source Name	Not Given
Source Entity	US Fish and Wildlife Service
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
ManagementRecommendations	http://www.ecy.wa.gov/programs/sea/wetlands/bas/index.html
Geometry Type	Polygons

Freshwater Emergent Wetland	
Priority Area	Aquatic Habitat
Site Name	N/A
Accuracy	NA
Notes	Wetland System: Freshwater Emergent Wetland - NWI Code: PEM1/SSA
Source Dataset	NWIWetlands
Source Name	Not Given
Source Entity	US Fish and Wildlife Service
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
ManagementRecommendations	http://www.ecy.wa.gov/programs/sea/wetlands/bas/index.html
Geometry Type	Polygons

Freshwater Emergent Wetland	
Priority Area	Aquatic Habitat
Site Name	N/A
Accuracy	NA
Notes	Wetland System: Freshwater Emergent Wetland - NWI Code: PEM1/SSF
Source Dataset	NWIWetlands
Source Name	Not Given
Source Entity	US Fish and Wildlife Service
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
ManagementRecommendations	http://www.ecy.wa.gov/programs/sea/wetlands/bas/index.html
Geometry Type	Polygons

Freshwater Emergent Wetland	
Priority Area	Aquatic Habitat
Site Name	N/A
Accuracy	NA
Notes	Wetland System: Freshwater Emergent Wetland - NWI Code: PEM1Ch
Source Dataset	NWIWetlands
Source Name	Not Given
Source Entity	US Fish and Wildlife Service
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
ManagementRecommendations	http://www.ecy.wa.gov/programs/sea/wetlands/bas/index.html
Geometry Type	Polygons

Freshwater Emergent Wetland	
Priority Area	Aquatic Habitat
Site Name	N/A
Accuracy	NA
Notes	Wetland System: Freshwater Emergent Wetland - NWI Code: PEM1F
Source Dataset	NWIWetlands
Source Name	Not Given
Source Entity	US Fish and Wildlife Service
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
ManagementRecommendations	http://www.ecy.wa.gov/programs/sea/wetlands/bas/index.html
Geometry Type	Polygons

Freshwater Emergent Wetland	
Priority Area	Aquatic Habitat
Site Name	N/A
Accuracy	NA
Notes	Wetland System: Freshwater Emergent Wetland - NWI Code: PEM1F
Source Dataset	NWIWetlands
Source Name	Not Given
Source Entity	US Fish and Wildlife Service
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
ManagementRecommendations	http://www.ecy.wa.gov/programs/sea/wetlands/bas/index.html
Geometry Type	Polygons

Freshwater Emergent Wetland	
Priority Area	Aquatic Habitat
Site Name	N/A
Accuracy	NA
Notes	Wetland System: Freshwater Emergent Wetland - NWI Code: PEM1F
Source Dataset	NWIWetlands
Source Name	Not Given
Source Entity	US Fish and Wildlife Service
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
ManagementRecommendations	http://www.ecy.wa.gov/programs/sea/wetlands/bas/index.html
Geometry Type	Polygons

Freshwater Emergent Wetland	
Priority Area	Aquatic Habitat
Site Name	N/A
Accuracy	NA
Notes	Wetland System: Freshwater Emergent Wetland - NWI Code: PEM1F
Source Dataset	NWIWetlands
Source Name	Not Given
Source Entity	US Fish and Wildlife Service
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
ManagementRecommendations	http://www.ecy.wa.gov/programs/sea/wetlands/bas/index.html
Geometry Type	Polygons

Freshwater Emergent Wetland	
Priority Area	Aquatic Habitat
Site Name	N/A
Accuracy	NA
Notes	Wetland System: Freshwater Emergent Wetland - NWI Code: PEM1Fx
Source Dataset	NWIWetlands
Source Name	Not Given
Source Entity	US Fish and Wildlife Service
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
ManagementRecommendations	http://www.ecy.wa.gov/programs/sea/wetlands/bas/index.html
Geometry Type	Polygons

Freshwater Forested/Shrub Wetland	
Priority Area	Aquatic Habitat
Site Name	N/A
Accuracy	NA
Notes	Wetland System: Freshwater Forested/Shrub Wetland - NWI Code: PFOC
Source Dataset	NWIWetlands
Source Name	Not Given
Source Entity	US Fish and Wildlife Service
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
ManagementRecommendations	http://www.ecy.wa.gov/programs/sea/wetlands/bas/index.html
Geometry Type	Polygons

Freshwater Forested/Shrub Wetland	
Priority Area	Aquatic Habitat
Site Name	N/A
Accuracy	NA
Notes	Wetland System: Freshwater Forested/Shrub Wetland - NWI Code: PFOC
Source Dataset	NWIWetlands
Source Name	Not Given
Source Entity	US Fish and Wildlife Service
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
ManagementRecommendations	http://www.ecy.wa.gov/programs/sea/wetlands/bas/index.html
Geometry Type	Polygons

Freshwater Forested/Shrub Wetland	
Priority Area	Aquatic Habitat
Site Name	N/A
Accuracy	NA
Notes	Wetland System: Freshwater Forested/Shrub Wetland - NWI Code: PFOC
Source Dataset	NWIWetlands
Source Name	Not Given
Source Entity	US Fish and Wildlife Service
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
ManagementRecommendations	http://www.ecy.wa.gov/programs/sea/wetlands/bas/index.html
Geometry Type	Polygons

Freshwater Forested/Shrub Wetland	
Priority Area	Aquatic Habitat
Site Name	N/A
Accuracy	NA
Notes	Wetland System: Freshwater Forested/Shrub Wetland - NWI Code: PFOC
Source Dataset	NWIWetlands
Source Name	Not Given
Source Entity	US Fish and Wildlife Service
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
ManagementRecommendations	http://www.ecy.wa.gov/programs/sea/wetlands/bas/index.html
Geometry Type	Polygons

Freshwater Forested/Shrub Wetland	
Priority Area	Aquatic Habitat
Site Name	N/A
Accuracy	NA
Notes	Wetland System: Freshwater Forested/Shrub Wetland - NWI Code: PFOC
Source Dataset	NWIWetlands
Source Name	Not Given
Source Entity	US Fish and Wildlife Service
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
ManagementRecommendations	http://www.ecy.wa.gov/programs/sea/wetlands/bas/index.html
Geometry Type	Polygons

Freshwater Forested/Shrub Wetland	
Priority Area	Aquatic Habitat
Site Name	N/A
Accuracy	NA
Notes	Wetland System: Freshwater Forested/Shrub Wetland - NWI Code: PFOA
Source Dataset	NWIWetlands
Source Name	Not Given
Source Entity	US Fish and Wildlife Service
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
ManagementRecommendations	http://www.ecy.wa.gov/programs/sea/wetlands/bas/index.html
Geometry Type	Polygons

Freshwater Forested/Shrub Wetland	
Priority Area	Aquatic Habitat
Site Name	N/A
Accuracy	NA
Notes	Wetland System: Freshwater Forested/Shrub Wetland - NWI Code: PFOA
Source Dataset	NWIWetlands
Source Name	Not Given
Source Entity	US Fish and Wildlife Service
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
ManagementRecommendations	http://www.ecy.wa.gov/programs/sea/wetlands/bas/index.html
Geometry Type	Polygons

Freshwater Forested/Shrub Wetland	
Priority Area	Aquatic Habitat
Site Name	N/A
Accuracy	NA
Notes	Wetland System: Freshwater Forested/Shrub Wetland - NWI Code: PFOA
Source Dataset	NWIWetlands
Source Name	Not Given
Source Entity	US Fish and Wildlife Service
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
ManagementRecommendations	http://www.ecy.wa.gov/programs/sea/wetlands/bas/index.html
Geometry Type	Polygons

Freshwater Forested/Shrub Wetland	
Priority Area	Aquatic Habitat
Site Name	N/A
Accuracy	NA
Notes	Wetland System: Freshwater Forested/Shrub Wetland - NWI Code: PFOA
Source Dataset	NWIWetlands
Source Name	Not Given
Source Entity	US Fish and Wildlife Service
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
ManagementRecommendations	http://www.ecy.wa.gov/programs/sea/wetlands/bas/index.html
Geometry Type	Polygons

Freshwater Forested/Shrub Wetland	
Priority Area	Aquatic Habitat
Site Name	N/A
Accuracy	NA
Notes	Wetland System: Freshwater Forested/Shrub Wetland - NWI Code: PFOF
Source Dataset	NWIWetlands
Source Name	Not Given
Source Entity	US Fish and Wildlife Service
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
ManagementRecommendations	http://www.ecy.wa.gov/programs/sea/wetlands/bas/index.html
Geometry Type	Polygons

Freshwater Forested/Shrub Wetland	
Priority Area	Aquatic Habitat
Site Name	N/A
Accuracy	NA
Notes	Wetland System: Freshwater Forested/Shrub Wetland - NWI Code: PSS/EM1C
Source Dataset	NWIWetlands
Source Name	Not Given
Source Entity	US Fish and Wildlife Service
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
ManagementRecommendations	http://www.ecy.wa.gov/programs/sea/wetlands/bas/index.html
Geometry Type	Polygons

Freshwater Forested/Shrub Wetland	
Priority Area	Aquatic Habitat
Site Name	N/A
Accuracy	NA
Notes	Wetland System: Freshwater Forested/Shrub Wetland - NWI Code: PSS/EM1F
Source Dataset	NWIWetlands
Source Name	Not Given
Source Entity	US Fish and Wildlife Service
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
ManagementRecommendations	http://www.ecy.wa.gov/programs/sea/wetlands/bas/index.html
Geometry Type	Polygons

Freshwater Forested/Shrub Wetland	
Priority Area	Aquatic Habitat
Site Name	N/A
Accuracy	NA
Notes	Wetland System: Freshwater Forested/Shrub Wetland - NWI Code: PSS/EM1F
Source Dataset	NWIWetlands
Source Name	Not Given
Source Entity	US Fish and Wildlife Service
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
ManagementRecommendations	http://www.ecy.wa.gov/programs/sea/wetlands/bas/index.html
Geometry Type	Polygons

Freshwater Forested/Shrub Wetland	
Priority Area	Aquatic Habitat
Site Name	N/A
Accuracy	NA
Notes	Wetland System: Freshwater Forested/Shrub Wetland - NWI Code: PSSC
Source Dataset	NWIWetlands
Source Name	Not Given
Source Entity	US Fish and Wildlife Service
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
ManagementRecommendations	http://www.ecy.wa.gov/programs/sea/wetlands/bas/index.html
Geometry Type	Polygons

Freshwater Forested/Shrub Wetland	
Priority Area	Aquatic Habitat
Site Name	N/A
Accuracy	NA
Notes	Wetland System: Freshwater Forested/Shrub Wetland - NWI Code: PSSC
Source Dataset	NWIWetlands
Source Name	Not Given
Source Entity	US Fish and Wildlife Service
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
ManagementRecommendations	http://www.ecy.wa.gov/programs/sea/wetlands/bas/index.html
Geometry Type	Polygons

Freshwater Forested/Shrub Wetland	
Priority Area	Aquatic Habitat
Site Name	N/A
Accuracy	NA
Notes	Wetland System: Freshwater Forested/Shrub Wetland - NWI Code: PSSC
Source Dataset	NWIWetlands
Source Name	Not Given
Source Entity	US Fish and Wildlife Service
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
ManagementRecommendations	http://www.ecy.wa.gov/programs/sea/wetlands/bas/index.html
Geometry Type	Polygons

Freshwater Forested/Shrub Wetland	
Priority Area	Aquatic Habitat
Site Name	N/A
Accuracy	NA
Notes	Wetland System: Freshwater Forested/Shrub Wetland - NWI Code: PSSC
Source Dataset	NWIWetlands
Source Name	Not Given
Source Entity	US Fish and Wildlife Service
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
ManagementRecommendations	http://www.ecy.wa.gov/programs/sea/wetlands/bas/index.html
Geometry Type	Polygons

Freshwater Forested/Shrub Wetland	
Priority Area	Aquatic Habitat
Site Name	N/A
Accuracy	NA
Notes	Wetland System: Freshwater Forested/Shrub Wetland - NWI Code: PSSC
Source Dataset	NWIWetlands
Source Name	Not Given
Source Entity	US Fish and Wildlife Service
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
ManagementRecommendations	http://www.ecy.wa.gov/programs/sea/wetlands/bas/index.html
Geometry Type	Polygons

Freshwater Forested/Shrub Wetland	
Priority Area	Aquatic Habitat
Site Name	N/A
Accuracy	NA
Notes	Wetland System: Freshwater Forested/Shrub Wetland - NWI Code: PSSC
Source Dataset	NWIWetlands
Source Name	Not Given
Source Entity	US Fish and Wildlife Service
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
ManagementRecommendations	http://www.ecy.wa.gov/programs/sea/wetlands/bas/index.html
Geometry Type	Polygons

Freshwater Forested/Shrub Wetland	
Priority Area	Aquatic Habitat
Site Name	N/A
Accuracy	NA
Notes	Wetland System: Freshwater Forested/Shrub Wetland - NWI Code: PSSF
Source Dataset	NWIWetlands
Source Name	Not Given
Source Entity	US Fish and Wildlife Service
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
ManagementRecommendations	http://www.ecy.wa.gov/programs/sea/wetlands/bas/index.html
Geometry Type	Polygons

Freshwater Forested/Shrub Wetland	
Priority Area	Aquatic Habitat
Site Name	N/A
Accuracy	NA
Notes	Wetland System: Freshwater Forested/Shrub Wetland - NWI Code: PSSF
Source Dataset	NWIWetlands
Source Name	Not Given
Source Entity	US Fish and Wildlife Service
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
ManagementRecommendations	http://www.ecy.wa.gov/programs/sea/wetlands/bas/index.html
Geometry Type	Polygons

Freshwater Forested/Shrub Wetland	
Priority Area	Aquatic Habitat
Site Name	N/A
Accuracy	NA
Notes	Wetland System: Freshwater Forested/Shrub Wetland - NWI Code: PSSF
Source Dataset	NWIWetlands
Source Name	Not Given
Source Entity	US Fish and Wildlife Service
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
ManagementRecommendations	http://www.ecy.wa.gov/programs/sea/wetlands/bas/index.html
Geometry Type	Polygons

Freshwater Forested/Shrub Wetland	
Priority Area	Aquatic Habitat
Site Name	N/A
Accuracy	NA
Notes	Wetland System: Freshwater Forested/Shrub Wetland - NWI Code: PSSF
Source Dataset	NWIWetlands
Source Name	Not Given
Source Entity	US Fish and Wildlife Service
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
ManagementRecommendations	http://www.ecy.wa.gov/programs/sea/wetlands/bas/index.html
Geometry Type	Polygons

Freshwater Forested/Shrub Wetland	
Priority Area	Aquatic Habitat
Site Name	N/A
Accuracy	NA
Notes	Wetland System: Freshwater Forested/Shrub Wetland - NWI Code: PSSF
Source Dataset	NWIWetlands
Source Name	Not Given
Source Entity	US Fish and Wildlife Service
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
ManagementRecommendations	http://www.ecy.wa.gov/programs/sea/wetlands/bas/index.html
Geometry Type	Polygons

Freshwater Forested/Shrub Wetland	
Priority Area	Aquatic Habitat
Site Name	N/A
Accuracy	NA
Notes	Wetland System: Freshwater Forested/Shrub Wetland - NWI Code: PSSF
Source Dataset	NWIWetlands
Source Name	Not Given
Source Entity	US Fish and Wildlife Service
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
ManagementRecommendations	http://www.ecy.wa.gov/programs/sea/wetlands/bas/index.html
Geometry Type	Polygons

Freshwater Forested/Shrub Wetland	
Priority Area	Aquatic Habitat
Site Name	N/A
Accuracy	NA
Notes	Wetland System: Freshwater Forested/Shrub Wetland - NWI Code: PFOA
Source Dataset	NWIWetlands
Source Name	Not Given
Source Entity	US Fish and Wildlife Service
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
ManagementRecommendations	http://www.ecy.wa.gov/programs/sea/wetlands/bas/index.html
Geometry Type	Polygons

Freshwater Forested/Shrub Wetland	
Priority Area	Aquatic Habitat
Site Name	N/A
Accuracy	NA
Notes	Wetland System: Freshwater Forested/Shrub Wetland - NWI Code: PSSC
Source Dataset	NWIWetlands
Source Name	Not Given
Source Entity	US Fish and Wildlife Service
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
ManagementRecommendations	http://www.ecy.wa.gov/programs/sea/wetlands/bas/index.html
Geometry Type	Polygons

Freshwater Forested/Shrub Wetland	
Priority Area	Aquatic Habitat
Site Name	N/A
Accuracy	NA
Notes	Wetland System: Freshwater Forested/Shrub Wetland - NWI Code: PSSC
Source Dataset	NWIWetlands
Source Name	Not Given
Source Entity	US Fish and Wildlife Service
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
ManagementRecommendations	http://www.ecy.wa.gov/programs/sea/wetlands/bas/index.html
Geometry Type	Polygons

Freshwater Forested/Shrub Wetland	
Priority Area	Aquatic Habitat
Site Name	N/A
Accuracy	NA
Notes	Wetland System: Freshwater Forested/Shrub Wetland - NWI Code: PSSC
Source Dataset	NWIWetlands
Source Name	Not Given
Source Entity	US Fish and Wildlife Service
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
ManagementRecommendations	http://www.ecy.wa.gov/programs/sea/wetlands/bas/index.html
Geometry Type	Polygons

Freshwater Forested/Shrub Wetland	
Priority Area	Aquatic Habitat
Site Name	N/A
Accuracy	NA
Notes	Wetland System: Freshwater Forested/Shrub Wetland - NWI Code: PSSA
Source Dataset	NWIWetlands
Source Name	Not Given
Source Entity	US Fish and Wildlife Service
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
ManagementRecommendations	http://www.ecy.wa.gov/programs/sea/wetlands/bas/index.html
Geometry Type	Polygons

Freshwater Forested/Shrub Wetland	
Priority Area	Aquatic Habitat
Site Name	N/A
Accuracy	NA
Notes	Wetland System: Freshwater Forested/Shrub Wetland - NWI Code: PSSC
Source Dataset	NWIWetlands
Source Name	Not Given
Source Entity	US Fish and Wildlife Service
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
ManagementRecommendations	http://www.ecy.wa.gov/programs/sea/wetlands/bas/index.html
Geometry Type	Polygons

Big brown bat	
Scientific Name	*Eptesicus fuscus*
Notes	This polygon mask represents one or more records of the above species or habitat occurrence. Contact PHS Data Release (360-902-2543) for obtaining information about masked sensitive species and habitats.
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	Y
SGCN	N
Display Resolution	TOWNSHIP
ManagementRecommendations	http://wdfw.wa.gov/publications/pub.php?id=00605

Little Brown Bat	
Scientific Name	*Myotis lucifugus*
Notes	This polygon mask represents one or more records of the above species or habitat occurrence. Contact PHS Data Release (360-902-2543) for obtaining information about masked sensitive species and habitats.
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	Y
SGCN	N
Display Resolution	TOWNSHIP
ManagementRecommendations	http://wdfw.wa.gov/publications/pub.php?id=00605

Yuma myotis	
Scientific Name	*Myotis yumanensis*
Notes	This polygon mask represents one or more records of the above species or habitat occurrence. Contact PHS Data Release (360-902-2543) for obtaining information about masked sensitive species and habitats.
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	Y
SGCN	N
Display Resolution	TOWNSHIP
ManagementRecommendations	http://wdfw.wa.gov/publications/pub.php?id=00605

DISCLAIMER. This report includes information that the Washington Department of Fish and Wildlife (WDFW) maintains in a central computer database. It is not an attempt to provide you with an official agency response as to the impacts of your project on fish and wildlife. This information only documents the location of fish and wildlife resources to the best of our knowledge. It is not a complete inventory and it is important to note that fish and wildlife resources may occur in areas not currently known to WDFW biologists, or in areas for which comprehensive surveys have not been conducted. Site specific surveys are frequently necesssary to rule out the presence of priority resources. Locations of fish and wildlife resources are subject to variation caused by disturbance, changes in season and weather, and other factors. WDFW does not recommend using reports more than six months old.

Appendix B
Tables of Plant and Animal Species Surveyed in the Project Area

Appendix B
Plants Identified In and Around the Proposed Action

Species	Common Name	Coniferous Forest	Kettle Wetland and Buffer	Disturbed Areas	Bluff	Open/ Grassland	Brackish Marsh
Plants							
Acer macrophyllum	bigleaf maple				x		
Toxicodendron diversilobum	Pacific poison oak				x		
Oenanthe sarmentosa	water parsley		x				
Perideridia sp.	yampah		x				
Apocyrum androsaemifolium	spreading dogbane	x			x		
Asarum caudatum	British Columbia wildginger	x					
Achillea millefolium	common yarrow				x	x	x
Nothocalais sp.	false-dandelion				x		
Anaphalis margaritacea	western pearly everlasting			x	x		
Artemisia californica	coastal sagebrush	x			x		
Artemisia sp.					x		
Symphyotrichum subspicatum	Douglas aster						x
Cirsium vulgare	bull thistle			x			
Cotula coronopifolla	common brassbuttons						x
Pseudognaphalium canescens ssp. *Microcephalum*	Wright's cudweed			x	x	x	
Grindelia sp.	gumweed						x
Leucanthemum vulgare	oxeye daisy			x			
Hieracium sp.	hawkweed			x	x	x	
Senecio jacobaea	tansy ragwort (stinking willie)				x		
Senecio sp.	senecio			x	x		
Solidago canadensis	Canadian goldenrod			x			
Achlys triphylla	vanilla-leaf	x					
Berberis aquifolium	hollyleaved barberry/Oregon grape	x		x	x		
Berberis nervosa	Cascade barberry				x		
Alnus rubra	red alder	x					
Corylus cornuta	beaked hazelnut/beaked hazel/western hazel	x			x		
Lepidium sp.	pepperweed				x		
Campanula scouleri	pale bellflower				x		
Linnaea borealis	twinflower	x		x		x	
Lonicera ciliosa	orange honeysuckle			x	x		
Sambucus nigra ssp. *cerulea*	blue elderberry			x	x	x	
Sambucus racemosa	red elderberry			x			
Symphoricarpos albus	common snowberry	x	x	x	x		
Moehringia macrophylla	largeleaf sandwort				x		
Cerastium sp.	chickweed			x			
Paxistima myrsinites	Oregon boxleaf			x			
Chenopodium album	fat hen/white goosefoot/common lambsquarters						x
Salicornia sp.	pickleweed						x
Cornus sericea	redtwig dogwood/redosier dogwood		x				
Marah oregana	Oregon bigroot/coastal manroot/western wildcucumber					x	
Carex deweyana	Dewey's sedge	x					
Carex lyngbyei	Lyngbye's sedge						x
Carex obnupta	slough sedge		x				
Carex inops	long-stolon sedge			x		x	
Luzula sp.	woodrush			x			
Arbutus menziesii	Pacific madrone			x	x		
Arctostaphylos uva-ursi	bearberry	x		x		x	
Gaultheria shallon	salal	x			x		
Vaccinium ovalifolium	oval-leaf huckleberry/oval-leaf blueberry/Alaska blueberry				x		
Vaccinium ovatum	evergreen huckleberry	x			x		
Vaccinium parvifolium	red huckleberry	x					
Cytisus scoparius	Scot's broom	x	x	x	x	x	x
Lupinus sp.	lupine				x		
Vicia sp.	vetch	x			x		

Appendix B
Plants Identified In and Around the Proposed Action

Species	Common Name	Coniferous Forest	Kettle Wetland and Buffer	Disturbed Areas	Bluff	Open/ Grassland	Brackish Marsh
Quercus garryana	Oregon white oak	x		x		x	
Centaurium erythraea	European centaury			x			
Ribes sanguineum	redflower currant			x	x		
Ribes watsonianum (?)	spring gooseberry					x	
Hypericum perforatum	common St. John's wort			x	x	x	
Hypericum sp.	St. John's wort	x			x	x	
Juncus bufonius	toad rush		x				
Juncus effusus	soft rush/lamp rush/common rush		x				x
Lycopus sp.	water horehound		x				
Mentha sp.	mint		x				
Micromeria douglasii	yerba buena				x		
Maianthemum stellatum	starry Solomon-plume/starry false lily of the valley/false Solomon's seal				x		
streptopus amplexifolius	clasping-leaved twisted-stalk/clasping twistedstalk/twisted stalk/claspleaf twistedstalk					x	
Nuphar polysepala	spatterdock/Rocky Mountain pond-lilly			x			
Chamerion sp.	fireweed				x		
Goodyera oblongifolia	rattlesnake-plantain					x	
Abies grandis	grand fir	x					
Pseudotsuga menziesii	Douglas-fir	x		x	x	x	
Tsuga heterophylla	western hemlock	x					
Plantago lanceolata	narrow-leaf plantain			x		x	x
Aira praecox	early hairgrass/yellow hairgrass			x			x
Elymus repens	quackgrass			x		x	x
Agrostis stolonifera	creeping bentgrass						x
Agrostis capillaris	colonial bentgrass		x	x		x	
Agrostis sp.	bentgrass						x
Dactylis glomerata	orchard grass					x	
Deschampsia cespitosa	tufted hairgrass						x
Schedonorus arundinaceus	tall fescue	x		x			
Festuca sp.	fescue			x			
Holcus lanatus	velvetgrass/common velvetgrass			x	x	x	x
Lolium sp.	ryegrass						x
Phalaris arundinacea	reed canarygrass		x				
Achnatherum sp.	needlegrass					x	
Polygonum sp.	knotweed		x				
Rumex acetosella	sheep sorrel			x	x		
Rumex occidentalis	western dock						x
Rumex stenophyllus	narrow-leaved dock						x
Athyrium felix-femina	lady fern		x				
Polystichum munitum	western swordfern	x		x	x	x	
Pteridium aquilinum	bracken fern	x			x	x	
Claytonia sibirica	Siberian miners'-lettuce	x					
Batis maritima	saltwort/turtleweed						x
Trientalis borealis	northern starflower	x			x		
Ceanothus velutinus var. veluntinus	tobacco bush				x		
Amelanchier alnifolia	western serviceberry	x		x		x	
Crataegus douglasii	black hawthorn		x		x		
Fragaria vesca	woodland strawberry			x			
Geum macrophyllum	large-leaf avens					x	
Rosa gymnocarpa	naked-hip rose/dwarf rose	x			x		
Holodiscus discolor	oceanspray	x			x	x	
Malus fusca	Oregon crab apple	x	x		x		
Oemleria cerasiformis	Indian plum	x					
Comarum palustre	marsh cinquefoil/purple marshlocks		x				x
Prunus emarginata	bitter cherry	x		x			

Appendix B
Plants Identified In and Around the Proposed Action

Species	Common Name	Coniferous Forest	Kettle Wetland and Buffer	Disturbed Areas	Bluff	Open/ Grassland	Brackish Marsh
Rosa nutkana	Nootka rose	x					
Rubus ulmifolius	Himalayan blackberry/elmleaf blackberry			x	x		
Rubus laciniatus	cut-leaf blackberry			x	x		
Rubus occidentalis	black raspberry			x	x		
Rubus parviflorus	thimbleberry				x		
Rubus spectabilis	salmonberry	x					
Rubus ursinus	Pacific blackberry/California blackberry	x		x	x	x	
Spiraea douglasii	hardhack/rose spirea	x		x			
Galium sp.	bedstraw	x					
Populus trichocarpa	black cottonwood	x		x			
Salix scouleriana	Scouler willow	x	x	x	x		
Salix sp.	willow			x			
Heuchera sanguinea	small-flower coral bells				x		
Digitalis purpurea	purple foxglove			x			
Solanum dulcamara	climbing nightshade		x				
Sparganium emersum	European bur-reed		x				
Taxus brevifolia	Pacific yew	x			x		
Typha latifolia	cat-tail			x			
Urtica dioca	stinging nettle	x					
Viola palmata	early blue violet					x	

Appendix B
Animals Identified In and Around the Proposed Action

Species	Common Name	Coniferous Forest	Oak-Grassland	Disturbed Areas	Palustrine Wetland	Brackish Marsh
Reptiles and Amphibians						
Taricha granulosa	Northern rough-skinned newt				x	
Plethodon cinereus	Western red-backed salamander	x			x	
Rana aurora	Northern red-legged frog	x			x	
Rana catesbeiana	Bullfrog				x	
Bufo boreas	Western toad				x	
Hyla regilla	Pacific tree frog	x			x	
Sceloporus occidentalis	Western fence lizard		x			
Gerrhonotus coeruleus	Northern alligator lizard		x			
Charina bottae	Rubber boa				x	x
Thamnophis sirtalis pickeringi	Puget Sound red-sided garter snake	x	x	x	x	x
Birds						
Loons and Grebes						
Gavia immer	Common loon					x
Aechmorphorus occidentalis	Western grebe					x
Podiceps gisegena	Red-necked grebe					x
Podiceps auritus	Horned grebe					x
Podilymbus podiceps	Pied-billed grebe					x
Waterfowl						
Anas platyrhynchos	Mallard				x	x
Anas acuta	Pintail				x	x
Anas strepera	Gadwall				x	x
Mareca american	American widgeon				x	x
Spatula clypeata	Northern shovelor				x	x
Anas discors	Blue-winged teal				x	x
Anas carolinensis	Green-winged teal				x	x
Aix sponsa	Wood duck				x	x
Aytha valisineria	Canvasback				x	x
Aytha collaris	Ring-necked duck				x	x
Aytha marila	Greater scaup				x	x
Aytha affinis	Lesser scaup				x	x
Bucephala clangula	Common goldeneye				x	x
Bucephala albeola	Bufflehead				x	x
Oxyura jamaicensis	Ruddy duck				x	x
Mergus serrator	Red-breasted merganser				x	x
Oidemia nigra	Common scoter				x	x
Melanitta deglandi	White-winged scoter				x	x
Melanitta perspicillata	Surf scoter				x	x
Raptors						
Cathartes aura	Turkey vulture	x	x	x		
Accipiter cooperii	Cooper's hawk		x			
Accipiter striatus	Sharp-shinned hawk	x	x	x		
Buteo jamaicensis	Red-tailed hawk *	x	x	x		
Haliaeetus leucocephalus	Bald eagle	x				x
Pandion haliaetus	Osprey	x			x	x
Falco sparverius	American kestrel		x	x		
Bubo virginianus	Great horned owl	x	x			
Asio flammeus	Short-eared owl				x	x
Tyto alba	Barn owl		x	x		
Upland Game Birds						
Dendragapus obscurus	Blue grouse	x				
Bonasa umbellus	Ruffed grouse *	x	x			
Lophortyx californicus	California quail	x	x			
Phasianus colchicus	Ring-necked pheasant		x	x		

Appendix B
Animals Identified In and Around the Proposed Action

Species	Common Name	Coniferous Forest	Oak-Grassland	Disturbed Areas	Palustrine Wetland	Brackish Marsh
Herons						
Ardea herodias	Great blue heron				x	x
Butorides virescens	Green heron				x	x
Rails and Coots						
Rallus limicola	Virginia rail				x	x
Fulica americana	American coot				x	x
Doves and Pigeons						
Columba fasciata	Band-tailed pigeon	x	x	x		
Zenaidora macroura	Mourning dove		x	x		
Shorebirds						
Charadrius vociferus	Killdeer			x		x
Capella gallinago	Common snipe				x	x
Uria aalge	Common mure					x
Cepphus columba	Pigeon guillemot					x
Cerorhinca monocerata	Rhinoceros auklet					x
Kingfishers						
Megaceryle alcyon	Belted kingfisher				x	
Hummingbirds						
Selasphorous rufus	Rufus hummingbird	x	x	x	x	
Woodpeckers						
Colaptes auratus	Common flicker *	x	x			
Dryocopus pileatus	Pileated woodpecker *	x				
Sphyrapicus varius	Red-breasted sapsucker *	x				
Dendrocopos villosus	Hairy woodpecker *	x				
Dendrocopos pubescens	Downy woodpecker	x				
Songbirds						
Empidonax trallii	Willow flycatcher		x	x		
Empidonax difficilis	Western flycatcher	x	x			
Contopus sordidula	Western wood pewee	x	x			
Nuitallornis borealis	Olive-sided flycatcher	x				
Hirundo rustica	Barn swallow				x	x
Petrochelidon pyrrhonota	Cliff swallow[1]					
Iridoprocne bicolor	Tree swallow				x	x
Cyancitta stelleri	Stellar's jay	x	x			
Corvus brachyrhynchos	Common crow *	x	x	x	x	x
Parus atricapillus	Black-capped chickadee	x				
Parus rufescens	Chestnut-backed chickadee *	x				
Psaltriparus minimus	Common bushtit		x	x		
Sitta canadensis	Red-breasted nuthatch *	x				
Certhia familiaris	Brown creeper	x				
Troglodytes troglodytes	Winter wren *	x	x			
Thryomanes bewickii	Bewick's wren				x	x
Telmatodytes palustris	Marsh wren				x	x
Turdus migratorius	American robin		x			
Ixoreus naveius	Varied thrush *	x	x			
Hylocichla ustulata	Swainson's thrush	x	x			
Regulus satrapa	Golden-crowned kinglet *	x				
Regulus calendula	Ruby-crowned kinglet	x				
Anthus spinoletta	Water pipit				x	x
Bombycilla cedrorum	Cedar waxwing		x			
Lanius excubitor	Northern shrike		x			
Sturnus vulgaris	European starling	x	x			
Vireo gilvus	Warbling vireo		x			
Dendroica petechia	Yellow warbler				x	
Dendroica coronata	Yellow-rumped warbler	x				
Geothlypis trichas	Common yellowthroat				x	
Oporornis tolmiei	MacGillivray's warbler		x	x		
Wilsonia pusilla	Wilson's warbler		x	x		
Sturnella neglecta	Western meadowlark		x	x		
Agelaius phoeiceus	Red-winged blackbird				x	
Molothrus ater	Brown-headed cowbird	x	x	x	x	

Appendix B
Animals Identified In and Around the Proposed Action

Species	Common Name	Coniferous Forest	Oak-Grassland	Disturbed Areas	Palustrine Wetland	Brackish Marsh
Piranga ludoviciana	Western tanager		x			
Hesperiphona vespertina	Evening grosbeak	x				
Carpodacus purpureus	Purple finch	x				
Carpodacus mexicanus	House finch	x				
Spinos pinus	Pine siskin	x				
Spinus tristis	American goldfinch		x	x		
Pipilo erthrophtalmus	Rufus-sided towhee	x	x	x		
Passersulus sandwichensis	Savannah sparrow		x	x		x
Pooecetes gramineus	Vesper sparrow		x	x		
Junco hyemalis	Dark-eyed junco		x	x		
Spizella passerina	Chipping sparrow		x	x		
Zonotrichia leucophrys	White-crowned sparrow		x	x		
Passerella iliace	Fox sparrow		x	x		
Melospiza melodia	Song sparrow		x	x		
Mammals						
Large and Medium Size						
Procyon lotor	Raccoon		x	x	x	x
Mustela frenata	Long-tailed weasel	x	x	x	x	x
Mephitis mephitis	Striped skunk	x	x	x	x	x
Canis latrans	Coyote *	x	x	x	x	x
Sciurus griseus	Western gray squirrel		x			
Tamiasciurus douglasi	Douglas squirrel *	x				
Erethizon dorsatum	Porcupine	x	x	x	x	x
Lepus americanus	Snowshoe hare		x	x	x	x
Sylvilagus floridanus	Eastern cottontail		x	x	x	x
Odocoileus hemionus	Black-tailed deer	x	x	x	x	x
Furbearers						
Mustela vison	Mink				x	x
Castor canadensis	Beaver				x	
Ondatra zibethica	Muskrat				x	
Small Mammals						
Sorex cinerus	Masked shrew	x	x		x	x
Sorex trowbridge	Trowbridge shrew	x	x			
Sorex vagrans	Vagrant shrew				x	x
Sorex obscurus	Dusky shrew	x	x	x	x	x
Sorex bendirei	Pacific water shrew				x	
Neurotrichus gibbsi	Shrew mole				x	x
Scapanus townsendi	Townsend mole	x			x	x
Scapanus orarius	Pacific mole		x			
Eutamias townsendi	Townsend chipmunk	x				
Peromyscus maniculatus	Deer mouse	x	x			
Microtus townsendi	Townsend vole		x		x	x
Microtus oregoni	Oregon vole	x	x	x		
Mus musculatus	House mouse		x			
Zapus trinolatus	Pacific jumping mouse	x	x		x	x

Notes:
1. along cliffs and bluffs
* staff observations

Appendix I

Landmarks Tree Inventory



August 2021
Pioneer Aggregates South Parcel Project

ANCHOR QEA

Landmark Tree Inventory Report

Prepared for CalPortland

Received 1-18-2023

August 2021
Pioneer Aggregates South Parcel Project

Landmark Tree Inventory Report

Prepared for
CalPortland – DuPont Plant
4301 Pioneer Avenue
DuPont, Washington 98327

Prepared by
Anchor QEA, LLC
1201 3rd Avenue, Suite 2600
Seattle, Washington 98101

Project Number: 190217-01.01
ND: 10552.09402 4843-8920-1864v1

TABLE OF CONTENTS

1 Introduction 1

2 Tree Survey Methods 2

3 Health of Trees Observed 3

4 Landmark Tree Inventory Results 4

5 Landmark Tree Impacts 5

6 Landmark Tree Replacement Plan 7

TABLES

Table 1 Landmark Tree Criteria 2

Table 2A Summary of Landmark Trees Within the Expansion Area Tax Parcels 4

Table 2B Summary of Landmark Trees Within the Re-Mine Area Tax Parcels 4

Table 3 Summary of Impacts to Landmark Trees within Expansion Area Parcels 6

Table 4 Tree Replacement Summary for All Trees 8

Table 5 Revegetation Planting Plan 9

FIGURES

Figure 1 Vicinity Map

Figure 2 Landmark Trees Within South Parcel Project Area

APPENDICES

Appendix A Weyerhaeuser Pathologist Report

Appendix B Tree Survey Data

ABBREVIATIONS

City	City of DuPont
dbh	diameter at breast height
DMC	City of DuPont Municipal Code
MRO	Mineral Resource Overlay
Project	South Parcel Expansion Project

1 Introduction

CalPortland operates the Pioneer Aggregates Mine facility in DuPont, Washington (Figure 1). CalPortland is proposing an expansion of the mine to the south, known as the South Parcel Project (Project), within the City of DuPont's (City's) designated Mineral Resource Overlay (MRO) District.

The South Parcel Project includes mining within areas previously undisturbed by mining (termed the "Expansion Area") and mining deeper within a portion of the existing mine, referred to as the "Re-Mine Area." The Expansion Area is approximately 188 acres and is composed of three subareas (see Figure 2). The Kettle Area is a 10.8-acre previously undisturbed area. The 9.2-acre Buffer Strip is a strip of vegetation that was retained along the inside of the originally permitted mine bordering the South Parcel. The South Parcel is 168 acres located southeast of the original mine and inside the Mineral Resource Overlay area in the City of DuPont's adopted Comprehensive Plan. Approximately 126 acres within the 168-acre South Parcel are forested.

All areas to be cleared and mined are within the City's Comprehensive Plan MRO area. The purpose of an MRO designation is to implement the Growth Management Act, the Surface Mining Act, and the DuPont Comprehensive Plan by designating commercially viable mineral resources where they occur and allowing for extraction of resources from those areas (DMC 25.60.010).

This report is prepared to inform decisions made regarding tree retention requirements under DMC 25.120, to the extent DMC 25.120.030 is applicable to land and trees within the City's designated mineral Resource Overlay area.

Typical development projects are required to retain a certain number of trees within the tax parcel being developed. The proposed South Parcel Project includes activity on multiple tax parcels. For this report, landmark trees were inventoried within a study area that included all the tax parcels where work is proposed. For this reason landmark trees are counted that would be removed from the proposed Re-Mine Area and landmark trees in the buffer area adjacent to the Re-Mine Area are counted as retained. Similarly, landmark trees that would be removed from the proposed Expansion Area and landmark trees that would be retained within the buffer adjacent to the Expansion Area are inventoried.

Landmark trees in the Re-mine area and the expansion area are counted separately in this report because City permits for the existing mine authorize removal of trees from the Re-mine area and not the expansion area.

2 Tree Survey Methods

The City of DuPont Municipal Code (DMC) defines a "landmark tree" as "an existing healthy, well-formed tree which poses no safety hazard due to potential collapse," and that is of the following species, trunk type, and minimum diameter measured at breast height (dbh) (Table 1). See DMC 25.10.120.005.

Table 1
Landmark Tree Criteria

Trunk Type	Species	
	Oregon White Oak, Pacific Yew, or Madrone (dbh, inches)	**Douglas Fir, Western Red Cedar, Western Hemlock, or Bigleaf Maple (dbh, inches)**
Single Trunk	24	30
Multi-Trunk (sum of diameters)	30	45

A landmark tree inventory was conducted by a two-person team over 6 days in October 2019 and 1 day in September 2020. The team was led by Anchor QEA Biologist and Certified Arborist Joseph Pursley (International Society of Arboriculture PN-7486A). Trees meeting the species and stem size criteria for landmark trees (Table 1) were evaluated visually to determine if they met the health and form standard defined for landmark trees in the DMC.

Trees that did not exhibit apparent evidence of insect damage, woodpecker damage, rot, dwarf-mistletoe, or other similar tree ailments were considered healthy. Well-formed trees do not have broken leaders, significant wind damage, or exhibit irregular growth, including conifers with multiple stems.

All healthy and well-formed trees meeting the size criteria were marked with high-visibility spray paint, and a numbered aluminum tag was placed on the north side of the tree stem. For multi-trunk and multi-stemmed landmark trees, only one numbered tag was used. The location of each tagged and numbered tree was recorded using a Trimble differential global positioning system. Information collected at each tagged and numbered tree included the dbh of each stem, tag number, and species.

Available maps of Oak Management Units in the city and aerial photographs were also reviewed. Aerial photographs reveal that much of the Study Area was thinned and that many of the larger trees were removed between 1990 and 2002. Oak Management Unit (OMU) No. 14 lies within the Study Area, and one Oregon white oak that meets the City's Landmark tree criteria was found within OMU-14.

3 Health of Trees Observed

Poorly formed and unhealthy trees, including trees with damaged stems, broken leaders, insect damage, woodpecker damage, evidence of rot, dwarf-mistletoe, and other tree ailments, are prevalent in the study area. Most of the trees within the Study Area that met the landmark size criteria could not be deemed landmark trees because they are unhealthy, damaged, or otherwise poorly formed.

Historical aerial photographs suggest this is a naturally recruited, fairly even-aged stand established on previously logged property. The most common causes of poor health observed were insect damage, including bark beetle, and brown cubical rot. Most of the poorly formed trees appeared to have significant wind damage, resulting in loss of significant branches and lost leaders of conifers. Crowding under the closed canopy has also resulted in many specimens that are oddly formed in response to competition for sunlight.

4 Landmark Tree Inventory Results

The Study Area inventoried for landmark trees included the complete tax parcels that will be affected by mining of the Expansion Area and the Re-Mine Area. As summarized in Tables 2A and 2B and depicted in Figure 2, 141 trees within the Study Area met the landmark tree criteria of size, species, health, and form (Appendix B).

Table 2A
Summary of Landmark Trees Within the Expansion Area Tax Parcels

Common Name	Scientific Name	Total Trees	Trees in Expansion Area	Trees in Adjacent Buffer
Bigleaf maple	*Acer macrophyllum*	2	**-**	2
Douglas fir	*Pseudotsuga menziesii*	81	**73**	8
Pacific madrone	*Arbutus menziesii*	1	**1**	-
Pacific yew	*Taxus brevifolia*	1	**1**	-
Western red cedar	*Thuja plicata*	10	**1**	9
Total non-Oak		**95**	**-**	**-**
Oregon white oak	*Quercus garryana*	13	**13**	-
Total		**108**	**89**	**19**

Table 2B
Summary of Landmark Trees Within the Re-Mine Area Tax Parcels

Common Name	Scientific Name	Total Trees	Trees in Re-Mine Area	Trees in Adjacent Buffer
Bigleaf maple	*Acer macrophyllum*	-	-	-
Douglas fir	*Pseudotsuga menziesii*	15	1	14
Pacific madrone	*Arbutus menziesii*	1	-	1
Pacific yew	*Taxus brevifolia*	2	-	2
Western red cedar	*Thuja plicata*	8	1	7
Total non-Oak		**26**	**-**	**-**
Oregon white oak	*Quercus garryana*	7	2	5
Total		**33**	**4**	**29**

5 Landmark Tree Impacts

This evaluation of landmark tree impacts focuses on the landmark trees removed from the Expansion Area parcels because tree removal within the Re-Mine Area is authorized under existing permits. Table 3 lists the total number of landmark trees within the Expansion Area tax parcels that will be retained and the number that will be removed, by species.

Table 3
Summary of Impacts to Landmark Trees within Expansion Area Parcels

	Oregon white oak (*Quercus garryana*)	**Big Leaf Maple (*Acer macrophyllum)***	**Douglas fir (*Pseudotsuga menziesii*)**	**Pacific madrone (*Arbutus menziesii*)**	**Pacific yew (*Taxus brevifolia*)**	**Western red cedar (*Thuja plicata*)**	**Total Trees**
Trees Removed (under this request)	13	0	73	1	1	1	89
Trees Retained	0	2	8	0	0	9	19
Total Landmark Trees	**13**	**2**	**81**	**1**	**1**	**10**	108

Note: No western hemlock (*Tsuga heterophylla*) that meet landmark tree criteria are present on the Expansion Area parcels.

6 Landmark Tree Replacement Plan

The Surface Mine Reclamation Act (RCW 78.44) gives the Washington Department of Natural Resource (DNR) exclusive regulatory authority over surface mine reclamation in the state and requires miners to leave property in a condition suitable for its subsequent use following the completion of mining. The reclamation requirements are intended to address landscape concerns on the scope and scale appropriate for mining operations and are consistent with the purpose or intent of the City's landmark tree ordinance.

CalPortland successfully plants trees on the slopes of the existing mine as part of their ongoing mine reclamation program and in compliance with the Surface Mine Reclamation Act (RCW 78.44). Tree planting success (survival) is one component of the reclamation plan that is reviewed, approved, and inspected for compliance by the DNR. Implementation of the reclamation plan is assured by a financial guarantee provided to the DNR by the CalPortland in the form of a bond.

This practice will continue in the South Parcel and as mining progresses in other areas of the mine consistent with an updated mine reclamation plan reviewed, approved, and inspected by the DNR and required by the Surface Mine Reclamation Act (RCW 78.44).

Soil for future tree planting begins prior to mining when the site is cleared of stumps and debris, slash is ground to chips for later use as a soil amendment, and topsoil is mixed with wood chips and clean clay and silt washed from processed gravel (belt press fines) and stockpiled for later use in reclamation.

As extraction in each mine segment is completed, slopes are cut to final contours. In the South Parcel, slopes (approximately 3 feet horizontal to 1 foot vertical) will border the eastern and southwestern portions of the mine floor and join the existing mine area to the north.

The amended topsoil is then spread across the contoured slopes and cross tracked with a dozer to prevent erosion.

After topsoil placement, holes are dug in the slopes where trees are planted. Tree planting is proposed where new reclaimed slopes planted with trees and suitable to be designated as open space will remain after mining. Once final reclamation is complete, Sequalitchew Village will have approximately 180 acres of these slopes planted with a variety of trees including Douglas fir, red alder (*Alnus rubra*), and Oregon white oak, ranging in age from seedlings to nearly 40 years old.

Tree seedlings are generally planted during the fall and spring. Douglas fir, white oak, and other species are typically planted at an approximate spacing of 10- by 10-foot, establishing a stocking level of approximately 430 trees per acre on the reclaimed slopes. These plantings are

complemented by naturally recruited red alder, bigleaf maple, and Pacific madrone occurring in the buffers adjacent to the mined slopes.

CalPortland proposes removing 89 landmark trees in the Expansion Area. A typical tree mitigation plan might require a developer to replace removed Landmark trees at a ratio of 50:1 (Table 4). At a stocking ratio of 430 trees per acre, such a plan would require CalPortland to plant trees on only 10.9 acres to achieve a 50:1 replacement ratio for 89 trees. CalPortland expects to plant approximately 180 acres total on the slopes of the mine.

A typical mitigation plan might require a developer to plant trees for mitigation in a single season and monitor their success for 3 to 5 years. CalPortland will have planted a variety of trees on the reclaimed slopes of Sequalitchew Village over a period of at least three decades and will monitor and ensure their success with a reclamation bond held by DNR during that time.

In 2020 CalPortland began testing plantings of Oregon white oak and will continue to include Oregon white oak in the mix of trees planted in the future to ensure that at least 650 (50X13) white oaks are planted.

As the reclaimed areas mature, a native understory of herbaceous and woody species will also propagate from seed and rhizomes naturally occurring in the redistributed topsoil. Reclaimed slopes along the western boundary of the site are designed in a sinuous fashion to mimic and blend with the native topography that parallels Puget Sound.

Deleterious vegetation such as blackberry and Scotch broom will be removed mechanically, to allow tree establishment and release from shading and competition for nutrients and moisture.

Table 4
Tree Replacement Summary for All Trees

Type	Quantity to Be Removed	Mitigation Ratio	Approximate Number of Trees to Be Planted[1]
Landmark Trees	89	50:1	4,450

Note:

1. The total number of trees to be planted is limited by the areas suitable for planting prior to development of Sequalitchew Village, in accordance with the City of DuPont Comprehensive Plan.

Table 5 summarizes the proposed replacement tree planting. Tree seedlings will be planted during the dormant season. Douglas fir, white oak, and other species will be planted at 10- by 10-foot spacings, establishing a stocking level of approximately 430 trees per acre on the reclaimed slopes. These plantings are expected to be complemented by naturally recruited red alder, bigleaf maple, and Pacific madrone. Based on the success of the reforested slopes in the existing mine, Douglas fir

(1+1 seedling stock) and red alder (plug 1 or yearling pull-ups) are recommended. In 2020 CalPortland began testing plantings of Oregon white oak. If initial plantings are successful, then theses species will be added to the mix of trees planted. Based on existing reclamation at the site, volunteer seedlings are expected to propagate on the topsoiled slopes, in addition to the planting described above. The mature forests that buffer the western mine boundary provide an excellent seed source of other native deciduous and conifer species including Pacific madrone, bigleaf maple, western hemlock, and western red cedar.

Table 5
Revegetation Planting Plan

Common Name	Scientific Name	On Center Spacing (feet)	Planting Season
Douglas fir	*Pseudotsuga menziesii*	10	October 15 – March 15
Oregon white oak	*Quercus garryana*	10	October 15 – March 15
Red Alder	*Alnus rubra*	10	October 15 – March 15

Figures



LEGEND:

- Pioneer Aggregates Property (791 ac)
- South Parcel MRO Addition (172 ac)
- Mining Limits (620 ac)
- Sequalitchew Creek
- Kettle Wetland

South Parcel Project

- Expansion Area (188 ac)
- Re-mine Area (125 ac)

NOTES:
Imagery: 2017 USDA NAIP

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Feet

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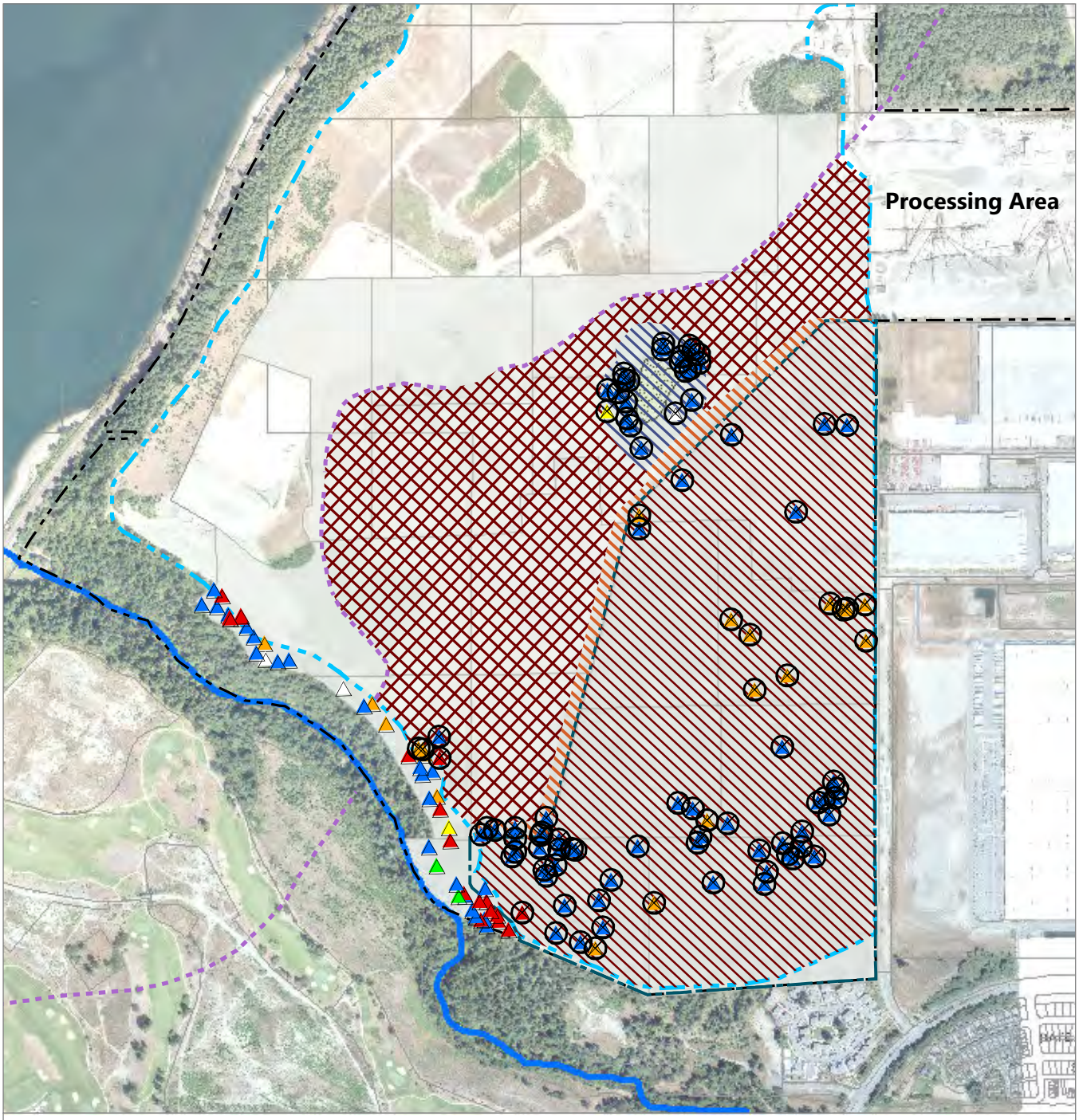
ANCHOR QEA

Figure 1
Vicinity Map
Landmark Tree Inventory Report
Pioneer Aggregates South Parcel Project



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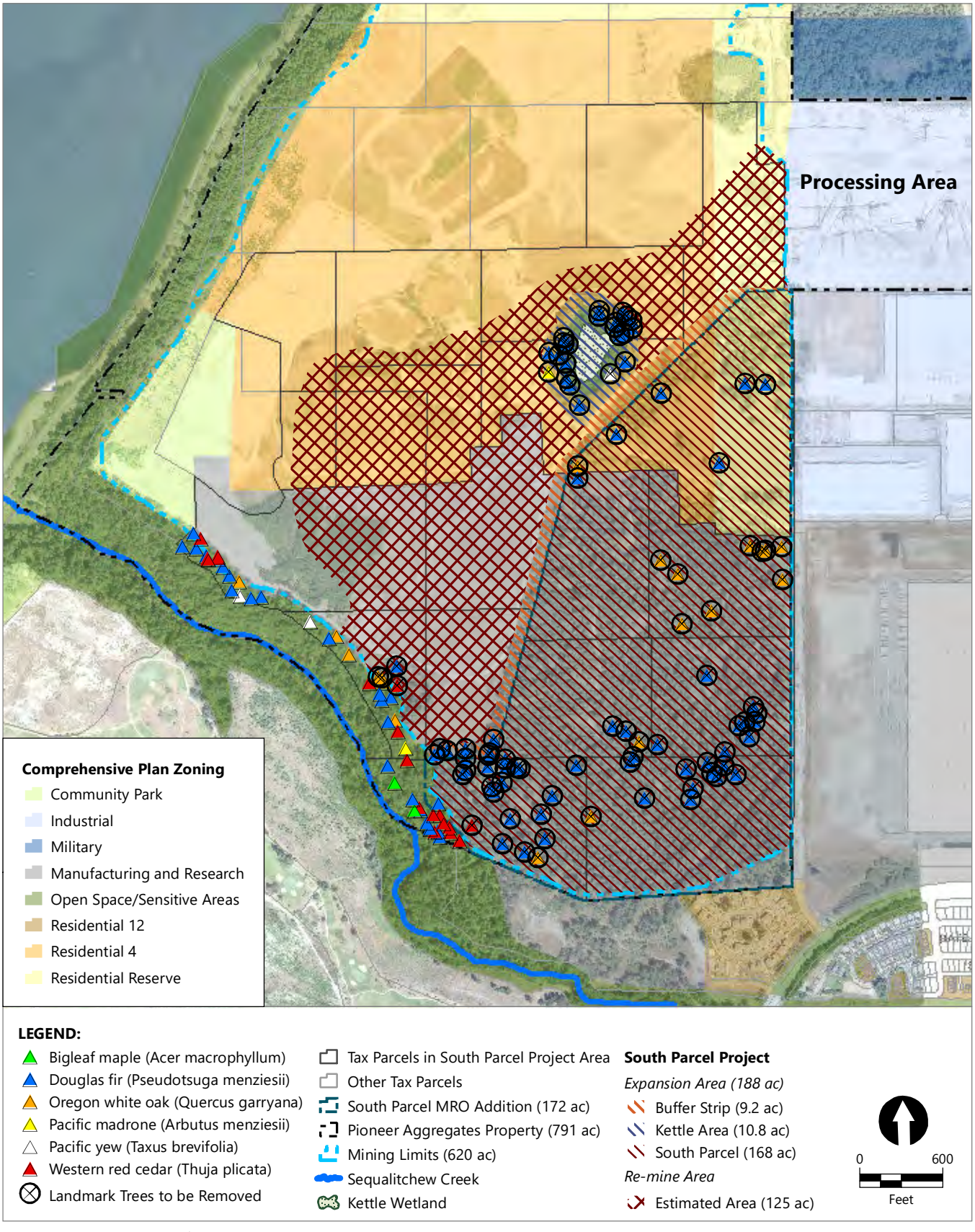
ANCHOR QEA

Figure 2
Landmark Trees Within South Parcel Project Area
Landmark Tree Inventory Report
Pioneer Aggregates South Parcel Project



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ANCHOR QEA

Figure 3
Landmark Trees and Comprehensive Plan Zoning
Landmark Tree Inventory Report
Pioneer Aggregates South Parcel Project

Appendix A
Weyerhaeuser Pathologist Report

Location • Weyerhaeuser Research
505 N Pearl St
Centralia, WA 98531

8/16/2019

Subject: Weyerhaeuser Dupont Mine Site “Landmark Trees” Recognizance

Author: John Browning (Weyerhaeuser Forest Pathologist)

Weyerhaeuser has a forested area adjacent to the Dupont CalPortland gravel mine. We are interested in removing these trees so the area can be mined for gravel. Most of the trees on this land are Douglas-fir. The city of Dupont has a “Landmark tree” statute as shown in Table 1. On 8/26/2019, Mary Castle (Weyerhaeuser Manager of Western Minerals) and myself walked this land to examine these trees and see if we thought they would qualify as “Landmark trees.”

Table 1. Dupont Landmark tree statute.

25.10.120.005 Landmark tree.

“Landmark tree” means an existing healthy, well formed tree which poses no safety hazard due to potential collapse and that is of the following species, trunk type, and minimum diameter measured at breast height:

	Species	
Trunk type	Oregon white oak, Pacific yew, or madrona	Douglas fir, western red cedar, western hemlock, or big leaf maple
Single trunk	24 inches	30 inches
Multi-trunk (sum of diameters)	30 inches	45 inches

(Ord. 18-1045 § 2 (Exh. A))

Stand Composition:

This stand is primarily Douglas-fir mixed with some Oregon white oak. We also found a small amount of big leaf maple. The majority of the Douglas-fir is probably smaller than the 30" DBH requirement for Landmark Trees but there are still many big trees larger than 30". These are mostly open grown Douglas-fir with very large branches down to the ground. Photos 1-3 show examples of these "Woofy" Douglas-fir.

Damage and Hazards:

Mary and I thought most of the large Douglas-fir would be rejected from the Landmark Tree status due to form and possibly safety concerns. Most of these trees have major damage approximately 30 to 40 feet up the truck were the top had died or been broken out and side branches had taken over. Jim Tweedy (mine manager for Glacier NW) stated that this damage was likely due to a major ice storm back in the 50s. Many of these trees also have forked tops. In addition, quite of few of these trees also have considerable sweep at the base. Photos 4 through 12 show examples of the form issues with these Douglas-fir.

From a hazard tree standpoint there is always concern in large Douglas-fir when the top dies and laterals take over because this will develop a weak area and likely entry point for decay.

We looked for root disease and decay and found some evidence of brown cubical rot (possibly *Schweinitzii* although we did not find any fruiting bodies) decaying smaller Douglas-fir to the point that they were falling over (Photos 13 to 16). While I suspect that there is major decay is some of the larger Douglas-fir I did not find any that had fallen over. There are some with evidence of wounds near the base which could be entry points for decay (Photos 17 to 19). Weyerhaeuser Research does have a Resistograph drill which could be used to test these trees for decay without majorly damaging the trees.

There were Douglas-fir with evidence of woodpecker activity which usually indicates insect infestation (Photo 20). Photos 21 to 23 show large hole evidence of boring activity near the base of the trees. Some trees had lots of sap flow which probably indicates a bark beetle infestation (Photo 24).

Hardwoods.

Most of the hardwoods on this site were Oregon white oaks. We did not find any of these trees large enough to meet the Landmark tree definition of 24" (30" for multiple trunks). We did examine one large bigleaf maple which had lots of decay within 6' of the base (Photo 25).

Trees with good form.

We did find a few Douglas-fir large enough to be classified as "Landmark trees" with good form. Overall, we saw maybe six trees that would meet the "Landmark tree" definition as we interpreted it.

General Form Photos:



Photo 1. Open grown Douglas-fir with large branches down to the ground.





Photos 2 & 3. Open grown Douglas-fir with large branches.

Damage and hazards photos:



Photo 4. Trunk deformed 30’ up.



Photo 5. Douglas-fir with poor form



Photo 6. Douglas-fir with poor form



Photo 7. Douglas-fir with poor form



Photo 8. Douglas-fir with poor form

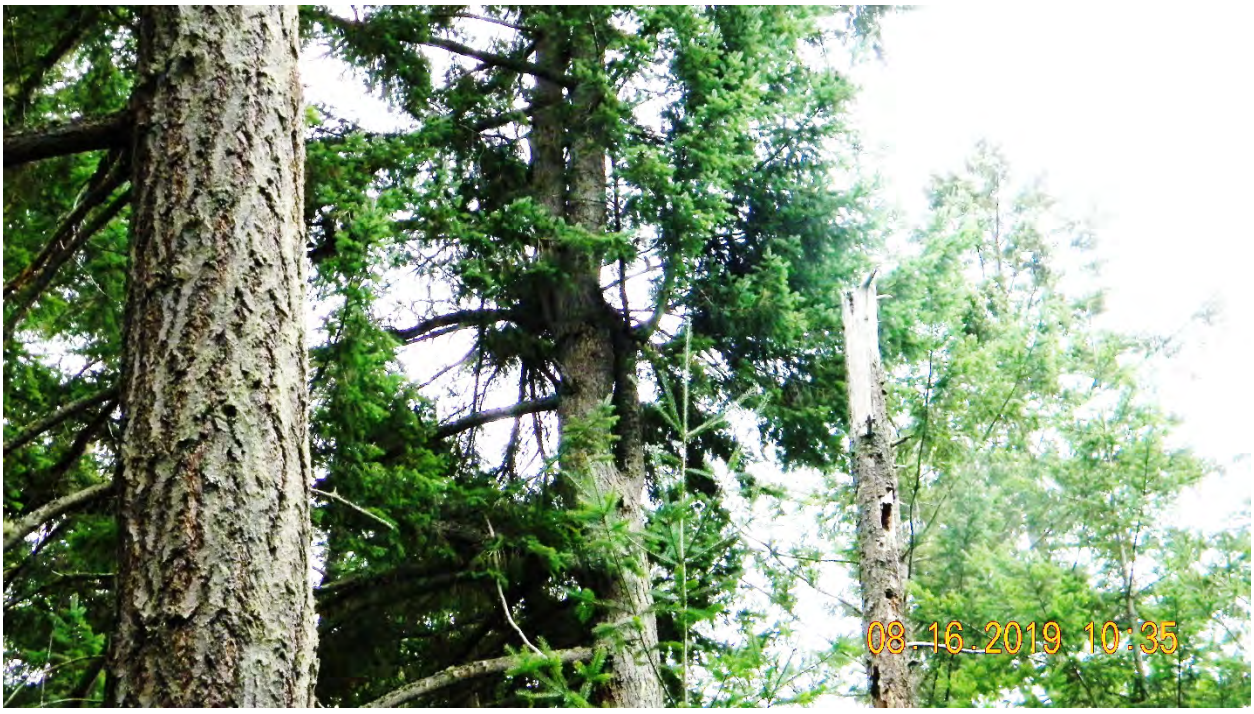

Photo 9. Douglas-fir with poor form



Photo 10. Douglas-fir with poor form



Photo 11. Douglas-fir with poor form



Photo 12. Douglas-fir with poor form

Fallen trees with decay photos:



Photos 13 and 14. Fallen tree with brown cubical rot, possibly *Schweinitzii*.



Photo 15. Fallen tree with brown cubical rot



Photo 16. Falling tree with brown cubical rot

Wound Photos:



Photo 17. Wound on Douglas-fir. Probably allowing decay to enter truck.



Photo 18. Wound on Douglas-fir. Probably allowing decay to enter truck.



Photo 19. Wound on Douglas-fir. Probably allowing decay to enter truck.

Woodpecker activity photos:



Photo 20. Woodpecker activity. Usually indicating tree infested with insects.



Photo 21. Holes near the base of the tree.



Photo 22. Holes near the base of the tree.



Photo 23. Holes near the base of the tree.

Sap flow photo:



Photo 24. Sap flow from truck. Indicating either insect attacks or fungal infections.

Hardwood with decay photo:



Photo 25. Large big leaf maple with evidence of considerable decay

Photos of large Douglas-fir with good form:



Photo 26. Large straight tree, possible “Landmark tree”



Photo 27. Large straight tree, possible “Landmark tree”



Photo 28. Possible “Landmark tree”

Appendix B
Tree Survey Data

Appendix B
Tree Survey Data

Common Name	Scientific Name	Tag Number	Number of Stems	Total dbh (inches)	Within Clearing Limits	City of Dupont Land Use
Douglas fir	*Pseudotsuga menziesii*	1104	1	43	Yes	Residential Reserve
Douglas fir	*Pseudotsuga menziesii*	1135	1	29	Yes	Residential Reserve
Douglas fir	*Pseudotsuga menziesii*	1155	1	29	Yes	Residential 4
Douglas fir	*Pseudotsuga menziesii*	1165	1	37	Yes	Residential 4
Douglas fir	*Pseudotsuga menziesii*	1176	1	29	Yes	Residential Reserve
Oregon white oak	*Quercus garryana*	1190	3	39	Yes	Residential 4
Douglas fir	*Pseudotsuga menziesii*	1192	1	34	Yes	Manufacturing and Research
Oregon white oak	*Quercus garryana*	1006	1	28	Yes	Manufacturing and Research
Oregon white oak	*Quercus garryana*	1007	1	22	Yes	Manufacturing and Research
Oregon white oak	*Quercus garryana*	1008	2	48	Yes	Manufacturing and Research
Oregon white oak	*Quercus garryana*	1014	2	30	Yes	Manufacturing and Research
Oregon white oak	*Quercus garryana*	1015	1	24	Yes	Manufacturing and Research
Oregon white oak	*Quercus garryana*	1041	3	31	Yes	Manufacturing and Research
Oregon white oak	*Quercus garryana*	1043	3	34	Yes	Manufacturing and Research
Oregon white oak	*Quercus garryana*	1052	4	48	Yes	Manufacturing and Research
Oregon white oak	*Quercus garryana*	1098	3	34	Yes	Manufacturing and Research
Douglas fir	*Pseudotsuga menziesii*	1217	1	37	Yes	Manufacturing and Research
Douglas fir	*Pseudotsuga menziesii*	1226	1	32	Yes	Manufacturing and Research
Douglas fir	*Pseudotsuga menziesii*	1227	1	33	Yes	Manufacturing and Research
Douglas fir	*Pseudotsuga menziesii*	1228	1	30	Yes	Manufacturing and Research
Douglas fir	*Pseudotsuga menziesii*	1237	1	31	Yes	Manufacturing and Research
Douglas fir	*Pseudotsuga menziesii*	1238	1	32	Yes	Manufacturing and Research
Douglas fir	*Pseudotsuga menziesii*	1240	1	34	Yes	Manufacturing and Research
Douglas fir	*Pseudotsuga menziesii*	1246	1	30	Yes	Manufacturing and Research
Douglas fir	*Pseudotsuga menziesii*	1250	1	30	Yes	Manufacturing and Research
Douglas fir	*Pseudotsuga menziesii*	1263	1	30	Yes	Manufacturing and Research
Douglas fir	*Pseudotsuga menziesii*	1266	1	30	Yes	Manufacturing and Research
Douglas fir	*Pseudotsuga menziesii*	1275	1	30	Yes	Manufacturing and Research
Douglas fir	*Pseudotsuga menziesii*	1276	1	30	Yes	Manufacturing and Research
Oregon white oak	*Quercus garryana*	1278	3	39	Yes	Manufacturing and Research
Douglas fir	*Pseudotsuga menziesii*	1279	1	33	Yes	Manufacturing and Research
Douglas fir	*Pseudotsuga menziesii*	1280	1	30	Yes	Manufacturing and Research
Douglas fir	*Pseudotsuga menziesii*	1285	1	32	Yes	Manufacturing and Research
Oregon white oak	*Quercus garryana*	1292	4	47	Yes	Manufacturing and Research
Douglas fir	*Pseudotsuga menziesii*	1413	1	30	Yes	Manufacturing and Research
Douglas fir	*Pseudotsuga menziesii*	1415	1	33	Yes	Manufacturing and Research
Douglas fir	*Pseudotsuga menziesii*	1419	1	36	Yes	Manufacturing and Research

Appendix B
Tree Survey Data

Common Name	Scientific Name	Tag Number	Number of Stems	Total dbh (inches)	Within Clearing Limits	City of Dupont Land Use
Douglas fir	*Pseudotsuga menziesii*	1420	1	40	Yes	Manufacturing and Research
Douglas fir	*Pseudotsuga menziesii*	1421	1	46	Yes	Manufacturing and Research
Douglas fir	*Pseudotsuga menziesii*	1422	1	31	Yes	Manufacturing and Research
Douglas fir	*Pseudotsuga menziesii*	1436	1	40	Yes	Manufacturing and Research
Oregon white oak	*Quercus garryana*	1493	1	30	Yes	Manufacturing and Research
Douglas fir	*Pseudotsuga menziesii*	1496	1	31	Yes	Manufacturing and Research
Douglas fir	*Pseudotsuga menziesii*	1301	1	33	Yes	Manufacturing and Research
Douglas fir	*Pseudotsuga menziesii*	1304	1	30	Yes	Manufacturing and Research
Western red cedar	*Thuja plicata*	1309	1	41	Yes	Open Space/Sensitive Areas
Western red cedar	*Thuja plicata*	1317	1	33	No	Open Space/Sensitive Areas
Douglas fir	*Pseudotsuga menziesii*	1323	1	31	Yes	Manufacturing and Research
Douglas fir	*Pseudotsuga menziesii*	1329	1	32	Yes	Manufacturing and Research
Douglas fir	*Pseudotsuga menziesii*	1341	1	38	Yes	Manufacturing and Research
Western red cedar	*Thuja plicata*	1356	1	38	No	Open Space/Sensitive Areas
Western red cedar	*Thuja plicata*	1357	1	32	No	Open Space/Sensitive Areas
Douglas fir	*Pseudotsuga menziesii*	1359	1	30	No	Open Space/Sensitive Areas
Douglas fir	*Pseudotsuga menziesii*	1360	1	30	No	Open Space/Sensitive Areas
Western red cedar	*Thuja plicata*	1393	1	35	No	Open Space/Sensitive Areas
Western red cedar	*Thuja plicata*	1394	1	33	No	Open Space/Sensitive Areas
Western red cedar	*Thuja plicata*	1395	1	32	No	Open Space/Sensitive Areas
Douglas fir	*Pseudotsuga menziesii*	1501	1	30	Yes	Manufacturing and Research
Douglas fir	*Pseudotsuga menziesii*	1502	1	31	Yes	Manufacturing and Research
Douglas fir	*Pseudotsuga menziesii*	1503	1	36	Yes	Manufacturing and Research
Douglas fir	*Pseudotsuga menziesii*	1505	1	30	Yes	Manufacturing and Research
Douglas fir	*Pseudotsuga menziesii*	1506	1	34	Yes	Manufacturing and Research
Douglas fir	*Pseudotsuga menziesii*	1511	1	30	Yes	Manufacturing and Research
Douglas fir	*Pseudotsuga menziesii*	1512	1	31	Yes	Manufacturing and Research
Douglas fir	*Pseudotsuga menziesii*	1513	1	31	Yes	Manufacturing and Research
Douglas fir	*Pseudotsuga menziesii*	1515	1	31	Yes	Manufacturing and Research
Douglas fir	*Pseudotsuga menziesii*	1516	1	30	Yes	Manufacturing and Research
Douglas fir	*Pseudotsuga menziesii*	1521	1	30	No	Open Space/Sensitive Areas
Western red cedar	*Thuja plicata*	1529	1	40	No	Open Space/Sensitive Areas
Pacific madrone	*Arbutus menziesii*	1532	1	24	No	Open Space/Sensitive Areas
Douglas fir	*Pseudotsuga menziesii*	1535	1	31	Yes	Open Space/Sensitive Areas
Douglas fir	*Pseudotsuga menziesii*	1536	1	38	Yes	Manufacturing and Research
Douglas fir	*Pseudotsuga menziesii*	1537	1	30	Yes	Manufacturing and Research
Douglas fir	*Pseudotsuga menziesii*	1538	1	37	Yes	Manufacturing and Research

Appendix B
Tree Survey Data

Common Name	Scientific Name	Tag Number	Number of Stems	Total dbh (inches)	Within Clearing Limits	City of Dupont Land Use
Douglas fir	*Pseudotsuga menziesii*	1540	1	32	Yes	Manufacturing and Research
Douglas fir	*Pseudotsuga menziesii*	1543	1	38	Yes	Manufacturing and Research
Douglas fir	*Pseudotsuga menziesii*	1544	1	38	Yes	Manufacturing and Research
Douglas fir	*Pseudotsuga menziesii*	1546	1	30	Yes	Manufacturing and Research
Douglas fir	*Pseudotsuga menziesii*	1573	1	32	Yes	Residential 4
Douglas fir	*Pseudotsuga menziesii*	1577	1	35	Yes	Open Space/Sensitive Areas
Douglas fir	*Pseudotsuga menziesii*	1578	1	33	Yes	Open Space/Sensitive Areas
Douglas fir	*Pseudotsuga menziesii*	1580	1	31	Yes	Open Space/Sensitive Areas
Pacific madrone	*Arbutus menziesii*	1583	1	24	Yes	Residential 4
Douglas fir	*Pseudotsuga menziesii*	1584	1	30	Yes	Residential 4
Douglas fir	*Pseudotsuga menziesii*	1585	1	33	Yes	Residential 4
Douglas fir	*Pseudotsuga menziesii*	1587	1	31	Yes	Open Space/Sensitive Areas
Douglas fir	*Pseudotsuga menziesii*	1558	1	32	Yes	Open Space/Sensitive Areas
Douglas fir	*Pseudotsuga menziesii*	1589	1	32	Yes	Open Space/Sensitive Areas
Douglas fir	*Pseudotsuga menziesii*	1603	1	32	Yes	Residential 4
Douglas fir	*Pseudotsuga menziesii*	1604	1	34	Yes	Open Space/Sensitive Areas
Douglas fir	*Pseudotsuga menziesii*	1609	1	31	Yes	Open Space/Sensitive Areas
Douglas fir	*Pseudotsuga menziesii*	1610	1	30	Yes	Open Space/Sensitive Areas
Douglas fir	*Pseudotsuga menziesii*	1612	1	35	Yes	Residential 4
Douglas fir	*Pseudotsuga menziesii*	1613	1	30	Yes	Residential 4
Douglas fir	*Pseudotsuga menziesii*	1615	1	33	Yes	Residential 4
Douglas fir	*Pseudotsuga menziesii*	1617	1	34	Yes	Residential 4
Douglas fir	*Pseudotsuga menziesii*	1621	1	30	Yes	Open Space/Sensitive Areas
Douglas fir	*Pseudotsuga menziesii*	1622	1	30	Yes	Open Space/Sensitive Areas
Douglas fir	*Pseudotsuga menziesii*	1625	1	40	Yes	Residential 4
Pacific yew	*Taxus brevifolia*	1627	1	24	Yes	Open Space/Sensitive Areas
Douglas fir	*Pseudotsuga menziesii*	1636	1	32	Yes	Manufacturing and Research
Western red cedar	*Thuja plicata*	1639	1	42	No	Manufacturing and Research
Oregon white oak	*Quercus garryana*	1643	2	31	No	Open Space/Sensitive Areas
Western red cedar	*Thuja plicata*	1644	1	39	No	Open Space/Sensitive Areas
Douglas fir	*Pseudotsuga menziesii*	1649	1	34	No	Open Space/Sensitive Areas
Douglas fir	*Pseudotsuga menziesii*	1652	1	32	No	Open Space/Sensitive Areas
Douglas fir	*Pseudotsuga menziesii*	1653	1	33	No	Open Space/Sensitive Areas
Oregon white oak	*Quercus garryana*	1654	3	57	No	Open Space/Sensitive Areas
Oregon white oak	*Quercus garryana*	1656	1	25	No	Open Space/Sensitive Areas
Oregon white oak	*Quercus garryana*	1657	1	27	No	Open Space/Sensitive Areas
Douglas fir	*Pseudotsuga menziesii*	1659	1	32	No	Open Space/Sensitive Areas

Appendix B
Tree Survey Data

Common Name	Scientific Name	Tag Number	Number of Stems	Total dbh (inches)	Within Clearing Limits	City of Dupont Land Use
Western red cedar	*Thuja plicata*	1662	1	34	No	Open Space/Sensitive Areas
Oregon white oak	*Quercus garryana*	1667	3	34	No	Open Space/Sensitive Areas
Oregon white oak	*Quercus garryana*	1671	1	26	No	Open Space/Sensitive Areas
Douglas fir	*Pseudotsuga menziesii*	1672	1	30	No	Open Space/Sensitive Areas
Pacific yew	*Taxus brevifolia*	1676	3	32	No	Open Space/Sensitive Areas
Western red cedar	*Thuja plicata*	1362	1	31	No	Open Space/Sensitive Areas
Douglas fir	*Pseudotsuga menziesii*	1363	1	31	No	Open Space/Sensitive Areas
Douglas fir	*Pseudotsuga menziesii*	1366	1	30	No	Open Space/Sensitive Areas
Douglas fir	*Pseudotsuga menziesii*	1370	1	46	No	Open Space/Sensitive Areas
Western red cedar	*Thuja plicata*	1371	1	38	No	Open Space/Sensitive Areas
Bigleaf maple	*Acer macrophyllum*	1372	1	35	No	Open Space/Sensitive Areas
Douglas fir	*Pseudotsuga menziesii*	1381	1	30	No	Open Space/Sensitive Areas
Bigleaf maple	*Acer macrophyllum*	1384	1	31	No	Open Space/Sensitive Areas
Douglas fir	*Pseudotsuga menziesii*	1390	1	30	No	Open Space/Sensitive Areas
Douglas fir	*Pseudotsuga menziesii*	1680	1	34	No	Open Space/Sensitive Areas
Oregon white oak	*Quercus garryana*	1681	1	28	No	Open Space/Sensitive Areas
Pacific yew	*Taxus brevifolia*	1683	1	24	No	Open Space/Sensitive Areas
Douglas fir	*Pseudotsuga menziesii*	1684	1	33	No	Open Space/Sensitive Areas
Douglas fir	*Pseudotsuga menziesii*	1685	1	33	No	Open Space/Sensitive Areas
Douglas fir	*Pseudotsuga menziesii*	1686	1	30	No	Open Space/Sensitive Areas
Douglas fir	*Pseudotsuga menziesii*	1694	1	34	No	Open Space/Sensitive Areas
Western red cedar	*Thuja plicata*	1695	1	45	No	Open Space/Sensitive Areas
Western red cedar	*Thuja plicata*	1696	1	42	No	Open Space/Sensitive Areas
Douglas fir	*Pseudotsuga menziesii*	1699	1	38	No	Open Space/Sensitive Areas
Western red cedar	*Thuja plicata*	1700	1	39	No	Open Space/Sensitive Areas
Western red cedar	*Thuja plicata*	1701	1	42	No	Open Space/Sensitive Areas
Douglas fir	*Pseudotsuga menziesii*	1705	1	32	No	Open Space/Sensitive Areas
Western red cedar	*Thuja plicata*	1707	1	43	No	Open Space/Sensitive Areas
Douglas fir	*Pseudotsuga menziesii*	1708	1	30	No	Open Space/Sensitive Areas
Douglas fir	*Pseudotsuga menziesii*	1713	1	31	No	Open Space/Sensitive Areas

Appendix J

Floodplain Habitat Assessment and Mitigation Report

November 2020
DuPont Aggregates South Parcel Project

Floodplain Habitat Assessment and Mitigation Report

Prepared for
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1 Introduction

Glacier Northwest, Inc., dba CalPortland, is seeking regulatory approvals for the Pioneer Aggregates South Parcel Project (Project), which proposes to extend sand and gravel mine operations to the southeast of existing activities at the Pioneer Aggregates Mine in DuPont, Washington. This Floodplain Habitat and Mitigation Report (Report) has been prepared per Federal Emergency Management Agency (FEMA) guidelines as defined in the FEMA guidance document *Regional Guidance for Floodplain Habitat and Assessment and Mitigation in the Puget Sound Basin* (FEMA 2013).

There is one waterbody in the Project Area, the 1.78-acre Kettle Wetland. Fish and wildlife habitat conservation areas located within the Project Area include the Kettle Wetland, the associated wetland bu

ffer, and upland vegetation communities. The following Project documents have been prepared describing the Kettle Wetland and vegetation communities and wildlife habitat conditions within the Project Area:

- *North Sequalitchew Creek Project Impact Area Wetland Delineation Report* (Anchor Environmental 2007)
- *Addendum to 2007 North Sequalitchew Creek Project Impact Area Wetland Delineation Report* (Anchor QEA 2018)
- *South Parcel Expansion Project Critical Areas Report* (Anchor QEA 2020a)

These other reports provide supporting information such as the Project description, Kettle Wetland delineation and rating, vegetation and wildlife habitat description, topography, soils, geologic conditions, Project impacts, proposed mitigation measures, and associated figures, all of which are included by reference in this Report. Per FEMA guidance, the term Project Area is used in this Report (FEMA 2013). In the *South Parcel Expansion Project Critical Areas Report and Habitat Management Plan* (Anchor QEA 2020a), the term Expansion Area is used to describe the Project Area.

2 Project Area

The proposed Project is located on privately owned property at 4301 Pioneer Avenue in the City of DuPont, Pierce County, Washington (Figure 1). The proposed Project covers portions of Sections 22, 23, 26, and 27 of Township 19 North, Range 1 East at 47.118213 N latitude / -122.661295 W longitude.

The Project will be located on the following privately owned tax parcels: 0119233011, 0119233014, 0119233015, 0119233016, 0119233017, 0119262015, 0119262016, 0119232011, 0119232012, and 0119224005. The Project is located in the Chambers-Clover Watershed, Water Resource Inventory Area (WRIA) 12 (Ecology 2020).

The Project Area is zoned as Mineral Resources overlay (City of DuPont 2015). Project Area features including parcel boundaries, the analysis area, the Kettle Wetland, topography, soils, geology, and aerial photographs displaying vegetation communities are shown in the figures in the *South Parcel Expansion Project Critical Areas Report and Habitat Management Plan* (Anchor QEA 2020a) and *North Sequalitchew Creek Project Impact Area Wetland Delineation Report* (Anchor Environmental 2007).

2.1 Fish and Wildlife Habitat

There is one waterbody in the Project Area, the Kettle Wetland. The Kettle Wetland is a 1.78-acre wetland located southwest of the existing processing plant. This wetland is classified as a Class II wetland by City of DuPont regulations and a Category III wetland using the Washington State Department of Ecology (Ecology) wetland rating system. Water levels within the wetland are determined by the seasonal fluctuation in the elevation of the Vashon aquifer, which is the dominant source of hydrology for the wetland. The Kettle Wetland is more than 1/2 mile from a water of the United States and sits in a closed depression, with no surface water connection to the larger watershed, substantially limiting the wetland's opportunity to provide hydrologic or water quality functions. The Kettle wetland is within a FEMA mapped Special Flood Hazard Area without base flood elevation (Zone A). A second FEMA mapped Special Flood Hazard Area (also Zone A) is approximately 0.3 miles southwest of the Kettle Wetland (Figure 2). This second feature is on dry, excessively drained soils (Soil Survey Staff 2020). The second feature has been previously disturbed and cleared of woody vegetation. It provides poor habitat conditions for the species described in this document. Neither of the two Flood Hazard Areas have any surface water connections, the only hydrologic connections are precipitation and in the case of the Kettle wetland, groundwater.

The original Kettle Wetland delineation was conducted in 2007 by Anchor Environmental staff. The Kettle Wetland was redelineated in December 2017 due to the length of time that transpired since the original delineation occurred. During this later delineation, the Kettle Wetland was rated under Ecology's *Washington State Wetland Rating System – Western Washington: 2014 Update* (Hruby 2014)

and the 2018 DuPont Municipal Code Sensitive Areas Regulations (City of DuPont 2018). On April 17, 2019, the U.S. Army Corps of Engineers issued a determination that the Kettle Wetland is not a water of the United States (USACE 2018).

A complete description of the Kettle Wetland and associated wetland buffer vegetation, soil, and hydrologic characteristics, wetland functions, wetland delineation data forms, and the Ecology and City of DuPont wetland rating forms are included in the *North Sequalitchew Creek Project Impact Area Wetland Delineation Report* (Anchor Environmental 2007) and *Addendum to 2007 North Sequalitchew Creek Project Impact Area Wetland Delineation Report* (Anchor QEA 2018).

The Kettle Wetland is identified on Washington Department of Fish and Wildlife (WDFW) Priority Habitats and Species (PHS) Maps (WDFW 2020a) and U.S. Fish and Wildlife Service (USFWS) National Wetlands Inventory (NWI) Map Information (USFWS 2020a). The southwest portion of the Project Area is also mapped by WDFW PHS as a biodiversity area. The WDFW PHS identifies the Project Area as containing big brown bat (*Eptesicus fuscus*), little brown bat (*Myotis lucifugus*), and Yuma myotis bat *Myotis yumanensis*), which may breed in the area. No state or federally listed species are documented by WDFW within the Project Area (WDFW 2020a). Federally listed species are discussed in Section 2.1.1.

These reference maps should be included as figures.

2.1.1 Endangered Species Act-Listed Species and Critical Habitats

Endangered Species Act (ESA)-listed species and critical habitats under National Marine Fisheries Service (NMFS) and U.S. Fish and Wildlife Service (USFWS) jurisdiction in western Washington are referenced on the agencies' websites. The NMFS identifies ESA-listed species that occur or may occur within a broad geographic area, such as an evolutionarily significant unit (ESU) or a distinct population segment (DPS), rather than a project-specific location (NMFS 2020). The USFWS identifies ESA-listed species that occur or may occur within a specific location where a project is proposed (USFWS 2020b).

included the NMFS and USFWS species lists as appendices.

The October 2020 status and potential presence of federally listed species and critical habitats protected under the ESA that may occur within the Project Area are presented in Table 1. As shown in Table 1, 11 ESA-listed species are identified by NMFS and USFWS as having the potential to occur within the Project Area. Of these species, three are aquatic (fish); five are terrestrial (one amphibian, three birds, and one mammal), and three are plants. Designated critical habitat for several of these species is present within Pierce County; however, no designated critical habitat is present within the Project Area.

Table 1
Occurrence of Listed Species and Critical Habitat in or Near the Project Area

Common Name	Scientific Name	ESA Status	Jurisdiction	Species Present in Project Area	Critical Habitat Present in Project Area
Fish					
Puget Sound ESU Chinook Salmon	*Oncorhynchus tshawytscha*	Threatened	NMFS	No	No
Puget Sound DPS Steelhead	*Oncorhynchus mykiss*	Threatened	NMFS	No	No
Coastal-Puget Sound DPS Bull Trout	*Salvelinus confluentus*	Threatened	USFWS	No	No
Amphibians					
Oregon Spotted Frog	*Rana pretiosa*	Threatened	USFWS	No	No
Birds					
Marbled Murrelet	*Brachyramphus marmoratus*	Threatened	USFWS	No	No
Streaked Horned Lark	*Eremophila alpestris strigata*	Threatened	USFWS	No	No
Yellow-billed Cuckoo	*Coccyzus americanus*	Threatened	USFWS	No	No
Mammals					
Gray Wolf	*Canis lupus*	Proposed Endangered	USFWS	No	No
Plants					
Golden Paintbrush	*Castilleja levisecta*	Threatened	USFWS	No	No
Marsh Sandwort	*Arenaria paludicola*	Endangered	USFWS	No	No
Water Howellia	*Howellia aquatallis*	Threatened	USFWS	No	No

There are no federally listed species, designated critical habitats, or essential fish habitats in the Project Area. The ESA-listed or proposed terrestrial and plant species identified by the USFWS as potentially occurring in the Project Area do not occur in the vicinity of the Project Area based on the species' life history and habitat requirements. The Kettle Wetland does not provide wetland habitat features associated with Oregon spotted frog. Potential habitat for the four ESA-listed bird and mammal species identified in Table 1 (gray wolf, marbled murrelet, streaked horned lark, and yellow-billed cuckoo) is not located within many miles of the Project Area due to urban development. Additionally, these species are not typically associated with areas of human activity except in rare,

What about listed salmonid fish in the Sequalitchew Cr. system and marine shoreline, whose habitat may be affected by the Project and related restoration plan?

usually temporary, circumstances. Habitat features associated with the three plant species (golden paintbrush, marsh sandwort, and water howellia) are not present within the Project Area or vicinity.

3 Project Description, Environmental Effects, and Mitigation Measures

3.1 Project Description

The Project description is presented in the *South Parcel Expansion Project Critical Areas Report and Habitat Management Plan* (Anchor QEA 2020a).

3.2 Environmental Effects and Mitigation Measures

The following subsections provide a summary of environmental effects under the proposed Project. A complete description of potential Project impacts and Project mitigation measures is presented in the *South Parcel Expansion Project Critical Areas Report* (Anchor QEA 2020a).

3.2.1 Wetlands

Under the proposed Project, permanent impacts to the Kettle Wetland and its buffer would occur as a result of earthwork mining activities: the entire wetland would be excavated. The area of wetland disturbance is 1.78 acres, and the total buffer area of disturbance is 3.4 acres. All functions and values of the wetland will be mitigated for by constructing a larger wetland as described in the *South Parcel Expansion Project Wetland Mitigation Plan* (Anchor QEA 2020b).

3.2.2 ESA-Listed Species and Critical Habitats

Overall, the Project will not result in measurable potential impacts on ESA-listed species or critical habitats. There is no designated critical habitat located within the Project Area. Potentially suitable habitat for ESA-listed species identified by NMFS and USFWS as having the potential to occur within or near the Project Area is not present within the Project Area. Based on the proposed Project elements, if an ESA biological evaluation was performed for this Project, the effect determination for ESA-listed species and associated critical habitats would likely be no effect.

See comments on page 4.

4 Figures

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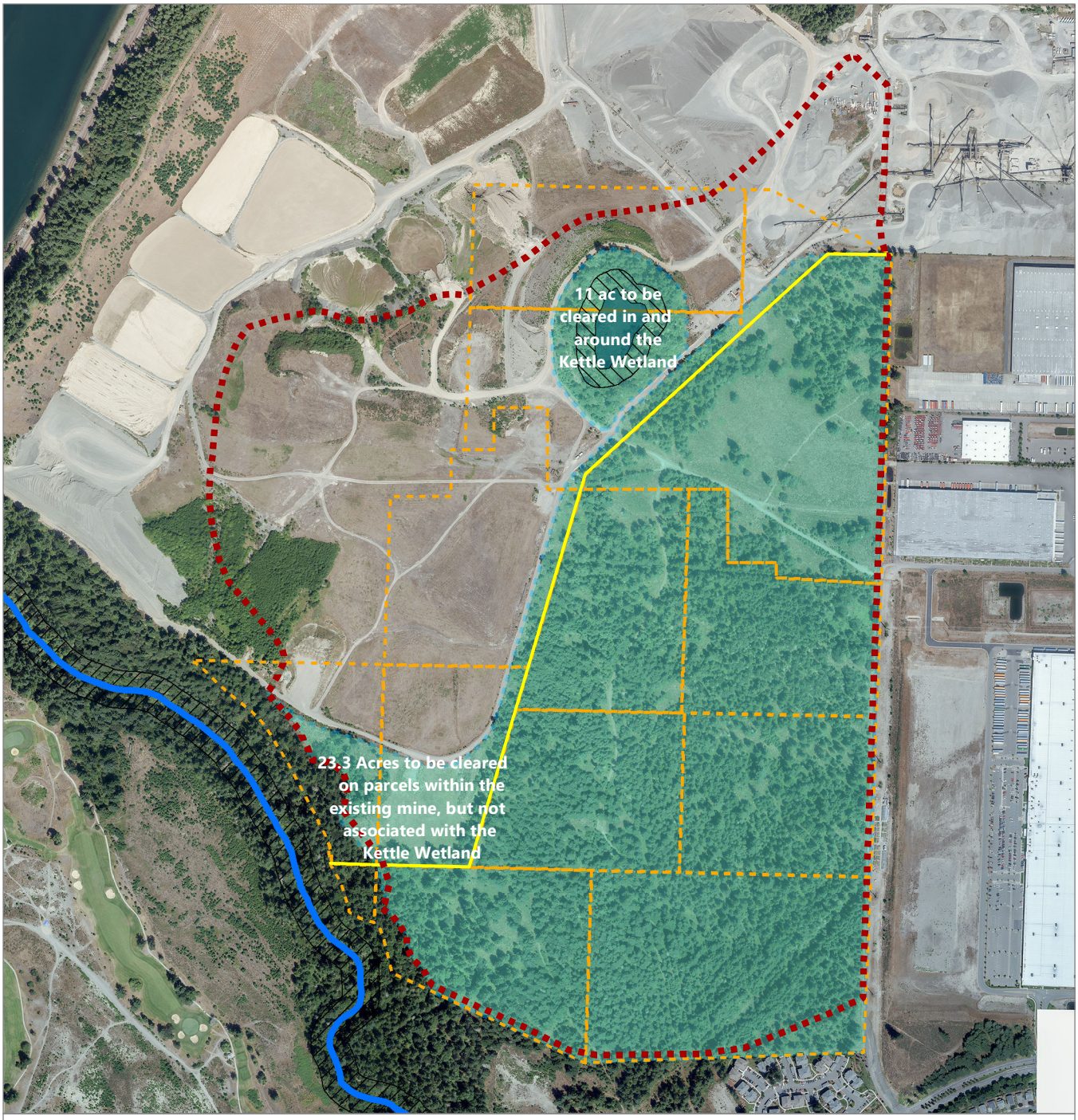

LEGEND:

- South Parcel Project
- Clearing Limits for Mine Expansion (201.6 ac)
- Boundary of Existing Mine
- Area Inside Existing Mine (100.7 ac)
- Kettle Wetland
- 100-ft Wetland Buffer
- Sequalitchew Creek
- 100-ft Stream Buffer

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Feet

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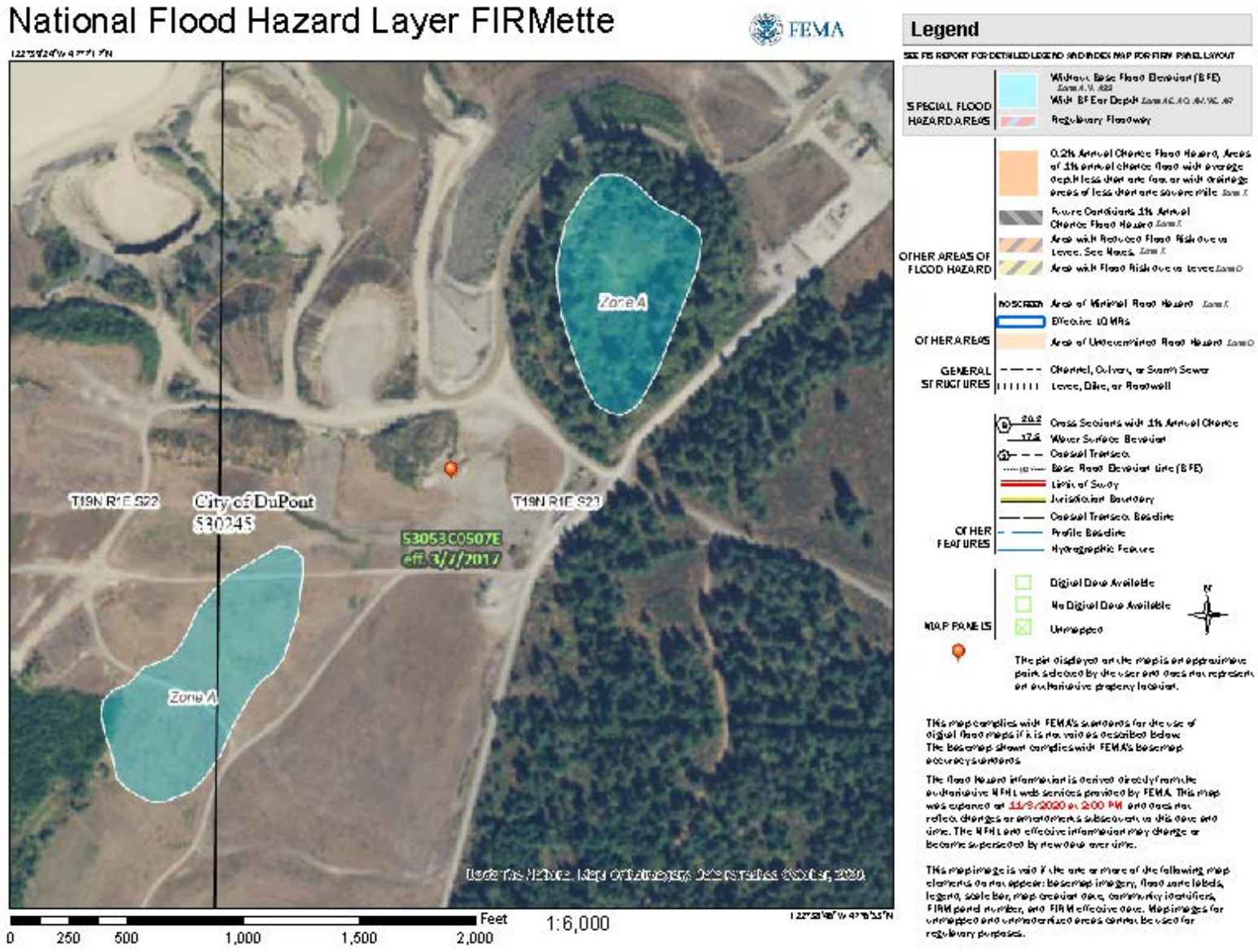
ANCHOR QEA

Figure #1
Project Area
FEMA Habitat Assessment
Pioneer Aggregates South Parcel Project



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ANCHOR QEA

Figure 2

Mapped Flood Hazards Within the Expansion Area

FEMA Habitat Assessment

Pioneer Aggregates South Parcel Project

Appendix K
Noise Study

Prepared for:

CalPortland

Prepared by:

Ramboll US Consulting

Lynnwood, Washington

Date

September 27, 2022

PIONEER AGGREGATES SOUTH PARCEL EXPANSION PROJECT

NOISE STUDY

RAMBOLL Bright ideas. Sustainable change.

CONTENTS

1. Introduction 1
2. Noise Level Terminology and Human Hearing 1
3. Affected Environment 2
3.1 Regulatory Overview 2
3.2 Existing Sound Levels 3
4. Operational Noise Impacts 6
4.1 Noise Sources 6
4.2 Noise Model 6
4.3 Modeling Assumptions 7
4.4 Noise Modeling Results 7
4.4.1 Compliance Assessment 7
4.4.2 Increases over Existing Sound Levels 8
5. Construction 9
6. Mitigation 10
6.1 Operation 10
6.2 Construction 10
7. Significant Unavoidable Adverse Impacts 10

TABLES

Table 1. DuPont Maximum Permissible Sound Levels (dBA) 2
Table 2. Applicable Ln Noise Limits for Class C EDNA Noise Sources 3
Table 3. Range of Existing Measured Hourly Sound Levels (dBA) 4
Table 4. Mining Equipment Noise Levels (L25/Leq, dBA) 6
Table 5. Model-Calculated Sound Levels (Leq/L25, dBA) 8
Table 6. Calculated Increases Over Existing Sound Levels (Leq, dBA) 9

FIGURES

Figure 1. Sound Level Measurement and Model Receptor Locations 5

1. INTRODUCTION

The Pioneer Aggregates South Parcel Project ("South Parcel Project") includes horizontal expansion of mining into approximately 188 acres previously undisturbed by mining and vertical expansion of approximately 125 acres where mining will deepen a portion of the existing mine. The South Parcel Project would extend mining at the current rate for approximately 14 additional years.

Mining under the South Parcel Project will proceed slowly from the north to the south over a period of five to eight years. The method of mining will be identical to that currently used in the permitted mine area. A dozer would push excavated material from the top of the mine face to two front-end loaders working on the mine floor. The front-end loaders would scoop-up the sand and gravel and dump it into portable hoppers that feed conveyors leading to the processing area.

A conveyor will start at the north end of the Expansion Area and will be extended south as mining progresses. The conveyor is comprised of a 48-inch-wide rubberized belt that is supported by a series of rollers, called idlers, mounted on steel framed segments that support the conveyor about five feet off the ground.

A 20-foot-high noise berm will be constructed along the southern boundary of the South Parcel behind retained vegetation and will help reduce potential noise associated with mining for adjacent land uses. The berm will be constructed prior to clearing in the adjacent portionof the South Parcel.

This analysis considers potential noise impacts to residences and other sensitive receivers nearest the expansion area. The following report reviews noise terminology, regulatory criteria applicable to the project, and the methods and findings of the analysis

2. NOISE LEVEL TERMINOLOGY AND HUMAN HEARING

Noise is sometimes defined as unwanted sound; the terms noise and sound are used more or less synonymously in this report. The human ear responds to a very wide range of sound intensities. The decibel scale (dB) used to describe sound is a logarithmic rating system which accounts for the large differences in audible sound intensities. This scale accounts for the human perception of a doubling of loudness as an increase of 10 dB. Therefore, a 70-dB sound level will sound about twice as loud as a 60-dB sound level. People generally cannot detect differences of 1 dB; in ideal laboratory stuations, differences of 2 or 3 dB can be detected by people, but such a change probably would not be detectable in an average outdoor environment. A 5-dB change would probably be perceived under normal listening conditions.

When addressing the effects of noise on people, it is useful to consider the frequency response of the human ear. Sound-measuring instruments are therefore often programmed to weight measured sounds based on the way people hear. The frequency-weighting most often used is A-weighting because it approximates the frequency response of human hearing and is highly correlated to the effects of noise on people. Measurements from instruments using this system are reported in "A-weighted decibels" or dBA. All sound levels in this evaluation are reported in A-weighted decibels.

Distance from the source, the frequency of the sound, the absorbency of the intervening ground, obstructions, and duration of the noise-producing event all affect the transmission and perception of noise. The degree of this effect also depends on who is listening and on existing sound levels.

3. AFFECTED ENVIRONMENT

3.1 Regulatory Overview

The project site is located within the City of DuPont in Pierce County. Section 9.09.040 of the DuPont Municipal Code (DMC 9.09.040) specifies noise limits based on the limits set in the Washington Administrative Code (WAC 173-60). DMC 9.09.040 establishes limits on sounds crossing property boundaries based on the Environmental Designation for Noise Abatement (EDNA) of the sound source and the receiving properties. Section 9.09.040(b) of the DuPont City Code identifies Class A EDNAs as residential areas, Class B EDNAs as commercial areas, and Class C EDNAs as industrial areas. The allowable noise level limits are displayed in **Table 1**.

Table 1. DuPont Maximum Permissible Sound Levels (dBA)

EDNA of Source Property	EDNA of Receiving Property		
	Class A Day/Night [a]	Class B	Class C
Class A	55/45	57	60
Class B	57/47	60	65
Class C	60/50	65	70

[a] The limits for noise received in Class A EDNAs are reduced by 10 dBA during nighttime hours (10 PM to 7 AM).
Source: DMC 9.09.040.

The city noise rule allows the limits presented in **Table 1** to be exceeded for certain periods of time: 5 dBA for no more than 15 minutes in any hour, 10 dBA for no more than 5 minutes of any hour, or 15 dBA for no more than 1.5 minutes of any hour. These allowed increases can be described in terms of the percentage of time a certain level is exceeded, using statistical noise descriptors (L_{n}s). For example, L_{25} represents a sound level that is exceeded 25 percent of the time, or 15 minutes in an hour. Similarly, $L_{8.33}$ and $L_{2.5}$ are the sound levels that are exceeded 8.33 and 2.5 percent of the time, or 5 and 1.5 minutes in an hour, respectively. At no time can the allowable sound level be exceeded by more than 15 dBA, represented by the L_{max}.

DMC Section 9.09.040(c) identifies a map that specifically designates the EDNA's for various properties within the City (Appendix A of Ordinance 208). The EDNA boundaries shown in this map identify a small Class A (Residential) EDNA on both sides of Barksdale Avenue in the historic village of DuPont, a small Class B (Commercial) EDNA between the historic village and I-5, and the remainder of the DuPont area as a Class C (Industrial) EDNA. DuPont Ordinance 208 and the associated map in Appendix A were adopted in 1978; they are no longer representative of current zoning and comprehensive land use plan designations. Furthermore, the 1978 map of EDNA designations does not adequately represent the basic uses identified in 9.09.040(b) that define EDNAs. It is, therefore, unclear whether the EDNA designations shown in the 1978 map or the EDNA identifications based on land uses in 9.09.040(b) should apply.

For this noise analysis, land use zones (as identified in Dupont's Zoning Map) were used to determine the appropriate noise limits for the various receiving properties. This approach is consistent with the more modern language and identification of EDNA designations based on actual uses and represents a more accurate reflection of current and expected future conditions. But applying either method for

identifying the appropriate EDNAs, the South Parcel would be considered a Class C EDNA, and the applicable Ln noise limits for a Class C EDNA noise source affecting different types of receiving properties are displayed in **Table 2**.

Table 2. Applicable Ln Noise Limits for Class C EDNA Noise Sources

EDNA of Source Property	Ln Limits			
	L_{25}	$L_{8.3}$	$L_{2.5}$	L_{max}
Class A [a]	60/50	65/55	70/60	75/65
Class B	65	70	75	80
Class C	70	75	80	85

[a] The limits for noise received in Class A EDNAs are reduced by 10 dBA during nighttime hours (10 PM to 7 AM) and are shown for Day/Night.
Source: DMC 9.09.040 (d)

Because noise generated by South Parcel mining would typically be fairly consistent over an hourly period, the allowances for short-term increases in the noise level limits would rarely apply. Therefore, the most stringent/conservative noise limit for the proposed mining (a Class C source) would be an L_{25} of 70 dBA at nearby Class C EDNAs, an L_{25} of 65 dBA at nearby Class B EDNAs, or an L_{25} of 60 dBA between 7 AM and 10 PM and 50 dBA between 10 PM and 7 AM at nearby Class A EDNAs.

DMC 9.09.050 exempts the following sources from the above noise limits:

- Temporary construction noise, except when received in Class A EDNA properties between the hours of 10 PM and 7 AM;
- Sounds created by motor vehicles when regulated by the state noise limit (Chapter 173-62 WAC), adopted by reference in DMC 9.09.040; and
- Sounds created by motor vehicles, licensed or unlicensed, when operated off public highways, except when such sounds are received in Class A EDNAs.

3.2 Existing Sound Levels

Ramboll measured sound levels from October 31 – November 1, 2019 to characterize the existing sound levels in the project vicinity as part of a noise study for an earlier proposal to mine the south parcel. For the measurements, Ramboll used Larson Davis LxT Class 1 sound level meters and measured hourly sound levels for a minimum of 24-hours. The meters were field-calibrated prior to the measurements and had been factory certified within the previous 12 months. The microphones were placed on tripods about 5 feet above the ground.

The sound level measurements were taken at two locations, shown in **Figure 1**. SLM1 was chosen to represent the nearest residences south of the mine on the north side of the Creekside Apartment complex. SLM2 represents the residential community across Center Drive from the South Parcel. At both measurement locations, noise from the existing Pioneer Aggregates facility was not audible and did not substantively contribute to the measured levels. A summary of the sound level measurement results is displayed in **Table 3,** and detailed information regarding the measured levels is included in Attachment A.

Table 3. Range of Existing Measured Hourly Sound Levels (dBA)

Location	Time [a]	L_{eq} [b]	L_{max}	L_2	L_8	L_{25}	L_{90}	L_{dn} [b]
SLM1	Day	39-48	52-72	43-56	42-49	37-47	33-45	47
	Early Morning	42-44	56-58	46-47	45-46	43-45	40-43	
	Night	35-44	48-58	39-47	37-46	35-45	33-43	
SLM2	Day	49-54	61-83	55-61	53-57	50-56	41-51	56
	Early Morning	52-55	69-700	57-59	56-58	53-56	45-49	
	Night	42-55	57-70	48-59	45-58	41-56	38-49	

[a] Daytime hours are defined as between 7 AM and 10 PM, early morning hours are between 5 and 7 AM, and nighttime hours are between 10 PM and 7 AM.

[b] The Leq is an energy-average sound level defined over a specified period of time, often one hour. It is useful for representing the energy of a fluctuating sound with a single number. The Ldn is a similar to a 24-hour Leq, except the Ldn includes an additional 10 dBA added to sound levels in each hour between 10 PM and 7 AM to account for increased sensitivity to noise at night.

SLM1 – Located behind the Creekside Apartment complex. Noise sources included JBLM and civilian aircraft, including helicopters. The noise environment at the apartment complex was relatively quiet during deployment and retrieval of the meters.

SLM2 – Located at the Edmond Village Park to represent the residential setbacks from Center Drive. The primary noise source was traffic along Center Drive. Sporadic noise sources included aircraft noise, both military and civilian.

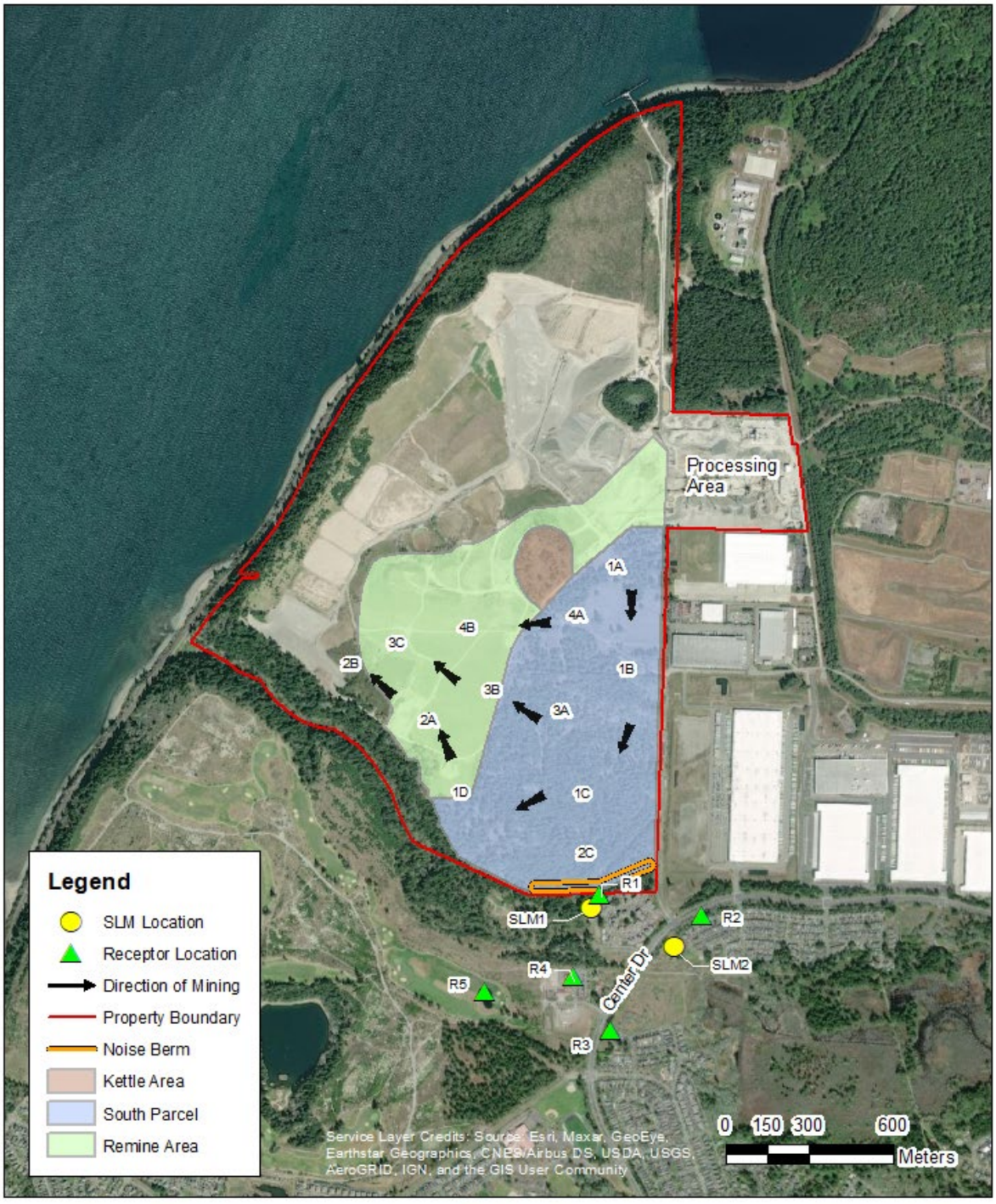

Figure 1. Sound Level Measurement and Model Receptor Locations

4. OPERATIONAL NOISE IMPACTS

The South Parcel Project will not substantially alter the majority of existing mining-related operations at the facility. The method of mining will be identical to that currently used in the permitted mine area. A dozer would push excavated material from the top of the mine face to two front-end loaders working on the mine floor. The front-end loaders would scoop-up the sand and gravel and dump it into portable hoppers that feed conveyors leading to the processing area. The material processing plants and barge-loading facilities would not change.

4.1 Noise Sources

Equipment required for mining the South Parcel includes two front-end loaders, a bulldozer, and conveyors and a electric conveyor drive motor. This equipment would work in tandem; the bulldozer would push material down the mining face to the loaders, which would load the material onto a conveyor going to the existing processing plant. The bulldozer and loaders would be the dominant noise sources at the nearest sensitive receivers to the South Parcel.

Noise from the excavation equipment was considered in noise modeling to estimate future noise associated with the facility. Noise from most equipment was characterized using measurements of equipment operating at the existing Pioneer Aggregates facility. The measurement of the electric conveyor drive motor was measured at a different facility and is from Ramboll's source sound level archives. The sound levels of the representative equipment are shown in **Table 4**.

Table 4. Mining Equipment Noise Levels (L_{25}/L_{eq}, dBA)

Equipment	Sound Level at 100 feet
Bulldozer	76
Front-End Loader	75
Electric conveyor drive motor	60
Conveyor	56
Source: Ramboll US Consulting	

Because the noise from a sand and gravel operation is typically fairly constant over the course of an hour, the noise standard that would be most limiting would be the hourly L_{25} limit. In order to more closely relate the calculated sound levels with the applicable noise limits, Ramboll used the measured L_{25} of each source when this information was available. However, not all of the equipment sound level information was available as an L_{25}. Because the noise generated by mining tends to be fairly continuous over the course of an hour, the sound levels of these operations described by the L_{eq} and L_{25} tend to be very similar. Therefore, in instances where L_{25} data were not available, Ramboll used the L_{eq} to represent an L_{25}.

4.2 Noise Model

Ramboll used the CadnaA noise model to estimate sound levels expected to be generated by the proposed mining expansion equipment. CadnaA is a computer program that calculates sound levels after considering the noise reductions or enhancements caused by distance, topography, ground surfaces, atmospheric absorption, and meteorological conditions in compliance with ISO 9613-2. The

modeling process included the following steps: (1) characterizing the noise sources based on frequency-specific measurements of representative equipment; (2) creating three-dimensional maps of the site and vicinity to enable the model to evaluate effects of distance and topography on noise attenuation, (3) assigning the equipment sound levels to the appropriate locations on the site, and (4) placing model "receptors" at several model receptor locations to represent places where the noise will be received.

4.3 Modeling Assumptions

The following assumptions were used in our assessment:

- The South Parcel will be mined in phases, beginning in the northeast section of the parcel and proceeding south and then west and northwest;
- The noise model evaluated mining activities in Phases 1B, 2C, and 3B to consider the range of sound levels that might occur from the South Parcel activities;
- For Phase 1B, much of the existing topography was assumed to be intact, providing some amount of intervening topography between the excavation equipment and the receivers to the south;
- For Phases 2C and 3B, most of the South Parcel was assumed to have been mined;
- For each phase considered, the noise model included one bulldozer pushing material down the mine slope, two front-end loader sat the toe of the slope loading material into a hopper, and a conveyor transporting material from the active mining area to the processing plant area;
- All equipment was assumed to operate concurrently and continuously;
- The South Parcel Expansion will not require increased capacity of the processing plants; and
- The site plan and noise model include a 20-foot high berm, constructed prior to mining of Phase 2C, located in the southeast corner of the site between the Creekside Apartments and the South Parcel. The berm will include trees and landscaping.

4.4 Noise Modeling Results

4.4.1 Compliance Assessment

As part of the noise assessment, Ramboll first compared the model-calculated sound levels with the applicable City noise limits to assess potential compliance with the limits. Sound levels from proposed excavation activities were modeled at six receptor locations representing three residential areas, a civic center, and a golf course nearest the South Parcel. The receptor locations are shown in **Figure 1**. The predicted future sound levels and detailed descriptions of each receptor location are provided in **Table 5**. Noise from the existing Pioneer Aggregates operations does not substantively contribute to the sound levels at the receptor locations considered in this assessment, and the predicted sound levels provided in **Table 5** can be considered representative of the entire operation with mining in the South Parcel.

As can be seen by the values in **Table 5,** sound levels from the proposed mine would easily comply with the applicable noise limits during daytime hours (i.e., 7 AM to 10 PM) at all locations. However, sound levels at the upper floors of the Creekside Apartments facing the site may exceed the noise limits if full mining activity occurs in Phase 2C during early morning hours (i.e., between 5 and 7 AM).

Because the dominant noise source at the Creekside Apartments during Phase 2C excavation is the bulldozer, Ramboll considered the noise benefits of restricting bulldozer use in this phase to daytime hours only. Prohibition of bulldozer use during the early morning hours results in modeled sound levels below the nighttime noise limits applied between 5 and 7 AM at all receptor locations.

Table 5. Model-Calculated Sound Levels (L_{eq}/L_{25}, dBA)

Model Receptor Location	Modeled Sound Level				Noise Limit [a]
	Phase 1B	Phase 2C	Phase 2C (No Bulldozer)	Phase 3B	
R1a	42	55	48	43	60/50
R1b	41	46	42	40	60/50
R2	40	45	43	37	60/50
R3	36	40	37	36	60/50
R4	37	39	36	38	65
R5	36	38	37	39	65

Receptor Locations:

R1a – Upper floor of the Creekside Apartments nearest the South Parcel

R1b – Ground floor of the Creekside Apartments nearest the South Parcel

R2 – Residences in Edmond Village

R3 – Residences in Palisade Village

R4 – Dupont Civic Center

R5 – The Home Course Golf Course

(a) The noise limits shown for residential locations are for daytime/nighttime hours, where daytime hours are from 7 AM to 10 PM and nighttime hours are from 10 PM to 7 AM.

Source: Ramboll US Corporation

4.4.2 Increases over Existing Sound Levels

In addition to evaluating the potential compliance of on-site sources associated with South Parcel activities, Ramboll considered potential noise impacts caused by project-related increases over existing baseline sound levels. This assessment was restricted to residential receptor locations potentially affected by project-related increases over existing levels.

For the project sound levels during daytime hours, we used the worst-case modeled levels expected during all phases of excavation. For the project sound levels during early morning hours, we used the worst-case modeled sound levels during all phases of excavation assuming *no bulldozer* in Phase 2C. Because mining activities in Phase 2C may exceed the nighttime noise limit of 50 dBA at the upper floors of the Creekside Apartments with all equipment in operation, use of the bulldozer in Phase 2C will be restricted to daytime hours only. The resulting increases over existing levels are displayed in **Table 6**.

Table 6. Calculated Increases Over Existing Sound Levels (Leq, dBA)

Model Receptor Location	Time of Day [a]	Measured Existing Levels	Level with South Parcel Expansion		
			Project Only [b]	Cumulative [c]	Increase [d]
R1a	Day	39-48	55	55-56	8-16
	Night	42-44	48	49-50	5-7
R1b	Day	39-48	46	46-50	2-8
	Night	42-44	42	45-46	2-3
R2	Day	49-54	45	51-55	0-1
	Night	52-55	43	52-55	0
R3	Day	49-54	40	50-55	0
	Night	52-55	37	52-55	0

Notes:

(a) Daytime hours are from 7 AM to 10 PM. Nighttime hours for the purpose of this evaluation are from 5 to 7 AM, when early morning excavation may occur.

(b) The daytime project levels shown are the highest modeled sound levels from all phases of South Parcel activities considered in this assessment. The nighttime levels shown are the highest levels from all modeled phases except 2C.

(c) Cumulative levels represent the existing measured sound levels + the modeled project-related sound levels.

(d) Apparent discrepancies in any calculated increases are artifacts of rounding the displayed sound levels to the nearest whole number.

Source: Ramboll US Corporation

As can be seen in **Table 4**, the sound levels when a bulldozer is working very near the project boundaries in Phase 2C are substantially higher than the baseline sound levels at the upper floors of the Creekside Apartments (R1a), resulting in potential increases of 8 to 16 dBA. If these sound levels were experienced throughout the life of the project, they would represent a substantial increase. However, the modeled levels at the Creekside Apartments are dominated by noise from a bulldozer working on the slope of 2C very near the southern project boundary. This worst-case condition would only occur during Phase 2C excavation. Even during Phase 2C excavation, the bulldozer would split its time between excavation in Phase 2C and excavation in the existing mining areas farther north and west, and sound levels much of the time would be substantially lower than the worst-case levels identified here. The variation in sound levels over the life of the mine and the variation in day-to-day bulldozer activities would reduce the potential noise impacts at the Creekside Apartments due to increases over baseline levels.

At the more distant residential locations (R2 and R3), increases over background sound levels are 1 dBA or less during even the worst-case Phase 2C activities. Such increases would not be discernable in an active outdoor environment and would result in no impact.

5. CONSTRUCTION

The material processing infrastructure that would be used to support South Parcel mining already exists. Construction directly related to the South Parcel would be limited to logging, preparation of new mining phases/segments for excavation, expansion of the on-site conveyor system to connect the

expanded mining area to the existing processing facility, and the construction of the berm on the south side of Phase 2C for noise attenuation.

Much of the construction activity would entail heavy equipment similar to, or the same as, the equipment required during excavation. Therefore, the sound levels of construction are expected to be similar to the modeled operational sound levels identified above. The exception would be sound levels associated with construction of the berm on the south side of Phase 2C. During construction of the berm, sound levels at nearby receivers may be noticeable and, at times, intrusive. This could result in temporary and short-term noise impacts at nearby properties. Construction activity is exempt from Dupont's noise regulations during daytime hours (7 AM to 10 PM).

6. MITIGATION

6.1 Operation

The plans for the site include construction of a 20-foot high berm on the south side of Phase 2C to reduce noise at off-site locations, especially at the Creekside Apartments. With such a berm, modeled sound levels of worst-case mining activities are well below the applicable daytime noise limits at all receptor locations.

Excavation in Phase 2C during early morning hours (i.e., between 5 and 7 AM) may exceed the stricter nighttime limit of 50 dBA applicable at the Creekside Apartments. The sound levels from Phase 2C activities affecting the Creekside Apartments is dominated by a bulldozer working at the top of the slope. Restriction of the bulldozer to daytime hours only within Phase 2C reduces the modeled sound levels at the Creekside Apartments to 48 dBA or less, which would comply with Dupont's nighttime noise limit.

6.2 Construction

Construction activities (i.e., logging and construction of the southern berm) would be conducted during daytime hours only (7 AM to 10 PM) to minimize noise impacts.

7. SIGNIFICANT UNAVOIDABLE ADVERSE IMPACTS

With construction of the proposed berm as noted above and with restriction of hours of bulldozer operation in Phase 2C to daytime hours only, the project is expected to fully comply with the Dupont noise limits. Furthermore, potential noise impacts at the Creekside Apartments (R1) can be mitigated by the proposed mitigation measures, although short-term unavoidable noise impacts may be expected. Due to the short-term nature of the impacts at R1, any such impacts would not be characterized as significant.

APPENDIX A
SOUND LEVEL MEASUREMENT DETAIL

SLM1: Located behind the Creekside Apartment Complex October 31- November 1, 2019								
Date	**Time**	**Leq**	**Lmax**	**Lmin**	**L2**	**L8**	**L25**	**L90**
31-Oct	12:00:00	47.4	72.0	33.1	55.5	47.2	42.0	34.7
31-Oct	13:00:00	38.7	58.6	32.1	44.9	42.7	38.8	33.3
31-Oct	14:00:00	40.3	61.4	32.3	48.9	43.3	37.4	33.6
31-Oct	15:00:00	41.3	60.2	32.2	50.9	43.7	38.6	33.7
31-Oct	16:00:00	41.8	61.1	33.1	50.1	45.3	39.7	35.1
31-Oct	17:00:00	41.0	55.6	35.0	45.6	43.5	41.8	37.4
31-Oct	18:00:00	42.2	61.2	38.3	46.0	43.8	42.4	40.3
31-Oct	19:00:00	40.8	52.3	36.9	43.2	42.3	41.3	38.8
31-Oct	20:00:00	41.1	54.0	37.6	43.3	42.4	41.5	39.6
31-Oct	21:00:00	44.2	69.3	37.0	52.6	43.0	41.4	38.8
31-Oct	22:00:00	38.1	51.5	33.6	41.3	39.8	38.5	35.9
31-Oct	23:00:00	37.7	49.7	33.6	41.9	39.7	38.0	35.3
1-Nov	0:00:00	37.2	49.9	33.2	41.9	39.5	37.6	34.5
1-Nov	1:00:00	36.1	48.2	33.1	39.7	38.5	36.3	34.3
1-Nov	2:00:00	35.2	49.1	32.1	38.9	37.3	35.4	33.3
1-Nov	3:00:00	36.8	48.5	33.3	40.3	39.1	37.3	34.6
1-Nov	4:00:00	39.1	55.3	34.3	41.9	40.7	39.6	37.2
1-Nov	5:00:00	42.4	57.9	37.5	45.8	44.5	43.2	39.7
1-Nov	6:00:00	44.3	55.5	40.8	47.0	45.9	44.9	42.5
1-Nov	7:00:00	44.8	53.5	41.0	47.4	46.5	45.4	43.1
1-Nov	8:00:00	46.8	61.7	42.9	50.3	48.7	47.0	44.7
1-Nov	9:00:00	45.3	63.5	38.6	48.8	47.0	46.1	40.9
1-Nov	10:00:00	42.5	64.9	36.4	50.0	45.6	41.1	38.1
1-Nov	11:00:00	47.9	71.8	36.2	50.2	44.1	40.4	37.6
Ldn = 47.0								

SLM2: Located at the Edmond Village Park October 31- November 1, 2019								
Date	**Time**	**Leq**	**Lmax**	**Lmin**	**L2**	**L8**	**L25**	**L90**
31-Oct	12:00:00	53.5	68.4	38.4	59.6	56.9	53.9	46.2
31-Oct	13:00:00	49.9	63.4	35.0	56.5	54.3	50.4	41.3
31-Oct	14:00:00	49.8	67.1	35.2	55.7	53.5	50.6	41.3
31-Oct	15:00:00	50.7	67.3	34.3	56.6	53.9	51.4	42.4
31-Oct	16:00:00	52.3	68.0	35.9	56.8	55.3	53.4	46.7
31-Oct	17:00:00	52.5	61.3	40.0	57.2	55.8	53.6	46.5
31-Oct	18:00:00	53.3	72.2	41.2	57.5	56.3	54.7	46.5
31-Oct	19:00:00	50.2	65.3	40.5	55.8	54.1	51.3	43.4
31-Oct	20:00:00	50.8	65.5	40.6	56.3	54.6	52.1	43.3
31-Oct	21:00:00	54.1	83.5	41.5	57.5	54.9	51.5	43.5
31-Oct	22:00:00	46.9	62.2	38.4	53.5	51.1	47.2	40.6
31-Oct	23:00:00	46.2	61.2	38.1	53.1	50.6	45.5	40.5
1-Nov	0:00:00	45.1	60.3	36.5	52.6	49.0	44.2	39.8
1-Nov	1:00:00	42.8	60.0	37.1	48.4	44.5	42.6	39.8
1-Nov	2:00:00	42.1	63.8	35.1	49.7	44.7	40.6	37.6
1-Nov	3:00:00	42.9	56.6	37.4	50.3	46.8	41.7	39.0
1-Nov	4:00:00	45.4	57.9	39.5	52.2	49.7	44.5	41.3
1-Nov	5:00:00	51.7	69.2	41.2	57.4	55.6	52.8	44.7
1-Nov	6:00:00	54.6	69.7	43.8	59.4	57.9	55.7	49.2
1-Nov	7:00:00	54.5	68.9	46.6	58.7	57.3	55.6	49.6
1-Nov	8:00:00	54.5	69.2	47.5	58.3	56.9	55.3	50.7
1-Nov	9:00:00	51.9	63.4	43.1	55.7	54.5	53.0	47.7
1-Nov	10:00:00	49.4	74.2	40.7	54.8	52.8	50.3	43.3
1-Nov	11:00:00	53.8	76.0	40.3	60.5	55.7	51.8	44.4
Ldn = 55.8								

Appendix L

Visual Impact Analysis

CALPORTLAND DUPONT SOUTH PARCEL MINING AREA EXPANSION VISUAL IMPACT ANALYSIS

Project Description

CalPortland, a building materials company producing cement and construction material products, is applying to expand sand and gravel mining operations at their existing Pioneer Aggregates Mine site in the City of DuPont, Washington. The proposed project, referred to as the South Parcel Project, includes horizontal expansion of mining into approximately 188 acres previously undisturbed by mining (Expansion Area), and vertical expansion of approximately 125 acres where re-mining will deepen a portion of the existing Pioneer Aggregates Mine (Re-mining Area). See Attachment A for a more detailed project description.

The South Parcel Project site is located southeast of the existing Pioneer Aggregates Mine in the City of DuPont (known as "the City"). The site is within the City's designated Mineral Resource Overlay and is bordered to the north and west by the existing Pioneer Aggregates Mine, to the east by industrial/ distribution facilities, and to the south by Sequalitchew Creek and the Creekside Village residential development. See Attachment A, Figure 1 for a map of the project area.

This project is anticipated to extend the time allowance for mining at the current rate by approximately 14 years, subject to market conditions.

Affected Environment

The area affected by the proposed expansion includes a mixture of open grassland and mature, open prairie forest dominated primarily by Douglas fir. This forest cover varies in density throughout the site, typical for a south Puget Sound prairie landscape, but is comparatively dense on the eastern edge of the site, along Powerline Road and Center Drive. This forested evergreen buffer provides a measure of visual opaqueness to the site, such that passersby currently cannot view the existing mining operations.

Methodology

The visual impact methodology is intended to document the nature of the existing landscape, and to identify impacts to visual resources that would result from alteration of the landscape from mining and reclamation. This assessment relied on the preparation of computer-based visual simulations of the landscape that would result from mining of the expansion area. These simulations are a generally accepted means to evaluate the nature of proposed visual change. The landscape at the proposed mine site is uniform and lacking in defining features.

A number of key viewpoints were identified from a variety of locations around the site, in consultation with City of DuPont staff and their EIS consultant. The selected viewpoints are intended to be representative of viewpoints where public views toward the site are available, and to illustrate the significant visual impacts to the public from the Proposed Action (see discussion of Key Viewpoint Selection below). At each of these locations, existing conditions were photographed with a SonyA6300 camera at an equivalent focal length of 35mm and 50mm. These photographs were later used as a basis of comparison against simulated conditions at the same viewpoints.

Digital engineered survey drawings of both the existing landscape and the proposed final grading plans following mining and reclamation were provided by the applicant as AutoCAD Civil3D files. These digital grading plans were imported into Trimble SketchUp Pro software to create digital elevation models of the corresponding terrain. This terrain model was then imported to Lumion Pro software, where the site model was further developed with realistic textures and built features such as fencing, paving and utility poles being added in their proposed positions. Accurately detailed plant models were added to represent vegetative screening at various stages of growth — from new plantings up to mature growth. Within the environment of the site model, views were created to match the key viewpoint photographs.

The viewpoint perspectives were accurately generated by computer, which serves to limit human error and minimize artistic license in the simulation process. These perspective views began as 'wire-frame' views of the ground surface and were then imported to light and material rendering software Lumion Pro. The simulated viewpoints were accurately positioned using geolocation data noted onsite during the initial photography. For each of those locations, the view settings were adjusted to match the original camera setting for focal length in order to achieve the same field of view. The view was then aligned using reference objects between the simulated view and an overlay of the original photograph. Lighting conditions were also set within the model to match those of the respective existing conditions photograph. Ultimately, the rendered views of the proposed South Parcel Project conditions were compared with the original photographs to show the unaltered context around the simulated proposed conditions. Conclusions regarding relative degree of change or impact were then made on the basis of the final photo-realistic simulations.

Visual impact assessment is based on a combination of identifying potential for public view, evaluating existing visual quality, identifying viewer sensitivities, and evaluating degree of visual change resulting from a proposed project. For this analysis, levels of visual quality and viewer sensitivity are estimated based on criteria that establish ratings of "high," "medium," and "low." Visual change is qualitatively evaluated based on the visual simulations. By qualitatively combining rankings of visual quality, visual sensitivity, and the direct visual change identified in the simulations, an overall determination can then be made regarding the potential impact on a given viewpoint by the project. For example, mining-related actions at a

particular viewpoint may show a high level of impact in the simulations, but when combined with a low visual quality and sensitivity ranking, would be considered to have little overall impact to visual quality in that area.

Visual quality was evaluated using the following criteria:

- **Low**: Landscape is common to the region and exhibits few, if any, memorable features, or patterns that provide visual diversity. A prevalence of encroaching human elements or landscape modifications exists, which do not compatibly blend with the natural surroundings. Human alterations exhibit low maintenance, design quality, or siting sensitivity.

- **Medium or Moderate**: Landscape exhibits generally attractive natural and man-made features/patterns, although they are not visually distinctive or unusual within the region. The landscape integrity of the area provides some positive visual experiences such as natural open space with some existing disturbance or well-maintained development.

- **High**: Landscape exhibits distinctive and memorable visual features and patterns that are largely intact and undisturbed – usually a rural or open space setting. Development or visual disturbances, if present, are well planned to integrate with natural landscape materials or character.

Viewer sensitivity is dependent on viewer types and exposure to a proposed activity, number of viewers, availability of views to the proposed activity, view orientation and duration, and viewer expectation. Levels of viewer sensitivity were evaluated by the following criteria:

- **Low**: Viewer types represent viewers of low visual sensitivity including agricultural and industrial workers who are involved in their work and not focused on the landscape. Viewer numbers and view duration are low. Viewers have low expectations of experiencing high quality views and are not typically in search of a quality visual experience. Views are often screened or limited.

- **Medium or Moderate**: Viewer types represent viewers of medium visual sensitivity including recreationists and passing motorists. Viewer numbers and view duration are moderate in scope. Viewers have only a moderate expectation of experiencing high quality views and may or may not be engaged with the passing visual experience.

- **High**: Viewer types represent viewers of high visual sensitivity including tourists and homeowners. Viewer numbers and view duration are high, with views oriented towards a specific landscape or vista. Viewers have every expectation of experiencing high quality views and are often in search of a quality visual experience. Views are often wide and sweeping, or from a superior vantage point.

Key Viewpoint Selection

Due to existing topography and vegetation, there are very few locations outside the existing or proposed mining areas from which these operations are now visible or would be visible in the future. Natural topographic relief in the area is minimal, outside the Sequalitchew Creek Canyon, which is a relatively deep incision in the surrounding plateau. Although views into the site from outside the existing or proposed mining areas are minimal, proposed mining operations would remove some of the existing vegetation on

the project area, which would affect some off-site views. Therefore, a number of locations were considered as potential locations where simulations would be appropriate.

Key Viewpoints (KVPs) were selected to illustrate the greatest or "worst case" visual impact to the public from the Proposed Action. Analysts reviewed previous environmental analysis of the CalPortland Mining site including the Glacier Northwest DuPont Mining Area Expansion and North Sequalitchew Creek Project Draft and Final Supplemental EIS (City of Dupont, 2006 and 2007, respectively), CalPortland DuPont North Parcel Mining Final EIS, (City of Dupont 2013), and City of DuPont land use designations (City of Dupont, 2021). Analysts also made a site visit to familiarize themselves with the landscape context of mining operations during viewpoint selection and took photographs of the site from various locations near the site (ESA, 2022).

A viewshed analysis using Google Earth (2022) demonstrated that there are no surrounding areas of higher ground that afford views of the site (ESA, 2022). Aerial photos show that current mining operations have maintained vegetated buffers along the west and south sides of the mine. As a result, there are no views into the site from Puget Sound or the Sequalitchew Creek canyon. Views into the South Parcel Project site from the north are only available from the existing mine.

This preliminary information was presented to the City of Dupont, and viewpoints were selected in consultation with City of DuPont staff (EA Engineering 2022).

There are no public viewpoints of the project site to the west, due to presence of the vegetated bluff at the west perimeter of the mine along Puget Sound. No public viewpoints are available from the northwest; the only views are from the mining access road and the abandoned Fort Lewis landfill. Therefore, the viewpoints chosen for simulations are limited to locations to the south and east of the proposed mine.

Visual simulations were developed from the four KVPs around the proposed mine site where a view to the proposed mining activity is available (KVPs 1, 2, 3 and 4), as identified in **Figure 1-1**. A summary description and selection criteria for these four KVPs is provided in **Table 1-1**. These viewpoints were chosen to provide representative depictions of the future landscape that would best illustrate proposed project changes from a variety of viewpoints. To the degree possible, "sensitive" viewpoints were selected from locations accessible to the public; these were believed to potentially impact the greatest number of people.

The four other viewpoints (KVPs 5, 6, 7 and 8) were considered but simulations were not considered necessary because the project site is blocked from view by vegetation and/or topography and would remain so during and after mining at the project site. This included a view at the west end of Sequalitchew Drive (KVP 5); a public road that is expected to be eventually extended but currently serves as an access point to a public trailhead; a typical view looking northwest towards the project site along Sequalitchew Trail (KVP 6); and a view from a semi-public viewpoint – The Home Course golf course south of Sequalitchew Creek (KVP 7). For these viewpoints, photos are included showing the approximate location of the project site beyond the vegetation and topography that obstructs views of the site.

The information in the 'Selection Rationale' column in **Table 1-1** represents the result of both site visits and consultation with City of DuPont Staff. This information, along with additional knowledge gained from subsequent site visits and analysis, was used as input for the preparation of the visual simulations. All

simulations prepared for this analysis are included in Attachment B in full page layout, in addition to the images in this report.

Figure 1-1 South Parcel Project Key View Points

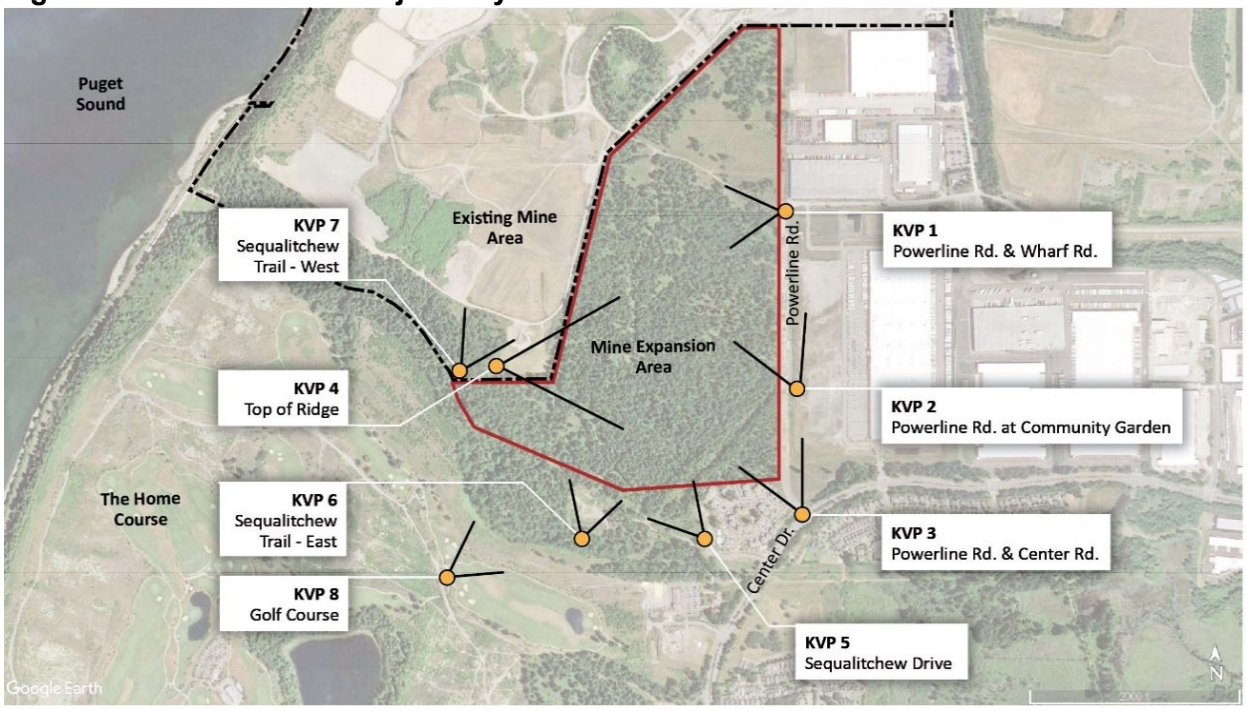

Table 1-1. Summary Description of Simulation Key Viewpoints (KVPs)

Key Viewpoint Description	Location and Viewers	Selection Rationale
1: Powerline Rd. at Wharf Rd. This viewpoint lies along Powerline Road at the point where there is a 90-degree bend in the road. The camera angle is looking in a westerly direction, down into the basin of the new creek bed.	Private Road: Vehicle passengers	Wharf Road is used primarily by trucks turning around for the adjacent warehouses, but Wharf Road is open to the public. Pedestrians and cyclists using Powerline Road can access this intersection. Views of vegetation along this road would be heavily affected.
2. Powerline Rd. at Community Garden. This viewpoint lies on the east side of Powerline Road near the south entrance to the community Garden. The camera angle is looking in a northwesterly direction.	Private Road: Garden users, cyclists, pedestrians.	Community garden users can drive to the community garden on Powerline Road. Pedestrians and cyclists also use Powerline Road.
3: Powerline Rd./Center Dr. This viewpoint lies on the northwest side of the intersection of Powerline Road and Center Drive. The camera angle is looking in a northwesterly direction.	Public: Vehicle passengers, DuPont residents	This represents a key public viewpoint. The public traveling along Center Drive can look into the site along the proposed access road and have a glimpse of the site alteration that is taking place. The view would be affected by removal of existing vegetation as part of mining operations...
4: Top of Ridge This viewpoint sits on top of the ridge between the active mining site and Sequalitchew Creek, at the southwest edge of the Expansion Area. The camera angle is looking in east northeast direction, giving an overview of the mine site after mining and restoration are complete.	Private: CalPortland employees	This viewpoint models a view that is located on the privately-owned site and is not available to the public. There currently is no public road or trail providing access to this spot. An observer must climb from the existing mine road up a small brush-covered knoll to reach it. Although not public, the viewpoint offers an extensive view of the project from above, which is intended to help the reader understand the character of the project landscape after reclamation.
Key Viewpoints considered but not simulated		
5: Sequalitchew Drive. This viewpoint lies at the current west end of this road, where public trail users frequently park. The camera angle is looking in a northwesterly direction.	Public: Trail users	This viewpoint shows where the project site stands in relation to this popular public trailhead along Sequalitchew Creek. Vegetation and topography block views of the project site.
6: Sequalitchew Trail - East This viewpoint lies on the public trail leading down to the Sound. The camera angle is looking in a northerly direction.	Public: Trail users	This viewpoint shows where the project site stands in relation to this popular public trail along Sequalitchew Creek. Vegetation and topography along Sequalitchew Creek block views of the project site.
7: Sequalitchew Trail - West This viewpoint lies on the public trail leading down to the Sound. The camera angle is looking in a northwesterly direction.	Public: Trail users	This viewpoint shows the lower portion of Sequalitchew Creek Trail at approximately the closest point on the trail to the project site. Because the site is directly uphill from this location, the view is not facing the site but shows the slope along the trail's north side. Vegetation and topography along Sequalitchew Creek block views of the project site and would not be affected.
8: The Home Course (Golf Course). This viewpoint lies near the edge of the golf course, near the edge of the Sequalitchew Creek ravine. The camera angle is looking in a northerly direction, toward Sequalitchew Creek and the project site.	Semi-Private: Golfers/Recreationists	This viewpoint shows where the project site stands in relation to the golf course. Vegetation within the golf course and along Sequalitchew Creek block views of the project site.

Simulations of the Proposed Action

Visual simulation of the project required depiction of vegetation removal and changes in topography, as well as revegetation of the landscape at a future point in time. The photos used for the 2006 Draft SEIS and 2013 EIS (City of Dupont 2006, 2013 respectively) capture a wider perspective than what the average human eye typically sees from a fixed position. In the versions presented here, due to the perspective of the KVPs, this approach would have minimized the effect on the views, therefore the images have a narrower perspective, more like what a human eye would focus on. To account for growth rates of woody vegetation, such as found in western Washington, growth rates from the Washington State University Extension program were used. An annual growth rate of 13-24 inches was applied to coniferous plant material in the simulations — with each plant model having a randomized size within the range of growth for the time of depiction. These growth rates generally reflect similar ongoing restoration area efforts within the existing mine. The growth rates are not guarantees of future plant growth, but act as an accepted method for modeling potential growth.

For the purposes of this analysis, simulations were prepared at three future points in time, referred to as Year X, Year X+ and Year Y. Where the proposed mining is not visible behind trees or another obstruction, the mine/portion of mine will be shown with hatching, brackets, or another method (See KVP 5, KVP 6, KVP 7 and KVP 8).

For KVP 1, 2 and 3, Year X simulates the view when the visual impact of the project would be the greatest. This is expected to occur in approximately two years from the beginning of mining). Tree planting along Powerline Road to provide a visual screen of mining activities at this location is in progress as of (late 2022) and completion of planting depends on seasonal factors. The fence would be moved to the eastern site boundary either when the trees are planted or at some time before the site is cleared to begin the mining operation. Vegetation on the site would be removed from the eastern perimeter except in buffer areas shown on the plans, in order to ready the site for mining to begin. An access road, temporary powerlines and newly planted trees would be installed to the west of the fence. In Year X, the trees are expected to reach heights between three and five feet. In Year X, trees would be removed from all areas to be mined. While there may be shrubby vegetation that remains in areas that will not be immediately mined, both the timing and the degree of clearing needed to remove the trees is difficult to predict. Therefore, for the simulations all areas to be mined are assumed to be either unvegetated or to have a native groundcover seeding.

At KVP 2, an additional simulation, Year X+ simulates the view approximately five years after the trees along Powerline Road have been planted, establishing a dense conifer screening that is expected to reach heights between eight and twelve feet by Year X+. A simulation was prepared for this future point in time for KVP 2, the most public-facing viewpoint at the eastern perimeter along Powerline Road near the Dupont Community Garden.

For all KVPs, Year Y is chosen to depict conditions ten years after the end of mining, when revegetation of the site is well established. Mining of the South Parcel is assumed to take approximately 14 years. Therefore, Year Y would be approximately 24 years after project inception. By that time, it is assumed that

the temporary powerlines along the east perimeter would have been removed and woody vegetation such as trees and shrubs would have been established on the slopes.

Year X and Year Y simulations were prepared for KVP 1, 2, and 3. KVP 4 is from a location where the public would not be permitted to be present, so a simulation was only prepared for the Year Y condition. Most of the interior mined areas are shown as reclaimed after mining with a native groundcover seeding. These areas are intended to eventually be developed for urban uses in the future, following completion of mining operations, and the reclamation area would likely change in the context of site-specific development.

Existing Conditions at Viewpoints

The following discussion describes existing conditions at the identified viewpoints.

KVP 1: Powerline Road at Wharf Road

The photo below was taken from the centerline of Powerline Road, immediately south of the right-angle bend, looking directly westward into the future mining expansion area. The gravel road on the right-hand side of the photo is an active service road for the existing mining operations. These operations are currently screened by existing mature vegetation that is typical of south Puget Sound prairie forests. The dense forest seen on the left side of the photo is typical of the dense buffer of Douglas fir that is found along the west side of Powerline Road from KVP 1 south to Center Drive.

The visual quality is judged to be moderate. No extended views are present. Existing vegetation is a mixture of disturbed and undisturbed vegetation. Some visual clutter is present, such as fences and gates.

Viewers are expected to be of a low sensitivity, including the occasional local motorist, bicyclist, or pedestrian. The landscape is common to the region and a prevalence of encroaching human elements or landscape modifications exist, which do not compatibly blend with the natural surroundings.



KVP 1 EXISTING

KVP 2: Powerline Road at Community Garden

This photo was taken from Powerline Road at the existing Dupont Community Garden between Wharf Road and Center Drive, looking northwest towards the proposed project.

The visual quality is judged to be moderate. No extended views are present. Existing vegetation is a mixture of disturbed and undisturbed vegetation. Some visual clutter is present, such as fences, gates, and signage. The east side of Powerline Road is dominated by large transmission line poles and overhead wires.

Viewers are expected to be of a low to moderate sensitivity and be more numerous than KVP 1. Viewers include the community garden users, and the occasional local motorist, bicyclist, or pedestrian, and City staff accessing a plant nursery. The landscape is common to the region and a prevalence of encroaching human elements or landscape modifications exist, which do not compatibly blend with the natural surroundings.



KVP 2 EXISTING

KVP 3 Powerline Road and Center Drive

This photo was taken from the berm on the east side of Center Drive (facing directly toward the proposed mining expansion site), approximately 15 feet back from the east-bound travel lane, directly in line with the centerline of Powerline Road as it intersects Center Drive. The character of the landscaped median of Center Drive contrasts strongly with the more haphazard nature of the distant landscape of firs and Scotch broom west of Center Drive. The existing power transmission towers following Powerline Road are clearly visible in the middle-ground of the photo. The dense forest of mature Douglas fir in the background is typical of the forest buffer along the eastern border of the proposed sand and gravel extraction site. It is a continuation of the forest seen in the left-hand side of the photo seen previously in KVP 2 Existing. This forest continues with similar density for approximately 1,800 feet to the west, directly away from the photo viewpoint. The density of the forest in the far-left hand side of the photo continues west along the existing Sequalitchew Creek all the way to Puget Sound, over 1.25 miles to the west.

The visual quality is judged to be moderate. The view is a mixture of mature second-growth forest in the background contrasting with a developed arterial collector road in the foreground, the Creekside Village Apartments on the left side of the view, and a high-tension power transmission line in the middle-ground.

Viewers are expected to be of medium sensitivity, including workers or residents of DuPont, as well as visiting recreationists driving along Center Drive.



KVP 3 EXISTING

KVP 4 Top of Ridge

This photo below illustrates the existing view from KVP 4. This photo was taken from a high point on the ridge between the Sequalitchew Creek canyon and the existing mine area. The viewpoint is on an existing mine site, in an isolated, inaccessible location, requiring a hike through unmarked forest. Although members of the public would not typically see it, the viewpoint was selected as one of the simulation viewpoints because it gives an unobstructed view of the South Parcel Project mining area. The grassy field in the foreground consists of reclaimed area from the existing mining operations that was re-contoured and hydroseeded. The forest in the background is the western edge of the forest first observed in KVP 2 Existing (in that photo, the viewer sees the eastern edge of this forested area).

Visual quality is classified as medium, with sweeping open views of the landscape and mature forests in the background. The middle ground view is dominated by the newly reclaimed mine area, showing evidence of recent vegetation growth.

Viewer sensitivity was not classified, as this view is on private property and will not be accessible once mining excavation begins. As noted, this view was simulated to help the reader understand the scope and extent of the mining operation, even though it is not from a place where the public would see the South Parcel Project.



KVP 4 EXISTING

KVP 5 Sequalitchew Drive

This photo illustrates the existing view from the current west end of Sequalitchew Drive. The camera angle is looking in a northwesterly direction towards the proposed project. Sequalitchew public trail users frequently park near this location. The photo shows the gravel trail entrance with residential structures in the background. The existing vegetation is comprised of evergreen native conifers and invasive scotch broom, which has overtaken the understory and open areas along the trail. The foreground includes a wooden fence, an “authorized vehicles only” sign and concrete slab with three wooden bollards painted white at the top to indicate the entrance to Sequalichew public trail.



KVP 5 EXISTING

KVP 6 Sequalitchew Trail- East

The photo below was taken from the center of the existing historic railroad bed to the southwest of the South Parcel Project. The photo shows the density of existing vegetation in the creek canyon, which obscures any clear view of the steep canyon walls. Viewers would be expected to be of high sensitivity, principally hikers, and other recreationists using the proposed trail system based on the existing old narrow gauge railway path. Visual quality is judged to be high, with an attractive view of a mature second-growth forest surrounding the viewer.



KVP 6 EXISTING

KVP 7 Sequalitchew Trail- West

The photo below shows the lower portion of Sequalitchew Creek Trail at approximately the closest point on the trail to the project site. The site is directly uphill from this location, so the view is not facing the site but shows the slope along the trail's north side on the right-hand side of the photo. Existing vegetation and topography along Sequalitchew Creek currently block views of the project site. Viewers are expected to be of high sensitivity, principally hikers and other recreationists. Visual quality is judged to be high, with an unbroken view of the forest and Sequalitchew Creek Trail.



KVP 7 EXISTING

KVP 8 The Home Course (Golf Course)

The photo below was taken from the top of a high knoll at the north side of the Home Course, a privately owned golf course immediately south of Sequalitchew Creek. This knoll is the highest point of land along the north side of the golf course. The tree line observed in the photo marks the top of the slope leading into the canyon. Viewers are expected to be of high sensitivity, principally users of the future golf course. Visual quality is judged to be high, with an unbroken view of an attractive mature second growth forest viewed across an open grassy meadow.



KVP 8 EXISTING

Impacts of the Proposed Action

Proposed Action

KVP 1 Powerline Road at Wharf Road

The deep excavation resulting from new mining operations of the Proposed Action would eliminate the mature trees that screen the existing mining operations from along Powerline Road. The beginnings of reforestation efforts are visible in the Year X simulation, which will eventually allow new trees to grow up and screen the views again. However, it will take 5 to 7 years to develop a full screen and longer for a more mature forest to develop. While visual change is evident, the Proposed Action would not have a significant adverse visual impact at Viewpoint 1. This is due to the lack of sensitive viewers, and the relative rapidity with which the landscape is expected to recover. Most of the unobstructed view from the road is expected to be screened within a five-year period due to vegetation regrowth. Existing and future views are shown below to help the reader see the degree of change.



KVP 1 EXISTING



KVP 1 YEAR X



KVP 1 YEAR Y

KVP 2 Powerline Road at Community Garden

KVP 2 is located on Powerline Road at the existing Dupont Community Garden between Wharf Road and Center Drive, looking northwest towards the South Parcel Project. Powerline Road extends from the foreground to the background. This angle was selected to show the angle from which most users, drivers of cars, and pedestrians, would view the South Parcel Project site. Evergreen trees will be planted along the property line adjacent to Powerline Road; estimated planted in fall/winter of 2022/2023, depending on weather conditions and the availability of trees. Prior to the beginning of mining the existing chain link fence will be moved to the property line.

Shrubby vegetation and large evergreen trees currently block views of the South Parcel Project site. That vegetation would be removed at the beginning of mining the South Parcel. An access road would parallel the east property line and would have temporary overhead powerlines to power dewatering wells. Removal of the second growth conifers and ground cover will contrast sharply with current conditions and will temporarily open up views of the South Parcel Project, an industrial use that is currently not visible from this location. Overhead lines would add an element of visual clutter. Given the sensitivity of viewers, this is considered a moderate impact on visual quality; the impact would be mitigated by the evergreen screening that would limit the duration of this impact.

In Year X, the site would be partially screened by densely planted evergreens along the fence line. By Year X+, the trees are expected to grow to approximately 8 to 12 feet in height. By Year Y, mining would be complete along this section. The power poles used for dewatering shown in Year X and Year X+ would be removed. Additionally, the fence along the perimeter would be removed in Year Y. The trees may be thinned as required for overall health. Existing and future views are shown below to help the reader understand changes over time.



KVP 2 EXISTING



KVP 2 AT YEAR X



KVP 2 AT YEAR X+



KVP 2 AT YEAR Y

KVP 3 Powerline Road and Center Road

The photo below is taken from the west side of Center Road looking northwest. Vehicles traveling on the west side of the Center Road would be going southwest, so this view is more like one that a pedestrian would see than what would be seen from a vehicle. The location and direction were selected to maximize the potential amount of disturbance visible in the simulation from the roadway.

Existing and future views are included to portray changes over time. As shown in the simulation of KVP 3 at Year X, the cut through the forest is clearly visible on the right-hand side closest to the power pole. The simulation demonstrates that the mining operation would not be visible from KVP 3. This is due to the grading, which causes the land to fall away quickly from the viewer. Additionally, a 20-foot-high berm planted with trees and other native landscape vegetation would be placed in this area to shield residents in Creekside Village Apartments from potential visual and auditory impacts resulting from mining activities in the expansion area. The South Parcel Project would not have a significant adverse visual impact at this KVP, due to a low degree of visual change, combined with the moderate existing visual quality and viewer sensitivity. The trees, which are cleared at Year X, would show regrowth by Year Y, although it would take many more years beyond Year Y before the trees would reach the same height as existing trees.



KVP 3 EXISTING



KVP 3 AT YEAR X



KVP 3 AT YEAR Y

KVP 4 Top of Ridge

This KVP occurs at the high point on the ridge between the Sequalitchew Creek canyon and the existing mine area. The viewpoint is on an existing mine site not typically seen by members of the public. It was selected as one of the simulation viewpoints because it gives an unobstructed view of the South Parcel Project mining area.

The scene in the Year Y simulation below depicts the interior of the mine following the completion of mining activity and restoration. In the foreground, the ground plane is relatively level with only minor variations in terrain. In the background, plateau benches step up towards the south end of the site to anticipate and facilitate future development. All side slopes are shown with dense tree plantings whereas the floor of the mine is relatively open having only been hydroseeded with native ground cover. Along the distant horizon, the screening vegetation effectively obstructs Powerline Road beyond.

Although the visual environment has been altered in this viewpoint, the impact is not judged to be significant. This is due to the inaccessibility of the viewpoint and total absence of sensitive viewers on the west and south sides of both the existing and proposed mining sites.



KVP 4 EXISTING



KVP 4 AT YEAR Y

KVP 5 Sequalitchew Drive

Vegetation and topography block views of the project site, which is generally indicated by the shaded band. all trees visible from this view are off-site from the project and would not be affected. this view has not been simulated as the visible trees are privately owned. viewers would be expected to be of high sensitivity, principally hikers, and other recreationists using the trail system. Visual quality is judged to be high because this is an established hiking trail.



KVP 5

KVP 6 Sequalitchew Trail- East

At KVP 6, all trees are located offsite and would not be affected by proposed mining, therefore no change to visual quality would occur as a result of this project. Sequalitchew Creek is below the trail to the left and the viewer is surrounded by lush undisturbed vegetation.



KVP 6

KVP 7 Sequalitchew Trail- West

The site is directly uphill from this location and is not visible; the view provided in the photo below shows the slope along the trail's north side on the right-hand side of the photo. Vegetation and topography along Sequalitchew Creek block views of the project site and would not be affected. All disturbance associated with the South Parcel Project will be outside of Sequalitchew Creek Park and set back a minimum of 100 feet from the top of the slope of Sequalitchew Creek Ravine. All trees in the photo below are offsite from the project and would not be affected. Viewer sensitivity and visual quality would not change as a result of the project site.



KVP 7

KVP 8 The Home Course (Golf Course)

The photo below was taken from the top of a high knoll at the north side of the Home Course, a privately owned golf course immediately south of Sequalitchew Creek. This knoll is the highest point of land along the north side of the golf course. All trees visible from this viewpoint are off-site from the project and would not be affected. Similarly, viewer sensitivity and visual quality would not be affected.



KVP 8

Cumulative Impacts

Cumulative impacts to views could, hypothetically, occur due to clearing that has taken place on the original mine and the North Parcel of the Pioneer Aggregate Mine. From viewpoints around the South Parcel Project, including KVPs 1, 2, and 3, however, there are no views of the original Pioneer Aggregate mine or the North Parcel. When clearing of the South Parcel occurs as part of the Proposed Action, views of the original mine and North Parcel would be temporarily opened up. The screening that is proposed for the South Parcel Project along the east perimeter will screen these views after the plantings reach a height of six feet or greater which is expected to occur by Year X+ or sooner. Views at KVP 5, 6, 7, and 8 would not be affected by clearing of the South Parcel; trees seen in the photos at those KVPs are located offsite. As such, cumulative impacts would be limited to the first few years prior to Year X. No other cumulative impacts are anticipated.

Impacts of the No Action Alternative

There are two No Action Alternatives- Scenario A Continuation of Existing Conditions; and Scenario B Site Development Under Existing Zoning.

In Scenario A Continuation of Existing Conditions, mining activities associated with the Re-Mine Area of the site and the Existing Mine would continue as currently permitted. The mining operation would retain a vegetated buffer at its perimeter with no lighting, and the interior of the mine would likely not be seen from existing public places. The Existing Mine has an estimated remaining life of 6 to 10 years with mining currently limited to 10 feet above groundwater. The South Parcel portion of the site is assumed to remain undeveloped and would continue in its vegetated condition.

In Scenario B, Site Development Under Existing Zoning, the proposal would not occur. The site would be developed for urban uses consistent with the City's Future Land Use Map. No attempt has been made to simulate the effects of future development; simulation would require the preparation of a development plan for the site which would be speculative. The majority of the area affected is currently designated by the City of DuPont Comprehensive Plan as Manufacturing and Research, with a smaller area designated for residential uses (City of Dupont 2021). The corner of the property near Center Drive is designated as Residential 12, which would allow higher density residential development where multifamily density averages 12 units per acre (City of Dupont 2021). Urban development, as permitted under current planning and zoning designations, would occur east of the lease line demarcating existing mining operations. The timing and nature of any such development would be driven by market forces.

In general, future structures would rise above the ground level and would be more visible within the surrounding landscape than the proposed South Parcel Project mining operations. Light and glare from buildings, the street, and security lighting would extend these effects into the nighttime hours. Future development would draw a greater number of daily users and viewers into the property than currently have access to it, both physically and visually. The degree of visual change outside of the property could be as great as or greater than the South Parcel Project, depending on buffer vegetation and the visual intensity and bulk of structures.

Mitigation Measures

The visual impact of the South Parcel Project is not expected to be significant. However, the following mitigation measure is proposed to further decrease the magnitude of potential impacts:

- Maintain a vegetated buffer along Powerline Road. Trees will be planted densely to establish screening during mining operations. After mining is completed, selective thinning may be necessary to facility a healthy future forest within the buffer.

Significant Unavoidable Adverse Impacts

The South Parcel Project would result in significant and unavoidable change to the visual character of the existing landscape within the proposed expansion area. The extraction of mined material will make this change virtually irreversible, because of the cost of transporting enough fill to replace the extracted sand and gravel. However, the South Parcel Project is not expected to result in a significant adverse effect to the visual environment of the surrounding community. The mining operation is expected to be only minimally visible to the general public from outside of the property boundary. In addition, mining is a transitional use of the site; although mining would alter the site for a number of years, after mining is complete, the site will likely be developed to another use.

References

City of DuPont. 2006. Glacier Northwest DuPont Mining Area Expansion and North Sequalitchew Creek Project Draft Supplemental Environmental Impact Statement.

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Appendix M

Cultural Resources Desktop Analysis

(The Cultural Resources Analysis is on-file with the City of DuPont and may be available upon request)

Appendix N

Traffic Impact Assessment

TECHNICAL MEMORANDUM

Project: **Pioneer Aggregates– South Parcel Project**

Subject: Traffic Impact Assessment

Date: July 18, 2022

Author: Marni C. Heffron, P.E., P.T.O.E.
Principal, Heffron Transportation, Inc.

Glacier Northwest (dba CalPortland) is seeking a permit to expand its existing Pioneer Aggregates Gravel Mine in Dupont, Washington. This expansion (hereafter referred to as the "South Parcel Project") would increase the mine footprint and extend the life of the mine. Current mine operations on the North Parcel and the respective transportation-related impacts were assessed in the June 2013 *Final Environmental Impact Statement (FEIS)*.[1] This memorandum evaluates the potential transportation impacts associated with the South Parcel Project and compares those to impacts previously evaluated in the FEIS.

1. Current and Planned Mine Operations

The Dupont Pioneer Aggregates Gravel Mine is located at the north end of the City of Dupont. The existing processing plant is accessed from Pioneer Avenue. The mining areas and processing plant location are shown on Figure 1.

Current Operations

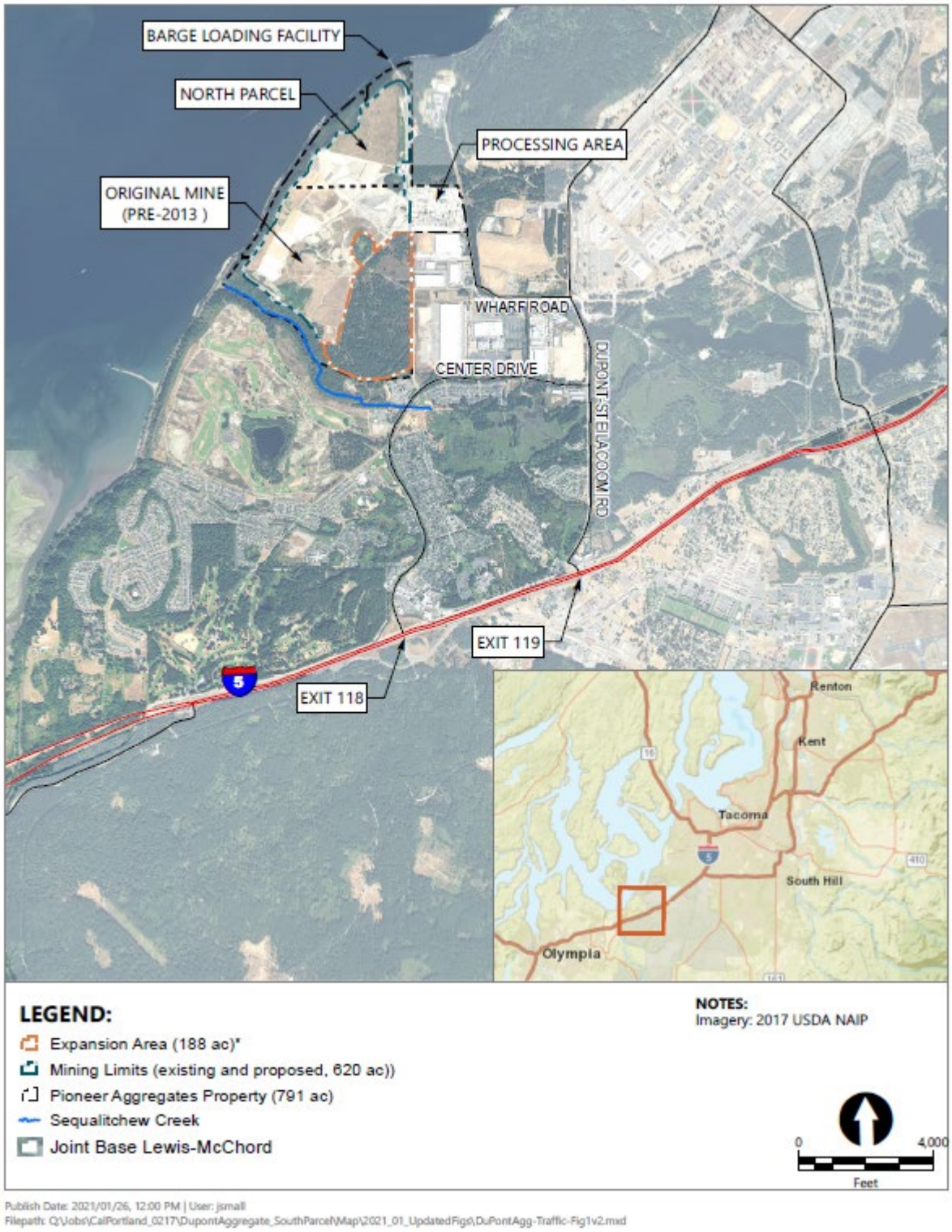
The mine, processing plant, and barge loading dock at Tatsolo Point have been in operation since 1997. The expansion of the mine to the 142-acre North Parcel (described in the 2013 *FEIS*) assumed extraction of approximately 2.8 million cubic yards of sand and gravel annually. It also assumed that 80% of that aggregate would be transported by barge, the same rate that had been historically barged before expansion. The remaining 20% was assumed to be exported from the site by truck, either as mined aggregate or as part of processed concrete. Section 2 of this memorandum presents information about the *FEIS*-estimated truck and employee traffic volumes, along with data about actual truck loads for the five years between 2015 and 2020.

Future Operations with South Parcel Project

The South Parcel Project would expand the footprint of the existing mine to include the 188-acre expansion area shown in Figure 1. It would increase the existing sand and gravel resources available to mine by 30 to 40 million cubic yards, and extend the life of the mine by an additional 14 years. This relates to an annual extraction rate of between 2.1- and 2.8-million cubic yards -per-year, which is similar to the maximum rate of extraction defined in the *FEIS*. CalPortland expects that 80% of the aggregate would continue to be transported by barge with the remaining aggregate exported by truck. The processing plant would remain in its current (and historic) location.

[1] City of Dupont, *Final Environmental Impact Statement for CalPortland Dupont North Parcel Mining,* June 2013.

Figure 1. Site Vicinity and Mining Operational Areas



2. Existing Mine-Generated Traffic Volumes

Predicted by FEIS

The 2013 *FEIS* included detailed trip generation estimates for the mine (see Chapter 3.11), which were based on historic operations and annual extraction rates. The trip generation estimates assumed that 20% of the mined aggregate would be transported from the site by truck (the remaining 80% would be by barge and not affect roadways). *FEIS* Table 3.11-4 summarized the trip generation estimates, and is presented below.

FEIS Table 3.11-4. Summary of Project-Generated Off-Site Trips

Trip Type	Vehicle Type	Daily	AM Peak Hour			PM Peak Hour		
			In	Out	Total	In	Out	Total
Typical Day								
Employee Commute	Automobile	126	3	0	3	0	3	3
Service & Deliveries	Light Truck	18	2	2	4	2	2	4
Product Transport	Heavy Truck	246	9	9	18	1	1	2
Logging [1]	Heavy Truck	0	0	0	0	0	0	0
Total		390	14	11	25	3	6	9
Peak Day								
Employee Commute	Automobile	200	7	3	10	0	4	4
Service & Deliveries	Light Truck	30	5	2	7	3	3	6
Product Transport	Heavy Truck	710	25	25	50	5	5	10
Logging [1]	Heavy Truck	24	0	0	0	0	0	0
Total		964	37	30	67	8	12	20

Source: Final Environmental Impact Statement for CalPortland Dupont North Parcel Mining, *June 2013.*

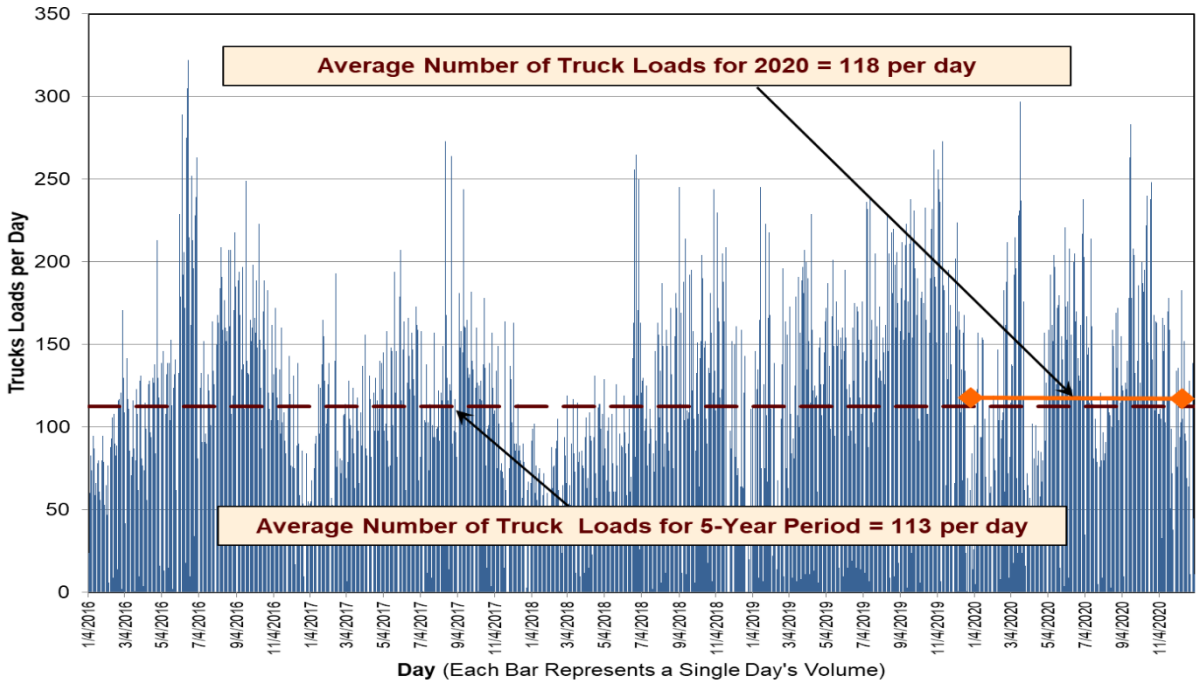
1. *Logging the North Parcel would occur only during the first year of operation.*

The FEIS had estimated that the mine would generate an average of 390 trips per day (195 trips entering the site and 195 trips exiting the site). Of these, 264 trips per day (132 inbound and 132 outbound) would be truck trips. On the peak day, daily trips were expected to increase to 964 trips per day (482 inbound and 482 outbound) of which 764 would be truck trips (382 inbound and 382 outbound). Trips during each of the commuter peak hours—AM and PM—were also determined. More traffic was expected to occur during the AM peak hour when product is typically transported out to construction sites. During the peak day, the mine was expected to generate 67 AM peak hour trips (37 inbound and 30 outbound). The PM peak hour would have much lower volumes, expected to be 20 trips on the peak day (8 inbound and 12 outbound).

Actual Truck Trips – Years 2016 through 2020

CalPortland tracks all trucks that exit the site with a load of material (e.g., truck loads). Five full years of data (from January 1, 2016 through December 31, 2020) were obtained from CalPortland and compiled to show the number of truck loads that exit the site each day. It is noted that each truck load reflects an outbound trip (an inbound trip is made by an empty truck and is accounted for later in the analysis). Figure 2 below shows each day's concrete and aggregate loads (trucks exiting the site).

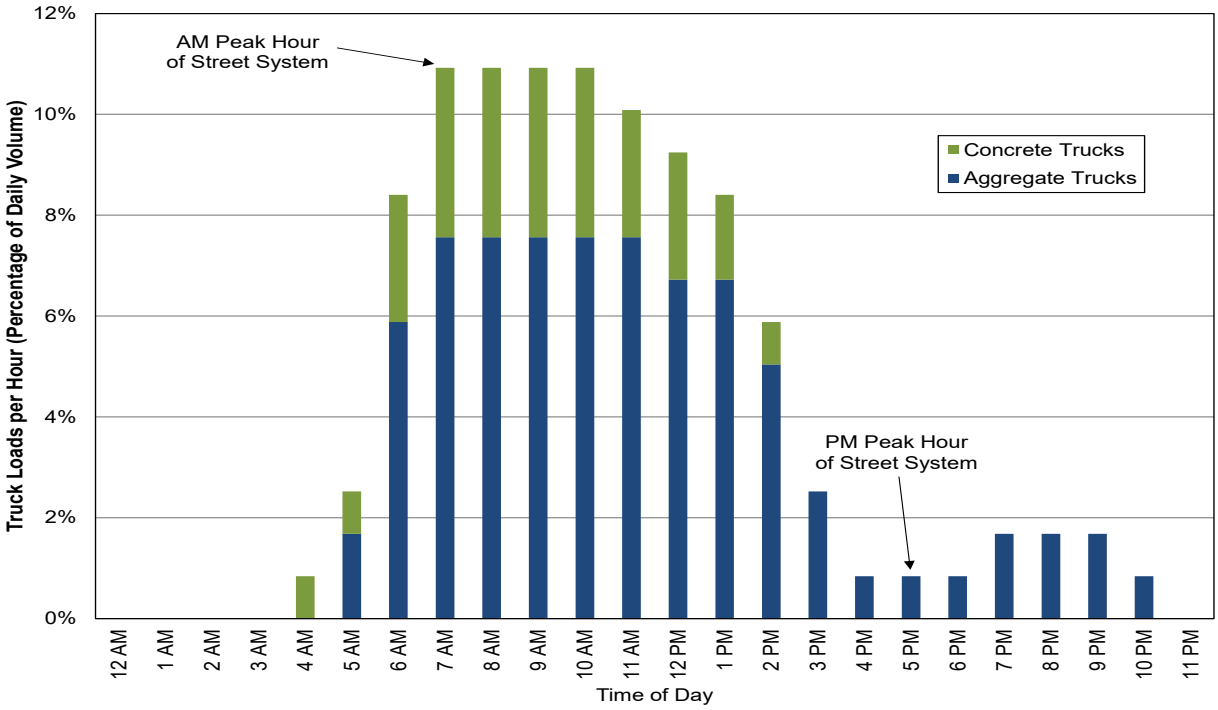
Figure 2. Daily Truck Loads (Outbound Truck Trips) – Actual for Years 2016 through 2020



Source: CalPortland Data compiled by Heffron Transportation, Inc., February 2022.

More detailed information was compiled for 2020. While the COVID-19 pandemic affected activity during some weeks of the year, the total aggregate mined was 2,776,615 cubic yards, just below the 2.8 million cubic yards anticipated by the FEIS. The average truck loads per day over the five-year span (113 truck loads per day) were very similar to the average for the year 2020 (118 truck loads per day). Further analysis was performed for the full year of 2020 data to derive average truck loads by time of day. Figure 3 shows the percentage of each day's trucks for each hour.

Figure 3. Percent Trucks by Hour – Weekday (2020)



Source: CalPortland Data compiled by Heffron Transportation, Inc., January 2021. Data reflect the average of full year of truck loads from 2020.

Table 1 compares the daily and peak hour truck trips from 2020 to those assumed in the *FEIS.* A total of 118 truckloads were processed on the average day in 2020, which results in 236 truck trips (empty truck inbound plus loaded truck outbound). The peak day of the year had 297 truckloads, equaling 594 truck trips. The total daily trips were below the level estimated in the *FEIS*. Actual AM peak hour trips were slightly higher for an average day (26 trips compared to the estimated 22 trips), but lower on the peak day (52 trips compared to the *FEIS* level estimated 57 trips). PM peak hour trips were lower for the average day and the same as expected for the peak day.

Table 1. Comparison of *FEIS* Truck Estimates to Actual Truck Volumes

Trip Type	Daily	AM Peak Hour			PM Peak Hour		
		In	Out	Total	In	Out	Total
FEIS Estimated Truck Trips [a]							
Average Day	266	11	11	22	3	3	6
Peak Day	740	30	27	57	8	8	16
Actual Truck Trips – Year 2020							
Average Day [b]	236	13	13	26	1	1	2
Peak Day [c]	594	26	26	52	8	8	16
Absolute Peak Day in Five- Year Period (06/15/2016) [d]	644	13	49	62	10	2	12

a. *Source:* Final Environmental Impact Statement for CalPortland Dupont North Parcel Mining, *June 2013.*
b. *Based on average loads per hour for all of year 2020.*
c. *Based on actual loads for the Peak Day in 2020 (March 18, 2020).*
d. *Highest day in five-year period between 01/01/2016 and 12/31/2020. This day had substantial concrete truck activity associated with a continuous pour operation.*

As shown above on Figure 2, the absolute highest volume in the past five years (June 15, 2016) generated 322 truck loads or 644 truck trips per day. This day had a very high number of concrete truck trips associated with a continuous-pour operation. The actual trips for that day were compiled to determine the peak hour volumes. The daily and PM peak hour trips were below the values assumed in the FEIS, but the AM peak hour was slightly higher due to the high number of outbound trips in the morning for the continuous pour. That type of event is very rare, and those volume levels were only observed one time in the five-year period.

3. Future Traffic with South Parcel Expansion

The South Parcel Project would allow for continued mine operations that are similar to those already permitted. The processing plant would remain in the same location, and the market area and travel patterns are expected to remain the same. Trip generation is expected to continue at current levels and would remain below the peak day estimates that had been evaluated in the 2013 *FEIS*. Expansion to the South Parcel would have a short period when logging trips are added to the traffic stream. The *FEIS* had estimated up to 24 logging truck trips per day (12 loads). This is likely to be conservatively high since the timber to be logged on the South Parcel is of poorer quality than for the previously-logged North Parcel.

The 2013 *FEIS* had evaluated traffic operations at area intersections for the future horizon year of 2035. The year 2035 conditions had accounted for substantial growth in traffic due to a dozen major development projects and background growth, and were consistent with assumptions in the *I-5 Joint Base Lewis-McChord (JBLM) Transportation Analysis*.[2] Impacts of the project were evaluated for the peak day condition, which as shown above, reflect a higher trip condition than occurred during the peak day in 2020. The *FEIS* traffic operations analysis found that, "…*project-generated trips are expected to constitute 3 percent or less of total trips through the LOS E and F intersections in the AM peak hour, and less than 1 percent in the PM peak hour. This reflects projected conditions on a day of peak mining operations; on days of more typical mining operations, these proportions would be even lower."* It goes on to conclude, *"Because the project-generated trips would represent a small proportion of traffic volumes at the study area intersections and would have negligible effect on the levels of service at the I-5 ramps and city intersections, no adverse level of service impacts are project to result from the South Parcel proposal."* The conclusion is still reasonable given that the trips are expected to remain similar to or less than those evaluated in the *FEIS,* and that the horizon year evaluated (2035) is reasonable to capture the extended life of the mine with expansion to the South Parcel.

4. Summary

The South Parcel Project is not expected to exacerbate transportation conditions in the study area. Trip generation is expected to continue at current levels and would remain below the peak day estimates that had been evaluated in the 2013 *FEIS*. Traffic operations had been evaluated in the *FEIS* for the anticipated South Parcel traffic and extended mine life, and concluded that the South Parcel would not adversely affect traffic operations in the site vicinity. This conclusion is still reasonable.

MCH/tsm

CalPortland Pioneer Mine - South Parcel Expansion - Traffic Impact Assessment - FINAL - 07-18-2022

[2] Washington State Department of Transportation (WSDOT) and the Tranpso Group, *I-5 Transportation Alternatives Analysis & Traffic Operational Model*, from Mounts Road to SR 512. Prepared for the City of Lakewood, September 2010.

Appendix O

Parking Narrative

1201 3rd Avenue, Suite 2600
Seattle, Washington 98101
206.287.9130

ANCHOR QEA

Memorandum

November 17, 2020

To: City of DuPont, Department of Community Development

From: John Small, Anchor QEA

cc: Pete Stoltz, CalPortland

Re: Pioneer Aggregates South Parcel Mine Expansion Parking Narrative

The purpose of this memorandum is to provide a narrative describing the existing and proposed parking and employee count related to the CalPortland South Parcel Mine Expansion Project. Current and proposed parking meets the requirements of Dupont Municipal Code (DMC) 25.95. The South Parcel Mine Expansion will not result in any change to the operation or employment at the facility. The project does not include erection or modification of any buildings. Parking for employees will remain the same at approximately 60 spaces for personal vehicles, plus additional space for company owned vehicles including trucks, trailers and heavy equipment. The total employment associated with CalPortland's existing mining operation in DuPont, an estimated 60-100 jobs depending on market conditions.

A paved parking lot with disabled parking and access is available at the mine office. Space in this lot is also available for high occupancy vehicles. Bicycles are not allowed inside the gates of the mine for safety reasons. Spaces in this lot meet the city standards for stalls and aisles set forth in DMC 25.95.050. Two additional gravel lots are located between the processing plant and Pioneer Ave and between the concrete batch plant and Solo Point Road. The gravel lots provide flexibility to accommodate more employee vehicles as needed in response to fluctuations in demand. Vehicle and pedestrian traffic are controlled throughout the site to protect worker safety and the site is closed to the public. There are established vehicle and pedestrian travel routes used to access parking areas, buildings and other locations on the site as well as for ingress and egress from the site.

In summary:

- The number of spaces provided is and will remain consistent with DMC 25.95.030 (1)
- The locations for parking are and will remain consistent with DMC 25.95.40
- Preferential Parking requirements are and will continue to be met consistent with DMC 25.95.070
- Parking areas have been developed in consistency with the provisions of DMC 25.9.5050 where applicable (gravel lots are not striped) and will remain so.

- Preferential parking provided meets and will continue to meet the requirements of DMC 25.95.060
- All loading and unloading facilities are and will remain in off street locations that do not impede or interfere with traffic on public roads.

Appendix P

Fiscal Condition Assessment

Pioneer Aggregates South Parcel Project

Fiscal Condition Assessment

February 28, 2024

Prepared for: City of Dupont

Final Report

ECONorthwest
ECONOMICS · FINANCE · PLANNING

Park Place
1200 Sixth Avenue
Suite 615
Seattle, WA 98101
206-823-3060

Table of Contents

1. OVERVIEW OF FISCAL CONDITION ASSESSMENT 1

PURPOSE 1
PROJECT CONTEXT 1
PROJECT PROPOSAL DESCRIPTION AND SEPA 3

2. EXISTING FISCAL CONDITIONS 4

CITY FISCAL OVERVIEW 4
City Tax Revenues Sources *4*
City Tax Revenue Trends *6*
CITY EXPENDITURES 7
City Expenditure Categories *7*
City Expenditure Trends *7*
SELECTED CITY TAX BASES 8
Assessed Value and New Construction *8*
Taxable Retail Sales *10*

3. TAX AND SERVICE ALLOCATIONS 11

TAX REVENUES 11
Property Taxes *11*
Sales & Use Taxes *11*
Business and Occupation Taxes *12*
Summary Taxes Generated *13*
PUBLIC SERVICES 14
Cost Allocation Approach *14*
Cost Allocation Metrics *15*
Cost Allocation to the Mine *15*
TAX AND COST ALLOCATION BALANCE 16

1. Overview of Fiscal Condition Assessment

Purpose

This report provides a reasonable analysis examining the tax revenues generated at the project in contrast to the costs of service that can be allocated to site. The analysis examines these revenues and costs that can be attributed to the site from an annual current year (2022) perspective given the best information available.

It should be noted that the analysis is limited to estimated revenues directly accruing to the City general fund. Indirect revenues, such as B&O taxes paid by companies providing repair and maintenance services to CalPortland, and charitable cash or in-kind contributions such as those made to the City Parks Department or DuPont Historic Society are not included. Similarly, the analysis does not identify all revenues generated by the CalPortland proposal that would accrue to other levels of government, including the State of Washington, or to non-city service districts, such as the school district. Although not quantified in this analysis, these revenues would benefit the respective governmental entities. In addition, the analysis does not address indirect effects to the broader economy, such as spending by employees or potential attraction of complementary businesses to the City.

Project Context

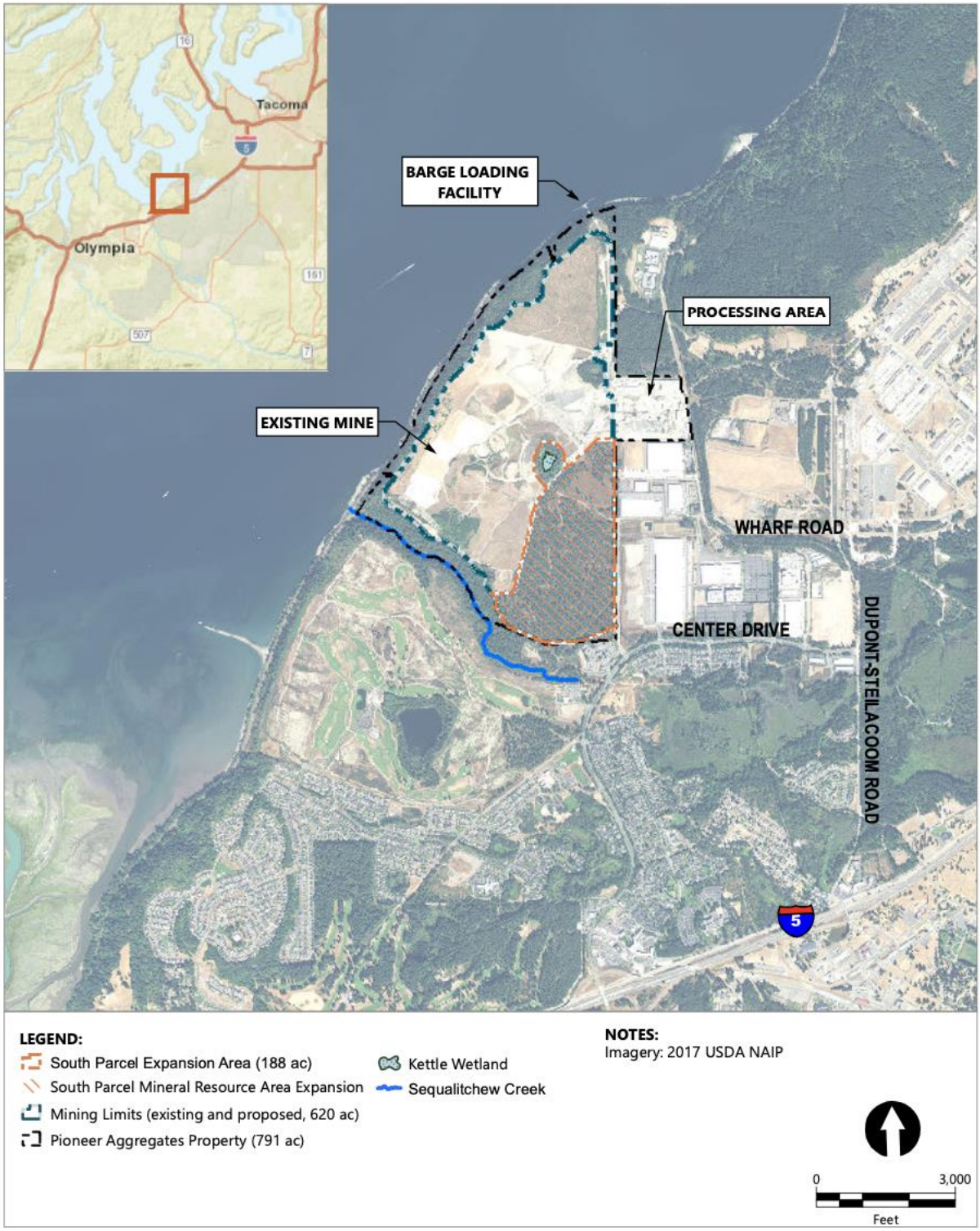
CalPortland's original sand and gravel mine was permitted in 1997 (355 acres). As provided under the Settlement Agreement, CalPortland applied for permits in 2013 for the North Parcel Mine Expansion to allow mining of approximately 142 acres within the North Parcel. Following the publication of a Final EIS in June 2013, the North Parcel mining expansion was permitted in 2014.

Mining activities at the existing site include mining, processing, transport of sand and gravel, and manufacturing of concrete. The processing area is located adjacent to the mine site on a 52-acre parcel owned by Glacier. Sand and gravel are removed from the mine by bull dozers and wheel loaders and transferred to the processing area by conveyor belts. At the processing facility, the material from the mine is crushed, washed, and separated into different size gradations. Aggregate products are stored in stockpiles in the processing area for distribution.

After completion of the production process, most of the finished aggregate products are transported from the plant area by conveyors and placed onto barges (approximately 80 percent) at Glacier's dock and barge-loading facility at Tatsolo Point. The remainder (approximately 20 percent) is sold as aggregate or used to make concrete on-site; in both cases it is transported by truck (see map below for context).

Exhibit 1: Pioneer Aggregates South Parcel Project Context Map

Source: Anchor QEA



Project Proposal Description and SEPA

The proposal is to expand the mining operations currently occurring on the North Parcel to the South Parcel. The South Parcel Project would include horizontal expansion of mining into approximately 188 acres previously undisturbed by mining, and vertical expansion of approximately 125 acres where re-mining will deepen a portion of the existing mine. The South Parcel Project would extend mining at the current rate for approximately 14 additional years.

The City of DuPont is the lead agency for SEPA review for projects within the city and is responsible for performing the statutory duties required for the Pioneer Aggregates South Parcel Project. Based on review of the May 2021 application materials submitted on the current project, the City of DuPont, as SEPA lead agency, determined that this project may have significant adverse impacts on the environment, and that an EIS should be prepared, consistent with RCW 43.21C.030 (2)(c).

The EIS will address probable significant adverse environmental impacts of the proposed Pioneer Aggregates South Parcel Project and will build upon the information and analysis in other environmental review for the mines at the site. While fiscal and economic issues are not required components of an EIS, the city has requested that it be studied. The purpose of this analysis is to understand how the existing mine operations contribute to both the tax revenue picture to the city as well as public service costs.

2. Existing Fiscal Conditions

City Fiscal Overview

Fiscal conditions presented below provide background about the revenues, expenditures, and tax bases of the city of Dupont. This analysis is focused on general government funds primarily include the city's General Fund which accounts for services to the public including public safety, street maintenance, land use, parks and recreation, and administrative functions. These services are largely supported by taxes, fees and charges, and intergovernmental revenues (i.e., state and federal contributions). This analysis is specifically focused on the taxes used to support the city's public services.

The analysis does not include the enterprise funds related to operating the Water Utility and Stormwater Utility. These enterprises are operated like a stand-alone business where with customer user fee are used to support all operating costs. Resources of the utilities cannot be used to subsidize general government functions.

City Tax Revenues Sources

This section discusses the city of Dupont's primary tax revenue sources and trends from 2011 to 2021. Unless cited otherwise, informing this memorandum is data from Washington state's Local Government Financial Reporting System for the city of Dupont. As with many cities in Washington State, the three largest revenues sources for the City of Dupont are (1) property taxes, (2) sales and use taxes, (3) utility taxes, and (4) business and occupation taxes (B&O). Taxes made up 74% of the city's overall revenue in 2021.

Current Expense Property Taxes

Initiative 747 limited local property tax increases to 1.0 percent each year, resulting in an erosion of the tax's purchasing power over time. Because of the method for calculating Dupont's property tax levy (equal to the 101% of the previous year's levy plus new construction add-on value), new construction is important to the city's ability to limit the erosion of the purchasing power of the property tax and to grow the levy beyond the statutory limitations. In 2023, property tax levy $2,014,558.

EMS Property Taxes

The city also collects a regular property tax for emergency medical services provided by the city. In 2023, property tax levy is $877,716.

Local Option Retail Sales and Use Taxes.

One of the key revenue sources that cities rely on is the retail sales tax. Of the 9.4% sales tax currently collected in the city on general retail purchases, a 1% "local" share of the tax accrues to local jurisdictions. The city receives 85% of the 1% local tax and Pierce County gets 15%. The

current rate accruing to the city is 0.85%. The local option sales tax generated $2,353,599 in local sales tax revenues for the city in 2021. This tax is levied not only on businesses in the area, but also on construction activity and some transactions that are related to housing, such as certain online purchases. The city also receives a population pro-rata share of 90% of the city allocation of Pierce County's 0.1% criminal justice sales tax.

Business and Occupation Taxes

This category of revenue includes monies received from business and occupation taxes on general business activities. The B&O tax rate in DuPont is 0.1%. The B&O tax generated $746,828 in tax revenues for the city in 2021.

Utility Taxes

The city levies a business and occupation tax on utilities; however, this tax is passed on to users of the utilities as part of their periodic bills. The city levies the following rates to the gross receipts of the utility providers:

- Electricity: 6%
- Water: 12%
- Sewer: 6%
- Stormwater: 10%
- Telephone: 6%
- Natural Gas: 6%
- Solid Waste: 8%

The utility tax generated $ $1,647,377 in tax revenues for the city in 2021.

Other Revenue Sources

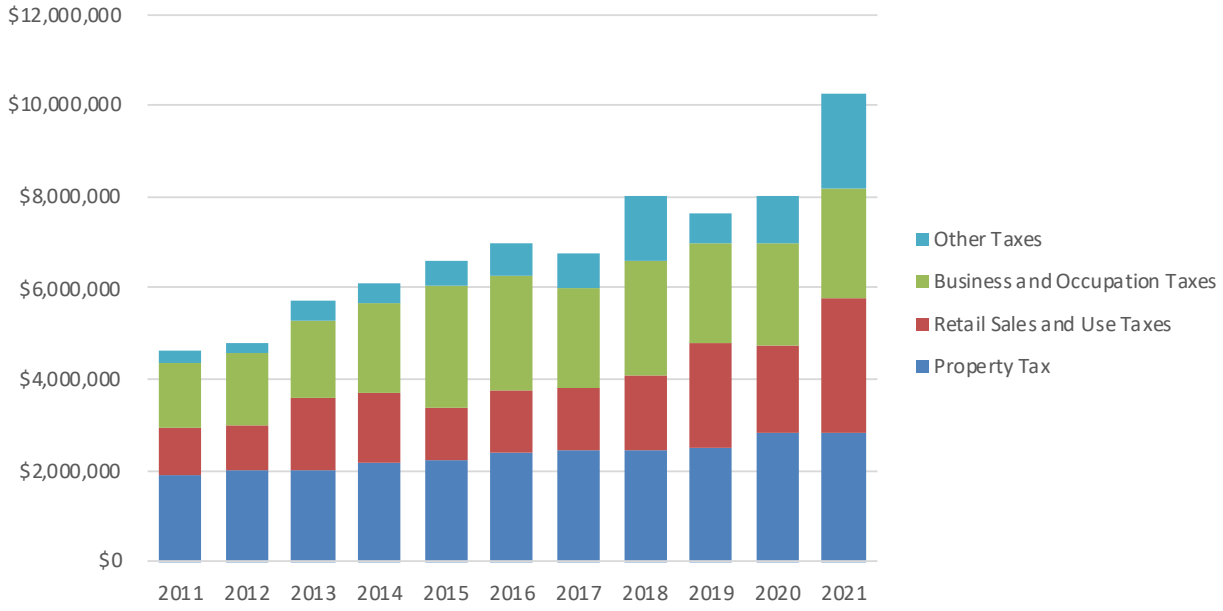
The City of Dupont collects revenues from a range of other local sources, including:

- Hotel/Motel Tax: The city receives a sales tax credit against the state portion of the sales tax of 2% on accommodations purchases. The proceeds of the tax are dedicated to economic development purposes supporting the tourism sector.
- Real Estate Excise Tax (REET). Real estate transactions are subject to a 0.50 percent local tax on the value of the transaction. REET revenues are restricted to finance capital projects. REET revenues are uncertain, given the volatility in the real estate market. Since REET is based on the total value of real estate transactions each year, the amount of REET revenues the city receives can vary substantially from year to year based on the normal fluctuations in the real estate market.
- Admission Tax. The city charges a tax on the value of transactions on admissions to a place or event. The admissions tax rate in DuPont is 5%.

City Tax Revenue Trends

Exhibit 2 presents a summary tax revenue for the city from 2011 to 2021. B&O tax revenues include both the tax on business gross receipts and utility providers (utility taxes). Property taxes have been a consistent and growing source of revenue for the city over the time. Sales taxes have also grown but a more volatile source of funding. The city has seen stronger relative growth in its B&O taxes (gross receipts and utility taxes). Other taxes are primarily consisted of the REET.

Exhibit 2: Summary Trends of Major Taxation Sources, City of Dupont, 2011 through 2021
Source: Washington State Auditor, Local Government Financial Reporting System.



City Expenditures

This section discusses the City of Dupont's primary expenditures and trends from 2011 to 2021. Unless cited otherwise, informing this memorandum is data from Washington state's Local Government Financial Reporting System for the city of Dupont.

City Expenditure Categories

The City of Dupont's major expenditures are as follows:

Public Safety

This category of expenditures includes costs for law enforcement, fire and emergency medical, detention/corrections, protective inspection services, and dispatch services. As of 2021, expenditures for public safety accounted for 55 percent of total city-wide expenditures.

General Government

This category of expenditures includes costs for personnel and centralized services; legislative, and executive activities; financial, recording, and election activities; and legal. As of 2021, expenditures for the general government accounted for 21 percent of total city-wide expenditures.

Transportation

This category of expenditures includes roads/streets maintenance, roads/streets administration and overhead. As of 2021, expenditures for transportation accounted for 7 percent of total city-wide expenditures.

Culture and Recreation

This category of expenditures includes library and park facilities costs. As of 2021, expenditures for culture and recreation accounted for 10 percent of total city-wide expenditures.

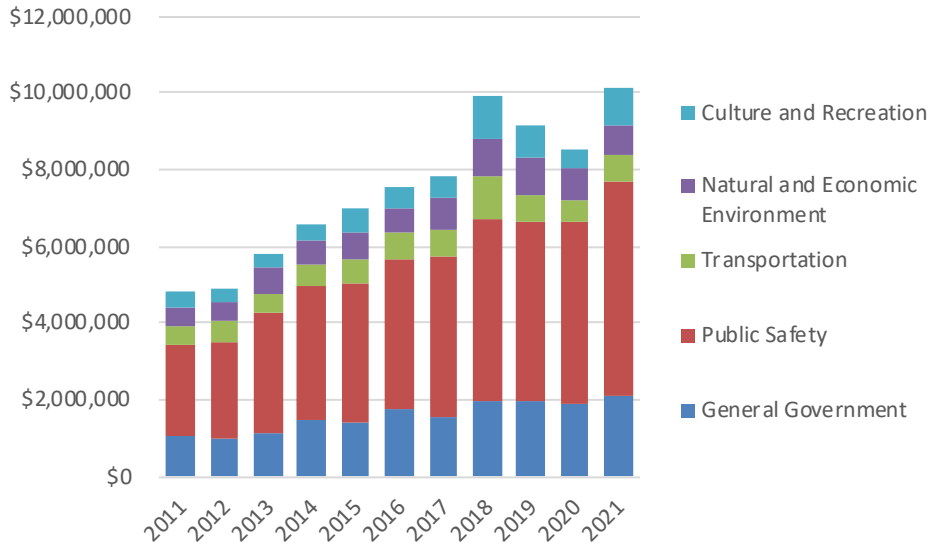
Natural and Economic Environment

This category includes work in community and economic development. As of 2021, expenditures for culture and recreation accounted for 7 percent of total city-wide expenditures.

City Expenditure Trends

Expenditures in the City of Dupont totaled $10.1 million in 2021, up from $4.9 million in 2011 (104 percent change).

Exhibit 3: Summary Trends of Expenditures, City of Dupont, 2011 through 2021
Source: Washington State Auditor, Local Government Financial Reporting System



Selected City Tax Bases

This section provides background on the following:

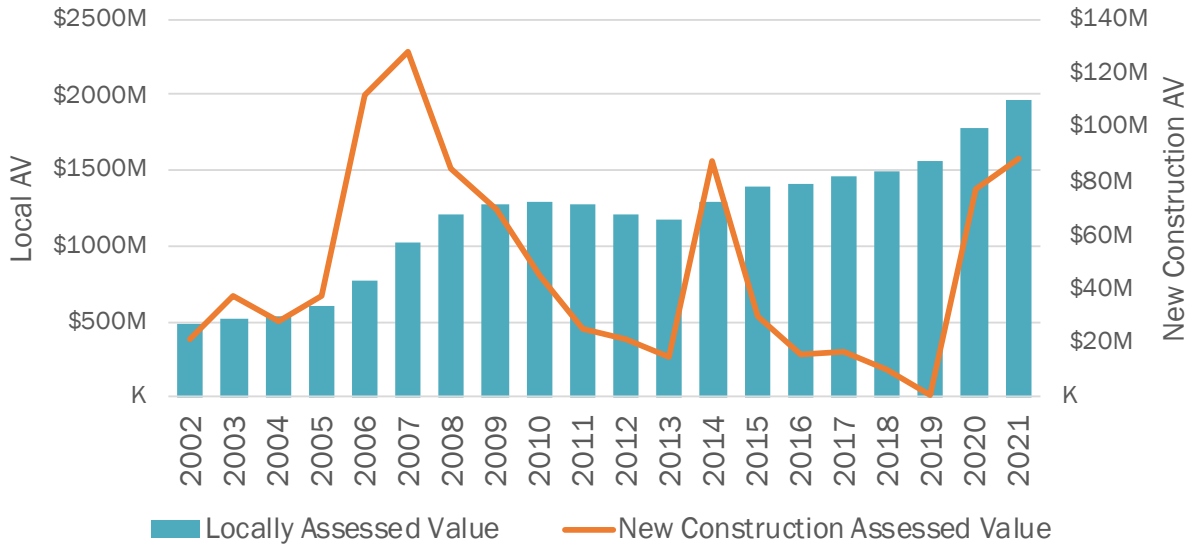
- Assessed value and new construction trends.
- Taxable retail sales trends

Assessed Value and New Construction

The Pierce County Assessor assesses the land and improvement value of all properties in the county for the purpose of levying property taxes. The assessor also values the amount of new construction for calculating the amount of "add-on" value to property tax collections. The trends for the city follow.

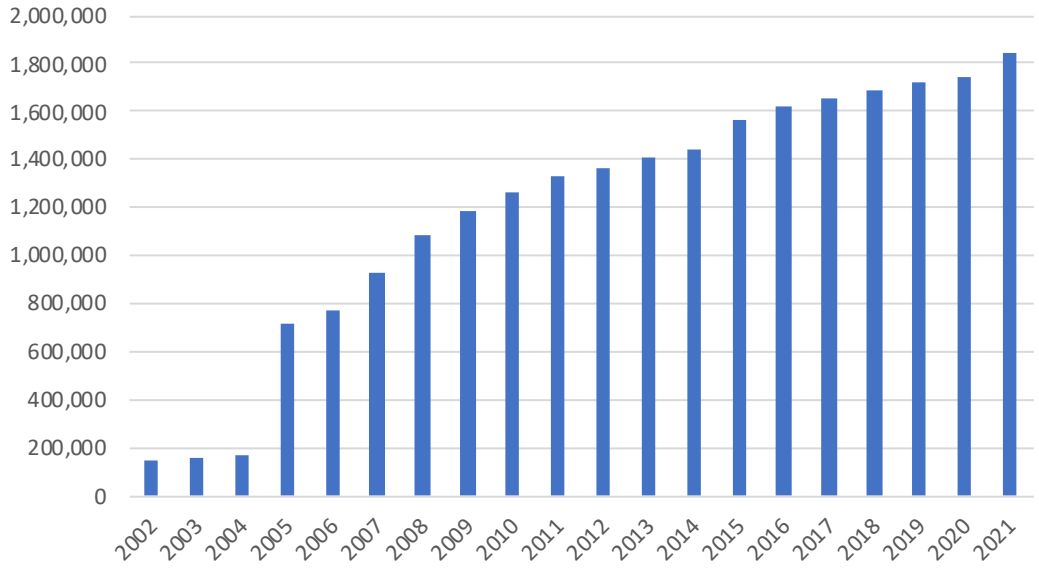
- In 2011, Dupont's local assessed value (AV) was $1.9 billion, about $1.5 billion more than local assessed value estimates in 2002.
- Valuation from new construction added substantially to Dupont's base from 2006 through 2009. The Great Recession did, however, cut this trend short. In 2010. New construction levels have picked up in the last several years but continue to be at levels lower than they have in the past.

Exhibit 4: Assessed Value and New Construction, City of Dupont, 2002 through 2021
Source: Washington State Department of Revenue.



Most taxing jurisdictions in Washington state must ensure that the amount of revenue they levy in the current year will not exceed the amount levied in the preceding year (plus additional funds for new construction, improvements to property, newly constructed wind turbines, solar, biomass, geothermal facilities, if the facility is not state assessed, increases in the value of state-assessed property, annexations, and refunds). In 2021, Dupont's highest lawful levy was $ $1,971,024 prior to the additional funds for new construction.

Exhibit 5: Highest Prior Levy, City of Dupont Regular Levy, 2002 through 2021
Source: Washington State Department of Revenue.

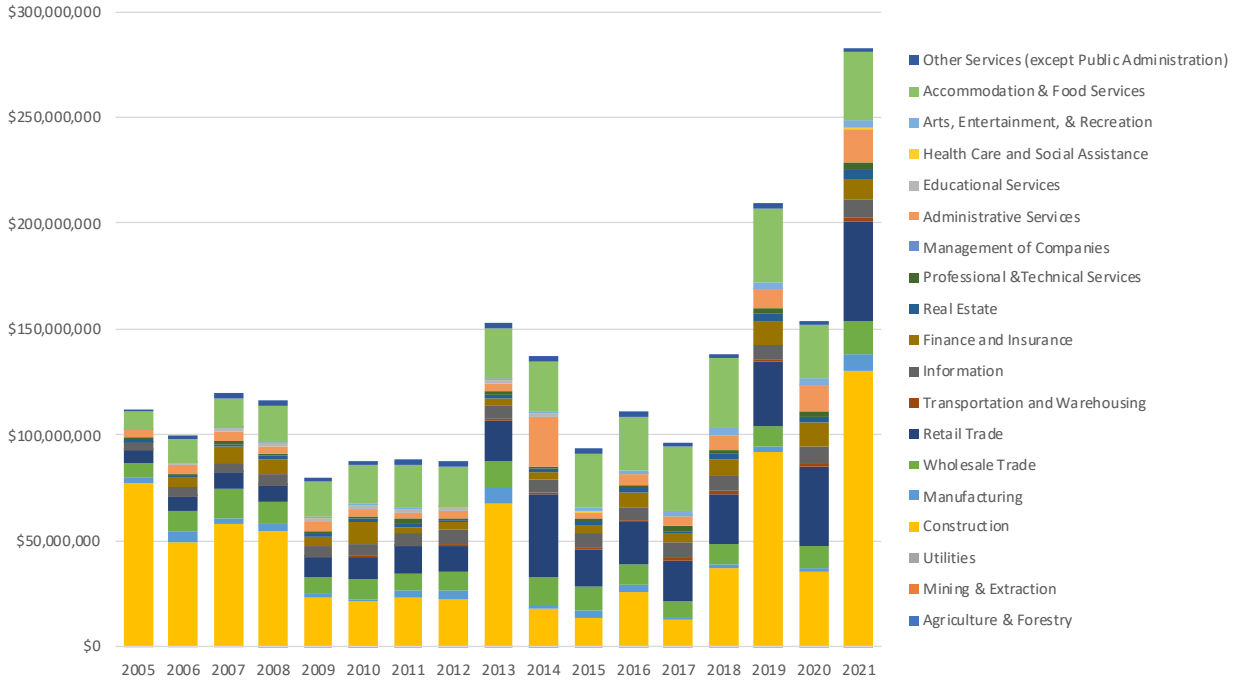


Taxable Retail Sales

Retail sales reflect spending that occurs within the city and is a significant source of tax revenue for the city.

- Taxable retail sales (TRS) have grown steadily over the last several years. Total sales (particularly for the construction sector) dipped following the onset of the recession (around 2009), but sales have since increased.
- The retail trade sector and accommodations & food services accounts for most of the remaining growth.

Exhibit 6: Taxable Retail Sales, City of Dupont, 2005 through 2021
Source: Washington State Department of Revenue.



3. Tax and Service Allocations

Tax Revenues

The tax analysis computes an estimated tax using the following methods applicable for a 2022 analysis year.

Property Taxes

Property tax revenues are estimated using the parcel list of the project and their 2022 certified taxable assessed values (for 2023 property taxes). The assessed values are then multiplied by the tax rate for the city's regular levy and EMS levy. Based on this summary, the project currently generates $58,000 in property taxes ($40,000 for the regular levy and $17,600 for the EMS levy).

Exhibit 7: Summary of Assessed Value and Levy Estimates
Source: Pierce County Assessor, 2022.

	Assessed Total	Taxable Total	Tax Rate (2023 taxes)	City Regular Levy	City EMS Levy	City Total
South Lease Area	$3,142,100	$3,142,100	$1.14924	$2,515	$1,096	$3,611
Existing Mine Lease Area	$5,845,200	$5,845,200	$1.14924	$4,679	$2,039	$6,718
Processing Area	$39,406,900	$39,406,900	$1.14924	$31,544	$13,743	$45,288
North Area	$2,075,700	$2,075,700	$1.14924	$1,662	$724	$2,385
Total	$50,469,900	$50,469,900		$40,400	$17,602	$58,002

The property also pays property taxes for personal property. Personal property includes machinery, equipment, furniture, and supplies of businesses and farmers. It also includes any improvements made to land leased from the government (leasehold improvements). The project applicant provided an estimate of their valued personal property.

Exhibit 8: Summary of Personal Property Value and Levy Estimates
Source: CalPortland, 2022.

	Personal Property Assessed Total	Personal Property Taxable Total	Tax Rate (2023 taxes)	City Regular Levy	City EMS Levy	City Total
Personal Property	$13,300,000	$13,300,000	$1.14924	$2,515	$1,096	$3,611

Personal property taxes are estimated to generate $3,600 in taxes in 2022.

Sales & Use Taxes

Of the 9.4% sales tax currently collected in the city on general retail purchases, a 1% "local" share of the tax accrues to local jurisdictions. The city receives 85% of the 1% local tax and Pierce County gets 15%. The current rate accruing to the city is 0.85. Sales tax collected at the site can vary substantially from year to year depending on level of purchases. For example, CalPortland may purchase a new Caterpillar 992 loader (the largest wheel loader that Caterpillar makes) is scheduled in the 2023 year and will substantially impact local sales tax revenue from the mine due to its location of delivery within the city's taxing boundaries. It also makes annual capital

improvements at the site that would be taxable construction expenditures. Likewise, sales tax revenue from customers making retail purchases at the site can also vary depending on the size of projects locally. CalPortland estimates that in a typical year the following taxable retail sales are made:

- Capital purchases: $100,000 - $300,000.
- Customer purchases: $10,000 - $30,000.

The analysis uses the mid-point for these categories: capital purchases: $200,000 and customer purchases: $20,000. Using these values produces a sales tax estimate of $1,870 in 2022.

Exhibit 9: Sales Tax Estimates
Source: CalPortland and ECONorthwest calculations, 2022.

	Estimated Taxable Retail Sales	City Sales Tax Rate	Estimated City Tax Due
Taxable Retail Sales	$220,000	0.0085	$1,870

Business and Occupation Taxes

This category of revenue includes monies received from business and occupation taxes on general business activities. The B&O tax rate in DuPont is 0.1%. CalPortland estimates from its B&O tax filing that in a typical year it reports a local gross receipt of $40,000,000. Using these values produces a B&O tax estimate of $75,690 in 2022.

Exhibit 10: B&O Tax Estimates
Source: CalPortland and ECONorthwest calculations, 2022.

	Estimated Gross Business Income	City B&O Tax Rate	Estimated City Tax Due
City B&O Tax Contribution	$40,000,000	0.0010	$40,000

Utility Taxes

The city levies a business and occupation tax on utilities; however, this tax is passed on to users of the utilities as part of their bills – in this case, payable by CalPortland. The city levies the following rates to the gross receipts of the utility providers:

- Electricity: 6%
- Water: 12%
- Sewer: 6%
- Stormwater: 10%
- Telephone: 6%
- Natural Gas: 6%
- Solid Waste: 8%

CalPortland estimates from its previous spending that the following purchased are made in a typical year:

- Cell Phone: $7,200
- Phone: $10,500
- Electricity: $1,130,000
- Water: $46,000
- Sewer (private): $1,240
- Solid Waste: $15,500

Using these values produces a utility tax estimate of $75,690 in 2022.

Exhibit 11: Utility Tax Estimates
Source: CalPortland and ECONorthwest calculations, 2022.

	Estimated Utility Purchases	City Utility Tax Rate	Estimated City Tax Due
Water	$46,000	12%	$5,520
Sewer	$1,240	6%	$70
Electricity	$1,130,000	6%	$67,800
Solid Waste	$15,500	8%	$1,240
Phone	$17,700	6%	$1,060
Total	$1,210,440		$75,690

Summary of Taxes Generated

The exhibit below summarizes the taxes generated by the mine in 2022. The analysis estimates that the mine generated $180,000 in taxes to the city. This figure represents 2.4% of the city's overall collections of these taxes.

Exhibit 12: Summary Tax Estimates
Source: CalPortland and ECONorthwest calculations, 2022.

Tax	Tax Estimate
Property Tax	$61,613
Sales Tax	$1,870
B&O Tax	$40,000
Utility Tax	$75,690
Total	$179,173

Public Services

Cost Allocation Approach

Public agencies do not typically allocate the costs of their general services (e.g., those supported by general taxes) to individual or classes of taxpayers. These services are all differentially consumed not just between different classes of taxpayers, but are also consumed by non-taxpayers as well (such as a visitor requiring public safety services). However, all taxpayers derived at least some indirect benefit in the form of things like crime deterrence, economic stability, and quality life that accrue a very local, city-specific level.

Given this complex issue, this analysis uses two different approaches to assign some cost "responsibility" to CalPortland's operations to provide some context on this challenging issue. The first approach reasons that residents and businesses derive roughly equal value from city services regardless of how much they may use those services. The second approach uses more specific data proxies to estimate an amount public service use.

The average value approach to estimating a cost allocation to the mine uses the 2022 DuPont Adopted Budget costs divided by number of people and covered employees in the city. The rationale for this approach, while not perfect, provides a simple measure of constituent demand for services, namely that the main recipients of a city's public services (those that are in the general fund) are its resident population and employees of its businesses.

However, this approach may overstate public service demand and costs associated with non-residential development/employees relative to residential land uses. To the extent that service demand and costs related to non-residential development generally or to mining operations specifically are overstated, the projected fiscal surplus to the City could be increased. The analysis uses the 2022 estimated population by the state's Office of Financial Management (10,180 people) and the Puget Sound Regional Council's estimate of covered employment in the city for 2021(5,123). Combined, a population-employment factor of 15,303 is used for this analysis.

The second approach uses more specific data in two key service areas where data is available. The city has been able to provide data on police calls for service near the mine as well as heavy vehicle traffic on the roads.

The cost allocation of approach for the Police Department creates a cost-per-call for service metric by tabulating the average number of calls for service over the five-year time period (2016-2021) across the city. This metric is then applied to calls for service within a police service area that includes the mine.

The cost allocation approach for Street Maintenance portion of the Public Works department is allocated differently. It assumes that 90% (accounting for the pavement related costs) are attributable to vehicle traffic and almost all the roadway wear and tear is attributable to heavy

vehicles. The cost allocation of the Street Maintenance uses roadway counts for heavy vehicles and apportions them based on average daily trips from CalPortland of heavy vehicles.

Cost Allocation Metrics

Using this cost allocation metrics, the following cost per population-employee and cost per use (for police and public works) is derived. This is done by dividing the budget item by 15,303, the population-employment factor for those elements. For police and public works, they are derived on a calls for service basis for police and heavy vehicle trips for streets.

Exhibit 13: Cost Allocation for City of Dupont Public Services
Source: City of Dupont and ECONorthwest calculations

	2022 Adopted Budget	Cost Allocations Per Population-Employee	Cost Allocations Per Use (Police and Public Works)
Mayor/Council	$140,214	$9	$9
Executive	$211,051	$14	$14
City Clerk	$248,611	$16	$16
Human Resources	$274,481	$18	$18
Legal	$129,722	$8	$8
Finance	$303,941	$20	$20
Central Services	$47,900	$3	$3
Information Technology	$80,860	$5	$5
Police Department	$2,643,834	$173	$407
Fire Department	$2,300,405	$150	$150
Community Development	$904,241	$59	$59
Parks, Facilities, and Greenways	$1,104,844	$72	$72
Public Works - Streets*	$616,992	$40	$544

Note: * Streets are allocated on heavy vehicle basis. Police are allocated on calls for sevice.

Cost Allocation to the Mine

Based on the analysis contained in the Traffic Impact Assessment conducted by Heffron Transportation for Pioneer Aggregates, it is noted that 2013 FEIS estimates that a typical day would have 126 employee commute trips (assumed in this analysis to be 63 employees making inbound and outbound trips to the site). Given that this analysis was done in 2013, employee numbers have been estimated at 80 in 2022 for this report. This figure represents 0.5% of the city's overall costs in these areas.

The exhibit below summarizes the cost allocation to mine using the two different methods. The Overall, the average cost approach allocates a smaller cost to the mine than the use approach. However, while the police cost under the use approach allocates a smaller amount than the

average approach, the use approach allocates a relatively larger amount to streets than the average approach.

Exhibit 14: Cost Allocation to Mine – Average and Cost Approach
Source: ECONorthwest, 2022.

	Average Approach	Use Approach
Mayor/Council	$700	$700
Executive	$1,100	$1,100
City Clerk	$1,300	$1,300
Human Resources	$1,400	$1,400
Legal	$700	$700
Finance	$1,600	$1,600
Central Services	$300	$300
Information Technology	$400	$400
Police Department	$13,800	$2,200
Fire Department	$12,000	$12,000
Community Development	$4,700	$4,700
Parks, Facilities, and Greenways	$5,800	$5,800
Public Works - Streets	$9,500	$128,400
Total	$53,300	$160,600

Tax and Cost Allocation Balance

The exhibit below compares tax revenues against public service costs. Based on this analysis, in 2022 revenues generated outpace costs and generate an annual surplus in the range of $18,400 to $125,700. These surpluses represent a cross subsidy to other taxpayers, which by itself, is not an atypical result when looking at narrow land uses. While the methods used in this analysis represents a reasonable approach to conducting the analysis given the information available, some caution should be warranted in consuming the information.

First, it is a single year and taxes and costs can vary from year to year – a surplus in a single year (here, 2022) does not guarantee a surplus in another year when taxes or costs might be different. Second, different measures to allocate costs might produce different cost allocations to the mine. Ultimately, the information provided in this report shed light on the nature of taxation and public services in the city of Dupont and how the specific conditions at the mine contribute to the city's fiscal bottom line.

Exhibit 15: Annual Surplus/Deficit
Source: ECONW calculations, 2022.

	Estimate	Estimate
Taxes Generated	$179,000	$179,000
Allocated Costs	$53,300	$160,600
Surplus/Deficit	$125,700	$18,400

Fiscal Impact under the No Action Alternative

The No Action Alternative assumes no mining on the South Parcel within the context of existing conditions. In this case, the short-term fiscal effects would be similar to those discussed in this analysis since there would be no change in operations and the output of the facility. However, over the longer-term the fiscal effects downstream of mining output limits on the site would be hard to gauge. On the cost side, less mining output would likely impact the largest cost driver to the city (i.e., less wear and tear on city operated streets) but it would also likely impact city revenues as sales taxes, utility taxes, and B&O taxes would decline.

The No Action Alternative also includes a scenario where the site may be developed under existing zoning. Generally, it is understood that zoning of the site could allow approximately 75% Manufacturing/Research Park and approximately 25% Single-Family Residential. The fiscal impact in this scenario will be different than the continued operation of the mine in a couple respects. Regardless, the longer-term downstream fiscal effects of this development would be hard to gauge without a specific proposal. On the revenue side, both manufacturing/research and residential uses represent a more intense use of the land that would lead to more property, sales, and utility, and other taxes on a per square foot basis. However, on the cost side these uses also generate more needs for public services such as public safety services for residential uses and public works needs to support manufacturing uses.

Appendix Q

Comments Received on the Draft EIS

STATE AGENCIES

Pioneer Aggregates South Parcel Draft Environmental Impact Statement (EIS)

Comment Form

Input from the public regarding the Pioneer Aggregates South Parcel Project EIS is welcome. Please submit this form to share your comments. Note: Submitted comment forms are subject to the Public Records Act (RCW 42.56).

Date
7/11/2024

First Name *
Nicole

Last Name *
Damer

Are you a resident of the City of DuPont, WA? *
- ○ Yes
- ◉ No

What city do you reside in?
Seattle

Are you a business owner? *
- ○ Yes
- ◉ No

Are you part of an Agency or Organization? *
- ◉ Yes
- ○ No
- ○ Not relevant to my input

What is the name of the Agency or Organization?
WA State DNR

If you have concerns regarding the EARTH, please describe them below.

On DEIS pages 3.1-5 and 3.3-4 the symbols for the Olympia Beds (Qob) and the Pre-Olympia Non-glacial Deposits (Qpon) used in the legend does not match what is shown in the cross section. 1 Cal EA

The first sentence under the Slope Stability section on Page 3.1-14 appears to have been cut-off: "A geotechnical analysis (Aspect 2021) evaluated the stability of the proposed cut slopes of the South Parcel Project during mining operations is." 2 EA Cal

On DEIS page 3.1-17 and page 22 (DEIS pdf page 347) of the Earth and Water Resource Report (Aspect Consulting, May 18, 2023) there is discussion regarding the steps that will be taken if the topsoil samples contain arsenic concentrations that exceed Ecology cleanup levels, but no indication of what will occur if the level of lead exceeds cleanup levels. What steps will be taken if the topsoil contains lead concentrations that exceeds the Ecology cleanup level? 3 Cal EA

Page 3.1-21 and page 25 (DEIS pdf page 350) of the Earth and Water Resource Report (Aspect Consulting, May 18, 2023) also discuss the arsenic sampling procedure for topsoil but contain no mention of lead sampling. What about the potential for lead contamination as discussed on page 3.1-16 (DEIS pdf page 101-102)? 4 Cal EA

If you have concerns regarding the AIR QUALITY, please describe them below.

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.

If you have concerns regarding NOISE, please describe them below.

If you have concerns regarding LAND USE, please describe them below.

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

If you have concerns regarding TRANSPORTATION, please describe them below.

If you have OTHER concerns not listed above, please describe them below.

DEIS pages iii and 2-14 erroneously list "Department of Natural Resources - Reclamation Permit." This should be "Department of Natural Resources - Surface Mine Reclamation Permit."

5
EA

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

dnr_smrp_deis_comments.pdf 1.63MB

(SEPA2021-002 comment period 6/14/2024-7/15/2024)

EIS Contact Person

Barbara Kincaid
Telephone: (253) 912-5393
Email: bkincaid@dupontwa.com

Required Approvals and/or Permits

Preliminary analysis indicates that the following approvals and/or permits may be required from agencies with jurisdiction[1] for continued mining. Additional permits/approvals may be required. Note that mining permits will not be legally effective unless and until permits for the Restoration Plan are issued.

State of Washington

- Dept. of Natural Resources - Reclamation Permit, Forest Practices Permit.
- Dept. of Ecology - NPDES, Administrative Order for Wetland Impacts.

City of DuPont

- Community Development – Site Plan Review, Tree Modification, Critical Areas Permit, Site Development Permit (including Grading Permit), Building Permit, Determination of Transportation Concurrency.
- Public Works – Site Work (Civil Work) Review and Storm Drainage Facilities Review.

EIS Authors and Principal Contributors

EA Engineering, Science and Technology, Inc., PBC

- EIS Project Manager, Primary Author: Project Description, Land Use, Peer Review Aesthetics and Air Quality.

DE Sherrard & Associates

- Surface Water & Groundwater Lead.

Aspect Consulting

- Surface Water, Groundwater, Earth.

Anchor QEA

- Trees, Critical Areas, Wetlands, Floodplain, Parking.

[1] An agency with jurisdiction is "an agency with authority to approve, veto or finance all or part of a nonexempt proposal (or part of a proposal)" (WAC 197-11-714(3)). Typically, this refers to a local, state or federal agency with licensing or permitting approval responsibility concerning a project.

Summary of Comments on A9168fb3a_jx9jxg_b40.tmp

Page: 7

Number: 1 Author: ndam490 Subject: Highlight Date: 7/11/2024 11:28:06 AM
This should be:
Surface Mine Reclamation Permit

- Continue to meet the Puget Sound regional demand for high-quality aggregates from designated mineral resource lands, including the existing mine and the South Parcel site in DuPont, using existing processing and transport facilities, and to achieve consistency with the terms of the 2011 Settlement Agreement.

- Expand mining horizontally into approximately 188 acres previously undisturbed by mining (including South Parcel), and vertical expansion of the depth of mining on approximately 125 acres where re-mining will deepen a portion of the Existing Mine to:
    - Fully utilize the site's high-quality reserves of sand and gravel that exists below the current permitted depth on the Existing Mine and under the surface of the South Parcel.
    - Extend the useful life of the existing processing and transport facilities by providing a reliably supply of quality aggregates for processing and transport.
    - Continue to provide the quality product mix to the sand and gravel market.

- Maintain barge export of the majority of mined aggregate materials to continue to limit the amount of export by truck and to maximize the environmental and other benefits associated with marine transport.

- Carry out a mine plan for the site that minimizes environmental impacts associated with mining activity, adheres to state and local regulations, and maximizes the economic value of the site;

- Ultimately, reclaim the site, including regrading, replacement of topsoil, and revegetation.

- Implement applicable provisions of the 2011 Settlement Agreement

Description of the Proposed Actions

To implement the Applicants Objectives for the site, the Proposed Actions for the Pioneer Aggregates South Parcel Project includes the following reviews and approvals:

- City of DuPont Community Development – Site Plan Review, Tree Modification Review, Critical Areas Permit, Determination of Transportation Concurrency.

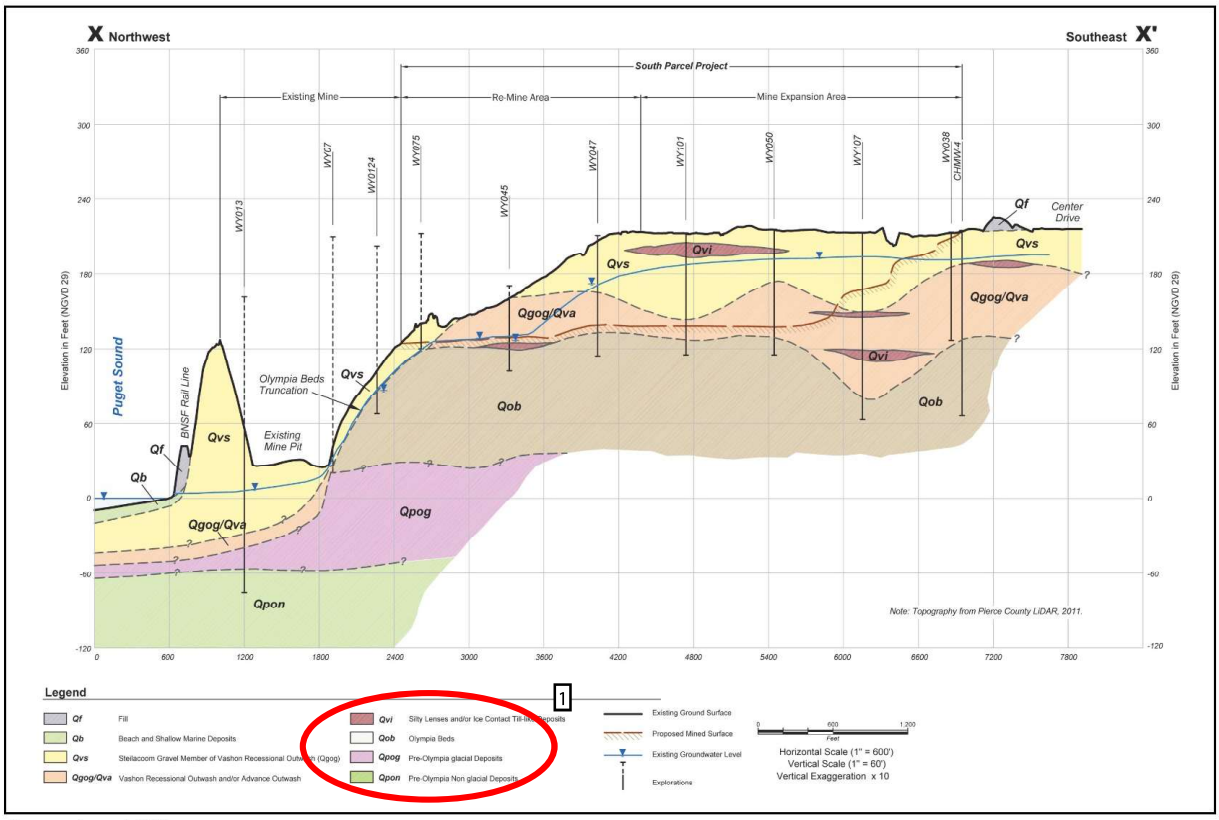
- Washington State Dept. of Natural Resources - Reclamation Permit, and Forest Practices Permit.

2 EA

The need for additional permits or approvals could be identified during the project review process.

Page: 65

Number: 1 Author: ndam490 Subject: Highlight Date: 7/11/2024 11:29:27 AM
This should be:
Surface Mine Reclamation Permit



Source: Aspect, 2022.

EA Engineering, Science, and Technology, Inc., PBC

Figure 3.1-2
Geologic Cross-Section

Page: 90

Number: 1 Author: ndam490 Subject: Oval Date: 7/11/2024 11:29:39 AM

The symbols for the Olympia Beds (Qob) and the Pre-Olympia Non-glacial Deposits (Qpon) used in the legend does not match what is shown on the cross section above.

The dewatering and grading associated with the Proposed Action would reduce groundwater flow toward the steep slopes of Sequalitchew Creek ravine along the east portion of the Expansion Area onsite. The Proposed Action would also route groundwater that would potentially flow toward the creek instead toward the mined areas. Ultimately, this is anticipated to reduce the potential for landslides and slope failures within the Sequalitchew Creek ravine. The seeps and springs identified on **Figure 3.1-3** are expected to be reduced or dewatered in their entirety, which may reduce the level of landslide hazard susceptibility within the ravine (see Section 3.3, **Surface Water** and Section 3.4, **Groundwater**, for details on groundwater and surface water flow).

Slope Stability

A geotechnical analysis (Aspect 2021) evaluated the stability of the proposed cut slopes of the South Parcel Project during mining operations is. The analysis showed acceptable factor of safety values (that exceed 1.5 static and 1.1 for seismic conditions) for slope stability for the mined condition within the site area and the adjacent Sequalitchew Creek ravine (see **Appendix B** for detail).

4 EA

Under a post-mining reclamation plan approved by the DNR, the mine slopes would be progressively reclaimed over the life of the Proposed Action. Mine slopes would be graded to 3H:1V or flatter where groundwater seepage is expected (i.e., on the eastern and southern slopes of the Expansion Area portion of the site) once the slope is no longer being mined. Slopes where groundwater is not anticipated to be present, such as along the southern boundary of the Re-Mine Area portion of the site, would be graded to 2H:1V.

Backfill is not required to achieve the reclaimed configuration; however, backfill may be used to enhance reclamation, as has been done elsewhere within the Existing Mine, to improve vegetation performance. The backfill would consist of retained finer material from the Expansion Area and imported clean fill. The proposed slope angles are flatter than the natural angle of repose of the remaining original soils and would provide the long-term erosion control and landscape base for planting. After establishment of vegetation, any long-term slope stability impact to earth-related features is expected to be low. The already high stability of newly created slopes would generally increase with the establishment of vegetation.

Erosion Potential

Due to their generally coarse-grained nature and good infiltration characteristics, the soils in the site area possess a low erosion risk and are generally not moisture sensitive. The erosion potential is increased by the removal of vegetation and construction of mine slopes; however, with proper storm water management techniques in place, these conditions are not anticipated to result in significant erosion of the coarse soils. The primary element of

Number: 1 Author: ndam490 Subject: Highlight Date: 7/11/2024 11:30:12 AM
It appears that this sentence was cut short.

be used in reclamation. If the sample results indicate the topsoil contains arsenic in concentrations equal to or greater than 20 ppm, then clean soil would be mixed with the topsoil to reduce the arsenic concentration. Stockpiled topsoil would not be used for reclamation until sample results confirm the concentrations of arsenic and lead meet cleanup criteria.

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Geologically Hazardous Areas

The impacts of the Proposed Action relative to landslide and steep slope hazards, and seismic hazards and liquefaction hazards are discussed below (also see **Figure 3.1-5)**. The identified Geologically Hazardous Areas are shown in **Figure 3.1-5** encircled with a bold black line. **Figure 3.1-5** also includes shading to indicate slope angles; shaded areas are not necessarily Geologically Hazardous Areas.

Landslide and Steep Slope Hazardous Areas

Landslide and steep slope hazards are not present within the site area but are present nearby in the Sequalitchew Creek ravine. The proposed mined slopes would be contoured to drain away from the ravine as shown on **Figure 3.1-5**. The slope stability analysis (see **Appendix B**) determined acceptable factor-of-safety values (greater than 1.5) for each of the profiles in the Expansion Area and Re-Mine Area portions of the site, as shown on **Figure 3.1-4**. Thus, the mined slopes would not be considered landslide or steep slope hazards.

Mining under the Proposed Action would locally reduce seeps and springs that have been observed in the Sequalitchew Creek ravine, as shown on **Figure 3.1-3**, resulting in an improvement in slope stability (see Section 3.5, **Plants and Animals**, for discussion on wetland habitat conditions). The Sequalitchew Creek ravine slope would also have an acceptable Factor of Safety greater than 1.5, as shown on **Figure 3.1-4**.

The hazard mitigations listed in Section 3.1.3, Mitigation Measures are intended to protect landslide and steep slope hazards located outside of, but nearby, the site area.

Erosion Hazardous Areas

The channel migration zone within the Sequalitchew Creek ravine, which is defined as an erosion hazard area, is not anticipated to be impacted by the Proposed Action. The flows from ravine springs would be reduced by the proposed dewatering process which would reduce the potential for channel migration and its associated potential for erosion. Therefore, no significant adverse impacts are anticipated to erosion hazards from the Proposed Action at the site or in adjacent areas.

Number: 1 Author: ndam490 Subject: Highlight Date: 7/10/2024 11:54:04 AM
What would happen if the topsoil contains lead that exceeds the Ecology cleanup level?

3.1.3 Mitigation Measures

The following mitigation measures have been included in the Proposed Action to reduce impacts on slope stability and erosion (see Section 3.3, **Groundwater**, and Section 3.4, **Surface Water**, for additional discussion and mitigation measures related to surface water and groundwater):

Proposed Mitigation Measures

- A reclamation plan would be prepared and implemented in accordance with the Surface Mining Act (RCW 78.44). The reclamation plan would be submitted to DNR for review and approval prior to mining. Prior review by the City is also required as part of that process.

- Mining would occur in segments; no mass clearing of the Expansion Area portion of the site would occur.

- An erosion and sediment control plan would be prepared and implemented in accordance with the requirements of the City of DuPont Municipal Code (DMC 22.01.180) and the NPDES Sand and Gravel General Permit. Erosion control features would include storm water drainage into the interior of the mine and onsite storm water disposal.

- A vegetated buffer would be maintained between the proposed mine area and the top of steep slopes in accordance with the City of DuPont's Sensitive Areas Code [DMC 25.105.070(2)].

- A 100-foot setback would be maintained from the top of slopes greater than 40% within the Sequalitchew Creek ravine, consistent with the conditions for the existing mine and the 1994 and 2012 Settlement Agreements.

- Earthwork for excavation and reclamation would be in accordance with the federal and state statutes of the Mine Safety and Health Act and the Surface Mining Act.

- Topsoil would be stockpiled and used for reclamation of mined areas. Consistent with the approved Reclamation Plan, Cleanup Action Plan developed for the South Parcel Project and published Ecology guidance, samples would be collected from stockpiled topsoil to confirm arsenic concentrations meet Ecology standards.

6
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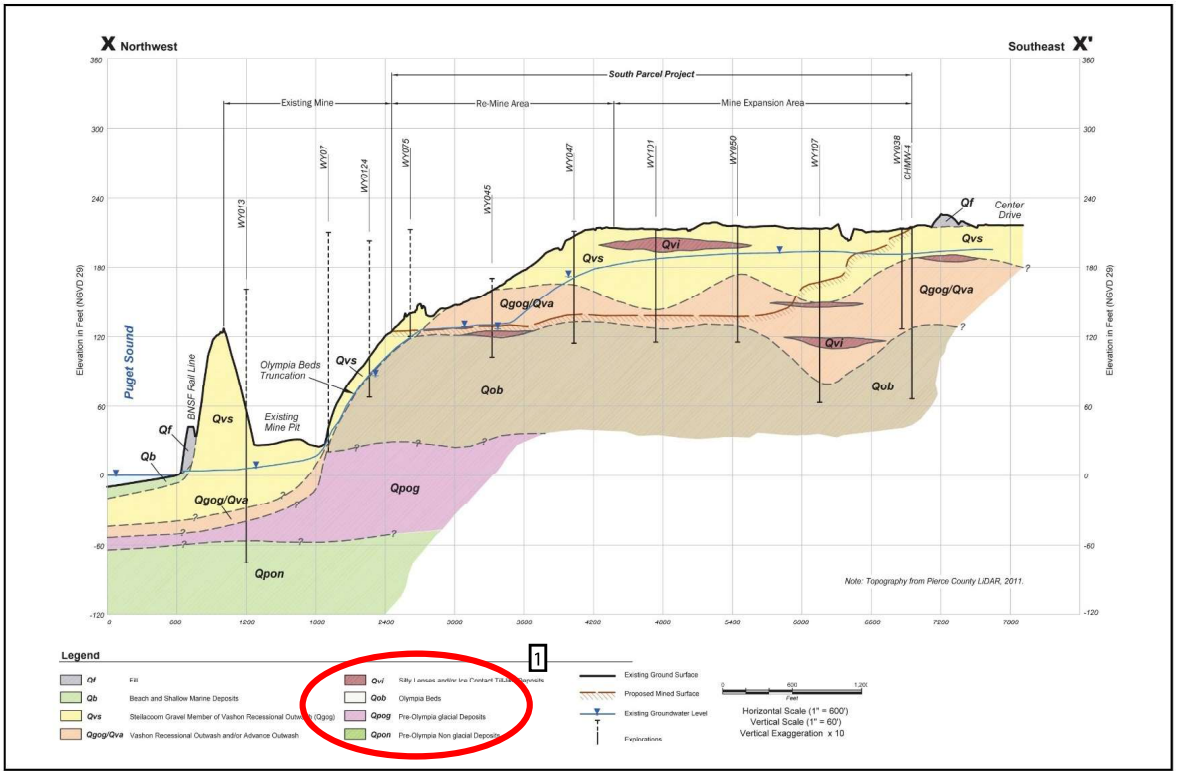
- After application of the topsoil, slopes would be re-vegetated by planting with trees and grass. When reclamation is complete, heavy equipment would generally not operate on the reclaimed slopes except for construction or maintenance of pedestrian paths, access roads, utilities, or other permitted facilities.

Page: 106

Number: 1 Author: ndam490 Subject: Highlight Date: 7/10/2024 12:14:57 PM
What about the potential for lead contamination as discussed on PDF page 102?



Source: Aspect, 2022.

EA Engineering, Science, and Technology, Inc., PBC

Figure 3.3-1
Generalized Geologic Cross Section

7
Cal

Page: 120

Number: 1 Author: ndam490 Subject: Oval Date: 7/11/2024 11:30:25 AM

The symbols for the Olympia Beds (Qob) and the Pre-Olympia Non-glacial Deposits (Qpon) used in the legend does not match what is shown on the cross section above.

(the conservative cleanup level established by Ecology for the TSP) or lead in concentrations exceeding 250 ppm, then the topsoil would be used in reclamation. If the sample results indicate the topsoil contains arsenic in concentrations equal to or greater than 20 ppm, then clean soil would be mixed with the topsoil to reduce the arsenic concentration. Stockpiled topsoil would not be used for reclamation until sample results confirm the concentrations of arsenic and lead meet cleanup criteria.

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2.2.6 Effects on Geologically Hazardous Areas

The effects of the Proposed Action relative to landslide and steep slope hazards, seismic hazards and liquefaction hazards are presented below and as shown on Figure 10. Additional discussion is provided in the Geotechnical Engineering Report (Aspect, 2021a).

2.2.6.1 Landslide and Steep Slope Hazards

Landslide and Steep Slope hazards are not present within the South Parcel Project area but are present nearby in the Sequalitchew Creek ravine. The mined slopes have been designed by a geotechnical engineer and are contoured to drain away from the ravine as shown on Figure 10. The slope stability analysis shows acceptable factor-of-safety values (greater than 1.5) for each of the profiles in the Expansion Area and Re-Mine Area as shown on Figure 11. Thus, the mined slopes will not be Landslide or Steep Slope Hazards.

The Proposed Action locally reduce the expression of seeps and springs that have been observed in the ravine as shown on Figure 9, resulting in an improvement in slope stability. The Sequalitchew Creek ravine slope would also have an FOS greater than 1.5 as shown on Figure 11.

The hazard mitigation recommendations listed below in Section 2.4 are intended to protect landslide and steep slope hazards located outside of, but nearby, the South Parcel Project area.

2.2.6.2 Erosion Hazards

DMC 25.105.050 (3) defines erosion hazards as including coastal erosion zones and channel migration zones (areas along a river or stream where the channel can be reasonably predicted to migrate over time) and coastal erosion zones. Coastal erosion zones are not relevant to the Proposed Action.

The channel migration zone within the Sequalitchew Creek ravine will not be impacted by the Proposed Action. The flows from ravine springs will be reduced by the dewatering process, which will reduce the potential for channel migration.

No adverse impacts are anticipated to erosion hazards from the Proposed Action at the South Parcel or adjacent areas.

2.2.6.3 Seismic Hazards

No adverse impacts are anticipated to seismic hazards from the Proposed Action at the South Parcel or adjacent areas. The slope stability analysis for seismic condition shows acceptable factor-of-safety values (greater than 1.1) for each of the profiles in the Expansion Area, Re-Mine Area, and Sequalitchew Creek ravine.

Number: 1 Author: ndam490 Subject: Highlight Date: 7/11/2024 8:57:41 AM
What would happen if the topsoil contains lead that exceeds the Ecology cleanup level?

2012), samples would be collected from stockpiled topsoil to confirm arsenic concentrations meet Ecology standards.

9 Cal

- After application of the topsoil, slopes would be revegetated by planting with trees and grass. When reclamation is complete, heavy equipment would generally not operate on the reclaimed slopes except for construction or maintenance of pedestrian paths, access roads, utilities, or other permitted facilities.
- The South Parcel would be cleared in segments corresponding to the mining plan.
- Internal drainage would be maintained during mining.
- Mine slopes would be track-walked to tamp soils and create surface roughness to encourage infiltration of stormwater on the slope.
- Mine slopes would be reclaimed with soil amendments and vegetation according to the DNR-approved Reclamation Plan.
- The existing wheel wash would continue to be used and maintained for vehicles exiting the mine.
- Settling ponds would be constructed upstream of the infiltration ponds.
- Mine slopes would be periodically inspected and repaired or revegetated to reduce erosion or improve surface stability.

2.5 Cumulative Impacts of Proposed Action and Restoration Plan

Cumulative impacts of the Proposed Action and Restoration Plan are described below.

The Proposed Action will reduce the potential for groundwater seepage and spring flow from the northern slope of the Sequalitchew Creek ravine. This will effectively reduce the potential for slope instability within the Sequalitchew Creek ravine.

Following implementation of the Restoration Plan, we anticipate higher streamflows in the Sequalitchew Creek ravine that could locally impact channel bank stability. This represents the return of channel-forming flows to Sequalitchew Creek and is a desired outcome of implementation of the Restoration Plan.

The return of higher flows is not anticipated to result in instability of the ravine side slopes because the restored flows would be similar to the flows present historically that did not impact global ravine stability. Similar flows were historically present during periods of land use disturbance in the ravine (e.g., during the period of railroad grade construction and initial logging of the ravine slope) and did not result in large-scale slope instability.

Number: 1 Author: ndam490 Subject: Highlight Date: 7/11/2024 8:57:24 AM
What about the potential for lead contamination as discussed on PDF page 102?

From: ECY RE SWRO SEPA COORDINATOR <swrosepacoordinator@ECY.WA.GOV>
Sent: Monday, July 15, 2024 3:29 PM
To: Barbara Kincaid <bkincaid@dupontwa.gov>
Cc: Price, John (ECY) <Jpri461@ECY.WA.GOV>; Rockett, Derek (ECY) <droc461@ecy.wa.gov>; Ison, Diana (ECY) <diso461@ECY.WA.GOV>; Fot, John (ECY) <jfot461@ECY.WA.GOV>; Smith, Sandy B. (ECY) <sasm461@ECY.WA.GOV>; Lattimore, Charlotte (ECY) <CLAT461@ECY.WA.GOV>; Newby, Eli (ECY) <ELNE461@ECY.WA.GOV>
Subject: ECY SEPA 202402587 - Pioneer Aggregates South Parcel Mine Expansion - Comments
Importance: High

Barb Kincaid, SEPA Contact:

Thank you for the opportunity to comment on the Pioneer Aggregates South Parcel Mine Expansion Project (Lead Agency File No(s). SEPA 2021-002). Ecology's comments are attached.

[Statewide SEPA Register No. 202402587]

Have a great day,

Joe Thomas
ERTS & SEPA Coordinator
Southwest Region
Cell: 360-480-3300

DEPARTMENT OF ECOLOGY
State of Washington

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY
Southwest Region Office
PO Box 47775, Olympia, WA 98504-7775 • 360-407-6300

RECEIVED
JUL 15 2024
CITY OF DUPONT

July 15, 2024

Barb Kincaid, SEPA Contact
City of DuPont
1700 Civic Drive
DuPont, WA 98327

Dear Barb Kincaid:

Thank you for the opportunity to comment on the draft environmental impact statement for the Pioneer Aggregates South Parcel Mine Expansion Project (SEPA 2021-002) as proposed by Glacier Northwest, Inc, dba CalPortland. The Department of Ecology (Ecology) reviewed the environmental checklist and has the following comment(s):

SOLID WASTE MANAGEMENT: John Price (206) 202-5623

1. On page 1-5 the drawdown around the marsh complex is described. The drawdown around JBLM Landfill #5 should also be described. — 1 Cal DS

2. Figures 3.3-6 through 3.3-9 should show JBLM landfill #5 as a feature so that the drawdown at the landfill can be seen — 2 Cal DS

3. The description of Groundwater Quality on page 3.3-12 states that "The most recent groundwater quality data reviewed from the site [JBLM LF #5] is from 2010" — 3 Cal DS

the text should be updated with reference to more recent groundwater quality data at the landfill (the 2022 annual monitoring report is available);

the 2023 report is not yet available but two 2023 semi-annual reports are available. — 4 Cal DS

SOLID WASTE MANAGEMENT: Derek Rockett (360) 995-3176

All grading and filling of land must utilize only clean fill. All other materials may be considered solid waste and permit approval may be required from your local jurisdictional health department prior to filling. All removed debris resulting from this project must be disposed of at an approved site. Contact the local jurisdictional health department or Department of Ecology for proper management of these materials. — 5 Cal EA

TOXICS CLEANUP/TACOMA SMELTER PLUME: Diana Ison (360) 999-9593

This proposed project is located in an area that has been contaminated with heavy metals due to the air emissions originating from the old Asarco smelter in North Tacoma. Glacier

Northwest (Glacier) prepared a Cleanup Action Plan (CAP) to remediate the contaminated soils within the South Parcel as part of the ongoing mining. Glacier joined Ecology's Voluntary Cleanup Program (VCP) as VCP No. SW1728 and requested an opinion on the proposed cleanup. Ecology reviewed the CAP and agreed with the plan. Ecology issued an opinion in February 2021. Glacier will sample and remediate the soils if they test above the Model Toxics Control Act cleanup levels for arsenic or lead. They will sample and remediate the soil in stages corresponding to the mining schedule. Glacier will continue to sample and remediate the soil until the mining is complete. At the end of the mining operations, Glacier will prepare and submit to Ecology a final cleanup report and apply for a No Further Action determination from Ecology. For questions regarding this VCP project, please contact Diana Ison with the Toxic Cleanup Program at (360) 999-9593 or via email at diana.ison@ecy.wa.gov.

6 Cal EA

TOXICS CLEANUP: John Fot (564) 233-5588

Inadequate discussion with regards to the potential impacts for the industrial park and JBLM Landfill 5 to the Northeast. Dewatering may cause additional settling affecting foundations and landfill liners. Dewatering will mobilize any potential landfill leachate/contamination and direct it toward the mine site.

7 Cal EA

TOXICS CLEANUP: Sandy Smith (360) 999-9588

The Pioneer Aggregates South Parcel Mine Expansion area includes and is within a quarter mile of several known or suspected contaminated sites. To search and access information concerning these sites see https://ecology.wa.gov/Spills-Cleanup/Contamination-cleanup/Cleanup-sites. The cleanup of these toxic cleanup sites is regulated under the Washington Model Toxics Control Act (MTCA), Chapter 70A.305 RCW, and implementing regulations contained in Chapter 173-340 WAC. Ecology recommends that pollution in the environment, if present within the Pioneer Aggregates South Parcel Mine Expansion area, be cleaned up in compliance with WAC 173-340 before construction or redevelopment and while contaminated soil and/or groundwater, if present, are more accessible.

If contamination is suspected, discovered, or occurs during development of the area, testing of the potentially contaminated media must be conducted. If contamination of soil or groundwater is readily apparent, or is revealed by testing, the Department of Ecology must be notified. Contact the Environmental Report Tracking System Coordinator at the Southwest Regional Office at (360) 407-6300. For assistance and information about subsequent cleanup and to identify the type of testing that will be required, contact Sandy Smith with the Toxics Cleanup Program at the Southwest Regional Office at (360) 999-9588.

8 Cal EA

WATER RESOURCES: Charlotte Lattimore (360) 407-6066

Under RCW 90.03.350, a Dam Safety construction permit is required for those dams or ponds that can impound a volume of 10 acre-feet or more of water or other liquids above ground level. This also includes ponds that share a common berm which in combination the volume is 10 acre-feet or more. The Pioneer Aggregates South Parcel Mine Expansion project references the construction of retention/detention ponds, if these impoundments meet or exceeds the above referenced criteria, you will need to apply for a dam construction permit. To determine if a Dam Safety construction permit is required for your project, the applicant must submit a set of construction plans to:
WA Department of Ecology

9 Cal City

Dam Safety Office
P.O. Box 47600
Olympia, WA 98504-7600

The construction permit application can be found by entering the following link into your search engine:
https://apps.ecology.wa.gov/publications/summarypages/ecy07038.html

9 cont

For additional information, please contact Charlotte Lattimore by e-mail at clat461@ecy.wa.gov or by telephone at (360) 407-6066.

WATER QUALITY/INDUSTRIAL OPERATIONS UNIT:
Eli Newby, Sand & Gravel Permit Manager
(360) 763-2633 | eil.newby@ecy.wa.gov

Pioneer Aggregates (WAG501178) currently has Sand and Gravel General Permit (NPDES) coverage issued for the 508.5-acre existing operation for a discharge to groundwater. Permitted existing facilities planning a significant process change must submit a complete and accurate Notice of Intent (NOI) no less than one hundred and eighty (180) days before the significant process change.

10 Cal

The proposed 188-acre expansion includes installation of wells to intercept and pump groundwater to dry out gravels for mining. The proposal states intercepted groundwater would be conveyed by surface channels and infiltrated in ponds on the floor of the Existing Mine. Pumping groundwater for mining meets the permit definition for a discharge of Mine Dewatering Water and will require a modification of permit coverage. Modification of existing monitoring locations or the addition of new monitoring points will be required for Mine Dewater Water to maintain compliance with permit conditions for representative sampling.

11 Cal

The Site Management Plan, Site Map, Monitoring Plan including quarterly Discharge Mentoring Reporting monitoring points must be updated as necessary to respond to changes in facility and site conditions.

12 Cal

Permitted existing facilities planning a significant process change must satisfy public notice requirements for the Ecology permit action as a part of the NOI application for modified permit coverage. Additional information can be found in in WAC 173-226-130(5) and WAC 173-220-150(1)(b).

13 Cal

Ecology's comments are based upon information provided by the lead agency. As such, they may not constitute an exhaustive list of the various authorizations that must be obtained or legal requirements that must be fulfilled in order to carry out the proposed action.

If you have any questions or would like to respond to these comments, please contact the appropriate reviewing staff listed above.

Department of Ecology
Southwest Regional Office

(JKT:202402587)

cc: John Price, SWM
Derek Rockett, SWM
Diana Ison, TCP
John Fot, TCP
Sandy Smith, TCP
Charlotte Lattimore, WR
Eli Newby, WQ

OTHER AGENCIES

NISQUALLY INDIAN TRIBE
Tribal Historic Preservation Office
4820 She-Nah-Num Drive S.E.
Olympia, Washington 98513
360.456.5221 (main)
877.768.8886 (toll free)
www.nisqually-nsn.gov

July 17, 2024

To: Barbara Kincaid
Director of Public Services
City of DuPont
1700 Civic Drive
DuPont, WA 98327

Re: Pioneer Aggregates South Parcel Project DEIS

We've received a copy of the Draft Environmental Impact Statement (DEIS) prepared by the City of DuPont as the lead agency for review of the proposed Pioneer Aggregates South Parcel Project under the provisions of Revised Code of Washington (RCW) 43.21C, the State Environmental Policy Act (SEPA). This proposed project lies within the traditional territories of the Nisqually Tribe, which is governed by the Nisqually Tribal Council. The Nisqually Tribal Council has delegated to the Nisqually Tribal Historic Preservation Officer (THPO) the responsibility of representing the Tribe with regard to cultural resources management issues throughout our traditional territories under Nisqually Tribal Council Resolutions 26-2014 and 17-2024.

The Nisqually THPO is submitting the following comments pertaining to the adequacy of identification efforts regarding cultural resources of significance to the Nisqually Tribe potentially affected by the proposed project, and the analysis of potential impacts to these resources, as currently reflected in the DEIS and its appendices. Please note that other Nisqually tribal programs may submit comments on the DEIS based on their own areas of expertise.

We first offer that, as a sovereign nation, rather than members of the general public, we respectfully encourage our governmental partners to provide opportunities for consultation and review under SEPA that acknowledge that distinction, rather than requesting tribal review via the public comment process. We nevertheless offer our comments on the DEIS at this time in order to better ensure that the final EIS both accounts for, and adequately analyzes potential effects on, the full range of cultural resources potentially impacted by the proposed mining of the South Parcel, the associated dewatering of the Vashon Aquifer, and the remediation of mining activities via the "restoration" of Sequalitchew Creek as represented in the analysis of cumulative impacts contained within the South Parcel DEIS.

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This proposed project is located within a landscape of deep and enduring significance to the Nisqually Tribe and our members. Inclusive of saltwater, shorelands and tidelands, forested uplands, glacial outwash prairies, and a vast, interconnected system of fragile glacially-created wetlands and kettle lakes, this landscape has sustained the Nisqually people for countless generations; a time depth of which the current archaeological record provides only the smallest glimpse. Through living within and actively managing this landscape since time immemorial, our

2
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people have left their legacy as represented within the pre contact and historic era archaeological sites and non-archaeological places of enduring historical, cultural, and spiritual significance encompassed therein. These cultural resources are the very reasons that the late Hereditary Chief, Leonard Squally, devoted the closing years of his life to trying to protect the places central to Nisqually tribal identity and well-being that constitute the ancestral village landscape of Sequalitchew, within which the City of DuPont is located.

2 cont

The cultural resource review and analysis contained within the DEIS is wholly inadequate to the representation of the history and significance of cultural resources potentially impacted by the proposed South Parcel Project. The inadequacy of this review and analysis is due to its improperly limited geographic scope, its methodological unsuitability and associated topically limited content, and the culturally uninformed identification efforts, analyses, and recommendations it contains. The cultural resource review and analysis undertaken to inform the DEIS fails to provide the City of DuPont with adequate information to "ensure that presently unquantified environmental amenities and values will be given appropriate consideration in decision making," as SEPA's mandates demand (RCW 43.21C.030). As currently written, the DEIS neither reflects a reasonable and good faith effort to identify all cultural resources potentially affected by this proposed project, nor offers adequate analysis of the Project's potential effects on those resources. We offer the following comments in support of that statement:

3 Cal

Geographic Scope

- The contractors who prepared the *Pioneer Aggregates South Parcel Project Cultural Resources Desktop Analysis* and its associated appendices included within the DEIS defined what they term as the "area of direct impacts (ADI)" for the proposed project within which they undertook their cultural resource identification and analysis efforts. The term "area of direct impacts" has no regulatory meaning within the context of SEPA. The geographic area that is to be analyzed during SEPA review is the "affected area" of the project, as required under the SEPA Rules at WAC 197-11-430(e). The delineation of the affected area of a proposed project under SEPA does not in any way distinguish between "direct" and "indirect" impacts. We offer a proposed boundary for the affected area of this project below.

4 Cal

- With further regard to the analysis of "direct" impacts, the contractors seem to be equating the term "direct" with "ground disturbance," thereby inherently delimiting both the number and types of cultural resources, and the range of cultural resource impacts, under analysis. Rather than being defined within SEPA, the term "direct effects" as commonly used within cultural resource identification and analysis efforts is derived from the National Historic Preservation Act of 1966 (54 USC 300101 et seq), and its implementing regulations, commonly referred to as the Section 106 process, found at 36 CFR Part 800. As recently clarified by the United States Court of Appeals for the District of Columbia Circuit (*National Parks Conservation Association v. Semonite*, No. 18-5179[D.C. Cir. 2019]), the term "direct effects" refers to the *causality* of the effect, rather than the *physicality* of the effect. The Court determined that *direct effects are those that arise from the same project at the same time and place with no intervening cause, regardless of specific type*. By limiting their review to their unilaterally determined and inadequate "ADI," the contractors have failed to account for all cultural resources within the affected area of the proposed project, as well

5 Cal

as the full range of potential project-related impacts to these resources, as required under SEPA.

5 cont

- The contractors selected a 1/8-mile radius around their "ADI" within which prior cultural resource efforts and previously recorded archaeological and historic-era resources have been briefly considered in their identification and analysis efforts. Please note that Section V.A.1. of the current version of the *Washington State Standards for Cultural Resource Reporting* (March 2023) states that the current knowledge regarding archaeological resources within a one-mile radius of a proposed project location should be presented within cultural resource reporting.

6 Cal

- Due to the improperly limited geographic scope of the contractor's cultural resource review and analysis, the DEIS fails to account for both the presence of all cultural resources potentially affected by the proposed South Parcel Project, and the full array of potential effects of the proposed project on these resources. Please instruct the contractors to identify all cultural resources within the entire *affected area* of the proposed project, a definition of which is proposed below, as well as within a one-mile radius of the affected area of the project. This will help to better ensure that their efforts both meet contemporary cultural resource investigation and reporting standards and provide the City with the data necessary understanding the full range of potential project impacts on all cultural resources of significance to the Nisqually Tribe.

7 Cal

Methodologies

- The contractors performed a "Desktop Analysis," rather than conducting an on the ground survey inclusive of subsurface testing, paired with a standard contemporary ethnographic review inclusive of Traditional Cultural Properties (TCPs). Given the scale and scope of proposed landscape modification associated with the South Parcel Project, a Desktop Analysis such as that undertaken by the contractors simply does not constitute a reasonable and good-faith effort to identify cultural resources potentially affected by the project. A cultural resource "Desktop Analysis" is inherently unsuitable to the parameters of environmental review required within an EIS, given the failure of this approach to provide any insight into the very "*unquantified* environmental amenities and values" that are mandated to be identified and analyzed under SEPA. The methodological inadequacy of this desktop-based effort within the context of the South Parcel Project DEIS is further magnified by the improperly limited geographic scope of the contractor's analysis.

8 Cal

- Being limited solely to the identification and analysis of *previously recorded archaeological resources* within, and within 1/8-mile of, the improperly delineated affected area of the proposed project, the Desktop Analysis produced by the contractors fails to account for both previously *unrecorded archaeological resources* potentially affected by the project, and a vast array of *non-archaeological* places and landscapes of traditional cultural, historical, and spiritual significance to the Nisqually Tribe, that may be impacted by the proposed South Parcel Project.

9 Cal

- The contractor's Desktop Analysis also lacks the depth of ethnographic and ethnohistoric inquiry necessary to the understanding of the existence and variety of cultural resources of

10 Cal

deep and enduring historic, archaeological, cultural, and spiritual significance to the Nisqually Tribe within the affected area of this proposed project. The contractor's failure to adequately consider ethnographic and contemporary cultural data have resulted in their failure to identify all cultural resources potentially affected by the proposed project, and their failure to analyze, or even recognize, the impacts of the project on these resources.

10 cont

Identification and Analysis

- Most contemporary cultural resource professionals are aware of the necessity of taking a landscape approach to the proper identification, and analysis of the significance, of cultural resources significant to affected tribes. Most are also aware that culturally uninformed archaeological research is of extremely limited utility when engaged in the identification of such resources and the evaluation of their eligibility for listing on the NRHP and other historic registers. Because it lacks both landscape-level contextualization and ethnographic research that meets contemporary professional standards and expectations, the identification effort undertaken by the contractor fails to account for all cultural resources potentially affected by the proposed South Parcel Project.

11 Cal

- It is the position of the Nisqually THPO that, given the scale and scope of the proposed project and its potential impacts on cultural resources of significance to the Nisqually Tribe, the affected environment that is to be analyzed under SEPA is the Sequalitchew Ancestral Village Landscape, which is, itself, a Traditional Cultural Property (TCP) eligible for listing on the National Register of Historic Places (NRHP) under all four NRHP Criteria of Evaluation. While not formally mapped at this time, the boundaries of the Sequalitchew Ancestral Village Landscape TCP can be said to largely mirror those of the greater Sequalitchew Creek watershed and its environs. Given the proposed dewatering of the Vashon Aquifer and associated dewatering of vast portions of the watershed itself, the impacts of the proposed project on the NRHP-eligible TCP that is the Sequalitchew Ancestral Village Landscape, and all of the cultural resources of significance to the Nisqually Tribe encompassed within that landscape, must be analyzed in the DEIS.

12 Cal

- The Sequalitchew Ancestral Village Landscape TCP is a single historic property that is itself comprised of numerous historic properties and cultural resources of archaeological historical, cultural, and spiritual significance to the Nisqually Tribe, consisting of both previously recorded and unrecorded pre contact and historic era archaeological and ethnographic sites and landscapes. Among these are seasonal and permanent village sites; resource gathering locations; locations of spiritual and ritual practice and prayer; places associated with important people and events; ancestral burial locations and cemeteries; and locations associated with spiritually powerful and culturally central entities. The failure of the contractors to engage in the level of ethnographic and ethnohistorical research necessary to identifying and analyzing potential impacts to these resources posed by the proposed project renders largely meaningless the consideration of cultural resource impacts within the DEIS.

13 Cal

- The vast majority of the cultural resources contained within the larger Sequalitchew Ancestral Village Landscape TCP are, themselves, NRHP-eligible historic properties, owing to their archaeological and/or traditional cultural significance, as well as simultaneously contributing to the significance of the overarching Sequalitchew Village Ancestral Landscape TCP. Because of the cultural and spiritual teachings and practices, important

14 Cal

people, and historical patterns and events with which it is associated, the significance of the Sequalitchew Ancestral Village Landscape TCP and its constituent archaeological sites, TCPs, and landscapes to contemporary members of the Nisqually Tribe cannot be overstated.

14 cont

- One of the many archaeologically, culturally, and spiritually significant cultural resources at the heart of the Sequalitchew Ancestral Village Landscape TCP that the contractors fail to address as a cultural resource is Sequalitchew Creek, the mouth of which is the subject of an oral tradition known as the "Giant of Sequalitchew," a Nisqually fisherman who use this beach for seine fishing. Sequalitchew Creek is, itself, an NRHP-eligible TCP owing, in part, to its historic spiritual use by practitioners of *Seowin*, the ancient and enduring lifeways of the Nisqually and other Coast Salish people, still vibrant today. The proposed dewatering of the Vashon Aquifer will not just adversely impact, but will irreparably damage, Sequalitchew Creek both as a water resource and as a critically important and spiritually central cultural resource, the cultural and spiritual significance of, and impacts to which, have not been addressed by the contractors.

15 Cal

- As another example, the glacial kettle lakes and interconnected wetlands that will be cleared, eliminated, and/or otherwise impacted by this proposed project are, in fact, cultural resources and, quite likely, NRHP-eligible TCPs, owing to the fact that these types of geophysical locations being integral to a specific ancestral cultural practice central to Coast Salish identity and well-being. Furthermore, a number of these kettle lakes are associated with culturally important non-human beings, rendering them further eligible for listing on the NRHP as TCPs. The kettle lakes and wetlands that will be impacted by the proposed project are cultural resources, yet were not identified as such by the contractors, and the analysis of the cultural and spiritual impacts of their destruction is, therefore, completely absent.

16 Cal

- The proposed gravel removal footprint of the South Parcel Project, specifically the expansion area, encompasses some of the last remaining undeveloped lands within the City's jurisdiction. These lands have significant potential for the restoration of the rare glacial outwash prairie habitat of Sequalitchew that once hosted a wealth of *Camassia quamash*, or blue camas, a food of immeasurable significance and nutritional value to the Nisqually people. These areas were seeded with camas by a culturally central non-human Person and are, therefore, eligible for listing on the NRHP as TCPs. As the contractors failed to undertake adequate ethnographic and ethnohistorical research, they have failed to identify this association which is well-documented in the published ethnographic literature available to them. No consideration has been given by the contractors to those NRHP-eligible TCPs consisting of areas within which plants of traditional cultural significance were long gathered and within which they have the potential to be restored so that they can, once again, fulfill their role as physical, cultural, and spiritual resources for the Nisqually people.

17 Cal

- The contractors attempt to provide an analysis of the cumulative impacts of both the proposed South Parcel Project and the associated Sequalitchew Creek Restoration Plan (Restoration Plan) on cultural resources within their improperly delineated "ADI." Neither a DEIS nor a final EIS analyzing the environmental impacts of the Restoration Place has, in fact, been produced, which renders the consideration of cumulative impacts completely

18 Cal City

meaningless. Both the June 2023 and January 2024 SEPA Environmental Checklists for the Restoration Plan state that there are no cultural resources that will be affected by the implementation of the plan, and that no studies were undertaken to make that determination. The Nisqually THPO therefore has no choice but to conclude that the analysis of cumulative impacts on cultural resources contained within the South Parcel DEIS is completely without scientific value or merit. We further note that project proponents are not permitted to provide the sole word "No" as a response to a SEPA Checklist question, and request that the SEPA Checklist of the Restoration Plan be amended by the proponent in conformity with regulatory requirements.

18 cont

- The dewatering of the Vashon Aquifer to facilitate mining will have expansive and devastating effects on animals that are culturally and spiritually central to the lifeways of the Nisqually people, including our salmon relatives whose habitat is protected by the 1854 Treaty of Medicine Creek alongside our inherent sovereign rights to manage and harvest them. To the Nisqually people, salmon are a cultural resource, and the lack of consideration given in the DEIS to the very real cultural harms posed by the dewatering of an entire aquifer and devastation of environmental elements central to supporting healthy salmon habitat is unconscionable. The many years and countless millions of dollars that have already been spent on salmon habitat restoration activities by the Nisqually Tribe and the State of Washington within the Sequalitchew estuary and the greater Nisqually Basin renders the dewatering of the Vashon Aquifer completely unconscionable. The dewatering of the Vashon Aquifer would, in fact, violate the inherent and treaty-protected sovereign rights of the Nisqually Tribe.

19 Cal

- The exploitation of the Nisqually ancestral homelands by others for financial gain, and the attendant physical destruction of the places and landscapes for which we have been given the ancestral responsibility to care, as well as the duty to stewards for future generations, has devastating effects on the physical, mental, emotional, and spiritual health of contemporary Nisqually tribal members. The disparate impacts of the proposed project on the well-being of the Nisqually Tribe and our members have not been considered. The lack of environmental justice analysis within the DEIS, and the failure to quantify and adequately analyze the land-based traumas and other cultural and spiritual harms to the Nisqually people posed by the potential South Parcel Project is a glaring and unacceptable oversight that must be addressed in the final EIS for the project.

20 Cal EA

- The release of confidential information regarding the existence and location of cultural resources of significance to the Nisqually Tribe in the final appendices to the DEIS is itself a cultural harm that must rectified immediately through the deletion of those portions of the publicly available DEIS, and their omission from the publicly available version of the final EIS when it is released.

21 City EA

Overall, the cultural resource-related portions of the DEIS fail to both satisfy contemporary professional standards for cultural resource practitioners and provide adequate and accurate information related to cultural resource impacts upon which the City of DuPont can make the most fully informed decisions regarding the proposed South Parcel Project. Given the unacceptable shortcomings of the cultural resource identification and analysis undertaken to inform the DEIS, the Nisqually THPO requests extensive revisions, including:

22 Cal EA

- An expansion of the parameters of review to the *entire affected area* of the project as required under SEPA, namely the boundaries of the NRHP-eligible Sequalitchew Ancestral Village Landscape TCP and the numerous cultural resources of which it is comprised;

- The documentation, assessment of the significance of, and robust analysis of the potential impacts of the proposed project on all *archaeological and non-archaeological cultural resources* significant to the Nisqually Tribe within the affected area of the proposed project; and

- An environmental justice analysis of both the *cultural harms, and the impairment of treaty-protected inherent sovereign rights*, to which the members of the Nisqually Tribe would be subjected as a result of the implementation of the South Parcel Project.

22 cont

We genuinely thank you for the thoughtful consideration of our comments and look forward to further consultation to assist the City of DuPont in obtaining the data that it needs in order to make a fully informed decision regarding the project.

Sincerely,

Brad Beach, THPO
Nisqually Indian Tribe
360-528-1084
360-456-5221 ext 1277
beach.brad@nisqually-nsn.gov

cc: Annette Bullchild, Director, Nisqually Indian Tribe

Pioneer Aggregates South Parcel Draft Environmental Impact Statement (EIS)

Comment Form

Input from the public regarding the Pioneer Aggregates South Parcel Project EIS is welcome. Please submit this form to share your comments. Note: Submitted comment forms are subject to the Public Records Act (RCW 42.56).

Date
7/11/2024

First Name *
Steven

Last Name *
Hartwig, P.E.

Are you a resident of the City of DuPont, WA? *
- Yes
- No

What city do you reside in?

Are you a business owner? *
- Yes
- No

Are you part of an Agency or Organization? *
- Yes
- No
- Not relevant to my input

What is the name of the Agency or Organization?
Pierce County Planning & Public Works, Sewer Utility

If you have concerns regarding the EARTH, please describe them below.
Please see attached letter.

If you have concerns regarding the AIR QUALITY, please describe them below.
Please see attached letter.

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.
Please see attached letter.

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.
Please see attached letter.

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.
Please see attached letter.

If you have concerns regarding NOISE, please describe them below.
Please see attached letter.

If you have concerns regarding LAND USE, please describe them below.
Please see attached letter.

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.
Please see attached letter.

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

1
EA

Please see attached letter.

If you have concerns regarding TRANSPORTATION, please describe them below.

Please see attached letter.

If you have OTHER concerns not listed above, please describe them below.

Please see attached letter.

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

U-116499-SH.pdf 848KB

(SEPA2021-002 comment period 6/14/2024-7/15/2024)

1
cont.

PLANNING & PUBLIC WORKS

9850 64th Street West
University Place, Washington 98467-1078

PierceCountyWa.gov/PPW

Jen Tetatzin, PE, PMP - Director

July 11, 2024
U-116499

Barb Kincaid, Public Services Director
City of DuPont
1700 Civic Dr.
DuPont, WA 98327

Subject: **For the proposed Pioneer Aggregates South Parcel Project, File No. SEPA 2021-002**

Dear Barb:

Thank you for the opportunity to comment on the City of DuPont EIS (DEIS) for the proposed Pioneer Aggregates South Parcel Project, File No. SEPA 2021-002. Below are Pierce County Sewer Utility comments for your consideration.

Existing Sewers in Powerline Rd. and easements need protection during this work.

- The proposed Noise/Visual Berm is too close to existing sewers and should be set back to avoid overloading the pipeline with a 20-foot berm.
- The proposed grading at the east end of the of the mine appears to impact existing sewers and should be reconsidered.

1 Cal EA

The dewatering plan lower groundwater levels over 60 feet in many areas and will likely lead to settlement. The County requests the following conditions be added to the mine's expansion project:

- CalPortland shall monitor settlement of all existing sewer mains inside the area impacted by the proposed dewatering.
- If settlement creates sags in the sewer system CalPortland must take corrective action to restore the sewer system line and grade.

2 EA City

Bell Marsh Wetland monitoring should be included to make sure water levels stay below the proposed sewer line at the Robinson Trail.

3 City Cal DS

Wetland monitoring is essential to ensure water levels stay below the proposed sewer line at the Robinson Trail Berm. Creating an opening in the trail berm is part of the 2011 agreement to mitigate the mine's expansion impact. The County requests the following conditions be added to the mine's expansion project:

- CalPortland shall monitor marsh water levels at the new Robinson Trail Bridge to ensure it does not reach the lowest elevation of the sewer main.

4 City Cal

- If water levels approach the sewer main, CalPortland must take corrective action to lower water level to the elevations specified in the EIS document and prevent future rises that could impact the sewer main.

4 cont.

Sincerely,

Steven L. Hartwig, P.E.
Wastewater Utility Manager
Pierce County Sewer Division

SH: kt
Cors\U-116499-SH

Pioneer Aggregates South Parcel Draft Environmental Impact Statement (EIS)

Comment Form

Input from the public regarding the Pioneer Aggregates South Parcel Project EIS is welcome. Please submit this form to share your comments. Note: Submitted comment forms are subject to the Public Records Act (RCW 42.56).

Date

7/15/2024

First Name *

John

Last Name *

Dawson

Are you a resident of the City of DuPont, WA? *

- Yes
- No

What city do you reside in?

Are you a business owner? *

- Yes
- No

Are you part of an Agency or Organization? *

- Yes
- No
- Not relevant to my input

What is the name of the Agency or Organization?

Puget Sound Clean Air Agency

If you have concerns regarding the EARTH, please describe them below.

If you have concerns regarding the AIR QUALITY, please describe them below.

Operations at this facility are likely subject to Puget Sound Clean Air Agency Regulation I, Section 9.15 (Fugitive Dust Control Measures), Section 9.18 (Crushing Operations), and Section 9.20 (Maintenance of Equipment). The facility should be sure to comply with all applicable Agency regulations.

As a dust mitigation measure, the facility proposes "covering or wetting truck loads or allowing adequate freeboard to prevent the escape of dust-bearing materials". The City of DuPont should assure that this mitigation measure becomes enforceable and should require that all trucks leaving this mine be covered.

Finally, stationary engines may be required to undergo air quality permitting through the Agency's Notice of Construction program (in Agency Regulation I, Section 6, and WAC 173-400), while non-road engines are subject to the Agency's notification requirements in Regulation I, Section 15.

1 Cal EA

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.

If you have concerns regarding NOISE, please describe them below.

If you have concerns regarding LAND USE, please describe them below.

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

If you have concerns regarding TRANSPORTATION, please describe them below.

If you have OTHER concerns not listed above, please describe them below.

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

(SEPA2021-002 comment period 6/14/2024-7/15/2024)

ORGANIZATIONS

RECEIVED
Organizations Letter 1
JUL 22 2024
CITY OF DUPONT

July 15, 2024

City of DuPont
Attn: Barbara Kincaid
1700 Civic Dr.
DuPont, WA 98327

RE: Pioneer Aggregates South Parcel Project; City File No. SEPA2021-002 (DEIS)

As a matter of record the Chambers-Clover Creek Watershed Council is writing in response to the Draft Environmental Impact Statement (DEIS) for the Pioneer Aggregates South Parcel Project, City File No. SEPA 2021-002. The CCWC is a convened body whose mission is to promote the protection and enhancement of water quality, water quantity, habitat, and related environmental components of the Chambers/Clover Creek watershed, Watershed Resources Inventory Area (WRIA) 12. The CCWC 2024-2029 Five Year Action Agenda identifies Stream Flows as the Priority 1 for the Watershed Council. It also continues to identify the Sequalitchew Creek sub-basin as a restoration priority. We also support the recommendations outlined by Washington's Streamflow Restoration law (RCW 90.94), and the 2018 Salmon Habitat Protection and Restoration Strategy for Puyallup and Chambers Watersheds which emphasize the importance of precluding the degradation of wetland systems. Conserving sensitive land helps ensure a healthy, robust, and sustainable salmon population as well as access to clean drinking water.

1
EA
DS

The CCWC commends the DEIS for acknowledging the link between groundwater and surface water flows, however dewatering the Vashon Aquifer in the South Expansion Area does not respect this connection and will exacerbate degradation within the Sequalitchew sub-basin. Thus, we thank you for the opportunity to provide comments on the proposed project.

It is appropriate that Section 3.3.2 of the DEIS, Groundwater Impacts of the Alternatives appropriately details the independent mining/reclamation impacts of Alternative 1 - Proposed Action, and additionally, the Cumulative Impacts sub-section effectively discusses the combined effects of the proposed mining/reclamation under Alternative 1 in combination with the Restoration Plan. This approach offers a better understanding of the irreversible impacts of the proposed action and the necessity for the Restoration Plan. We appreciate this approach, as it underscores that the proposed Restoration Plan was developed as a mitigation measure.

2
DS
Cal

However, the lingering assumption that Sequalitchew Creek is a predominately surface water-driven system is a fundamental mischaracterization. Sequalitchew Creek is, in fact, a groundwater discharge-driven system that has suffered significant adverse impacts due to declining Vashon Aquifer groundwater levels, constrictions to flows, and increasing stormwater runoff. These changes have degraded the once pristine, salmon-bearing upper

Sequalitchew Creek and its associated Edmonds Marsh ecosystem, which were originally sustained by the "groundwater" wetland complex. Similarly, the DEIS (and other related documents) inaccurately refers to the stretch of Sequalitchew Creek between West Edmond Marsh and the steep creek ravine as the "dry reach." It's time this terminology be corrected! A more accurate term would be "losing reach," indicating that surface water becomes disconnected from the groundwater table causing water to move from the stream to the ground through infiltration to adjacent and underlying unsaturated soils giving the appearance of a "dry reach". Figures 1a., 1b. and 2. clearly show that this reach is not "dry" when the groundwater table is higher with the infiltration of precipitation to the aquifer, as evidenced by (Figure 3) showing Lake Sellers the day before Figures 1a., b. and 2. were taken March 14, 2016. Also, in March 2017, and January 2022, I witnessed surface water flows that continued downstream through the entire losing reach all the way to the berm near City Hall.

2 cont

Impacts of proposed actions and restoration efforts for this reach must acknowledge the critical surface and groundwater connections. No attempts should be made to "seal" the reach to establish surface flows. Evidence remains of a failed attempt to do just that with the tangled CalPortland conveyor belts that now litter the creek bed in this losing reach (Fig. 7); these were originally placed there around 2009 in a volunteer stewardship effort to clear invasive plants and seal this reach with a misunderstanding of the surface and groundwater connections. Since the 1843 location of Fort Nisqually on the south bank of Sequalitchew Creek at this location where the creek was then 20' wide, many changes have occurred that are proximate causes to this disconnection with the groundwater table and its transition to a "losing" reach (filling in with Hudson Bay Company activities like the slaughter house over the creek, canals to drain the marsh for agriculture, the Fort Lewis Diversion Canal, and wastewater system changes from infiltrating septic systems to pipes carrying this potential recharge to sewer plants on the Sound, stormwater systems that flush runoff through the streams versus allowing flood plains to serve as aquifer recharge, as well as, obstructions from culverts in berms for roads, rails, and sewer lines that cross the area constricting streamflow and prompting beaver and groundwater responses). You have received a report from Don Russell entitled "RESTORATION OF THE SEQUALITCHEW CREEK WATERSHED", with the Section "Degradation of the American Lake/Sequalitchew Creek Watershed", which details much of this history.

3 DS Cal

The DEIS Page 3.3-9 states, "Sequalitchew Lake has a surface water outlet to Sequalitchew Creek at its Western end, which currently flows into the Diversion Canal ***due to beaver dam blockages***" (Emphasis mine). First, this lacks clarity; also, before 2014, it was common belief that the large beaver dam in eastern East Edmond Marsh prevented the outflow from Sequalitchew Lake, held behind the Diversion Canal Weir, from entering the Sequalitchew Creek channel. However, the beaver dam near the Diversion Canal was breached in the winter of 2015/2016. By March 15, 2016 (when there was also flow in the losing reach) it was evident that surface flows from Sequalitchew Lake, the eastern East Edmond Marsh downstream of the Weir, and the Bell, McKay, and Hammer Marsh complex directed by the Diversion Canal structures (Figures 4, 5, and 6) flowed into the Diversion Canal. This photo evidence correlates to DEIS Figure 3.4-2 as well as the discussion on page 3.4-6. Any "mitigation" or restoration plan for Sequalitchew Creek must recognize surface and groundwater inputs at East Edmond Marsh and consider the repairs of the Diversion Canal

4 DS Cal

Structure by JBLM which will further alter flows and contributions to the Sequalitchew Creek channel from Sequalitchew Lake and the adjacent marsh complex.

4 cont

The Department of Defense has completed feasibility planning for the Lake Sequalitchew Diversion Structure Repair Project at JBLM and has begun permitting. The proposed project includes the removal of fish ladder center structures, canal-creek crossover structures, and beaver dams; the installation of an automated telemetric gate, and the construction of three new weir diversion structures. This project aims to restore stormwater runoff flow, lake flow, and groundwater interflow to the creek and canal conveyance system, correct seasonal storm flows, and regulate lake levels to prevent backwater flow into the spring water distribution system (JBLM Notice of Proposed Activity in a Flood Plain, July 2024). This project is estimated to redirect 724 acre-feet per year back into Sequalitchew Creek (DOE Pub 21-11-012, Watershed Restoration and Enhancement Plan WRIA 12 - Chambers-Clover Watershed).

The JBLM Diversion Canal structure replacement and an updated Sequalitchew Creek Restoration Plan [using elements of the Sequalitchew Creek Restoration Plan proposed in 2014 by Mr. Don Russell in his letter attached to the City of DuPont (Document 5-10-2024) RFI Sequalitchew Creek Restoration Plan 20240430)] are moving in the right direction to protect Sequalitchew Creek and restore its ecological function, without the perpetual adverse impacts of proposed Alternative 1 and the flawed Restoration Plan mitigation. On Pages 1-2 of the DEIS, under Alternative 2 — No Action Alternative, it is stated, "While it is unlikely that the Sequalitchew Creek Restoration Plan would be implemented if the proposal does not occur, it is possible for other funding (e.g., grants) be obtained to carry out the Restoration Plan." An improved phrasing would be "The No Action Alternative will reference the potential impacts of implementing the Sequalitchew Creek Restoration Plan without being tied to the mitigation of Alternative 1's proposed action." Although alternative funding for this Restoration Plan has yet to be identified, elements of the Restoration Plan may be funded through alternative sources (e.g., grants, DOE Hirst Decision Funding, and Salmon Lead Entity identified sources).

5 DS Cal

It is imperative to take a multi-jurisdictional approach to identifying key problems and potential solutions while meeting county, state, and federal requirements to protect water quality, quantity, and habitat from further irreparable damage caused by misunderstandings and misjudgments that allow developments with perpetual adverse impacts — emphasizing the need to restore lost ecological functions. Therefore, the CCWC stands in favor of Alternative 2 – the No Action Alternative – strongly urging the initiation of discussions and the establishment of a committee to develop a Sequalitchew Creek Restoration Plan based on the factual assessment of hydrology, and opportunities for restoration of ecological functions. This plan should identify funding sources that avoid causing ongoing adverse impacts to the Sequalitchew Creek sub-basin and should provide positive impacts to the health of the Vashon Aquifer fed Chambers-Clover Creek Watershed.

6 City DS

The Chambers-Clover Watershed Council (CCWC), leveraging its heritage from the 1993 Chambers-Clover Creek Watershed Management Committee (CCCWMC) established by Pierce County, serves as a clearinghouse for scientific and policy information — possessing deep experience and expertise in the watershed's evolving dynamics. We are committed to

supporting the community of DuPont in Multi-Jurisdictional watershed conversations to ensure a healthy and sustainable watershed for generations that follow.

Kind Regards,

Renee Buck

Renee Buck, Chair
Chambers-Clover Watershed Council
(360) 340-8815



Fig 1.a. Losing reach of Sequalitchew Creek March 15, 2016



Fig 1.b. Losing reach of Sequalitchew Creek at wooden bridge January 22, 2017



Fig 2. Center Drive Pedestrian Walk portion of Losing Reach March 15, 2016



Fig 3. Northwest end of Lake Sellars (a nerby kettle lake) showing high groundwater levels March 14, 2016.



Fig 4. Surface Flow from Marsh Complex going through channel to Diversion Canal next to the weir at Sequalitchew Lake outflow March 15, 2016



Fig 5. Sequalitchew Creek channel just west of the "crossover culverts" at the Diversion Canal structure March 15, 2016; the beaver dam is breached and surface flows go towards the crossover complex, into the channel in Fig 4 an on into the diversion canal instead of westward towards West Edmond marsh.



Fig 6. The Diversion Canal just downstream of the weir with lake outflows joined by flow from canal in Fig 4, just to the left, and also from eastern end of East Edmond Marsh all

along the SW bank of the Canal.



Fig 7. Conveyor belts laid in creek bed tangled from groundwater rise remain after failed attempt to seal the losing reach of Sequalitchew Creek in 2009. (Nov. 6, 2016)

Pioneer Aggregates South Parcel Draft Environmental Impact Statement (EIS)

Comment Form

Input from the public regarding the Pioneer Aggregates South Parcel Project EIS is welcome. Please submit this form to share your comments. Note: Submitted comment forms are subject to the Public Records Act (RCW 42.56).

Date
7/15/2024

First Name *
Derek

Last Name *
Booth

Are you a resident of the City of DuPont, WA? *
- ○ Yes
- ◉ No

What city do you reside in?
Bainbridge Island

Are you a business owner? *
- ○ Yes
- ◉ No

Are you part of an Agency or Organization? *
- ◉ Yes
- ○ No
- ○ Not relevant to my input

What is the name of the Agency or Organization?
Environmental Caucus (as consultant representative)

If you have concerns regarding the EARTH, please describe them below.

If you have concerns regarding the AIR QUALITY, please describe them below.

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.
Please see attached.

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.
Please see attached.

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.

If you have concerns regarding NOISE, please describe them below.

If you have concerns regarding LAND USE, please describe them below.

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

If you have concerns regarding TRANSPORTATION, please describe them below.

If you have OTHER concerns not listed above, please describe them below.

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

Comment letter South Parcel DEIS_Booth.pdf 206.66KB

(SEPA2021-002 comment period 6/14/2024-7/15/2024)

Derek B. Booth, PhD, PE, PG
8934 Sands Avenue NE, Bainbridge Island, WA 98110

July 15, 2024

The City of DuPont
1700 Civic Dr.
DuPont, WA 98327
ATTN: Barb Kincaid

RE: Comments on the Draft Environmental Impact Statement for the proposed Pioneer Aggregates South Parcel Project

Since 2009, I have served as a consultant to the Environmental Caucus with respect to South Parcel mine proposal and Sequalitchew Creek Restoration Plan. Caucus representatives are in support of the following comments.

I have conducted a targeted review of this document on behalf the Environmental Caucus, with a focus on the "Groundwater" and "Surface Water" sections of the Affected Environment (Sections 3.3 and 3.4 of the document), along with their summaries presented in Section 1. I have identified two topics that should motivate minor changes to this DEIS.

1. Conformance of the 2017 South Parcel Monitoring Plan

The South Parcel Monitoring Plan is attached as Appendix F to the DEIS, but its substantive requirements are not described in much detail in the DEIS's Groundwater section. The Plan was the subject of multiple meetings and draft documents through much of 2017, with the final version approved by the Environmental Caucus and with explicit commitments to further actions by both CalPortland and the Environmental Caucus, should the actual declines in groundwater levels exceed the amounts anticipated by the modeling. As the Plan was developed, I worked closely with Mindy Roberts of Washington Conservation Action and representatives from the Nisqually Delta Association.

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The 2017 plan reads as follows:

> "Throughout the adaptive management process, status updates, monitoring data, and final reports will be shared with the Environmental Caucus. Should groundwater levels not meet the performance thresholds established in this plan, then CalPortland would notify the Environmental Caucus and plan and implement adjustments. If adjustments are unsuccessful in meeting predicted groundwater levels, CalPortland and the

> Environmental Caucus would initiate a technical review conference and, if necessary, meet and confer to share information and determine the appropriate additional steps" (p. 10).

This document also outlined an extensive "Meet and Confer Process" (Section 4.2.6), as authorized in Section 7.3 of the Settlement Agreement, should the groundwater levels not meet the criteria established in the Monitoring Plan.

The DEIS, in contrast, does not provide many of the details that have been incorporated into the Monitoring Plan, and it is quite nonspecific as to the process that would be followed in the case of unanticipated response:

DEIS, pp. 1-21, 3.3-32:

> "• If performance threshold water levels are exceeded, adaptive management responses (such as adjusting the dewatering operations and/or the boundaries and depth of mining so that performance threshold exceedances do not occur) would be required before additional mining could occur.
>
> "• Since dewatering Step 3 would be irreversible, increased monitoring vigilance at different phases of Step 3 as dewatering and mining progress southward could be warranted to ensure that performance threshold water levels are not exceeded."

The DEIS should be revised to articulate more explicitly the actions that both parties (Environmental Caucus and CalPortland) have already agreed to under such circumstances in the 2017 Monitoring Plan. The present wording implies that an indeterminate range of actions could be sufficient to allow additional mining to proceed.

1 cont.

2. Reemergence of a previously analyzed and rejected mitigation strategy

One of the earliest (2010) proposed mitigation measures for the South Parcel mine was a pump/gravity drain of the intercepted groundwater, dubbed "North Sequalitchew Creek" and ordained with the prospect of significant environmental benefits. None of these benefits, save its efficiency in conveying groundwater out of the mining area, could be substantiated in the course of subsequent review. As noted in the DEIS, this measure does not increase flows between Sequalitchew Lake and the ravine, nor does it mitigate for any reductions in groundwater levels beneath the marsh complex should the anticipated drawdowns be exceeded. Most importantly, it does not address the fundamental impairment of this watershed, namely the loss of water out of Sequalitchew Lake into the Diversion Canal. For all of these reasons, this suite of related

2 DS City

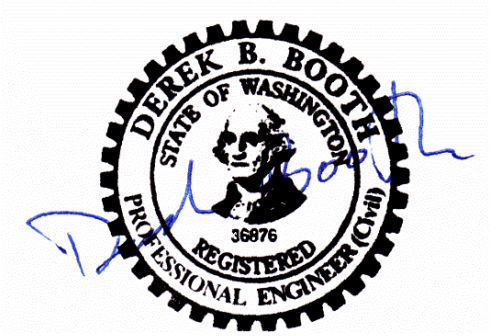
actions has been abandoned for over a decade as a credible mitigation measure.

Despite this history, the DEIS includes several variations of this action in its list of "groundwater contingency mitigation measures that could be implemented." They appear in six separate locations in the DEIS (pp. 1-22, 1-25, 1-29, 2-29, 3-3.33, and 3.5-17). Extracting this discredited "mitigation" from a 14-year-old document and presenting it as a credible contingency mitigation measure, without any clear designs or substantive evaluation, is a disservice to the extensive efforts that have gone into crafting the Final Restoration Plan (in which measures of this nature nowhere appear). It also distracts from the fundamental requirement for the restoration of the Sequalitchew Creek watershed: reestablishment of headwaters-to-Sound water flow through the wetland and creek complex downstream of Sequalitchew Lake.

2 cont.

In summary, any groundwater contingency mitigation measures presented in the DEIS should be clearly linked to the agreed-upon monitoring thresholds that might trigger such actions, and they should demonstrate a direct relationship to the impact that has given rise to their consideration. All others should be removed from the document.







Subject: **DEIS for Pioneer Aggregates South Parcel Projects**

Date: **July 15, 2024**

To: **Barbara Kincaid, City of DuPont SEPA Official,**

Thank you for the opportunity to comment on the Pioneer Aggregates South Parcel Project, City File No. SEPA2021-002. My name is Kirk Kirkland and I have reviewed various settlement agreement since 1994, between CalPortland, City of Dupont and Nisqually Delta , Black Hills National Audubon Society and Tahoma Audubon Society.

Again in March 2021 – CalPortland and the Environmental Caucus of non-governmental organizations finalized the Sequalitchew Creek Restoration Plan Funding Agreement and CalPortland funding the Restoration Plan Permit Fund per the terms of the agreement.

That Sequalitchew Lake can never be a suitable water source for Edmond Marsh and Sequalitchew Creek is a myth perpetrated by the CalPortland consultants to conceal the fact that dewatering the Vashon aquifer will cut off Vashon aquifer discharge as the sole source of water in Edmond Marsh and in the upper and lower reach of Sequalitchew Creek.

1 DS City Cal

The obvious remedy for this is to leave intact the restore Edmond Marsh by remove Beaver dams and then to intercept the Vashon aquifer groundwater to flow in Edmond Marsh flows then down the canyon reach of Sequalitchew Creek.

In addition the proposed Sequalitchew Creek Restoration Plan is based upon Core Group members fleshing out the five essential action elements prescribed by the Agreement This consensus was not based upon an understanding of (1) the natural hydrological condition and functioning of the Sequalitchew Creek watershed, (2) of the watershed's current impaired condition, and (3) of habitat conditions that existed when native salmon populations did inhabit this watershed.

2 DS City Cal

Increasing surface water flow from Sequalitchew Lake into Edmond Marsh's was intended for mitigation for dewatering the Vashon aquifer. However, groundwater discharging into Sequalitchew Creek is not congruent with the Plan's Vision *"…to restore flows and ecological conditions for native salmon populations in the Sequalitchew Creek Basin."*

3 DS City Cal

The Agreement's proposed Restoration Plan, if implemented, will not result in realization of the Plan's stated vision and more important the mitigation does not provide long- term flow in the creek when the pumps are turned off in 2038

At the Environmental Coalition, we are would like to see that the next phase of gravel mining results in a restored gravel mine where de watering if used in a limited basis is to restore Edmunds March permanently and to plant and replace the forests and wetlands that stood on these 313 acres.

4 DS City Cal

To accomplish this goal, we would like to use the final mining phase to lay the foundation for a city park that will provide a forest canopy sufficient to provide carbon sequestering needed for reduce effects of global warming. The current mine must also mitigate for the loss of natural forest found in 1994 and its effect on climate change during the mining operation.

To accomplish these goals, we ask that the city council consider requiring a Supplemental Environmental Statement to modify the two proposed Alternatives.

Non-member of the Environmental Caucus:

The Environmental Coalition of Pierce County was not a member of the "core group" which included the Environmental Caucus which represented a number of non-profit organizations including the Nisqually Delta Association (NDA), the Black Hills Audubon Society, Washington Environmental Council (WEC), the National Audubon Society, People for Puget Sound, the Tahoma Audubon Society, the Seattle Audubon Society

Many of these organizations involved in the agreement have since changed their name or their mission or are no longer in existence which include Tahoma Audubon Society, People for Puget Sound, Washington Environmental Council and Seattle Audubon Society.

Section 4.5.3

At the Environmental Council we disagree with the decision that under Section 4.5.3 of the Agreement, between CalPortland and the Environmental Caucus which approved of the Restoration Plan which deemed the plan to be, "adequate mitigation of all direct and indirect impacts of mining on Sequalitchew Creek" and that implementation of the plan is intended to constitute "more than 'mitigation" as defined in WAC 197-110-768 (Page 78 of 1995 pages)

5 DS City Cal

Since this agreement was signed we believe that several conditions have changed and that the Restoration Plan no longer meets the requirements of

the Revised Code of Washington and the City of Dupont's municipal code and Comp Plan Goals regarding critical area ordinances

> According to Section 4.5.3. the Environmental Coalition is not bound by the agreement. Under Section 4.5.3 of the Agreement, This part of the agreement is binding only on the nongovernmental entities. The agreement also acknowledges that further mitigation measures may be suggested and implemented through the applicable permit processes.

5 cont.

The two alternatives considered the Draft EIS are not consistent with the goal to preserve Edmunds Marsh. They are in violation of the Critical Areas Ordinance and the City's 2015 Comprehensive Plan. The proposed South Parcel Mine Expansion can not proceed because it is not consistent with the 1994 agreement with CalPortland (former Lone Star) over the expansion of the gravel mine. That agreement called for (on Page 22), “WRECO and Lone Star agree to seek no permits in the future to mine in a manner that would significantly impact the flow of Sequalitchew Creek”.

Failure of the proposed mitigation plan:

The following significant Unavoidable Adverse impacts are listed on page 405 pf the DEIS):

- *"Water temperature in Sequalitchew Creek would be warmer than under existing conditions from April through September and would likely exceed the 7-day average of daily maxima criterion of 16°C in multiple months between May and September.*

- *"Water levels in Edmond Marsh would be lower than existing conditions by up to 3 feet. This impact is primarily attributable to the Restoration Plan and is necessary to achieve flow from Sequalitchew Lake to the Sequalitchew Creek ravine. However, the change in water level also includes the impact of changes in groundwater levels from dewatering for mining.*

- *"Water levels in isolated lakes and kettle wetlands would be lower by the amount of the change in groundwater levels from dewatering. The decrease would be 3 feet for Wetland 1D, 2 feet for Pond Lake, 1 foot for Wetlands #8 to #11, and 0.5 feet for Old Fort Lake. •*

- *"There would be periods, approximately 10 percent of the time, when flows in Sequalitchew Creek with the Proposed Action and Restoration Plan would be lower than under existing conditions*

- *"Another potential drawback of CalPortland's mitigation action is that it is, at best, a temporary action because pumping in perpetuity is not feasible, and groundwater discharge/infiltration to the commingled Vashon-Sea Level Aquifer would substantially decrease . In addition, it likely would over-mitigate expected dewatering impacts to Sequalitchew Creek if active year-round (as opposed to only during certain dry or low-flow conditions)" according to the DEIS page 36.*

- *"In addition the proposed restoration plan includes several contingent measure for consideration and/or further study to supplement Sequalitchew Creek flows during dry periods when no outflow from Sequalitchew Lake occurs or if the Restoration Plan. These plans have not considered the drought summers since 2019 that has effected Sequalitchew Lake and other natural sources.*

- *"Many of the mitigation measures are likely at best, **a temporary action because pumping in perpetuity is not feasible**, according to Page 36 of the DEIS*

This proposed restoration technique is flawed because it will provide substantial pumped groundwater flow from the west end of Edmond marsh and down the ravine reach of Sequalitchew Creek. However, once the dewatering pumps are turned off and removed water in Edmond Marsh and flow in the ravine reach of Sequalitchew Creek will disappear.

The proposed restoration plan for the Edmunds Marsh is dependent on an extensive array of dewatering pumps around the south and east perimeter of the mine pit. The combined discharge of these pumps is discharged into Edmond Marsh. And consequence of permitting dewatering of the Vashon aquifer will only become evident when the dewatering pumps are turned off 14 years hence.

The proposed restoration plan does not include a long-term solution for the loss of Edmunds Marsh and associated wetlands. It is a net loss of wetland values and functions. In the year 2038 there will be no viable salmon habitat in the Sequalitchew Creek sub watershed, no functional Edmond Marsh wetland, and no groundwater discharge flow in Sequalitchew Creek.

6 DS City Cal

Dupont Critical Area Ordinances:

Dupont municipal Code (DMC 25.105.010: Directing a policy of no net loss of wetland and stream function, Value, and area within the city.

DMC 25.105.010: Preventing, to the extent practicable, adverse cumulative impacts to water quality, wetlands, stream corridors, and fish and wildlife habitats using best available science

7 EA City

2015 Comp Plan Goals

Natural Environment Goal NE-1: Protect DuPont's natural environment by meeting the needs of today's citizens without compromising the needs of future generations.

- NE 1.1 Preserve environmentally sensitive areas and those that are valuable natural and aesthetic resources to the City
- **NE 1.4** Work with JBLM, The Department of Ecology, Glacier NW, environmental groups, and other affected parties to restore and improve the flow of water through Sequalitchew Creek.

Natural Environment Goal NE-5: Restore historic stream flow, improve habitat conditions, and promote long term preservation efforts within the City.

8 EA City

- **NE 5.1** Maintain and where possible restore and enhance ecological functions and values of the Sequalitchew Creek Watershed, lakes, marshes, streams, wetlands, bluffs, and recognize the potential for passive public access on or at Old Fort Lake

- **NE 5.3**. Maintain important wildlife habitats and function wildlife corridors to link important natural areas such as Edmond Marsh and Sequalitchew Creek.

8 cont.

This DEIS does not implement the agreements of 1994, 2011 and 2021 that calls for the permanent wetland function of Edmunds Marsh in the 1994 agreement "to seek no permits in the future to mine in a manner that would significantly impact the flow of Sequalitchew Creek".

In other words, with Alternative 1, the Sequalitchew Creek watershed will become a groundwater discharge area deprived and dysfunctional as much as the Clover and Chambers Creek Sub basin and Watershed has been de-watered by extensive suburban development in Spanaway and Lakewood and recent summer droughts since 2019.

9 DS City Cal

Supplemental Environmental Analysis needed

For this reason we are asking Dupont City Council to fund a Supplemental Impact Analysis that will study proper mitigation for the proposed de-watering scheme. As proposed there is no meaningful mitigation for the impacts of South Parcel mine expansion that is meaningful mitigation on for the draining of the Vashon Aquifer and Sequalitchew Creek that does not end in 14 years.

- **Impact on Creek Ravine**: The expansion plans are to dewater the Vashon Aquifer, which will severely impact the Sequalitchew Creek Ravine. According to the proposal (page 3.1-14), the seeps and springs that sustain the creek year-round will be drastically reduced or eliminated. The potential consequences of this dewatering will result in:

- **Drying up of vegetation:** The lush vegetation that thrives in wet conditions may struggle or die off. Plants adapted to moisture may wilt, lose leaves, or become dormant.
- **Soil erosion:** Without the binding effect of wet soil, erosion becomes a concern. Rainwater can wash away loose soil particles, leading to gullies and landslides.
- **Loss of wildlife habitat:** Animals and insects that rely on the wet environment may move elsewhere or face challenges finding food and shelter.
- **Temperature changes in the creek:** The loss of cool groundwater and the drying up of vegetation will lead to significant temperature changes in the creek, affecting aquatic life.
- **Decreased biodiversity:** The impact on groundwater will lead to decreased biodiversity in the ravine.
- **Drying up of the tree canopy:** The extensive tree canopy, which provides shade, cooler temperatures, and habitat for wildlife, will dry up, altering the landscape dramatically.

10 DS City Cal EA

- **Loss of Aquifer seeps:** No mitigation measures in the proposal effectively address the loss of the Vashon Aquifer seeps, leading to the irreversible degradation of the Sequalitchew Creek watershed.

10 cont.

Alternate Creek Restoration Plan for long-term mitigation.

Phase 1 This Alternative Restoration Plan for the Sequalitchew Creek watershed is based upon an *understanding of the hydrology of the area*, *native salmon habitat requirements* and the *conditions that now adversely impact water quality* in the Sequalitchew Creek watershed. And some information comes from the 1997 Chambers-Clover Creek Watershed Management Committee Watershed Characterization report.

The alternative proposal for mitigation would embody the following actions:

- **Removal of the culvert beneath the berm** located in the vicinity of City Hall. It should be replaced with either an open box culvert or a foot bridge and removal of the sidewalk beneath the Center Drive overpass.

  Both of these actions should be undertaken and completed before removing existing beaver dams. The culvert and sidewalk are physical obstructions to flow in a surface water drainage ditch or sometimes call a “dry reach of Sequalitchew Creek”. This should be removed as an integral part of the City’s obligation to properly design, construct, operate and maintain its surface water management system.

  DuPont city codes recognize such drainage ditch work as necessary and highly desirable. Furthermore this work can be undertaken as soon as practical without an HPA permit since no in water work of a salmon bear stream is involved. Such an opportunity will be negated by releasing up gradient beaver dam impound water prior to this work being completed.

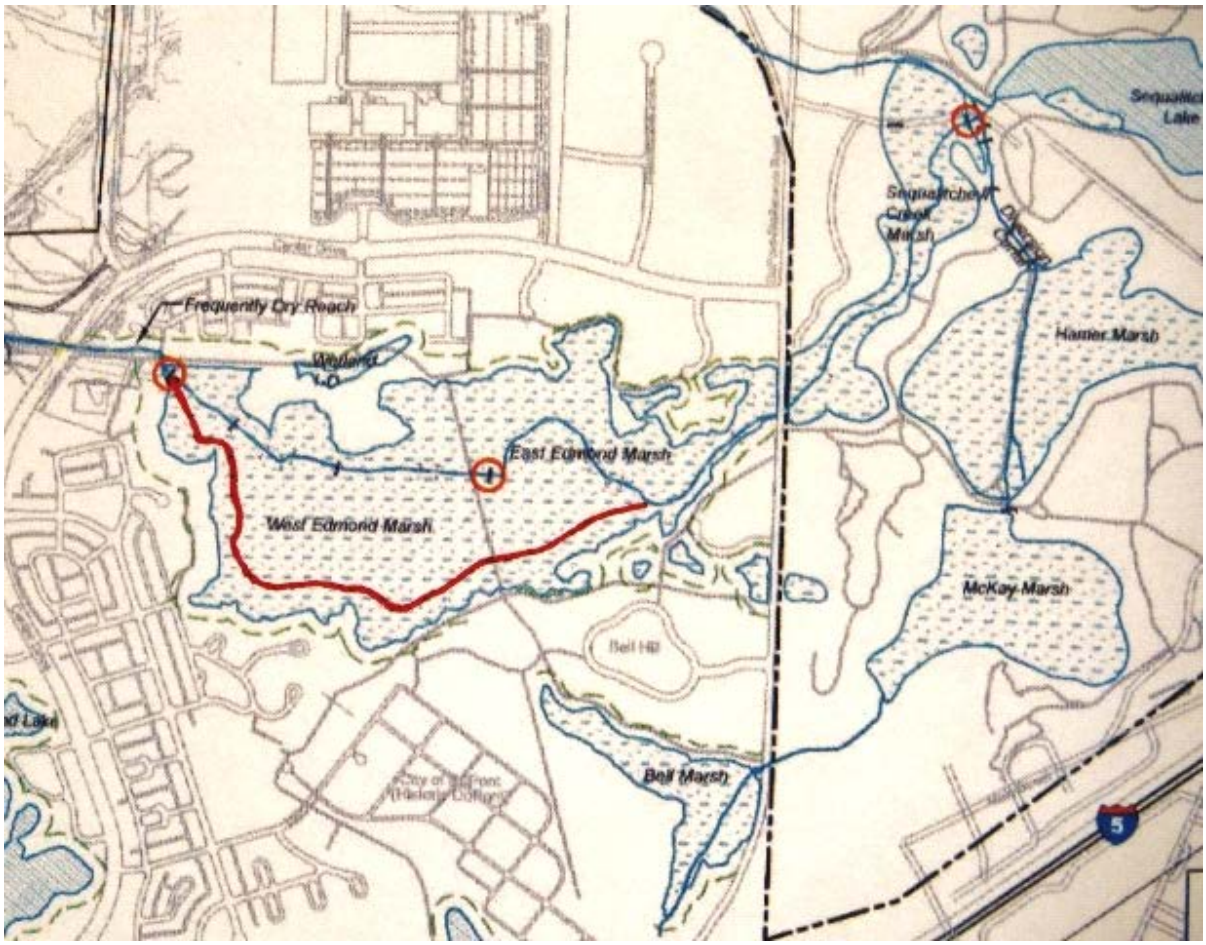
- Our Sequalitchew Creek Restoration Plan does not require dewatering the Vashon Aquifer. It provides long term mitigation that enhances the restoration needed after the gravel mine is abandoned. It would keep groundwater flowing through the wetlands and creek, along with the water diverted from Sequalitchew Lake.

11 DS City Cal

Phase 2 Ground water interception:

This plan should be studied with a Supplemental Environmental Analysis which calls for intercepting Vashon Aquifer ground water flow from the southeast to northwest flow by constructing a groundwater interception and discharge fed into Sequalitchew Creek all along the eastern boundary of Edmond Marsh as shown in red on the illustration below.

12 DS City Cal



Map showing alternative to be studied that shows intercepting the southeast to northwest subsurface groundwater flow of the Vashon Aquifer by constructing a groundwater interception and discharge fed into Sequalitchew Creek all along the eastern boundary of Edmond Marsh

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- Construction of a ground-water-interception channel from the Vashon Aquifer would assure perennial Coho salmon inhabitable and groundwater discharge flow from east to west through Edmond Marsh and down the ravine reach of Sequalitchew Creek.
- After the culvert and side walk impediments to surface water runoff flow is accomplished, the Edmond Marsh pond should be removed so that it is lowered to its pre-beaver dam impact level. Further beaver dams should be removed downstream in such a way to sequence beaver dam removals until all beaver dam impediments to east to west flow are removed from the East and West Edmond Marsh.
- The eastern most beaver dam should remain in place until it is established that surface water flow from Sequalitchew Lake has sufficient flow from groundwater discharge alone from groundwater discharge flowing into Sequalitchew Creek and Edmond Marsh complex
- The result of beaver dam removal and clearing existing culverts will be

12 cont.

a lower surface water level throughout Edmond Marsh (its historic condition) and restoration of a significant and unimpeded east to west flow of a seasonally fluctuating in quality, quantity and mix of surface and ground water flowing through the system.

- Once all the Beaver dams are removal the enhanced water flow through Edmond Marsh to the accumulated fine grained sediment from the groundwater fed areas will be flushed out of Edmunds Marsh and work to “seal” the “dry reach of Sequalitchew Creek”, thus assuring enhanced surface water flow through this “dry” drainage ditch.

12 cont.

Contrast this restoration proposal to the DEIS proposed action which uses warm, low dissolved oxygen concentration of surface water flow from Sequalitchew Lake that includes additional stormwater runoff and other surface water flow from Bell, McKay and Hamer Marshes that will not meet clean water standards. Such a notion that Alternative One Restoration Plan will restore Edmond Marsh wetland is a fatally flawed.

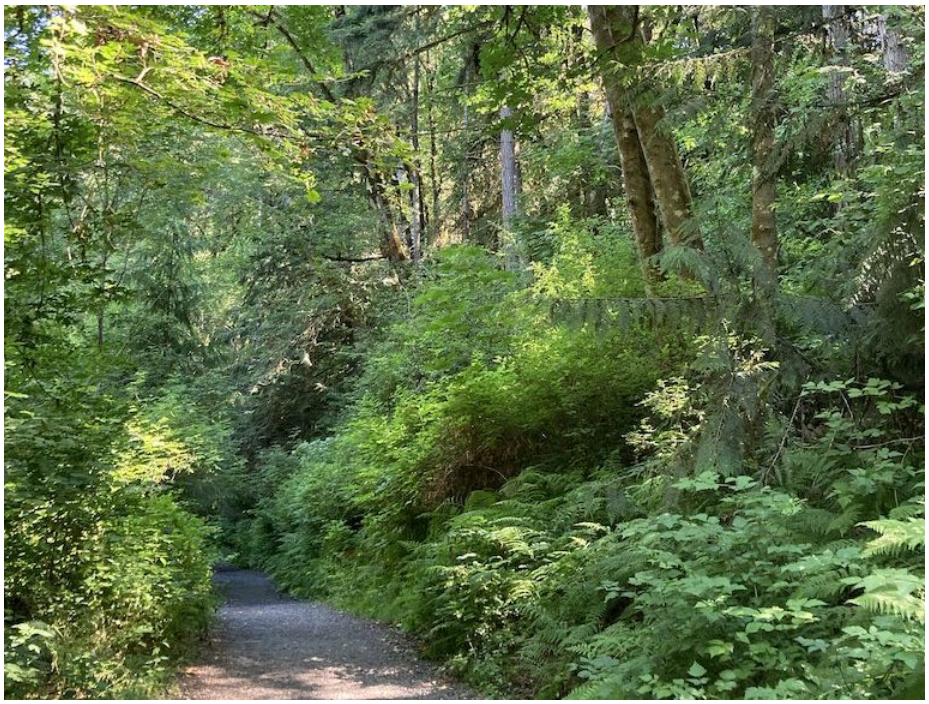
13 City DS

Please review the Sequalitchew Creek Restoration Plan with a Supplemental Analysis. It has potential to comply with Dupont's Comp Plan of 2015, **Natural Environment Goal 5.1** to **"**maintain" and "enhance ecological functions and values of the Sequalitchew Creek Watershed, lakes, marshes, streams, wetlands."



border and mind and sound.jpg

Photo of mine showing previous mitigation retaining forested buffers along the shore. Other mitigation eliminated bright lights on docks that disturb migrating birds and eliminated use of gravel trucks for delivery in Puget Sound and to the dock on Puget sound..



pix trail & Sequalitchew-Creek.jpg

Popular Sequalitchew-Creek trail through undisturbed forest.

Conclusion:

Since the first settlement agreement in 1994, CalPortland and the following mining owners have delivered on several critical mitigation requirements that law a foundation for restoring the gravel mine to it's former condition. Such mitigation included the reduction of dock size, removal of dock lighting that would have affected birds in the adjacent National Wildlife Refuge. And one of the most important mitigation requirement was to retain the tree buffer along the railroad tracks and beaches of Puget Sound.

Look at the scar left by Chamber Bay Golf course and the millions of dollars required to create 400 acre recreation area. These two previous mitigation requirements in Dupont were very important for the neighboring National Wildlife Refuge and residents on Anderson Island. Large docking facilities with truck delivery with bright lights were required by State Environmental Policy Act for mitigation for light and glare regulations.

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The previous company owners should be commended for their adherence to permit conditions and their willingness to recognize the value that local environmental groups can provide to improve mitigation and preservation for people on trails and for wildlife and their habitats.

Now after 30 years of operation, with just 14 years of operation in sight, Dupont Municipal Code and Comp Plan require looking at how this next phase of mining will result in a natural area for next generation of residents in Dupont/Northwest Landing and Pierce County.

Edmunds Marsh has been for decades a valued area for migrating birding and wildlife that provides a place for quiet. Some of the over 20,000 people in Northwest Landing & Dupont are found on any weekend hiking the Sequalitchew Creek Trail.

A viable mitigation option must be found to offset the permanent damage by the de-watering of the Proposed Action One and for the expansion of the mine. As proposed this restoration plan for the creek and Edmunds Marsh would result in the loss of existing conifer forest/scrublands, the existing kettle wetland, and associated animal habitat on the site. These areas are protected by Dupont municipal code and Comp Plan goals.

14 cont.

Even more important is that the proposed restoration has no lasting value. It ends the day the pumps are turned off. It is a meaningless short term mitigation that ends in 14 years.

More important, the final phase of expansion of the mine, must leave behind a recovery plan that replaces places the scar of mining with the forests and wetlands that were hear when the mining permit was issued.

Thank you for this opportunity to comment.

Kirk Kirkland

_____

For the Environmental Coalition
253 761 1693 | kirkkirkland9@gmail.com

[end

July 22, 2024

Re: Pioneer Aggregates South Parcel Project
City File No. SEPA2021-002
City of Dupont, Washington

To Whom It May Concern:

The following is a public comment submitted by the Garry Oak Coalition, a Washington State 501c3 non-profit based in Lakewood, regarding the Pioneer Aggregates South Parcel Project, City File No. SEPA2021-002. This submission is being made during the public comment period for the Draft Environmental Impact Statement (DEIS). Please make us a party of record and inform us of any future decisions, comment deadlines or public hearings related to this matter.

We would like to express our grave concern about any plans to “dewater” the aquifer, our opposition to further expansion of any mining activities in this environmentally sensitive and biologically diverse area, and our firm support of a restoration plan for Sequalitchew Creek and environs, as proposed by numerous environmental non-profits in the past, as well as the protection of Edmond Marsh and the aquifer in general.

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We also subscribe to comments submitted by Kurt Reidinger in 2021, Don Russell (current and past comments), Eric Chandler, and the Chambers-Clover Creek Watershed Council.

As Pierce County itself points out, this area is a sole source aquifer and as such must be protected. See below for example a county publication for the public, accessed at https://www.piercecountywa.gov/DocumentCenter/View/1:21877/Critical-Aquifer-Recharge-Areas?bidId=

2
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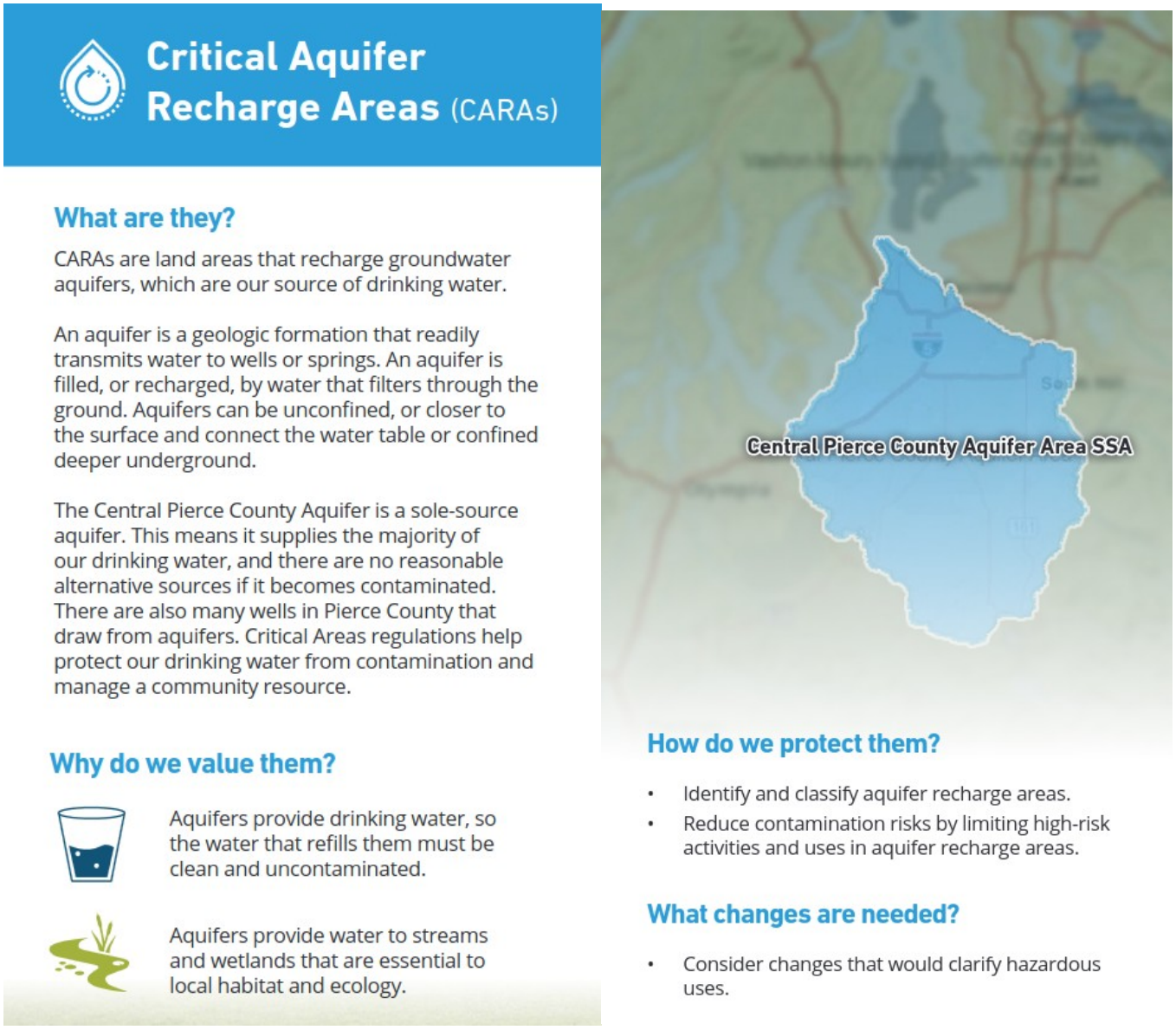

Clearly, sole source aquifers should not be dewatered, and no plan involving dewatering should be considered.

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Scientists have been increasingly sounding the alarm about the drastic effects of excessive groundwater withdrawals. In our region, we are seeing what used to be virtually perennial creeks and wetlands drying up, and research has recently shown that excessive groundwater withdrawals have even affected the tilt of the Earth.[1] Clearly, there should be no talk of "dewatering" of our sole source aquifer.

We are also in a biodiversity crisis, which has had terrible consequences for our region's salmon – a key part of our ecosystem. As NOAA has stated: "Pacific salmon are keystone species, and play an

1 https://www.scientificamerican.com/article/rampant-groundwater-pumping-has-changed-the-tilt-of-earths-axis/

essential role in the health and function of ecosystems. Salmon benefit other species as food and their bodies enrich habitats through the cycling of nutrients from the ocean to freshwater streams." In addition, they have played a critical role in the culture and food economy of the region's native peoples for millennia. Sequalitchew Creek, as a salmon-bearing creek, needs to be restored and protected from further adverse environmental impacts.

4 EA

Please see recent articles in the *Seattle Times* urging salmon restoration by Willie Frank III, chairman of the Nisqually Tribe and Ron Garner, president of the Puget Sound Anglers State Board[2], as well as Leonard Forsman, chairman of the Suquamish Tribe, wrote in April.[3]

Today, the number salmon, once so unbelievably abundant, is dwindling. This has prompted people throughout the region to launch initiatives to help save the salmon and restore their habitat. This has included the breeching of dams and creek restoration. Restoration of salmon habitat is incompatible with the expansion of mining near Sequalitchew Creek and the dewatering of the aquifer. We urge the responsible authorities to facilitate and require the restoration of habitat and not its further destruction.

The biodiversity crisis is not limited to salmon of course. You have heard from commenter Eric Chandler about the profusion of fungi, including rare and possibly even unique species. Others, including Kurt Reidinger, in his 2021 comment, have noted that: "[t]his area, the ravine, has diverse conditions and thus harbors a diverse flora (with at least one rare, state-sensitive species)".

We are living in a time that many have begun to call the Sixth Extinction. Mass die-offs are occurring with disturbing frequency. It is a time that requires that we secure maximum protections for biodiverse areas such as that at Sequalitchew Creek – not only for the benefit of the wildlife, the flora and fauna, but we humans, too, who are also a part of the ecosystem. Our interconnectedness must not be forgotten.

5 City EA

Thank you for your serious consideration of the critical issues that we have touched on above.

We are depending on the City of Dupont as the local authority to do the right thing: protect our environment from further degradation and act now to ensure its restoration.

Sincerely,

Christina Manetti

Christina Manetti, Ph.D.
President, Garry Oak Coalition (501c3)

2 https://www.seattletimes.com/opinion/if-we-can-come-together-to-save-salmon-so-can-you/
3 https://www.seattletimes.com/opinion/every-part-of-this-soil-is-sacred-restore-respect-for-our-shared-home/

WASHINGTON CONSERVATION ACTION

July 22, 2024

Barb Kincaid
City of Dupont
1700 Civic Drive
Dupont, WA 98327

Dear Ms. Kincaid:

Thank you for the opportunity to provide input on the **Draft Environmental Impact Statement for the proposed Pioneer Aggregates South Parcel Project**. Washington Conservation Action Education Fund (WCA) is a 501(c)(3) organization founded in 1967 as Washington Environmental Council (WEC). Our mission is to develop, advocate for, and defend policies that ensure environmental progress and justice by centering and amplifying the voices of the most impacted communities. We are committed to water and habitat protections for all Washington State waters and communities.

WEC and People For Puget Sound (now a program of WCA) were signatories to a 1994 Settlement Agreement for the proposed Lone Star Northwest Dupont gravel mining expansion and dock construction that would have significantly impacted delicate shorelines around the Nisqually Delta area and north. Ecology had denied a Conditional Use Permit in 1993 and significant disputes had preceded that denial. Through mediation, the organizations agreed to a new vision for the Dupont shoreline and created a framework for cooperative efforts (see Attachment 1 – 1994 Settlement Agreement).

1 DS City

Since 2017, WEC and our partners in the Environmental Caucus have been negotiating with CalPortland on details and funding of the restoration plan for the Sequalitchew Creek watershed, which generally calls for funding and permitting of the restoration plan as a condition of the Environmental Caucus not opposing the mine expansion. We negotiated a Sequalitchew Creek Restoration Plan Funding Agreement and an Acknowledgement Agreement Regarding Sequalitchew Creek Restoration Plan and Monitoring Plan for South Parcel Mining that included several steps where the company agreed to multiple safeguards with the Environmental Caucus.

The DEIS as currently written falls short of incorporating key parts of the agreed-upon monitoring plan. Please see the detailed July 15, 2024 letter submitted by Derek Booth on behalf of the Environmental Caucus. We urge the City of Dupont to make each change identified by Derek Booth.

2 DS City Cal

Thank you again for the opportunity to comment on the Draft EIS. If you have questions regarding these comments, please do not hesitate to contact us.

Sincerely,



Mindy Roberts, Ph.D., P.E.

Puget Sound Program Director

Washington Conservation Action



Attachment 1 – 1994 Settlement Agreement

Final Agreement
John Darling
7-22-03

SETTLEMENT AGREEMENT
FOR
LONE STAR NORTHWEST DUPONT PROJECT

December 25, 1994

TABLE OF CONTENTS

Page No.

RECITALS 1

AGREEMENTS 3

I. PROGRAMMATIC AND PROJECT REVISIONS 3

A. Overview 3
B. DuPont Shoreline Master Program Amendment 5
C. Proposed DuPont Comprehensive Plan Update 6
D. Revised Project Applications 7
E. State Environmental Policy Act Compliance 10
F. Process Facilitation and Remedies 15

II. MITIGATION 16

A. Overview 16
B. Additional Mitigation Measures 17
C. City Fiscal Mitigation Fund 22
D. Environmental Mitigation Funding 23

III. GENERAL TERMS 25

A. Disposition of Existing Litigation and Applications 25
B. Other Terms 27

ATTACHMENTS

A	Critical Path
B	Proposed DSMP
C	Mineral Resource Lands
D	Calthorpe Plan
E	Revised Project Illustration
F	SHB Releases and Stipulation and Order of Dismissal
G	Pierce County Release and Stipulation and Order of Dismissal
H	Public Access Plan
I	Sign Installation Detail
J	Sequalitchew Creek Setback
K	Asphalt and Concrete Plant Covenant

SETTLEMENT AGREEMENT
FOR
LONE STAR NORTHWEST DUPONT PROJECT

THIS SETTLEMENT AGREEMENT is dated this 25th day of December, 1994, and executed by and among the WASHINGTON STATE DEPARTMENT OF ECOLOGY ("Ecology"); the CITY OF DUPONT ("City"); LONE STAR NORTHWEST, INC. ("Lone Star"); WEYERHAEUSER REAL ESTATE COMPANY ("WRECO"); the NISQUALLY DELTA ASSOCIATION ("NDA"); the BLACK HILLS AUDUBON SOCIETY; the WASHINGTON ENVIRONMENTAL COUNCIL ("WEC"); the NATIONAL AUDUBON SOCIETY; PEOPLE FOR PUGET SOUND; the TAHOMA AUDUBON SOCIETY; the SEATTLE AUDUBON SOCIETY; and ANDERSON ISLAND QUALITY OF LIFE COMMITTEE ("Anderson Island QOLC").

Recitals

A. Lone Star and WRECO are the proponents of the Pioneer Aggregates Project, which is described in an Environmental Impact Statement issued by the City of DuPont and the State Department of Ecology on February 4, 1993. The originally proposed project involves a sand and gravel mining operation and improvements to an existing dock to accommodate a sand and gravel barge transshipment facility for transport of related construction materials. The project is proposed on lands within the City of DuPont limits, most of which are owned by WRECO and leased by Lone Star. The Nisqually Delta area contains important wetlands, shoreline, and upland habitat and wildlife, and is rich in natural resources including gravel resources.

B. The City approved a Site Plan Approval, Shoreline Substantial Development Permit, and a Shoreline Conditional Use Permit for the Pioneer Aggregates Project on September 2, 1993.

C. On October 15, 1993, Ecology denied the Conditional Use Permit pursuant to RCW 90.58.140(12) and appealed issuance of the Substantial Development Permit to the Shorelines Hearings Board (SHB No. 93-65).

D. On October 15, 1993, the NDA and the Black Hills Audubon Society appealed the City's decision to issue a Shoreline Substantial Development Permit and Shoreline Conditional Use Permit to the Shorelines Hearings Board (SHB No. 93-64).

E. In addition, the NDA and Judith Krill and Karl Krill appealed the Site Plan Approval to Pierce County Superior Court (Pierce County Cause No. 93-2-09515-1). Judith Krill and Karl Krill have dismissed their appeal.

F. On October 26, 1993, WRECO and Lone Star appealed Ecology's denial of the Shoreline Conditional Use Permit to the Shoreline Hearings Board (SHB No. 93-69). All of the respective shoreline appeals were consolidated by order of the Shorelines Hearings Board in its Pre-Hearing Order dated December 14, 1993.

G. Long-standing disputes have surrounded the appropriate shoreline designation and permitted uses of the subject shoreline area in the City of DuPont as detailed in the Requests for Review of the various parties. In 1975, the subject portion of the Dupont Shoreline of Statewide Significance surrounding the dock was designated "Urban" under a Master Program approved by the City and Ecology. The use of the shoreline for an industrial-related dock has been disputed in prior court proceedings because of the proximity of the existing dock to the Nisqually National Wildlife Refuge and its location on a shoreline of statewide significance. In 1990, Lone Star submitted permit applications for the Pioneer Aggregates Project which proposed use and rehabilitation of the DuPont dock for a sand and gravel barge transshipment facility. The Lone Star proposal renewed opposition to the Urban shoreline designation, and the subject appeals eventually ensued.

H. In January 1994, the parties retained a professional mediator to facilitate settlement discussions to determine whether a settlement agreement that meets the needs and interests of the various parties could be reached.

I. Through the mediation sessions, a new vision for the DuPont shoreline has emerged which, if implemented, will end the long-standing disputes between various parties to this Agreement and establish a framework for cooperative efforts among the various interest groups. This framework would ensure that the shoreline of statewide significance is preserved and protected in a manner that allows enhanced public access for the citizens of DuPont, while allowing valuable gravel resources to be available to the Puget Sound region. It is the desire of the parties to reach a lasting settlement.

J. In order to avoid protracted litigation and its associated costs, all parties desire to resolve fully all of their disputes regarding the Pioneer Aggregates Project. It is understood that the parties undertake this compromise and settlement of disputed issues of law and fact without admitting any error or liability with respect to their previous actions or legal positions.

K. For purposes of this Agreement, certain terms shall have the following meanings: the term "parties" shall mean the undersigned parties to this Settlement Agreement; the term "non-governmental parties" shall mean all parties, except Ecology and the City.

In consideration of the promises and covenants contained herein, the parties agree as follows:

AGREEMENTS

I. PROGRAMMATIC AND PROJECT REVISIONS

A. Overview.

1. The non-governmental parties agree to propose programmatic and permit actions to implement a new vision for the DuPont shoreline. That vision would serve both public and private interests by protecting the environment and providing a location for water shipment of the aggregate resource found in DuPont. The location of the sand and gravel barge

transshipment facility would be moved northward near Tatsolo Point, approximately 1.5 miles farther away from the Nisqually National Wildlife Refuge than is the existing dock. WRECO and Lone Star would abandon all plans to use the existing DuPont dock as a commercial shipping facility, and the area would be available to the public for shoreline access and passive recreational uses consistent with a Conservancy designation. In addition to these mitigation measures, additional mitigation would be provided as set forth in Section II below.

2. The parties recognize that a number of programmatic and permit-specific actions will be required to implement the new vision for the DuPont shoreline. Those actions include: the programmatic actions of a Shoreline Master Program amendment and a DuPont Comprehensive Plan Update; revised project applications; and for all actions compliance with the State Environmental Policy Act ("SEPA"). This Agreement sets forth a process by which each of these programmatic and project-specific components will be undertaken.

a. The specific agreements regarding amendments to the Shoreline Master Program are set forth in Section I.B.

b. The specific agreements regarding the City Comprehensive Plan Update are set forth in Section I.C.

c. The specific agreements regarding revisions to project permits are set forth in Section I.D.

d. SEPA compliance provisions are contained in Section I.E.

e. A critical path containing milestones by which certain key actions are to occur is set forth in Attachment A.

3. The non-governmental parties to this Agreement agree to use their best efforts to obtain all programmatic and project-specific approvals necessary to implement this Settlement Agreement, including but not limited to, providing testimony and letters of support on environmental documents and at public hearings on the proposed Comprehensive Plan Update,

proposed Shoreline Master Program amendments, and project-specific revisions as set forth in this Agreement. The non-governmental parties agree not to challenge any of the programmatic or project-specific approvals granted by private, local, state or federal entities, or any of the environmental documents or decisions issued consistent with this Agreement.

4. The governmental entities agree to consider the programmatic and project-specific proposals in good faith and in accordance with the agreed upon process and schedules set forth in this Agreement, and as set forth in Attachment A.

B. DuPont Shoreline Master Program Amendment.

1. The non-governmental parties agree to actively support an amendment to the DuPont Shoreline Master Program which would accomplish the objectives of this Settlement Agreement. The amendment to the DuPont Shoreline Master Program that will be proposed to accomplish these objectives shall be substantially in the form contained in Attachment B attached hereto and incorporated herein by reference ("Proposed DSMP Amendment"). The Proposed DSMP Amendment will be processed strictly in accordance with the provisions of WAC ch. 173-19. The Proposed DSMP Amendment provides for:

a. A map and text amendment to allow location of a sand and gravel barge transshipment facility in the Tatsolo Point area, by establishing a Special Management Unit or other appropriate shoreline designation that permits those uses described in Section II.B.4 below (hereinafter referred to as the "Special Management Unit"). The sand and gravel barge transshipment facility will be used solely for those uses described in Section II.B.4 below.

b. A map amendment to eliminate the existing Urban shoreline designation near the mouth of Sequalitchew Creek and to redesignate this area as a Conservancy environment. Elimination of the Urban shoreline designation will occur concurrently with the final approval of the Proposed DSMP Amendment as set forth in Attachment B and immediately

prior to the approval of the state and local permits necessary for construction of the sand and gravel barge transshipment facility.

2. The non-governmental parties to this Agreement agree to support the Proposed DSMP Amendment and to work cooperatively towards its adoption by the governmental entities by actions that will include, but are not limited to, letters and testimony in support of the amendment.

3. The City agrees to consider the Proposed DSMP Amendment in good faith, and will submit a final decision to Ecology according to the agreed upon public process and schedules set forth herein and in Attachment A. Ecology and the City will fully comply with the public comment and participation requirements of RCW 34.05 and WAC 173-19.

4. Ecology agrees to consider the City's submittal on the Proposed DSMP Amendment in good faith and according to the agreed upon process and schedules set forth herein and in Attachment A. Ecology will determine whether the City's submittal is consistent with the Shoreline Management Act under Ecology's powers granted to it under the Act.

5. The non-governmental parties agree not to appeal the approval of the Proposed DSMP Amendment if it is approved, provided it is adopted in substantially the form attached hereto as Attachment B.

C. Proposed DuPont Comprehensive Plan Update.

1. The City is currently in the process of updating its Comprehensive Plan pursuant to the requirements of Washington's Growth Management Act.

2. Ecology and the non-governmental parties agree not to oppose the following components of a Comprehensive Plan Update:

a. Shoreline provisions which show an intent to eliminate the existing Urban shoreline designation and establish a Special Management Unit in the Tatsolo Point area

and which would provide for any other details necessary for the Comprehensive Plan to be consistent with the Proposed DSMP Amendment as set forth in Attachment B.

b. Public Access provisions which include a new public access trail down the north side of Sequalitchew Creek that extends ten feet on either side of the center line of the narrow gauge railway (rather than the south side of the Creek as presently shown in the 1985 Comprehensive Plan) to the mouth of Sequalitchew Creek on the Puget Sound shoreline as set forth in Attachment H. The public access area will be available for passive recreational uses consistent with the Conservancy designation.

c. Land Use provisions consistent with the plan for Hoffman Hill prepared by Peter Calthorpe as set forth in Attachment D attached hereto and incorporated herein by reference, which accommodate WRECO's plans for residential development of Hoffman Hill in the future.

d. Mineral Resource Lands provisions including a mineral resource lands designation, which applies to the lands north of Sequalitchew Creek, as designated as the Pioneer Aggregates' Lease Area, as depicted in Attachment C, and policies which meet the requirements of the Growth Management Act and make these lands available for resource extraction under industrial zoning.

3. The City agrees to consider the proposed Comprehensive Plan Update set forth above in good faith and according to the schedules set forth in Attachment A.

D. Revised Project Applications.

1. WRECO and Lone Star agree to seek permits and approvals for a Revised Project, which shall be defined to mean the Pioneer Aggregates Project as approved by City of DuPont Ordinance Nos. 485 and 486, except as modified to relocate the sand and gravel barge transshipment facility in the Tatsolo Point area, together with related relocation of the access road and conveyor system, and as modified to add or remove conditions. The permits and

Section I.D.1 (cont'd.)

approvals sought by WRECO and Lone Star pursuant to this paragraph, shall specifically not include an asphalt plant or concrete plant consistent with the specific deletion of such facilities by the City Council in their approval of Ordinance Nos. 485 and 486. A recordable declaration in the form annexed hereto as Attachment K shall be executed, which shall prohibit use of the Pioneer Aggregates Lease Area for an asphalt or concrete plant for a period of 99 years from the date of execution of this Agreement. An illustrative depiction of the Revised Project is contained in Attachment E. The parties agree that the final location of the Revised Project will be within the City of DuPont and further agree that the dock location will be within the range shown in Attachment B as the location for the Special Management Unit, which the parties agree is outside of the Nisqually Delta shoreline of statewide significance. WRECO and Lone Star are agreeing to no other permit modifications, except those specifically referenced herein. The proposed conceptual drawing set forth in Attachment E shows the maximum physical and visual impact to the bluff contemplated by the parties, and Lone Star will develop alternative plans that minimize visual and physical impacts to the bluff, taking into account concerns regarding noise, safety and cost. The parties recognize that project changes may occur through the engineering, survey, SEPA, and permitting process. The non-governmental parties agree to support any reasonable modifications to the proposal which do not: increase environmental impacts of the Revised Project, substantially change the location and size of the Revised Project, substantially change the feasibility of the Revised Project, or substantially increase the costs of the Revised Project. Measures that minimize environmental impacts and costs may be brought to the attention of the Environmental Review Committee created pursuant to Section I.E below, and the parties will, in good faith, consider inclusion of such measures into the Revised Project.

2. The non-governmental parties agree to support Lone Star's and WRECO's efforts to obtain all necessary permits and approvals for the Revised Project and to solicit support for the Revised Project from various interest groups and governmental entities, including but not

Section I.D.2 (cont'd.)

limited to Fort Lewis, the Corps of Engineers and the Nisqually Tribe. The non-governmental parties agree to use their best efforts to obtain all necessary permits for the Revised Project by the milestones set forth in Attachment A. The non-governmental parties also agree that they will not appeal any programmatic approval or permit approval necessary to implement the Revised Project. This agreement not to appeal any approvals shall include and shall apply to any local, state, or federal environmental document or threshold determination.

3. The City agrees to consider any necessary permits for the Revised Project in good faith and according to the agreed upon public process and schedules set forth in Attachment B. If the City approves any permit for the Revised Project, the City agrees not to challenge any permit or approval granted by another governmental agency which is consistent with their approval.

4. Ecology agrees to consider the proposed permits for the Revised Project in good faith and according to the agreed upon public process and schedules set forth in Attachment A. In the event that the City does not approve any necessary permits for the Revised Project, Ecology will review the decision and determine whether an appeal is appropriate under the powers granted to Ecology by the Shoreline Management Act or other authority. If Ecology approves a permit for the Revised Project, Ecology agrees not to challenge any permit or approval granted by another governmental agency for the Revised Project provided those approvals are consistent with this Agreement.

5. The parties agree that limited surface mining and the processing plant construction can commence at Lone Star's option after execution of this Agreement, pursuant to Ordinance No. 485 independent of any shoreline permit or the pending appeals, provided, no material is removed from the site by barge and further provided that the amount of aggregates removed annually does not exceed the volume equivalent to 20% of the total material which was estimated in the Pioneer Aggregates Final EIS to be mined annually (i.e., the amount of material

Section I.D.5 (cont'd.)

that was to be removed by truck). Ecology has determined that for purposes of this Agreement only, such limited mining activity is not dependent upon any use or development occurring in the shoreline, and is an economically independent activity; provided, however, that this determination shall not be used against any party in the event that litigation of the Underlying Actions (defined at III.A.5) is resumed pursuant to Section I.F(2). The limited mining and truck transport is permitted under City Ordinance Nos. 485 and 486, which include the mitigation measures applicable to this activity. If Lone Star exercises this option, they agree to limit the interim truck traffic to essentially the same hours of operation as the facility located in Steilacoom, which is between the hours of 7:00 a.m. and 7:00 p.m. For this limited surface mining, Lone Star shall provide a semi-annual report to the City and Ecology documenting where and how much aggregate has been removed and any progress in the construction of the processing plant.

6. Proposed mitigation measures for the Revised Project are set forth in Section II, below. The non-governmental parties agree to seek no further mitigation measures beyond those provided therein, unless a measure is agreed to by Lone Star through the process set forth in Section I.E(3)(e) and Section I.D(1).

7. In the event that any governmental agency denies or conditions the Revised Project in a manner inconsistent with Section II of this Agreement, Lone Star and WRECO will have the options set forth in Section I.F below.

E. State Environmental Policy Act Compliance.

1. The Comprehensive Plan Update SEPA process will proceed independently through the EIS process presently under way in an effort to adopt the Comprehensive Plan Update according to the Growth Management Act deadline. The EIS for the Comprehensive Plan Update will include environmental analysis of the proposed amendments for the Comprehensive Plan Update set forth in Section I.C above.

2. The Proposed DSMP Amendment set forth in Section I.B shall be evaluated in a Supplemental Environmental Impact Statement (SEIS). The SEIS shall discuss the environmental impacts of the proposed Special Management Unit and the elimination of the current Urban shoreline designation. Ecology will investigate the availability of grant monies that may be available to assist the City in programmatic planning and environmental review.

3. The SEIS for the Proposed DSMP Amendment will also consider the environmental impacts of the Revised Project proposal. With regard to the SEIS, the parties agree to the following:

a. Lead Agencies: Ecology will act as a lead agency responsible for the preparation of the environmental review document. The City shall, at its option, be a co-lead agency.

b. Funding and Scope of Work: Lone Star will be responsible for funding the necessary environmental studies, except to the extent grant money is available to the City for analyzing the Proposed DSMP Amendment. Ecology will use best efforts to complete the environmental review for the Revised Project within reasonable cost limits. The Environmental Review Committee will prepare a proposed scope of work and budgetary goals for the SEIS and submit them to Ecology for its approval within 45 days from the effective date of this Agreement. The SEIS will analyze (1) the Proposed DSMP Amendment and reasonable alternatives to accomplish its objectives, and (2) the elements of the Revised Project not previously analyzed in the Pioneer Aggregates Final EIS, and reasonable alternatives that would accommodate the sand and gravel barge transshipment facility, conveyor, and access road elements on property owned or controlled by WRECO or Lone Star.

c. Milestones: The parties agree to use best efforts and act in good faith to meet the milestones set forth in Attachment A. Remedies for missing certain Key Milestones are set forth in Section III.A.2 below.

d. Staff: Ecology agrees to assign one staff person to facilitate all necessary permits, approvals, and environmental review documents. The staff person should be a full-time employee with Ecology and shall have experience in managing large projects in the south Puget Sound region. The Ecology staff person shall also work on the Master Program amendment, and any other activities, including meeting with other agencies as necessary.

e. Environmental Review Committee: To coordinate the efforts of the parties during the SEPA process, an Environmental Review Committee is established with the following representatives of the parties: Ron Summers (Lone Star), Phil White (WRECO), Janet Dawes (NDA), as well as a representative to be named from Ecology, the City, acting through the City Council, and the Anderson Island QOLC. In the event any named designee cannot serve, the affected party shall name a new representative. The Environmental Review Committee will convene upon request of Ecology when Ecology desires input on an aspect of the SEPA process. The Environmental Review Committee may also consider measures to reduce environmental impacts or costs as set forth in Section I.D(1). The parties will in good faith consider measures recommended by the Committee for changes to the project and Ecology will consider whether the suggested measures warrant inclusion in the SEIS according to the SEPA Rules.

f. Consultants: Ecology shall use best efforts to provide environmental analysis in-house. Where necessary, outside consultants will be selected by Ecology, after consultation with the City and the Environmental Review Committee. Where possible, consultants with previous experience on the Pioneer Aggregates Final EIS will be used, with the exception of a new noise study conducted in accordance with Section I.E.3.g below.

g. Cooperative Noise Compliance:

(i) The existing measured Ldn at the eastern shore of Anderson Island, as measured at the water-side lawn of the Robert Moore residence at Cole Point, as representative of the homes in the area, shall not increase by more than 5 dBA as a

result of the Revised Project. This standard shall be referred to as the Noise Standard. In addition, even if the Noise Standard is met, Lone Star will undertake reasonable mitigation measures, excluding modifying operating hours, to reduce noise impacts further below the Noise Standard.

(ii) The parties agree that moving the sand and gravel barge transshipment facility north near Tatsolo Point constitutes mitigation for potential noise impacts of the Revised Project upon the Nisqually NWR and the City of DuPont.

(iii) The parties agree upon the following method as the most efficient, fair and enforceable manner by which to ensure that the Revised Project does not have a significant noise impact: 1) The parties agree to the Noise Standard set forth in subparagraph (i) above as the appropriate noise limit for the Revised Project with regard to Anderson Island; 2) The parties agree that the only additional study necessary to implement this standard is to establish a baseline Ldn at the eastern shore of Anderson Island to serve as a basis for monitoring; 3) The parties agree to use an independent noise consultant to measure the existing Ldn at Cole Point on Anderson Island for use as the baseline; 4) A "Cooperative Noise Compliance Committee" (CNCC) shall be formed to adopt the baseline and develop a Monitoring Program, to be implemented by an entity selected and managed by the CNCC; and 5) Following start up of operations of the Revised Project and implementation of monitoring, the CNCC will reconvene to develop a Mitigation Plan only if monitoring under the Monitoring Program establishes that the Noise Standard has been violated.

(iv) The CNCC shall be comprised of one representative from Lone Star, WRECO, Ecology, the City, NDA, and the Anderson Island QOLC. Any party, at its option, may be represented by a person with experience in noise issues. The CNCC shall work on a consensus basis. The responsibilities of the CNCC shall include overseeing and reviewing the noise consultant's work; adopting the Anderson Island baseline against which the Noise

Standard will apply; identifying mitigation measures, excluding modification of operating hours, to reduce noise impacts further below the Noise Standard; developing a Monitoring Program, using as a basis the draft monitoring plan attached to City of DuPont Ordinance No. 486; reviewing monitoring reports; and, only if the Monitoring Program establishes that violations of the Noise Standard have occurred, developing a Mitigation Plan for the Revised Project, which may include modification of operating hours, to meet the Noise Standard.

(v) The Greenbush Group is accepted by all parties as the Noise Consultant.

(vi) The Monitoring Program to be developed shall provide for independent monitoring and reporting to the CNCC, to be provided on a timeline agreed upon by the CNCC.

(vii) The CNCC may, at its option, commence efforts prior to final acceptance of this Agreement by all parties.

(viii) Ecology shall appoint a contract administrator who shall be responsible for entering into the contract with the consultant selected by the CNCC.

(ix) Funding for the noise consultant contract will be provided for in the SEIS. Lone Star will be responsible for funding noise monitoring under the Monitoring Program.

(x) In the event that the parties cannot agree to any element of the noise program developed herein or by the CNCC, or in the event that the parties cannot agree to a Mitigation Plan following any violation of the Noise Standard established under the Monitoring Program, the parties shall employ the dispute resolution process established in Section III.B.1 of this Agreement.

h. Fiscal Study. Lone Star is committed to contribute its fair share to needed City services that may increase as a result of the Pioneer Aggregates Project

Section I. E.3.h (cont'd.)

being situated in the City of DuPont. The fiscal analysis provided in the Final Environmental Impact Statement dated February 4, 1993 is being reviewed, and a revised report will be included in the project-specific SEPA review for the Revised Project as necessary.

4. The parties agree that preparation of the SEIS is being done because of a proposed Shoreline Master Program Amendment and a proposed Revised Project, and therefore its preparation shall in no way be used to attack the adequacy of the original EIS documents for the Pioneer Aggregates Project.

F. Process Facilitation and Remedies.

1. To facilitate implementation of this Settlement Agreement, including the processing of all necessary permits and approvals, the State will create an Inter-Agency Task Force. The Inter-Agency Task Force will include members from Ecology, Department of Natural Resources, the Washington Department of Wildlife and Fisheries, and any other agency deemed appropriate by Ecology. The Task Force shall use its best efforts to minimize delays, and provide coordination and technical assistance as necessary to facilitate the programmatic and permit review processes.

2. The parties agree not to appeal any programmatic or project-specific approvals granted which are consistent with this Agreement. If all permits and approvals are obtained and no permit appeals are filed, the Revised Project will be built and the Underlying Actions will be dismissed pursuant to Section III.A. If, however, any necessary programmatic or permit-specific approval is not obtained, or any permit is appealed by anyone, then Lone Star and WRECO may opt to continue to pursue the approvals for the Revised Project through the appeals process, but if this is not a satisfactory option to Lone Star and WRECO, they may, at their sole discretion, opt to defend the original permit approvals obtained by Ordinance No. 485 and Ordinance No. 486; provided that WRECO and Lone Star need not abandon one appeal option to

Section I.F.2 (cont'd.)

pursue the other. These litigation options remain open to WRECO and Lone Star until the consolidated shorelines appeals are dismissed pursuant to Section III.A.3 of this Agreement, and the Pierce County appeal is dismissed pursuant to Section III.A.4. In the event Lone Star and WRECO opt to pursue the Revised Project through the appeals process, the non-governmental parties agree to support WRECO and Lone Star in any appeals brought to obtain such permits. In the event Lone Star and WRECO opt to defend and pursue the original City approvals obtained, then the other parties reserve all rights to pursue their opposition to those original approvals.

II. MITIGATION

A. Overview.

1. Lone Star and WRECO agree to undertake the mitigation measures expressly set forth in this section, provided, however, that all mitigation measures are expressly contingent upon Lone Star's receipt of all necessary permits and approvals to implement all aspects of the Revised Project on acceptable terms and upon the expiration of all appeal periods with no appeals being filed. If a permit appeal is filed in connection with the Revised Project by anyone, then WRECO and Lone Star will have the options set forth in Section I.F(2). If Lone Star and WRECO successfully defend the permits and opt to proceed with the Revised Project, then they will undertake the additional mitigation set forth below, except that contributions to the mitigation fund may be reduced as set forth below.

2. The parties agree that the mitigation measures herein are adequate to mitigate all direct and indirect impacts of the Revised Project. The parties recognize further mitigation measures may be suggested and implemented through the processes set forth in Section I.D(1), I.E(3)(e) and II.B(4).

B. Additional Mitigation Measures.

1. Public Access Plan. WRECO and Lone Star agree to the following public access provisions:

a. WRECO agrees to dedicate to the City an area for public trail access along the existing narrow gauge rail on the north side of Sequalitchew Creek to the Puget Sound shoreline in the vicinity of the existing dock, as shown on Attachment H.

b. Public access will not be provided by Lone Star or WRECO at the new sand and gravel barge transshipment facility; a public access route will be set aside down the north side of Sequalitchew Creek to the Puget Sound Shoreline area in the vicinity of the existing dock. WRECO agrees to remove the existing DuPont dock structure from the aquatic lands upon completion of the construction of the new gravel dock or, at WRECO's option, earlier. Alternatively, at the request of the State, WRECO will turn over all right, title, and interests in the dock to DNR. WRECO agrees to forego future normal maintenance and repair of the dock structure during the pendency of the permitting and new dock construction process, provided the parties agree not to use any future deterioration of the dock structure against WRECO in the event that appeal proceedings of SHB No. 93-69 are resumed.

c. Lone Star and WRECO, in cooperation with Ecology, agree to place educational signs and native vegetation adjacent to the trail in the location of the salt marsh to educate the public and discourage physical intrusions into the marsh area.

2. Hoffman Hill.

a. WRECO agrees to establish a buffer on Hoffman Hill as shown by the green area on the map in Attachment D, subject to a record survey. The buffer shall be established through the imposition of an easement. At the time development occurs adjacent to the buffer, WRECO will dedicate the buffer to the City. The parties acknowledge that the agreed upon setback and buffer set forth in Attachment D is sufficient to protect bluff stability, as well as to mitigate impacts from Hoffman Hill residential development on bluff habitat and its wildlife, and the resources associated with the viewshed from the Nisqually National Wildlife

Refuge. Ecology agrees to consider this mitigation as part of any mitigation package which may be required for the residential development of Hoffman Hill after environmental review.

b. The easement, known as a Native Growth Protection Easement (NGPE), will convey to the public a beneficial interest in the land within the easement. This interest includes the preservation of native vegetation for all purposes that benefit the public health, safety, and welfare, including, but not limited to, control of surface water and erosion, maintenance of slope stability, visual and aural buffering, and protection of plant and animal habitat. The NGPE imposes upon all present and future owners and occupiers of land subject to the easement the obligation to leave undisturbed all trees and all other vegetation within the easement, provided, that a public access trail consistent with the Calthorpe Plan, including access to the two existing public view points, and appurtenances necessary to use the trail and viewpoints, such as handrails at the view points, may be constructed in the easement. Obligations under the easement are enforceable on behalf of the public by the City of DuPont, and, if the City is provided written notice of an alleged violation and fails to take action within 30 days of such notice, the easement is enforceable by NDA and Ecology. The easement shall provide for liquidated damages in the amount of $5,000 for each tree cut in excess of 12 inches dbh or for clearing more than 1,500 square feet of brush, and $2,500 for trimming any tree or for each tree cut smaller than 12 inches dbh or for clearing less than 1,500 square feet of brush. The easement shall also provide that if litigation is necessary to enforce the terms of the easement, the prevailing party shall be entitled to its attorney's fees and costs. Prior to the sale of lots adjacent to the buffer, WRECO shall inform in a conspicuous manner prospective purchasers of the buffer's status as an NGPE and that protection of the NGPE buffer will be enforced by the City. WRECO will obtain written acknowledgment from the purchasers that they have received such notice and that they consent to be subject to the terms of the easement including that the purchaser agrees to give the same notice on the same terms to subsequent purchasers. The notice

Section II.B.2.b (cont'd.)

shall also be filed with the Pierce County Auditor's Office prior to or at closing of the sale. Failure to provide any such notice will result in liquidated damages of $5,000 against the person required to give such notice. All liquidated and unliquidated damages shall be payable to the City for restoration and improvements to the buffer, provided that when NDA and Ecology enforce the agreement, that party's attorney's fees and costs shall be payable from the damages collected.

c. Permanent survey stakes and signs shall be set delineating the buffer prior to WRECO selling the property or receiving approval for any development or pre-development activity on Hoffman Hill. Before beginning and continuously during the course of any grading, building construction, or other development activity on a lot subject or adjacent to the NGPE, the common boundary between the easement and the area of development activity must be fenced or otherwise continuously marked in a highly visible manner, such as yellow caution tape, to the satisfaction of the City. At the time that roads are constructed on the site, one sign per lot shall be posted, or other physical notice mutually agreed upon by Ecology, NDA, WRECO, and DuPont shall be provided, at the boundary between the buffer and each adjacent private lot alerting subsequent occupiers and users of the land to the existence of the buffer and the need to protect it. The signs shall be similar to the example attached hereto as Attachment I. The message on the sign shall be modified appropriately.

d. Ecology, the City and the nongovernmental parties agree not to seek any buffer proposal for Hoffman Hill that is inconsistent with the Calthorpe Plan shown in Attachment D; provided, however, this shall not apply to environmental impacts from future development which are unrelated to the Nisqually National Wildlife Refuge and which may be disclosed in subsequent environmental review. The parties agree not to propose any plan calling for public acquisition of Hoffman Hill for expansion of the Refuge unless such plan is conditioned on WRECO being a willing seller entitled to full fair market value and upon

approval of the City. Nothing contained in this section shall be construed as limiting or prohibiting the City from exercising its rights to acquire by eminent domain, all or any portion of the Hoffman Hill area for a public purpose other than the expansion of the Refuge.

e. Additional Mitigation Provisions Regarding Hoffman Hill.

(i) The public access trail provided for herein shall be designed and constructed by WRECO, its successors or assigns, subject to approval by the City of the plans and specifications therefor;

(ii) The design for the trail shall include reasonable accommodation to meet the requirements of the Americans with Disabilities Act.

(iii) If the City so elects, it may design and construct the trail and charge WRECO the reasonable costs thereby incurred. In such event, WRECO shall have an opportunity for design input and shall be credited in such amount against the costs of any recreational improvements which it might be reasonably required to install as a part of residential platting or development in the City. Any City employee who will be working on the trail project will be required to have credentials for this type of construction project.

(iv) Removal by the City or by WRECO with the City's permission, of trees and undergrowth in conjunction with trail construction or maintenance, or the removal by either party of dangerous trees near the trail or public viewpoints, shall not be deemed a violation of any provision of this Agreement.

(v) The City may by ordinance provide that it shall be a civil offense, enforceable in Municipal Court, for any person to remove, without permission from the City, brush, trees, or other growth from the Native Growth Protection Easement except as provided in the preceding subparagraph iv.

(vi) The design for the trail shall include public access thereto from a public right-of-way.

3. New Dock. Upon receipt of all necessary permits for the Revised Project, and the expiration of all applicable permit appeal periods with no appeals being filed, Lone Star agrees to construct a new gravel transshipment facility in the Tatsolo Point area. The new gravel dock will be smaller than the existing DuPont dock and will be sized to handle barging of sand, gravel, and related construction materials originating from or for use with materials from the DuPont site in connection with Lone Star's business only, and will not be oversized to handle future uses or any other commodities. The dock structure will not contain any creosote pilings. Grated decking will be used in the near-shore environment.

4. Concurrent and Future Use. WRECO and Lone Star agree that use of the new dock shall be for barge loading of sand, gravel, and related construction materials originating from or for use with materials from the DuPont site and shall be used for no other concurrent purpose while the dock is used as a sand and gravel barge transshipment facility. At the conclusion of mining operations in the City, Lone Star and WRECO agree to limit proposed future uses, if any, of the Special Management Unit to development of no greater size or impacts than the sand and gravel barge transshipment facility built for the Revised Project. The parties recognize and agree that at the conclusion of the 25-year payment period set forth in II.D.(1) below, the parties may seek and negotiate further environmental mitigation funding for environmental impacts due to the sand and gravel barge transshipment facility. The term "related construction materials" as it is used in this paragraph is intended to refer to glass, shredded rubber, or other additives required or recommended by any agency of the State of Washington or the United States to be included in sand or gravel. It shall not be deemed to include asphalt.

5. Shoreline Uses. Lone Star and WRECO agree to limit future use, if any, of the remaining DuPont shoreline outside of the Special Management Unit to non-industrial uses consistent with the Conservancy regulations of the existing DuPont Master Program. The permits obtained by Lone Star do not provide for any mining within 200 feet of Puget Sound or

Section II.B.5 (cont'd.)

Sequalitchew Creek. WRECO and Lone Star agree to seek no permits in the future to mine within the shoreline jurisdiction as defined by RCW Chapter 90.58, or within 100 feet of the top of the bank of Sequalitchew Creek, as shown on Exhibit J, or in a manner that would significantly impact the flow of Sequalitchew Creek. This shall not prohibit excavation for construction of the sand and gravel barge transshipment facility.

C. City Fiscal Mitigation Fund.

1. Lone Star and WRECO will pay $1,000,000 to the City of DuPont to compensate for any direct or indirect impacts of the Revised Project, including potential negative fiscal impacts of the site plan approval as referenced in Condition No. 99 to Ordinance No. 485, and in Condition No. 52 of Ordinance No. 486.

2. The $1,000,000 payment to the City by Lone Star and WRECO, referred to at Section II.C.2 above, will be made in a single lump sum at such time as mitigation is due under Section II.A. This payment is not to be deemed to be in lieu of or a substitute for any other mitigation required under Ordinance Nos. 485 or 486. Such payment is not intended to fund or to reimburse the City for the costs of studies required for development approvals, nor for enforcement of the terms of any such approvals for the Revised Project.

3. Lone Star and WRECO will also reimburse the City for the following:

a. The City's reasonable expenses in arriving at this agreement, including legal fees and disbursements of the City attorney and also legal fees and disbursements incurred by the City for independent legal review and consultation;

b. The City's reasonable expenses in connection with the review process for the Revised Project, including all legal fees and disbursements;

c. The City's expenses, if any, incurred in defense of any appeal of any process or permit relating to the Revised Project where the City is a party; provided that this provision shall not apply to such expenses if incurred by the City related to an appeal filed by the

Section II.C.3.c (cont'd.)

City from an approval received by WRECO or Lone Star from another governmental agency, nor shall it apply to any action brought by Lone Star or WRECO.

d. The fees, expenses and costs referred to in the preceding subparagraphs a through c will be payable whether or not the Revised Project is ultimately approved, and if approved whether or not it is abandoned in whole or part by WRECO or Lone Star.

4. In the event the City does not approve any necessary programmatic approval or permit for the Revised Project, Lone Star and WRECO may proceed as provided in Section I.F above, and shall have no obligation to the City under this Settlement Agreement.

D. Environmental Mitigation Funding.

1. Environmental Mitigation Trust. As a further mitigation measure, Lone Star and WRECO agree to make a grant to an Environmental Mitigation Trust ("EMT"), which will undertake acquisition of real property, development rights and easements as resource protection measures for the Nisqually Delta, in the area described as the Mitigation Landscape Area as defined in Section II.D.2.b. below. The EMT shall be a public or non-profit entity such as the Trust for Public Lands, the Nature Conservancy, or the Nisqually Land Trust, which shall be selected jointly by the NDA and Ecology.

2. Funding. Lone Star and WRECO agree to contribute to the trust designated pursuant to Section II.D.1 above, a grant payable as follows:

a. A down payment will be payable within 30 days after all permits necessary for the Revised Project have been issued, and all appeal periods for those permits have expired with no appeals being filed or alternatively any permits challenged are affirmed following appeal. The down payment shall be in the amount of $375,000. An additional $125,000 shall be payable on January 31, 1996, conditioned upon all state and local permits and approvals having been obtained by that date, and further conditioned upon all non-programmatic

permit and approval appeals periods having expired by that date with no appeal being filed or all appeals filed being fully resolved in Lone Star's and WRECO's favor by January 31, 1996.

b. The balance will be payable in annual installments of $50,000 per year for 25 years; provided, however, that if for any reason the aggregate operations have been suspended totally for six months or more, annual payments will be suspended until any portion of the aggregate operation is resumed. The first annual installment will be due upon completion of construction of the sand and gravel barge transshipment facility; for years 2 through 25 of operations of the Revised Project, the annual payment shall be due on June 29 unless the due date is modified pursuant to the suspension proviso in the preceding sentence. Payments in years 6 through 25 shall be adjusted for inflation according to the Producer Price Index for sand and gravel. The base year for inflation adjustments shall be the year that operations of the Revised Project commence. At Ecology's or NDA's option, the sum total of payments for years 21 through 25 may be accelerated to the time of or anytime after the down payment, if that sum total is contributed toward purchase of real property, development rights, or easements, in the Mitigation Landscape Area. The Mitigation Landscape Area shall be defined as:

(i) The Shoreline of Statewide Significance (as defined in the Shoreline Management Act) from Tatsolo Point south to De Wolf Bight, the Nisqually National Wildlife Refuge, and all areas contiguous to these lands, excluding those lands within the City limits of DuPont, and extending no further south or east than the I-5 freeway corridor; provided that land within the current city limits of DuPont may be included to the extent that it can be purchased from a willing seller. No portion of this geographic area shall be included to the extent that it is either urbanized or a disturbed natural environment that is unsuitable for natural habitat and for which a plan and funding for restoration of the habitat has not been identified.

(ii) In the event that the trustee determines that the protection of the natural environment of the Mitigation Landscape Area by purchase of the stated property

interests in the above-stated geographic areas has been completely frustrated or cannot be achieved, the Mitigation Landscape Area may be expanded to include shorelands and adjacent property associated with any river, stream or wetland that is associated with and forms an integral part of the ecology of the Nisqually Delta, subject to the limiting provision applicable to land within the current city limits of DuPont, as set forth in subparagraph (i) above.

c. If any necessary permit is denied or appealed, then Lone Star and WRECO may exercise their options under Section I.F. If they opt to pursue the Revised Project, are successful in obtaining the permits for it through the appellate process, and elect to build the Revised Project, then Lone Star and WRECO will fund the annual payments and the down payment, but will have no obligation to make the conditional January 31, 1996 payment unless all permit appeals or challenges to permit denials are fully resolved in Lone Star and WRECO's favor by January 31, 1996.

III. GENERAL TERMS

A. Disposition of Existing Litigation and Applications.

1. Appeals Stayed. The shoreline appeals (SHB Nos. 93-64, 93-65, and 93-69) and Pierce County appeal (Pierce County Cause No. 93-2-09515-1) shall be stayed and held on inactive status pending the outcome of the programmatic and permit-specific approval processes set forth above. The parties to the appeals will execute a Stipulation and Order of Continuance for the shoreline appeal and Pierce County Superior Court appeal concurrently with the execution of this Settlement Agreement. The parties to the appeals hereby authorize and direct their respective attorneys of record to sign and file the Stipulation and Order of Continuance upon execution of this Settlement Agreement by the parties of record to the appeals.

2. Key Milestones. Certain Key Milestones contained in Attachment A are marked by an asterisk (*). If any Key Milestone in Attachment A is not completed within two weeks of the target date, or if any necessary programmatic or permit-specific approval is not

obtained consistent with this Agreement, Lone Star and WRECO may exercise their options under Section I.F.2 above.

3. Dismissal of Shoreline Appeals. The parties to this agreement who are parties of record to the shoreline appeals hereby authorize and direct their respective counsel of record to execute and file the Stipulation and Order of Dismissal for Consolidated Cases SHB Nos. 93-64, 93-65, and 93-69 substantially in the form attached hereto as Attachment F, and incorporated herein by this reference, when the following conditions are met: 1) all necessary permits and approvals are obtained for the Revised Project; and 2) the appeal period for the last necessary project-specific approval or permit to issue has run with no programmatic or project-specific appeal having been filed. Lone Star and WRECO further agree that, upon completion of construction of the new dock, they will withdraw the permit applications for use of the existing DuPont dock.

4. Dismissal of Pierce County Appeals. Parties to this agreement who are parties of record to Pierce County Superior Court Cause No. 93-2-09515-1 hereby authorize and direct their respective attorneys of record to execute and file the Stipulation and Order of Dismissal substantially in the form attached hereto as Attachment G, and incorporated herein by this reference, when the following conditions are met: 1) all necessary permits and approvals are obtained for the Revised Project; and 2) the appeal period for the last necessary project-specific approval or permit to issue has run with no programmatic or project-specific appeal having been filed; provided it is agreed that, in the event this litigation is resumed, it shall not be a basis for challenging in any way the construction of the processing plant or mining of the material moved by truck pursuant to Section I.D.5 above.

5. Mutual Release. Effective upon the date of dismissal with prejudice of the last of the following iterated actions to be dismissed, SHB No. 93-64, SHB No. 93-65, SHB No. 93-69, and Pierce County Superior Court Cause No. 93-2-09515-1 (together the "Underlying

Actions"), the parties release and forever discharge each other and their officers, directors, shareholders, employees, representatives, agents, successors, and assigns, from any and all causes of action, claims, damages, liabilities, and demands of any nature whatsoever, arising out of or relating in any way to the allegations made in the Underlying Actions or in retaliation for any activities by the parties relating to their opposition to the originally permitted project.

B. Other Terms

1. Dispute Resolution and Enforcement. This Agreement is enforceable by any party to the Agreement. Prior to raising by motion, complaint or other legal proceeding any alleged violation of this Agreement or any alleged failure to perform any obligation imposed hereby, the aggrieved party shall first consult with the other parties consistent with the procedure outlined in Rule 26(i) of the Washington Superior Court Civil Rules, and, in the event the matter cannot be resolved, confirm such consultation in written correspondence to the alleged breaching party. If no agreement can be reached within 10 days from receipt of the letter, the parties will then submit the dispute to Washington Arbitration and Mediation Services or other agreed upon mediator for mediation first, and if that does not resolve the issue, then the parties may submit the dispute to binding arbitration or pursue any other remedies available by law.

2. Authority to Sign. Each of the parties signing this Agreement is legally authorized to enter into the terms and conditions of this Agreement and Stipulation and Orders of Dismissal of proceedings, and is authorized to legally to bind such parties thereto.

3. Agreement Binding. The provisions of this Agreement and the Stipulations and Orders of Dismissal shall apply to and be binding upon the parties hereto and their respective officers, directors, employees, agents, non-governmental attorneys, affiliates, wholly-owned subsidiaries, successors, and assigns.

4. Choice of Law. This Agreement shall be governed by and construed in accordance with the laws of the State of Washington.

5. Modification. This Agreement may be modified only by the express written agreement of all the parties.

6. Counterparts and Effective Date. This Agreement may be executed in counterparts and each executed counterpart shall have the same force and effect as an original instrument upon the effective date of the Agreement. This Agreement shall become effective as to all parties upon the date of signature of the party last in time to sign. The prior circulated agreement dated June 29, 1994 is replaced by this Agreement and shall have no force or effect.

DEPARTMENT OF ECOLOGY

By: _____ DATED: _____
Its: _____

CITY OF DUPONT

By: Gillard F Shirkel DATED: 27 Dec 1994
Its: Mayor

LONE STAR NORTHWEST, INC.

By: James A Repman DATED: Oct 27, 1994
Its: Pres.

WEYERHAEUSER REAL ESTATE COMPANY

By: Robert L Shields DATED: Dec 27, 1994
Its: Vice President

NISQUALLY DELTA ASSOCIATION

By: _____ DATED: _____
Its: _____

BLACK HILLS AUDUBON SOCIETY

By: _____ DATED: _____
Its: _____

WASHINGTON ENVIRONMENTAL COUNCIL

By: _____ DATED: _____
Its: _____

NATIONAL AUDUBON SOCIETY

By: _____ DATED: _____
Its: _____

PEOPLE FOR PUGET SOUND

By: _____ DATED: _____
Its: _____

TAHOMA AUDUBON SOCIETY

By: _____ DATED: _____
Its: _____

SEATTLE AUDUBON SOCIETY

By: _____ DATED: _____
Its: _____

ANDERSON ISLAND
QUALITY OF LIFE COMMITTEE

By: _____ DATED: _____
Its: _____

ATTACHMENT A

CRITICAL PATH

CRITICAL PATH MILESTONES

Date	Action
July 15, 1994	Amended Applications Submitted
July 15, 1994	Noise Study circulated to CNCC
October 15, 1994	*Pre-Draft SEIS circulated to Environmental Review Committee
October 30, 1994	Comments returned to DOE on pre-draft
	Note: Critical Path will be reviewed after receipt of comments to determine if there is a need to revise the schedule.
January 1, 1995	*Draft SEIS published
February 1, 1995	*SEIS comment period ends
May 1, 1995	*Final SEIS published
May 30, 1995	Public Hearing on DSMP, Permits
June 15, 1995	City Planning Commission recommendation on joint proposal
July 15, 1995	*City Council decisions on DSMP; Permits to follow; Notice of Action published
	Note: Decision on DSMP will be sent to Ecology per WAC 173-19-062; Applicant may need to waive transmittal time frame for permits
December 1, 1995	*DOE decision on DSMP and shoreline permit
December 15, 1995	DNR decision on Aquatic Lands Lease
December 31, 1995	*Building permits for transshipment facility issued

*KEY MILESTONES

321495

ATTACHMENT A

ATTACHMENT B

PROPOSED DSMP

FOR SETTLEMENT DISCUSSION PURPOSES ONLY

July 11, 1994

Tatsolo Point Special Management Unit

I. Purpose

The purpose of the Tatsolo Point Special Management Unit is to ensure that the shoreline resources of the Special Management Unit and the shoreline of statewide significance associated with the Nisqually Delta are protected while providing the City of DuPont with a location for access to Puget Sound for appropriate water dependent uses and activities and water related passive recreational uses and activities.

II. Policy

The Special Management Unit is located outside the shoreline of statewide significance. Development within the Special Management Unit should not be visible from anywhere within the Nisqually National Wildlife Refuge.

Uses in the Special Management Unit should be limited to water dependent uses and water related passive recreational uses. Water dependent uses should be limited to those uses associated with public transportation or with sand and gravel barge transshipment. Uses directly associated with the railroad may be allowed, provided that no feasible non-shoreline location is available.

All uses and activities should be designed, developed and conducted in a manner that minimizes the impact to: the natural and human environment; the aesthetic character of the area; and the public use and enjoyment of the area. Appropriate offsetting mitigation should be required for all unavoidable adverse impacts associated with permitted development.

Passive recreational uses and an industrial use may occur concurrently within the Tatsolo Point Special Management Unit. However, only one industrial use utilizing one dock may be permitted and operating within the Tatsolo Point Special Management Unit at any time.

III. Use Regulations

A. Permitted Uses: The following uses and activities are permitted within the Special Management Unit subject to compliance with the development standards contained in Section IV below:

- Passive recreational uses.
- Facilities associated with such passive recreational use, such as parking and restrooms, that are located landward of the ordinary high water mark.
- Fish and wildlife related research activities and developments.
- Fish and wildlife related natural resource enhancement activities and developments.
- Roads and railroads when located landward of the ordinary high water mark.
- Utilities when located landward of the ordinary high water mark.

B. Conditional Uses: The following uses and activities may be allowed only upon approval of a conditional use permit subject to compliance with the conditions of Section IV below:

- Facilities associated with passive recreational use that are located waterward of the ordinary high water mark.
- Aquaculture facilities and uses except when such facilities are for fish and wildlife related research and/or enhancement as provided in the Subsection A above.
- Utilities when located waterward of the ordinary high water mark.
- Roads and railroads when located waterward of the ordinary high water mark.
- Facilities for the loading and unloading of passengers and/or vehicles carried by ferry.
- Train station provided that the facility is located landward of the ordinary high water mark.

- Facilities for the barge shipment of sand and gravel, including such uses as a pier, a dock, mooring dolphins, mooring buoys for barge staging, a barge loader, a conveyor, necessary utilities, and an access road.

- Necessary accessory or ancillary uses of a commercial or industrial nature associated with a listed permitted or conditional use where the need for a shoreline location is fully demonstrated.

- Necessary shoreline stabilization activities associated with existing or proposed uses.

- Maintenance dredging may only be authorized provided that it is fully demonstrated that there is no feasible alternative that will have less environmental impact than the proposed dredging.

- Industrial facilities that are fully demonstrated to have less adverse impact to the natural and human environment than a sand and gravel barge transshipment facility that may be permitted within the Special Management Unit.

C. Prohibited Uses: The following uses are expressly prohibited in the Tatsolo Point Special Management Unit:

- All uses and activities not specifically listed above as permitted or conditional use.

- More than one industrial use within the Special Management Unit.

- More than one industrial dock within the Special Management Unit.

IV. Development Standards

In order to ensure that all uses and activities within the Special Management Unit minimize adverse impacts to the natural and human environment; the aesthetic character of the area; and the public use and enjoyment of the area, the following regulations and development standards apply:

- The footprint, shadow and disturbed area caused by a development or associated construction shall be the minimum necessary to accomplish the authorized use, and shall not be oversized to accommodate speculative future uses.

- All structures shall be designed and constructed to blend visually with the background as viewed from the water, unless the applicant fully demonstrates a need otherwise. Development shall to the maximum extent practicable avoid visibility from the Nisqually National Wildlife Refuge and shall minimize any unavoidable impacts to visibility from the Refuge while accomplishing the intended purpose of the permitted development.

- No dock may extend waterward more than 255 feet from the ordinary high water mark.

- The height of all structures shall be the minimum necessary to accomplish the permitted activity. Height shall be measured from mean higher high water if the structure is over water and from above average grade level if over land. Unless the applicant fully demonstrates a need otherwise, the following height limitations apply:

  a. Any dock and associated structure: 35 feet

  b. Any barge loading tower: 65 feet

  c. Any conveyor structure: maximum 35 feet above the railroad tracks.

- Lighting shall be the minimum necessary for the permitted purpose. Lighting shall be designed and constructed to minimize lighting of the shoreline, upland, and water areas and to minimize visibility from shoreline, upland, and water areas. Lighting shall meet applicable safety standards.

- Alteration and disturbance of the existing bathymetry, land contours, and upland and aquatic vegetation within shoreline jurisdiction shall be minimized.

- Any industrial use or activity shall be located to minimize interference with tribal fishing.

- Obstruction and interference with recreational and commercial navigation and use of the water and shoreline areas shall be minimized.

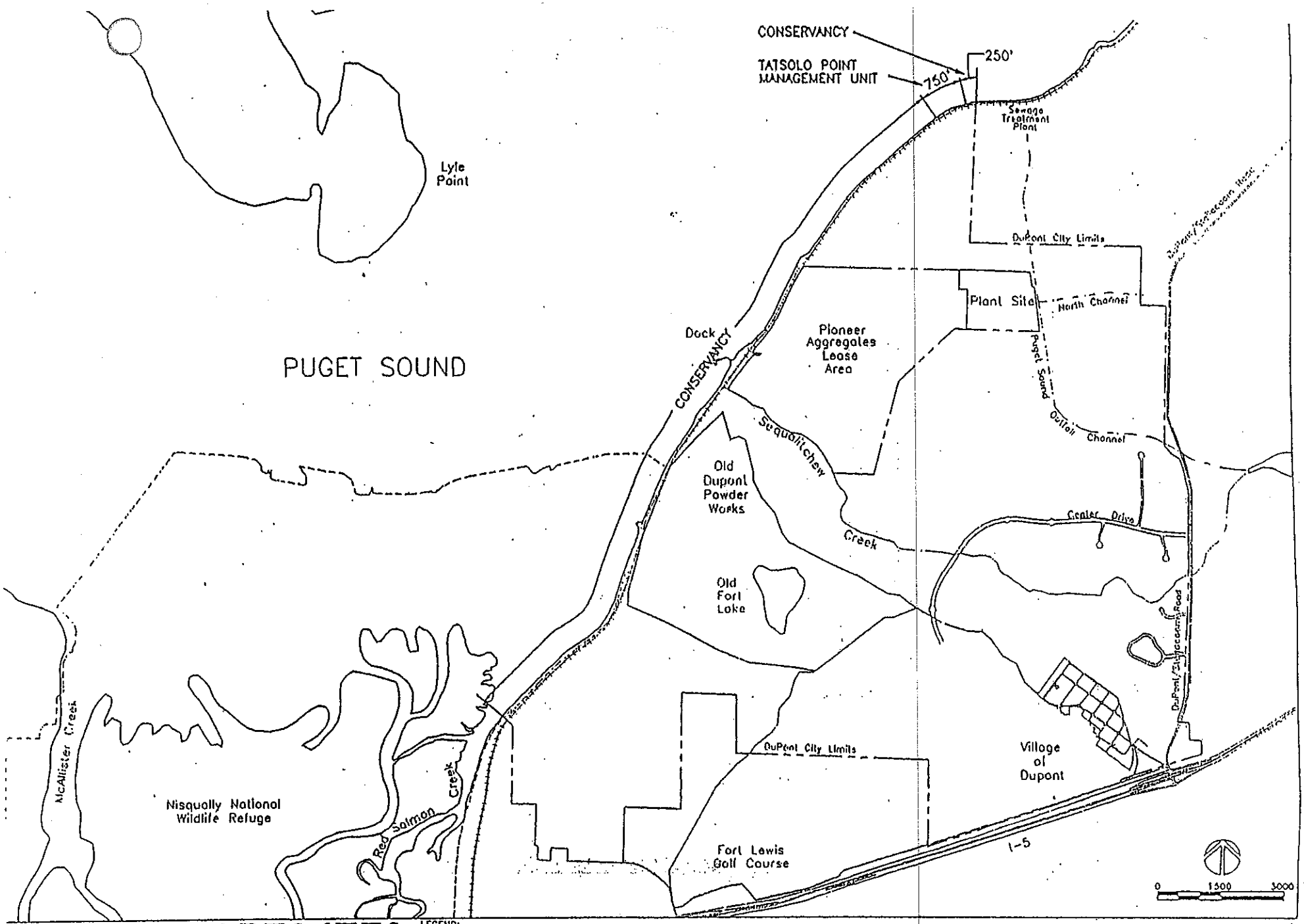
- Dredging for the creation of berthing areas is prohibited. Berths shall be located to minimize the potential for maintenance dredging. Maintenance dredging may be authorized only by conditional use permit provided that the applicant fully demonstrates that there is no feasible alternative that will have less environmental impact than the proposed dredging.

- Shoreline stabilization activities shall only be authorized when the applicant fully demonstrates that: the stabilization design and method used is compatible with and uses the natural shore processes and conditions present on the site to the greatest extent possible; and that the materials used are compatible with the natural conditions of the site.

- No aquatic or upland vegetation within shoreline jurisdiction shall be disturbed or removed nor any land form altered except as authorized by the specific terms of a shoreline permit.

- Compensatory mitigation shall be provided for all identified adverse impacts to the human and natural environment. This shall include mitigation for impacts caused by the ongoing operation of any use or activity and potential impacts caused by accidents.

221847



IONEER AGGREGATES

JPONT, WASHINGTON

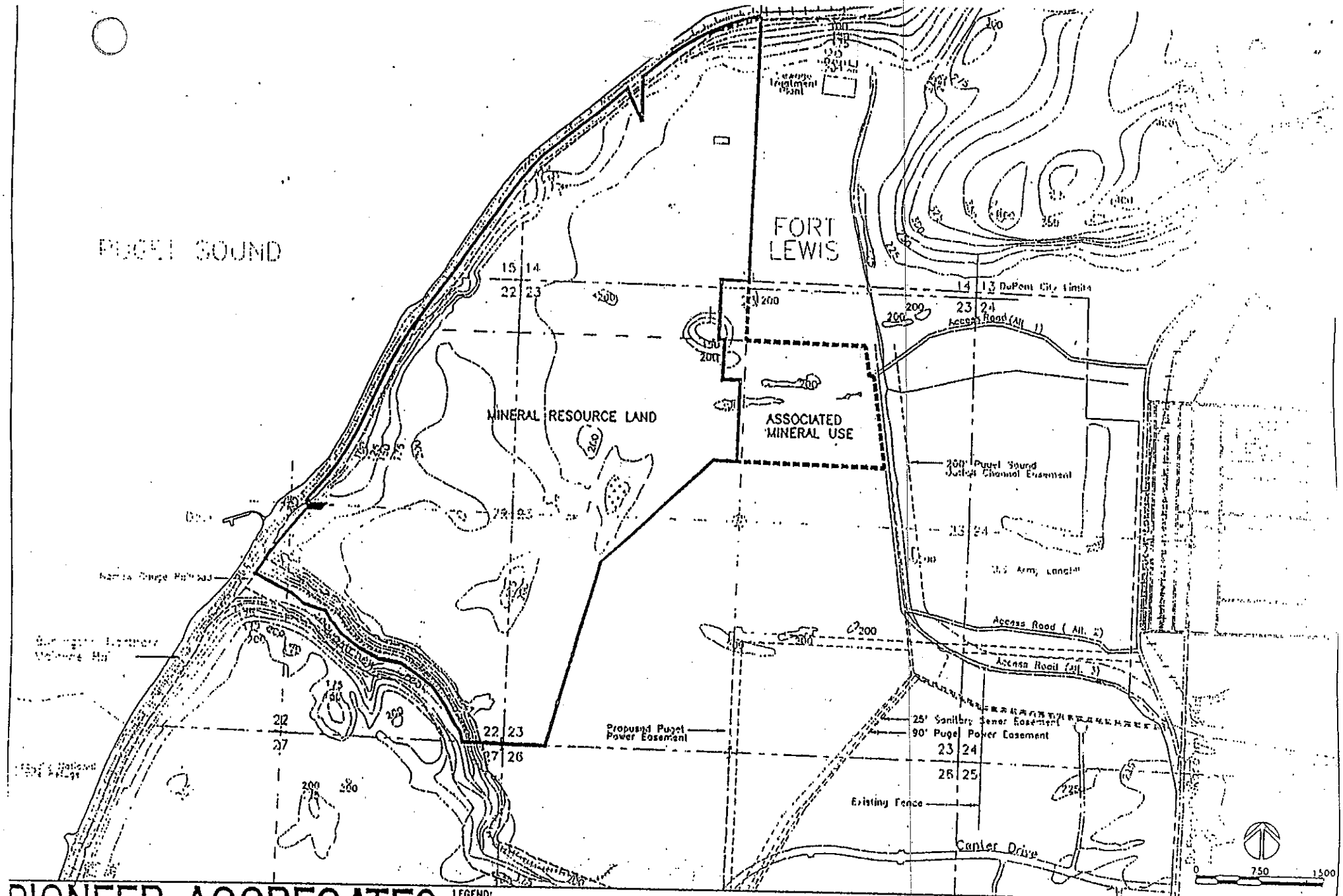
LEGEND:

- LEASE AREA
- DUPONT CITY LIMITS
- ROADS
- NISQUALLY NATIONAL WILDLIFE REFUGE BOUNDARY

Shoreline Redesignation from Urban to Conservany

ATTACHMENT C

MINERAL RESOURCE LANDS



PIONEER AGGREGATES

DUPONT, WASHINGTON

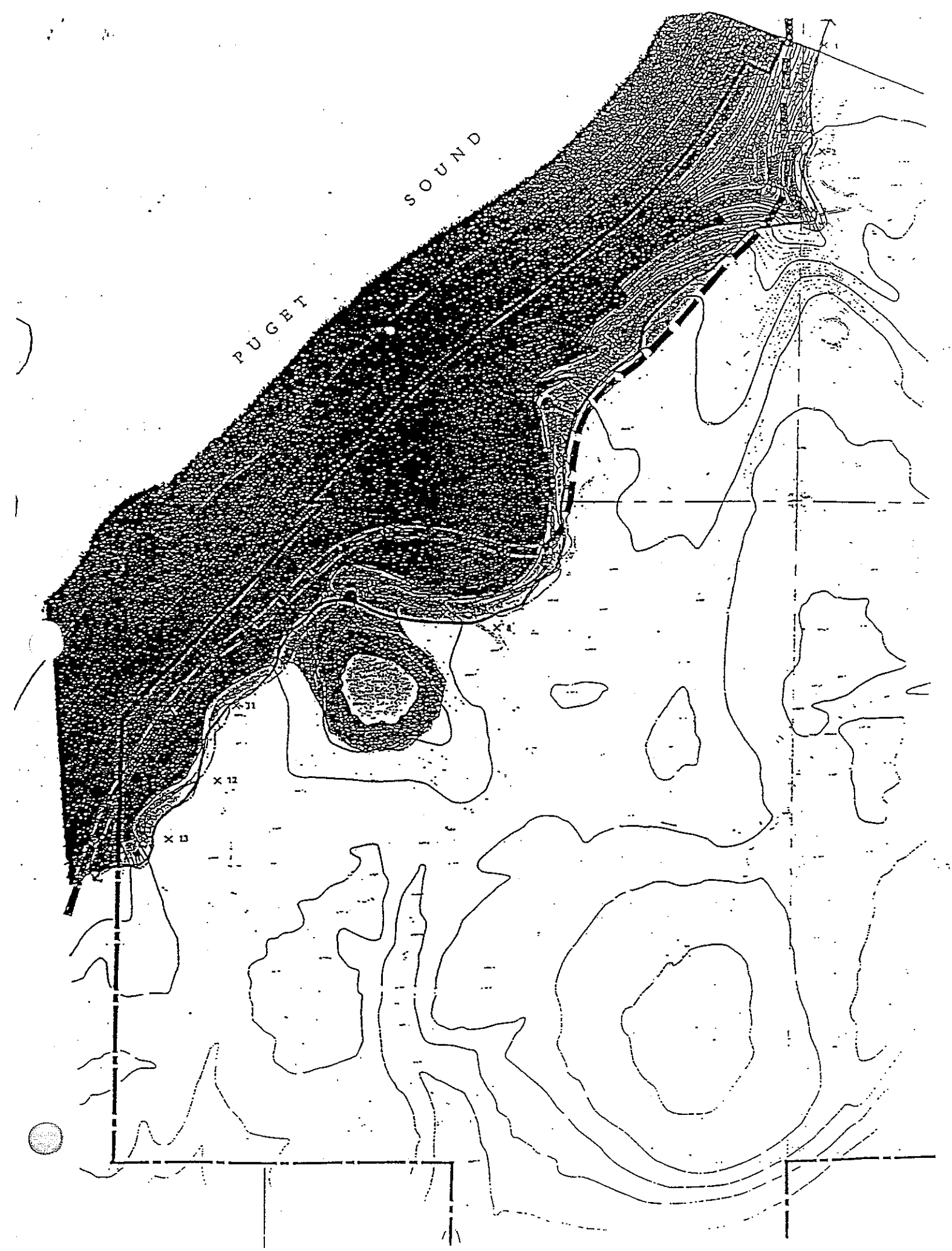
LEGEND:

- DUPONT CITY LIMITS
- ROADS
- LEASE LINE
- MINERAL RESOURCE LAND
- ASSOCIATED MINERAL USE
- 200' SETBACK FROM PUGET SOUND AND CENTER LINE OF SEQUALITCHEW CREEK

Mineral Resource Land

ATTACHMENT D

CALTHORPE PLAN


PUGET SOUND
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X 12
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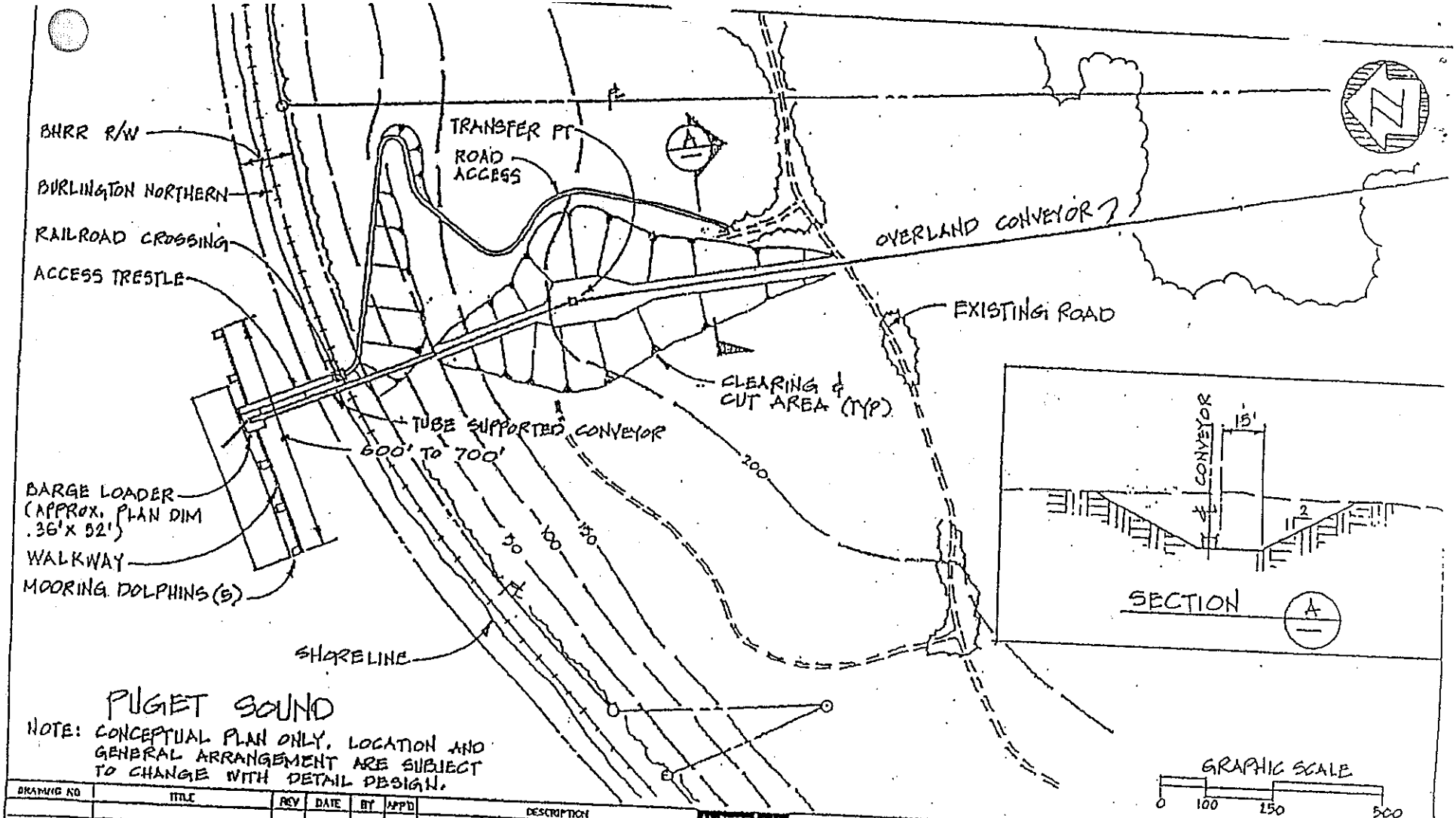
ATTACHMENT E

REVISED PROJECT ILLUSTRATION



NOTE: CONCEPTUAL PLAN ONLY. LOCATION AND GENERAL ARRANGEMENT ARE SUBJECT TO CHANGE WITH DETAIL DESIGN.

DRAWING NO	TITLE	REV	DATE	BY	APP'D	DESCRIPTION

Harris Group Inc.

CONCEPTUAL DOCK LAYOUT PLAN

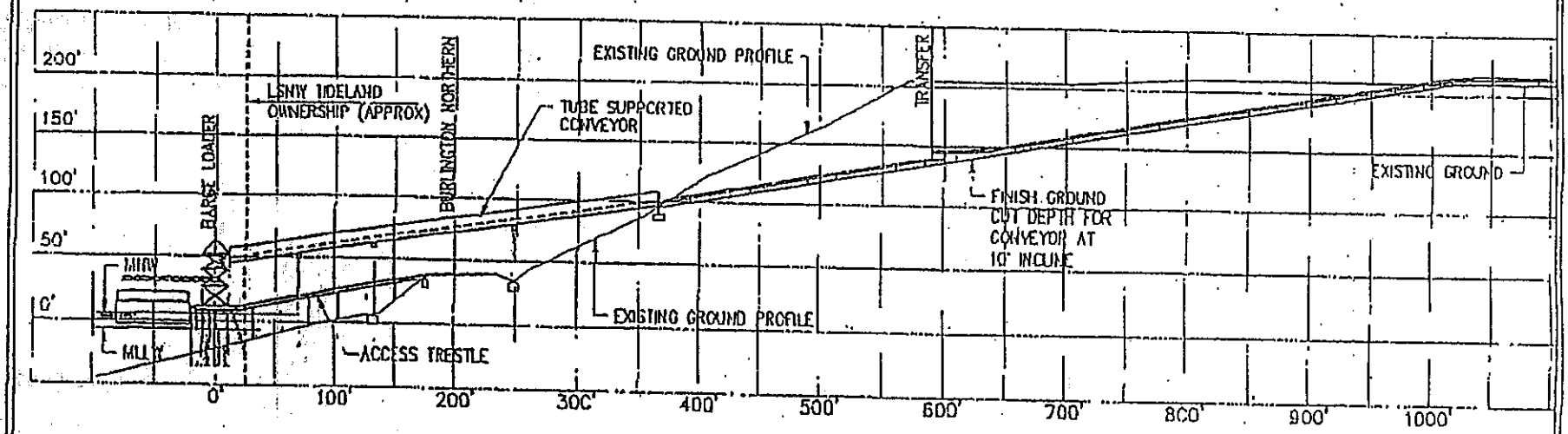
PIONEER AGGREGATES

APPROVED		SCALE	1"=200'	MO	DAY	YR
DATE		DRAWN	SFB	5	3	14
PROJECT	01-1313	CHK'D				
		APP'D				
		APP'D				

DRAWING NUMBER
SK-1313-DOCK-2

REV A

Harris Group Inc. B Size 11" X 17" FSB-14



Harris Group Inc.

CONCEPTUAL DOCK LAYOUT
VERTICAL PROFILE

PIONEER AGGREGATES

SFB 05-03-94

SK-1313-DOCKPR3

ATTACHMENT F

SHB RELEASES AND STIPULATION AND ORDER OF DISMISSAL

BEFORE THE SHORELINES HEARINGS BOARD

STATE OF WASHINGTON

NISQUALLY DELTA ASSOCIATION and BLACK HILLS AUDUBON SOCIETY, Appellants, vs. CITY OF DUPONT; LONE STAR NORTHWEST, INC.; and WEYERHAEUSER REAL ESTATE COMPANY, Respondents.	SHB NO. 93-64 STIPULATION AND AGREED ORDER OF DISMISSAL WITH PREJUDICE
STATE OF WASHINGTON, DEPARTMENT OF ECOLOGY, Appellant, vs. LONE STAR NORTHWEST, INC.; CITY OF DUPONT; and WEYERHAEUSER REAL ESTATE COMPANY, Respondents.	SHB NO. 93-65
LONE STAR NORTHWEST, INC.; and WEYERHAEUSER REAL ESTATE COMPANY, Appellants, vs. STATE OF WASHINGTON, DEPARTMENT OF ECOLOGY, Respondent.	SHB. NO. 93-69

STIPULATION

The parties to this action, through their attorneys of record, stipulate as follows:

1. All claims that were asserted in this consolidated action have been settled, resolved or compromised per the terms of the Settlement Agreement attached hereto and incorporated herein by reference.

2. An order may be entered dismissing the action with prejudice and without costs or attorneys' fees to any party.

HILLIS CLARK
MARTIN & PETERSON, P.S.

By_____
T. Ryan Durkan
WSBA No. 11805
Attorneys for Defendants
Lone Star Northwest, and
Weyerhaeuser Real Estate Co.

By_____
Rebecca E. Todd
WSBA No. 20713
Asst. Attorney General
Department of Ecology

BRICKLIN & GENDLER

By_____
David A. Bricklin
WSBA No. 7583
Attorneys for Nisqually Delta Ass'n and
Black Hills Audubon Society

PRESTON, THORGRIMSON,
SHIDLER, GATES & ELLIS

By_____
James J. Mason
WSBA No. 718
Attorneys for Defendant
City of DuPont

ORDER

Having reviewed the foregoing stipulation of the parties, the pleadings filed herein, and having determined that the parties have agreed to a settlement of the claims raised in this action, It Is Ordered:

This action is dismissed with prejudice and without an award of costs or attorneys' fees to any party.

Done at _____, Washington, this ___ day of _____, 1994.

_____
HONORABLE WILLIAM A. HARRISON
Administrative Appeals Judge

SHORELINES HEARINGS BOARD

_____
ROBERT V. JENSEN, Chairman

_____
RICHARD C. KELLEY, Member

GORDON F. CRANDALL, Member

BOBBI KREBS-McMULLEN, Member

JAMES A. TUPPER, Member

Presented by:

HILLIS CLARK
MARTIN & PETERSON, P.S.

By
T. Ryan Durkan
WSBA No. 11805
Attorneys for Defendants
Lone Star Northwest, and
Weyerhaeuser Real Estate Co.

Notice of Presentation Waived:

By
Rebecca E. Todd
WSBA No. 20713
Asst. Attorney General
Department of Ecology

BRICKLIN & GENDLER

By
David A. Bricklin
WSBA No. 7583
Attorneys for Nisqually Delta Ass'n and
Black Hills Audubon Society

PRESTON, THORGRIMSON,
SHIDLER, GATES & ELLIS

By_____
James J. Mason
WSBA No. 718
Attorneys for Defendant
City of DuPont

221259

ATTACHMENT G

PIERCE COUNTY RELEASES AND STIPULATION
AND ORDER OF DISMISSAL

IN THE SUPERIOR COURT OF WASHINGTON FOR PIERCE COUNTY

NISQUALLY DELTA ASSOCIATION, JUDITH A. KRILL, and KARL E. KRILL Plaintiffs, v. CITY OF DUPONT, a Washington municipal corporation; LONE STAR NORTHWEST, INC., a Washington corporation; and, WEYERHAEUSER REAL ESTATE COMPANY, a Washington corporation; OREGON CITY LEASING COMPANY, an Oregon corporation; and, STATE OF WASHINGTON, DEPARTMENT OF NATURAL RESOURCES, Defendants.	NO. 93 2 09515 1 STIPULATION AND AGREED ORDER OF DISMISSAL WITH PREJUDICE

STIPULATION

The parties to this action, through their attorneys of record, stipulate as follows:

1. All claims asserted in this action have been fully settled, resolved or compromised.

2. An order may be entered dismissing plaintiffs' complaint with prejudice and without an award of costs or attorneys' fees to any party.

HILLIS CLARK
MARTIN & PETERSON, P.S.

By_____
T. Ryan Durkan
WSBA No. 11805
Attorneys for Defendants
Lone Star, Weyerhaeuser Real Estate Co.,
and Oregon City Leasing

Dated: _____

BRICKLIN & GENDLER

By_____
David A. Bricklin
WSBA No. 7583
Attorneys for Plaintiffs

Dated: _____

PRESTON THORGRIMSON, SHIDLER
GATES & ELLIS

By_____
James J. Mason
WSBA No. 718
Attorneys for Defendant
City of DuPont

Dated: _____

ORDER

Based on the foregoing stipulation of the parties, it is hereby:

ORDERED, ADJUDGED AND DECREED that Plaintiff's Complaint be and the same is hereby dismissed with prejudice and without an award of costs or attorneys' fees to any party.

DATED this _____ day of _____, 1994.

_____
JUDGE/COURT COMMISSIONER

Presented by:

HILLIS CLARK
MARTIN & PETERSON, P.S.

By_____
T. Ryan Durkan
WSBA No. 11805
Attorneys for Defendants
Lone Star, Weyerhaeuser, and
Oregon City Leasing

Notice of Presentation Waived:

BRICKLIN & GENDLER

By_____
David A. Bricklin
WSBA No. 7583
Attorneys for Plaintiffs

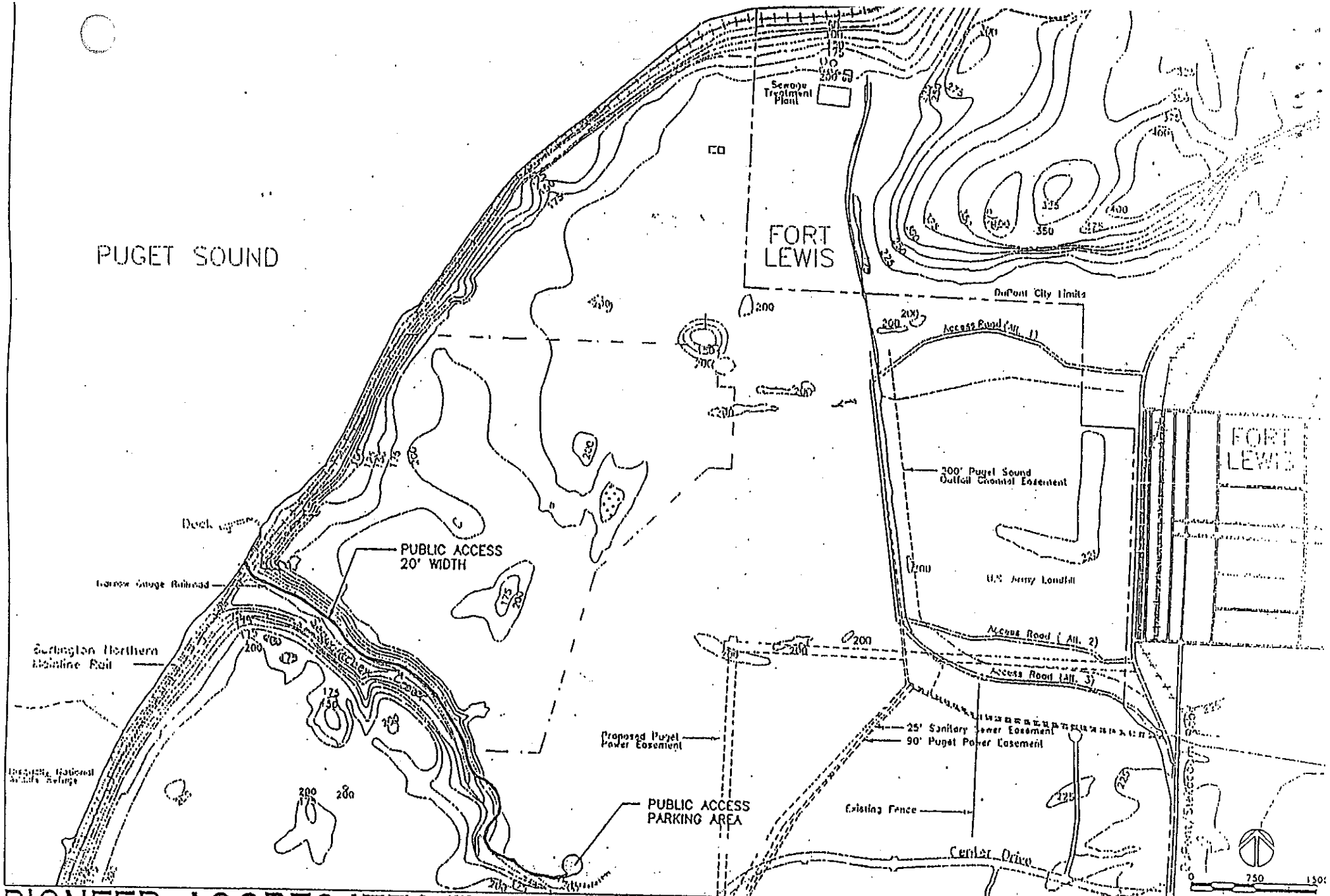
PRESTON THORGRIMSON, SHIDLER
GATES & ELLIS

By_____
James J. Mason
WSBA No. 718
Attorneys for Defendant
City of DuPont

221262

ATTACHMENT H

PUBLIC ACCESS PLAN



PIONEER AGGREGATES

DUPONT, WASHINGTON

LEGEND:

- DUPONT CITY LIMITS
- ROADS
- LEASE LINE
- SIZE AND LOCATION OF PARKING AREA MAY VARY BASED ON SITE CONDITIONS.

Public Access

ATTACHMENT I

SIGN INSTALLATION DETAIL



5' TO GRADE

ATTACH SIGN TO POST WITH TWO 5/16 GALVANIZED LAG BOLTS WITH WASHERS

PRE-PRINTED PLASTIC SIGN

8'- 4X4 CEDAR OR PRESSURE-TREATED POST SET 3' INTO HOLE

KING COUNTY
WETLAND/STREAM SIGN INSTALLATION DETAIL

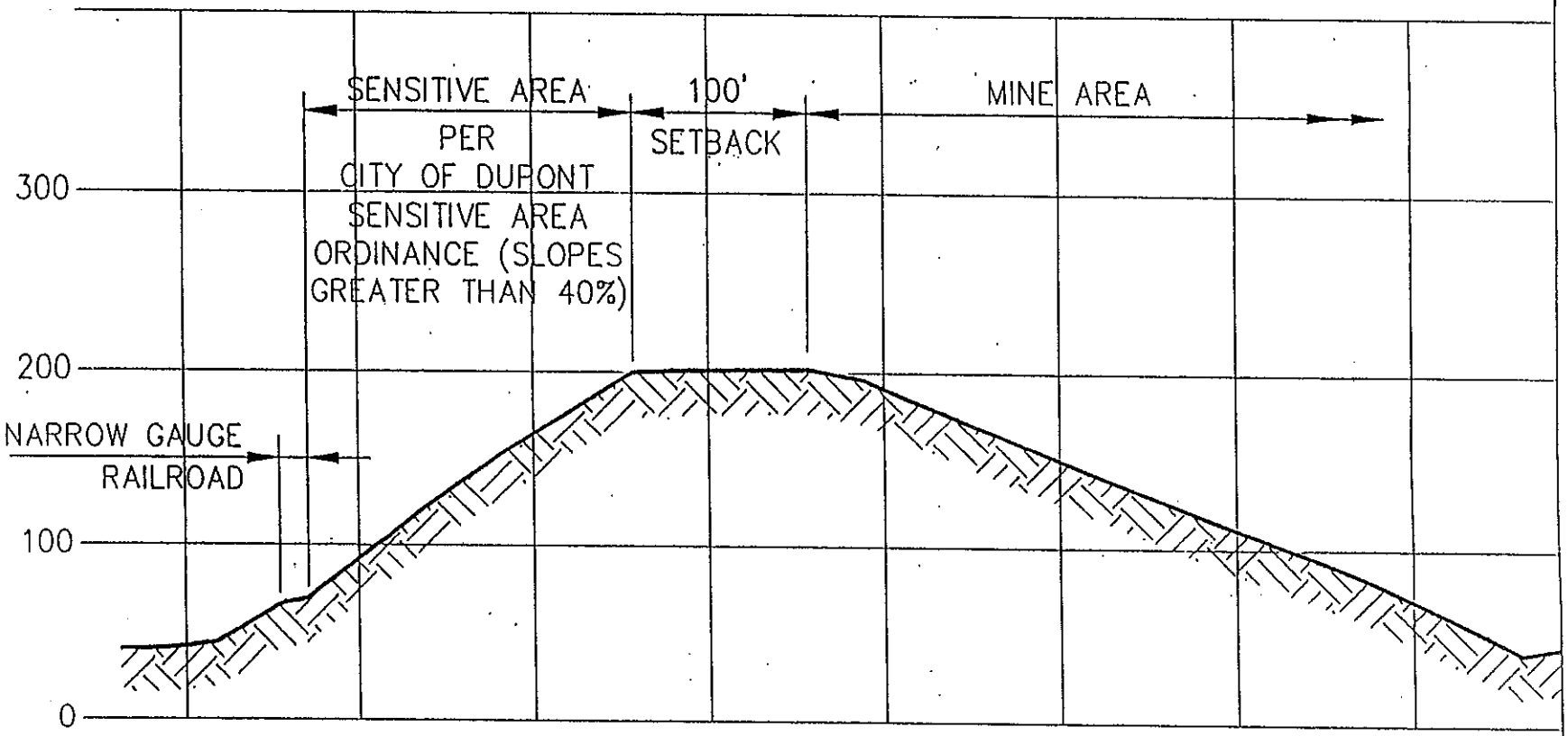
- The Wetland/Stream sign shall be posted at the boundary between the Sensitive Area Buffer, Setback Area or Setback Tract and the Building Setback Area.
- One sign shall be posted per lot for every 150-feet of Sensitive Area

ATTACHMENT J

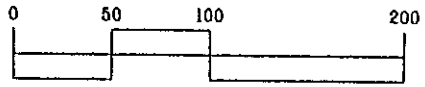
SEQUALITCHEW CREEK SETBACK

Harris Group Inc.

PIONEER AGGREGATES
SEQUALITCHEW CREEK
SENSITIVE AREAS
SHEET 5 OF 5



SECTION A



GRAPHIC SCALE
1 inch = 100 ft

ATTACHMENT K

ASPHALT AND CONCRETE PLANT COVENANT

Filed for Record at Request of:
After Recording Mail to:
HILLIS CLARK
MARTIN & PETERSON, P.S.
Attn: Ann M. Gygi
500 Galland Building
1221 Second Avenue
Seattle, Washington 98101-2925

THIS SPACE PROVIDED
FOR RECORDER'S USE:

<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<

DECLARATION RESTRICTING USE OF PROPERTY

THIS DECLARATION is made this ____ day of _____, 1994 by WEYERHAEUSER REAL ESTATE COMPANY, a Washington corporation ("Declarant").

RECITALS

A. Declarant is the owner of certain real property located in the City of DuPont, in Pierce County, Washington, more particularly described on the attached Exhibit A which is referred to herein as the "Property."

DECLARATION

1. Declaration of Restriction. Declarant hereby declares and impresses a covenant on the Property for a period of ninety-nine years from December 25, 1994, prohibiting construction of an asphalt plant or concrete plant anywhere on the Property.

2. Duration. For ninety-nine years, this Declaration shall run with and bind the Property, and shall inure to the benefit of and shall be enforceable by the City of DuPont to the extent provided by law. This Declaration is binding upon the Declarant's legal representatives, heirs, successors, and assigns. Every purchaser or grantee of any interest (including, without limitation, a security interest) in the Property, by acceptance of a deed or other conveyance therefor, thereby agrees that this Declaration is binding upon their use of the Property for the duration of the ninety-nine year period described above.

EXECUTED the day and year first above written.

WEYERHAEUSER REAL ESTATE COMPANY

By_____
Its_____

By_____
Its_____

STATE OF WASHINGTON)
) ss.
COUNTY OF KING)

On this ____ day of _____, 1994, before me, the undersigned, a Notary Public in and for the State of Washington, duly commissioned and sworn, personally appeared _____ and _____, to me known to be the _____ and _____, respectively, of WEYERHAEUSER REAL ESTATE COMPANY, a Washington corporation, the corporation that executed the foregoing instrument, and acknowledged the said instrument to be the free and voluntary act and deed of said corporation, for the uses and purposes therein mentioned, and on oath stated that they were authorized to execute the said instrument.

WITNESS MY HAND AND OFFICIAL SEAL hereto affixed the day and year first above written.

_____
Name _____
NOTARY PUBLIC in and for the
State of Washington, residing
at _____.
My commission expires _____.

EXHIBIT A TO DECLARATION RESTRICTING PROPERTY
LEGAL DESCRIPTION OF DECLARANT'S PROPERTY

THAT portion of Sections 22 and 23, Township 19 North, Range 1 East, W.M., Pierce County, Washington, more particularly described as follows:

BEGINNING at the Southeast corner of said Section 22;

THENCE along the South line of said Section 22,
N 87°49'38" W, 457.99 feet to the centerline of Sequalitchew Creek;

THENCE along said centerline, the following bearings and distances:

N 13°28'38" W, 129.14 feet;
N 41°18'14" W, 71.97 feet;
N 29°10'44" W, 239.19 feet;
N 34°50'25" W, 282.11 feet;
N 51°48'54" W, 221.02 feet;
N 55°46'05" W, 226.00 feet;
N 79°32'49" W, 267.29 feet;
N 62°09'45" W, 257.03 feet;
N 52°28'56" W, 257.90 feet;
N 36°30'27" W, 150.34 feet;
N 45°47'01" W, 43.05 feet;
N 29°18'46" W, 131.07 feet;
N 74°09'12" W, 73.54 feet;
N 70°33'10" W, 201.30 feet;
N 42°11'19" W, 83.69 feet;
N 52°39'53" W, 105.03 feet;

N 62°16'24" W, 483.82 feet to the Southeasterly Right-of-Way margin of the Burlington Northern Railroad;

THENCE Northeasterly along said Southeasterly Right-of-Way margin, the following bearings and distances:

N 35°15'30" E, 259.82 feet to a point of curvature;

Northeasterly 489.60 feet along the arc of a tangent curve to the right, having a radius of 4197.28 feet, through a central angle of 06°41'00" to a point of tangency;

N 41°56'30" E, 227.65 feet;
S 87°57'48" E, 156.43 feet;
N 41°56'30" E, 59.37 feet;
N 87°57'48" W, 215.01 feet;
N 02°02'12" E, 34.39 feet;
N 41°56'30" E, 188.14 feet to a point of spiral curvature;

N 41°22'48" E, along the spiral chord, 168.96 feet to a point of curvature;

Northeasterly 654.07 feet along the arc of said curve to the left, having a radius of 2897.93 feet, the radius point of which bears N 49°44'18" W, through a central angle of 12°55'55" to a point of spiral curvature;

N 26°12'42" E, along the spiral chord, 168.96 feet to a tangency;

N 25°39'00" E, 484.70 feet to a point of curvature;

Northeasterly 650.18 feet along the arc of a tangent curve to the right, having a radius of 4264.28 feet, through a central angle of 08°44'09" to a point lying 600 feet South (when measured at right angles from) the North line of said Section 22;

THENCE along a line parallel with and 600 feet South of said North line, S 88°53'04" E, 1253.64 feet to the East line of said Section 22;

THENCE along a line parallel with and 600 feet South of the North line of said Section 23, S 88°53'04" E, 2388.86 feet;

THENCE S 02°06'11" W, 450.07 feet;

THENCE S 88°53'04" E, 200.03 feet;

THENCE S 02°06'11" W, 921.50 feet;

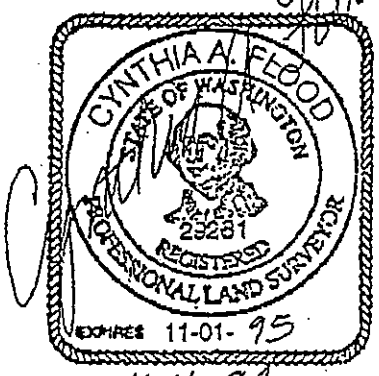
THENCE N 88°24'40" W, 272.74 feet;

THENCE S 47°45'56" W, 1770.31 feet;

THENCE S 16°28'48" W, 2207.74 feet;

THENCE N 88°47'45" W, 500.26 feet to the POINT OF BEGINNING.

See attached Exhibit "X".



5-16-94

INDIVIDUALS

Pioneer Aggregates South Parcel Draft Environmental Impact Statement (EIS)

Comment Form

Input from the public regarding the Pioneer Aggregates South Parcel Project EIS is welcome. Please submit this form to share your comments. Note: Submitted comment forms are subject to the Public Records Act (RCW 42.56).

Date
7/22/2024

First Name *
Elizabeth

Last Name *
Abbott

Are you a resident of the City of DuPont, WA? *
- (●) Yes
- ( ) No

Are you a business owner? *
- ( ) Yes
- (●) No

Are you part of an Agency or Organization? *
- ( ) Yes
- (●) No
- ( ) Not relevant to my input

If you have concerns regarding the EARTH, please describe them below.

If you have concerns regarding the AIR QUALITY, please describe them below.
I have concerns regarding on the taken down trees and how this will impact the future of our air quality. 1 EA

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.
Very concerned regarding the possibility of the ground water being contaminated. 2 DS

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.
Will this impact the creek? Cause the creek to be drained or dry up? How will this impact the animals that rely on the creek? 3 DS

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.
I have concerns regarding the impact on destroying the environment for the grey squirrel, contaminating of the water impacting the environment for the animals and the people around the site. 4 EA

If you have concerns regarding NOISE, please describe them below.

If you have concerns regarding LAND USE, please describe them below.

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

If you have concerns regarding TRANSPORTATION, please describe them below.

Highly concerned regarding safety of students crossing center street. Where will access of transportation to site be? Site is too close to school.

If you have OTHER concerns not listed above, please describe them below.

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

(SEPA2021-002 comment period 6/14/2024-7/15/2024)

Pioneer Aggregates South Parcel Draft Environmental Impact Statement (EIS)

Comment Form

Input from the public regarding the Pioneer Aggregates South Parcel Project EIS is welcome. Please submit this form to share your comments. Note: Submitted comment forms are subject to the Public Records Act (RCW 42.56).

Date

7/21/2024

First Name *

Mesha

Last Name *

Albone

Are you a resident of the City of DuPont, WA? *

- (●) Yes
- ( ) No

Are you a business owner? *

- ( ) Yes
- (●) No

Are you part of an Agency or Organization? *

- ( ) Yes
- (●) No
- ( ) Not relevant to my input

If you have concerns regarding the EARTH, please describe them below.

Sequalitchew creek is an environmentally sensitive area. My family and I live here right at the trailhead. We do not want our home to be damaged, destroyed, or exposed to the risks that come with mining including erosion, fire, and drought. 1 EA

If you have concerns regarding the AIR QUALITY, please describe them below.

Since my family and I live here I do not want them or myself to be exposed to the potential pollution associated with mining. 2 EA

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.

If Sequalitchew creek or the Vashon Aquifer is drained for months out of the year I am extremely concerned about the risk of drought and increased risk of fire in our area.

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.

If Sequalitchew creek or the Vashon aqueduct is drained for months out of the year I am extremely concerned about the risk of drought and increased risk of fire in our area. Furthermore, this area is home to various animals and critters that rely on the water for life. 3 DS EA

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.

If Sequalitchew creek or the Vashon aqueduct is drained for months out of the year I am extremely concerned about the risk of drought and increased risk of fire in our area. Furthermore, this area is home to various animals and critters that rely on the water for life. I do not want to displace the wildlife in our area. I do not believe this project is worth it. 4 EA

If you have concerns regarding NOISE, please describe them below.

I do not want our peaceful life interrupted with the noises associated with mining. Please DO NOT proceed with this project. 5 EA

If you have concerns regarding LAND USE, please describe them below.

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

If you have concerns regarding TRANSPORTATION, please describe them below.

If you have OTHER concerns not listed above, please describe them below.

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

(SEPA2021-002 comment period 6/14/2024-7/15/2024)

Pioneer Aggregates South Parcel Draft Environmental Impact Statement (EIS)

Comment Form

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Date

7/15/2024

First Name *

MARLEY

Last Name *

ALEXANDER

Are you a resident of the City of DuPont, WA? *

- (●) Yes
- ( ) No

Are you a business owner? *

- ( ) Yes
- (●) No

Are you part of an Agency or Organization? *

- ( ) Yes
- (●) No
- ( ) Not relevant to my input

If you have concerns regarding the EARTH, please describe them below.

This would be one of the worst things we could do to DuPont. Water is a major resource, we all need to keep as much of it as possible and allowing even the idea of having less of for our community would be devastating to all that share this earth. Once the water is gone we can not replace it. 1 EA

If you have concerns regarding the AIR QUALITY, please describe them below.

Our air is polluted enough already. Doing anything to our community to make it worse is a really bad idea. We need more trees and protected wetlands. 2 EA

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.

The above comments are relevant for this box too. We need all the water we have and giving up or allowing it to be taken or used would be devastating for our future as a community and a human race. 3 EA

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.

We need to work on keeping pollutants out and preserving not tearing apart or destroying what we have. 4 EA

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.

I always have concerns about all the above. We all coexist. With out one we don't have the other. Everyone plays a roll. We need to protect the animals, fish, trees etc. 5 EA

If you have concerns regarding NOISE, please describe them below.

I love our peaceful community adding more people or projects with definitely change the atmosphere of our town. The noise, the amount of people causing the noise etc. 6 EA

If you have concerns regarding LAND USE, please describe them below.

The land needs to be protected and kept the way it is or protected wetlands. We have already used so much and cut down so many trees. Imagine how many habitats we have already destroyed. We need to stop now. Nothing will remain. 7 EA

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

If you have concerns regarding TRANSPORTATION, please describe them below.

If you have OTHER concerns not listed above, please describe them below.

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

(SEPA2021-002 comment period 6/14/2024-7/15/2024)

Pioneer Aggregates South Parcel Draft Environmental Impact Statement (EIS)

Comment Form

Input from the public regarding the Pioneer Aggregates South Parcel Project EIS is welcome. Please submit this form to share your comments. Note: Submitted comment forms are subject to the Public Records Act (RCW 42.56).

Date

7/6/2024

First Name *

Sonia

Last Name *

Alvarado

Are you a resident of the City of DuPont, WA? *

- (●) Yes
- ( ) No

Are you a business owner? *

- ( ) Yes
- (●) No

Are you part of an Agency or Organization? *

- ( ) Yes
- (●) No
- ( ) Not relevant to my input

If you have concerns regarding the EARTH, please describe them below.

This project if approved, will permanently change the natural environment that exists and will due irreparable damage to the area. 1 EA

If you have concerns regarding the AIR QUALITY, please describe them below.

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.

This project if approved, will permanently change the natural environment that exists and due irreparable damage to our community. Many DuPont residents regularly enjoy this area and this project will permanently change the relationship with the environment in a negative way including reducing water levels permanently. 2 DS EA

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.

This project if approved, will permanently change the natural environment that exists and due irreparable damage to our community. Many DuPont residents regularly enjoy this area and this project will permanently change the relationship with the environment in a negative way. Further it will damage the natural habitats of countless animal and plant species native to DuPont. 3 DS EA

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.

This project if approved, will permanently change the natural environment that exists and due irreparable damage to our community. Many DuPont residents regularly enjoy this area and this project will permanently change the relationship with the environment in a negative way. Further it will damage the natural habitat of countless animal and plant species native to DuPont. 4 DS EA

If you have concerns regarding NOISE, please describe them below.

If you have concerns regarding LAND USE, please describe them below.

This project if approved, will permanently change the natural environment that exists and due irreparable damage to our community. Many DuPont residents regularly enjoy this area and this project will permanently change the relationship with the environment in a negative way. Further, it will be more unnecessary traffic to the area which is often beyond reasonable capacity already.

5 EA

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

This project if approved, will permanently change the natural environment that exists and due irreparable damage to our community. Many DuPont residents regularly enjoy this area and this project will permanently change the relationship with the environment in a negative way.

6 EA

If you have concerns regarding TRANSPORTATION, please describe them below.

If you have OTHER concerns not listed above, please describe them below.

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

(SEPA2021-002 comment period 6/14/2024-7/15/2024)

Pioneer Aggregates South Parcel Draft Environmental Impact Statement (EIS)

Comment Form

Input from the public regarding the Pioneer Aggregates South Parcel Project EIS is welcome. Please submit this form to share your comments. Note: Submitted comment forms are subject to the Public Records Act (RCW 42.56).

Date

7/11/2024

First Name *

Anthony

Last Name *

Amadee

Are you a resident of the City of DuPont, WA? *

- (●) Yes
- ( ) No

Are you a business owner? *

- ( ) Yes
- (●) No

Are you part of an Agency or Organization? *

- ( ) Yes
- (●) No
- ( ) Not relevant to my input

If you have concerns regarding the EARTH, please describe them below.

If you have concerns regarding the AIR QUALITY, please describe them below.

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.

As a 20 year resident of DuPont it appears CalPortland continues to attempt to expand their operation at the expense of the groundwater and aquifer. The loss of groundwater will adversely impact vegetation resulting in dry area ideal for brushfires during to hot summer months.

1 EA

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.

The lack of fresh water flowing into the marshlands will effect the mix of salt/fresh water balance resulting in loss of plant life and shellfish impacting the food chain for other species at the top.

2 DS EA

If you have concerns regarding NOISE, please describe them below.

If you have concerns regarding LAND USE, please describe them below.

Cal Portland's removal of topsoil and trees to obtain aggregate will expose the soil to toxins which will adversely effect the regrowth of trees and other vegetation resulting in further erosion and possible landslides within the area

3 EA

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

If you have concerns regarding TRANSPORTATION, please describe them below.

If you have OTHER concerns not listed above, please describe them below.

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

(SEPA2021-002 comment period 6/14/2024-7/15/2024)

Pioneer Aggregates South Parcel Draft Environmental Impact Statement (EIS)

Comment Form

Input from the public regarding the Pioneer Aggregates South Parcel Project EIS is welcome. Please submit this form to share your comments. Note: Submitted comment forms are subject to the Public Records Act (RCW 42.56).

Date

7/11/2024

First Name *

Simone

Last Name *

Amadee

Are you a resident of the City of DuPont, WA? *

- (●) Yes
- ( ) No

Are you a business owner? *

- ( ) Yes
- (●) No

Are you part of an Agency or Organization? *

- ( ) Yes
- (●) No
- ( ) Not relevant to my input

If you have concerns regarding the EARTH, please describe them below.

As a 20 yr DuPont resident, it has come to my attention that CalPortland wants to expand their mining operations to the detriment of DuPont and would have catastrophic & irreversible effects on our community, environment and wildlife. Dewatering the Vashon Aquifer will have devastating effects on our environment and community and cause the slopes of our beloved Sequalitchew Creek Trail to go dry and vegetation will die as the seeps will be eliminated. The seeps maintain the lush riparian environment and make up the creek flow.

1 DS EA

If you have concerns regarding the AIR QUALITY, please describe them below.

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.

Sequalitchew Creek will go dry for approximately five months each year during the hottest part of the year. The City of DuPont has used the Vashon Aquifer as potable drinking water in the past and still has a water right to the aquifer it wants to keep for future growth.

2 DS EA

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.

The water table of West Edmond Marsh will be lowered up to 9 feet. Other wetlands in DuPont will be lowered up to two feet.

3 DS EA

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.

Animals will be displaced, as creeks dry up fish will go away, plants will dry up & not to mention that this dry environment highly increases fire danger!

4 EA

If you have concerns regarding NOISE, please describe them below.

If you have concerns regarding LAND USE, please describe them below.

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.

Our beloved Sequalitchew Creek Trail
will no longer be the beautiful

5 EA

lush trail that we are all accustomed to and the babbling creek will dry up & be gone, taking vegetation & wildlife with it.

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

If you have concerns regarding TRANSPORTATION, please describe them below.

If you have OTHER concerns not listed above, please describe them below.

I am 100% against this mine expansion & draining of the Vashon aquifer for all the reasons above & urge the City of DuPont to NOT approve CalPortland's request.

6
EA

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

(SEPA2021-002 comment period 6/14/2024-7/15/2024)

Pioneer Aggregates South Parcel Draft Environmental Impact Statement (EIS)

Comment Form

Input from the public regarding the Pioneer Aggregates South Parcel Project EIS is welcome. Please submit this form to share your comments. Note: Submitted comment forms are subject to the Public Records Act (RCW 42.56).

Date

7/22/2024

First Name *

Carman

Last Name *

Ambrose

Are you a resident of the City of DuPont, WA? *

- (●) Yes
- ( ) No

Are you a business owner? *

- ( ) Yes
- (●) No

Are you part of an Agency or Organization? *

- ( ) Yes
- (●) No
- ( ) Not relevant to my input

If you have concerns regarding the EARTH, please describe them below.

If you have concerns regarding the AIR QUALITY, please describe them below.

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.

I am concerned about the proposed dewatering of Vashon Aquifer. In our growing community, it is not wise to reduce the amount of potable water for our citizens. Additionally, the environmental impacts to dewatering the aquifer will have countless negative consequences including: loss of vegetation, loss/reduction of wetlands, natural fire protection, lowing the water level of Old Fort Lake, and drying out the Sequalichew Creek area.

1 DS

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.

I am concerned about the impact to our wetlands, creek, seeps, and springs. These water sources are incredibly important to the vegetation and wildlife here. The proposed dewatering will have lasting negative consequences to our environment.

2 DS EA

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.

I am concerned the dewatering of the Vashon Aquifer will negatively impact the plants that rely on the seeps and springs near Sequalichew Creek. Wildlife rely on the water as well as the plants. They will no doubt be negatively impacted. The downstream effects of dewatering the aquifer will be felt throughout our ecosystem.

3 DS EA

If you have concerns regarding NOISE, please describe them below.

If you have concerns regarding LAND USE, please describe them below.

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.

I am concerned about the impact to the Sequalichew Creek Trail area. Our trail system, especially Sequalichew Creek Trail, attracts visitors from all over our region. With less water feeding Sequalichew Creek, the once peaceful lush environment of the trail will be forever changed.

4 EA

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

If you have concerns regarding TRANSPORTATION, please describe them below.

If you have OTHER concerns not listed above, please describe them below.

Please do not approve a mining permit that will destroy our stream, hillside, and wetlands. No mitigations exist, nor is any mitigation proposed, that would protect our environment.

5
EA

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

(SEPA2021-002 comment period 6/14/2024-7/15/2024)

Pioneer Aggregates South Parcel Draft Environmental Impact Statement (EIS)

Comment Form

Input from the public regarding the Pioneer Aggregates South Parcel Project EIS is welcome. Please submit this form to share your comments. Note: Submitted comment forms are subject to the Public Records Act (RCW 42.56).

Date
7/2/2024

First Name *
Krista

Last Name *
Andersin

Are you a resident of the City of DuPont, WA? *
- (●) Yes
- ( ) No

Are you a business owner? *
- ( ) Yes
- (●) No

Are you part of an Agency or Organization? *
- ( ) Yes
- (●) No
- ( ) Not relevant to my input

If you have concerns regarding the EARTH, please describe them below.

If you have concerns regarding the AIR QUALITY, please describe them below.

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.

Dear Director Kincaid,

I am extremely concerned about the proposed CalPortland South Parcel mine expansion and its impact on the groundwater level due to dewatering the Vashon Aquifer. This could significantly affect surrounding vegetation and increase fire danger for our residents, homes, and businesses. It would dry up the seeps along the Sequalitchew Creek Trail, causing the hillside slopes to dry up. I walk this trail with my dogs every week. I love to hear the babbling of the Sequalitchew Creek alongside the trail. If the South Parcel mine expansion receives a permit the creek water alongside the trail would go dry for almost half of the year. Currently, the underground water from the Vashon Aquifer feeds the lush hillside as well as the creek and our wetlands. Please DO NOT approve a mining permit that will destroy our stream, our hillside, and our wetlands IN PERPETUITY. No mitigations exist, nor is any mitigation proposed, that would protect our environment.

The projected drop in the groundwater level of up to 9 feet in Edmonds Marsh is of specific concern. Other areas of concern include the drop in groundwater level in Pond Lake, wetlands 8, 9, and 10, and Old Fort Lake. Additionally, the elimination of the Kettle Wetland and the drying up of seeps and springs feeding Sequalitchew Creek are troubling. This drop in groundwater level will likely dry out the vegetation surrounding the City of DuPont. Climate conditions have worsened since the 2011 Settlement Agreement was prepared. The City of DuPont is surrounded by forests, and climate change is already increasing the risk of fire to our residents. The resulting decrease in the groundwater level from the mine expansion will likely put DuPont residents at an even greater risk of fire danger.

Restoring Sequalitchew Creek does not have to depend on dewatering the Vashon Aquifer. It should be restored without dewatering the Vashon Aquifer. In fact, CalPortland could be a great community partner by funding the restoration WITHOUT dewatering the aquifer. As outlined above, the decrease in groundwater level throughout the area will likely have a significant negative environmental impact on our wetlands, vegetation, and wildlife.

Thank you!
Concerned Citizen

1 DS EA

2 DS

3 DS EA

4 DS EA

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.

If you have concerns regarding NOISE, please describe them below.

If you have concerns regarding LAND USE, please describe them below.

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

If you have concerns regarding TRANSPORTATION, please describe them below.

If you have OTHER concerns not listed above, please describe them below.

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

(SEPA2021-002 comment period 6/14/2024-7/15/2024)

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Date
7/2/2024

First Name *
Jeffery

Last Name *
Anderson

Are you a resident of the City of DuPont, WA? *
- (●) Yes
- ( ) No

Are you a business owner? *
- ( ) Yes
- (●) No

Are you part of an Agency or Organization? *
- ( ) Yes
- (●) No
- ( ) Not relevant to my input

If you have concerns regarding the EARTH, please describe them below.

If you have concerns regarding the AIR QUALITY, please describe them below.

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.

Dear Director Kincaid,

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Thank you!
Concerned Citizen

1 DS EA

2 DS

3 EA

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.

If you have concerns regarding NOISE, please describe them below.

If you have concerns regarding LAND USE, please describe them below.

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

If you have concerns regarding TRANSPORTATION, please describe them below.

If you have OTHER concerns not listed above, please describe them below.

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

(SEPA2021-002 comment period 6/14/2024-7/15/2024)

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Date

6/26/2024

First Name *

Josh

Last Name *

Anderson

Are you a resident of the City of DuPont, WA? *

- (●) Yes
- ( ) No

Are you a business owner? *

- ( ) Yes
- (●) No

Are you part of an Agency or Organization? *

- ( ) Yes
- ( ) No
- (●) Not relevant to my input

If you have concerns regarding the EARTH, please describe them below.

If you have concerns regarding the AIR QUALITY, please describe them below.

The mining and crushing of gravel creates and releases fine particulate matter called Crystalline Silica into the air which will be carried by the wind towards homes and schools. These dangerous particles will permeate homes, and neighborhoods.

1 EA Cal

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.

Dewatering (when groundwater inflows are pumped out to maintain access to mines) can cause a decrease in the surrounding water tables. This decrease, a long with an issue with PFAS

2 DS

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.

DuPont enjoys a very biodiverse environment that is essential in maintaining positive levels of fish/plants/animal populations. Allowing this expansion of mining into the undisturbed area, even if in a limited manner, would greatly impact those levels for generations to come.

3 EA

If you have concerns regarding NOISE, please describe them below.

If you have concerns regarding LAND USE, please describe them below.

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

If you have concerns regarding TRANSPORTATION, please describe them below.

If you have OTHER concerns not listed above, please describe them below.

I understand the need to grow and expand the city of DuPont but I urge the city to balance that need for growth and expansion with considerations being made for our future and quality of life it provides to the uniqueness that is DuPont.

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

(SEPA2021-002 comment period 6/14/2024-7/15/2024)

4
EA

Pioneer Aggregates South Parcel Draft Environmental Impact Statement (EIS)

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Date

7/13/2024

First Name *

Lanss

Last Name *

Anderson

Are you a resident of the City of DuPont, WA? *

- (●) Yes
- ( ) No

Are you a business owner? *

- ( ) Yes
- (●) No

Are you part of an Agency or Organization? *

- ( ) Yes
- (●) No
- ( ) Not relevant to my input

If you have concerns regarding the EARTH, please describe them below.

The Vashon Aquifer helps maintain the intrinsic natural beauty of the Sequalitchew Creek Trail.

1 EA

If you have concerns regarding the AIR QUALITY, please describe them below.

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.

If the water that flows around and down through the trail is stopped the vegetation currently there will not thrive. I and my family walk/run the trail weekly and during the summer it's cool and beautiful! If the water that currently feeds much of the side vegetation is eliminated I'm certain that the beauty of this amazingly beautiful trail will be significantly impacted. And the quality of the natural setting will suffer.

2 DS EA

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.

Surface water is a key component to the current ecosystem along the Sequalitchew Trail. Decreasing that or eliminating that water source will significantly detract from its current state of beauty

3 DS EA

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.

If you have concerns regarding NOISE, please describe them below.

If you have concerns regarding LAND USE, please describe them below.

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

If you have concerns regarding TRANSPORTATION, please describe them below.

If you have OTHER concerns not listed above, please describe them below.

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

(SEPA2021-002 comment period 6/14/2024-7/15/2024)

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Date
7/15/2024

First Name *
Sean

Last Name *
Arent

Are you a resident of the City of DuPont, WA? *
- Yes
- No

What city do you reside in?

Are you a business owner? *
- Yes
- No

Are you part of an Agency or Organization? *
- Yes
- No
- Not relevant to my input

What is the name of the Agency or Organization?
Clover Creek Restoration Alliance

If you have concerns regarding the EARTH, please describe them below.

If you have concerns regarding the AIR QUALITY, please describe them below.

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.
Sequalitchew Creek is groundwater-fed. By dewatering the nearby aquifer, CalPortland puts a nail in the coffin of the Creek.
While the hope is that Sequalitchew lake surface water will one day by directed back into the creek, the cooler groundwater is very much needed to keep temperatures viable for salmon.

1
DS

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.
This move to destroy Sequalitchew Creek is in violation of the Endangered Species Act. Salmon are a protected species, and efforts must be made to restore the habitat here.

2
EA

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.

If you have concerns regarding NOISE, please describe them below.

If you have concerns regarding LAND USE, please describe them below.

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

If you have concerns regarding TRANSPORTATION, please describe them below.

If you have OTHER concerns not listed above, please describe them below.

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

(SEPA2021-002 comment period 6/14/2024-7/15/2024)

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Date
7/22/2024

First Name *
Gloria

Last Name *
Ariosa

Are you a resident of the City of DuPont, WA? *
- (●) Yes
- ( ) No

Are you a business owner? *
- ( ) Yes
- (●) No

Are you part of an Agency or Organization? *
- ( ) Yes
- (●) No
- ( ) Not relevant to my input

If you have concerns regarding the EARTH, please describe them below.
I don't think it's a good idea for the town and the environment to drain our aquifer. Thank you. 1 EA

If you have concerns regarding the AIR QUALITY, please describe them below.

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.
Please do not let Cal Portland drain our aquifer. I think this is a bad idea for the health of the town and environment. STOP this please'! Thanks! 2 EA

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.
I think draining the aquifer will destabilize our environment - streams and wetlands. Stop this please! 3 EA

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.

If you have concerns regarding NOISE, please describe them below.

If you have concerns regarding LAND USE, please describe them below.

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

If you have concerns regarding TRANSPORTATION, please describe them below.

If you have OTHER concerns not listed above, please describe them below.

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

(SEPA2021-002 comment period 6/14/2024-7/15/2024)

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Date
7/15/2024

First Name *
Marriah

Last Name *
Armbruster Daye

Are you a resident of the City of DuPont, WA? *
- (●) Yes
- ( ) No

Are you a business owner? *
- ( ) Yes
- (●) No

Are you part of an Agency or Organization? *
- ( ) Yes
- ( ) No
- (●) Not relevant to my input

If you have concerns regarding the EARTH, please describe them below.
This will destroy the natural habitat. It is not a needed thing to do. We need to start figuring g out how to help Mother Earth, not continue to destroy her. 1 EA

If you have concerns regarding the AIR QUALITY, please describe them below.
Air quality can be poor at times, with all the extra machinery this will not help breathing.
Who will be held accountable for asthma or cancer issues in the years to come? 2 EA

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.
How is this going to affect the water quality? For the humans and the wildlife?! Who is responsible for issues that arise from the water supply? 3 DS

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.
We do. Not need to continue to contaminate the water supply, we have already seen what it does. We need to start looking ahead. 4 DS

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.
How will the vegetation change, will it survive? We know it will change and it won't be for the better. 5 EA

If you have concerns regarding NOISE, please describe them below.
Are we thinking about the increase noise levels. What about the people who have noise sensitivity? They already struggle to be in public, but now they are not safe in their own homes. 6 EA

If you have concerns regarding LAND USE, please describe them below.
This is not the place to destroy thousands of people use this area to reconnect with mother nature. 7 EA

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

If you have concerns regarding TRANSPORTATION, please describe them below.

If you have OTHER concerns not listed above, please describe them below.
How does this affect people's property value. Who covers the cost if they lose value?

8
EA

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

(SEPA2021-002 comment period 6/14/2024-7/15/2024)

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Date
7/15/2024

First Name *
James

Last Name *
Baglio

Are you a resident of the City of DuPont, WA? *
- (●) Yes
- ( ) No

Are you a business owner? *
- ( ) Yes
- (●) No

Are you part of an Agency or Organization? *
- ( ) Yes
- ( ) No
- (●) Not relevant to my input

If you have concerns regarding the EARTH, please describe them below.

If you have concerns regarding the AIR QUALITY, please describe them below.
Air quality will be degraded from this project. The dust will increase and hinder breathing for humans and wildlife.

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.
I'm against this project for the negative impacts on the Groundwater/Aquifer.

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.
I'm against this project for the negative impacts on surface water, streams and wetlands.

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.
I'm against this project for the negative impacts on the fish, plants and wildlife.

If you have concerns regarding NOISE, please describe them below.
I'm against this project for the negative impacts and increase of Noise.

If you have concerns regarding LAND USE, please describe them below.
I'm against this project for the negative impacts on the land use.

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.
I'm against this project for the negative impacts on the visual and aesthetics of this project.

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

1
EA

I'm against this project for the negative impacts on the cultural resources.

If you have concerns regarding TRANSPORTATION, please describe them below.

I'm against this project for the negative impacts on the transportation in DuPont.

If you have OTHER concerns not listed above, please describe them below.

I'm against this project for the negative impacts on the psychological and sociological effects on residents. Need a grocery store and Pickleball courts soon!!

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

(SEPA2021-002 comment period 6/14/2024-7/15/2024)

1 cont

2 EA

Pioneer Aggregates South Parcel Draft Environmental Impact Statement (EIS)

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Date
6/30/2024

First Name *
Ashley

Last Name *
Baird

Are you a resident of the City of DuPont, WA? *
- Yes
- No

What city do you reside in?

Are you a business owner? *
- Yes
- No

Are you part of an Agency or Organization? *
- Yes
- No
- Not relevant to my input

If you have concerns regarding the EARTH, please describe them below.

If you have concerns regarding the AIR QUALITY, please describe them below.

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.
FOCUS ON THE WATER

1
EA

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.

If you have concerns regarding NOISE, please describe them below.

If you have concerns regarding LAND USE, please describe them below.

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

If you have concerns regarding TRANSPORTATION, please describe them below.

If you have OTHER concerns not listed above, please describe them below.

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Date
7/22/2024

First Name *
Paul

Last Name *
Bakke

Are you a resident of the City of DuPont, WA? *
- Yes
- (•) No

What city do you reside in?
Olympia

Are you a business owner? *
- (•) Yes
- No

Where do you do business?
Olympia, Seattle

Are you part of an Agency or Organization? *
- Yes
- No
- (•) Not relevant to my input

If you have concerns regarding the EARTH, please describe them below.

"Reclamation" of mined lands results in habitat that is considerably inferior to the original land, in terms of soil quality, moisture regime, hydrological relationships to the groundwater and to associated wetlands and springs, and potential forest or prairie recovery. You can NEVER restore land to as good a quality as it is before mining, and you cannot reverse ongoing destruction of habitat availability and habitat quality through "restoration." 1 EA

If you have concerns regarding the AIR QUALITY, please describe them below.

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.

The most crucial requirement for fish habitat is water. By dewatering the nearby aquifer, which is hydrologically connected to Sequalichew Creek and to wetlands in the surrounding area, this project will greatly harm fish habitat. It will reduce or eliminate flow in parts of the creek. Reduced flows degrade water quality during crucial times of the year. 2 DS

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.

Dewatering the aquifer to allow deeper mining will reduce the presence and quantity of surface water in Sequalichew Creek and in area wetlands. This is a net loss of habitat and habitat quality to these areas and to the adjacent portions of Puget Sound which cannot be mitigated. 3 DS

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.

This action is incompatible with Puget Sound salmon recovery, as it will degrade a perennial stream entering Puget Sound. Streams such as Sequalichew Creek are refugia during late times of high temperature and low flow, since they are fed by seepage from deep, cool aquifers (see reference, Tague and Grant, 2004).The moist forest surrounding Sequalichew Creek will also be affected, and will be less resilient to drought, less able to shade the creek, and less able to support moisture-reliant plants. 4 EA Cal

If you have concerns regarding NOISE, please describe them below.

If you have concerns regarding LAND USE, please describe them below.

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.

Sequalichew Creek is a major visitor attraction in DuPont. Do not let the experience be degraded by loss of forest, drying up of the creek, and noisy mining activity.

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

If you have concerns regarding TRANSPORTATION, please describe them below.

If you have OTHER concerns not listed above, please describe them below.

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

Tague and Grant 2004_A geological framework for interpreting the low-flow regimes of Cascade streams, Willamette River Basin, Oregon.pdf 331.13KB

(SEPA2021-002 comment period 6/14/2024-7/15/2024)

WATER RESOURCES RESEARCH, VOL. 40, W04303, doi:10.1029/2003WR002629, 2004

A geological framework for interpreting the low-flow regimes of Cascade streams, Willamette River Basin, Oregon

Christina Tague

Department of Geography, San Diego State University, San Diego, California, USA

Gordon E. Grant

Pacific Northwest Research Station, USDA Forest Service, Corvallis, Oregon, USA

Received 26 August 2003; revised 14 January 2004; accepted 9 February 2004; published 28 April 2004.

[1] In ungauged basins, predicting streamflows is a major challenge for hydrologists and water managers, with approaches needed to systematically generalize hydrometric properties from limited stream gauge data. Here we illustrate how a geologic/geomorphic framework can provide a basis for describing summer base flow and recession behavior at multiple scales for tributaries of the Willamette River in Oregon. We classified the basin into High Cascade and Western Cascade provinces based on the age of the underlying volcanic bedrock. Using long-term U.S. Geological Survey stream gauge records, we show that summer streamflow volumes, recession characteristics, and timing of response to winter recharge are all linearly related to the percent of High Cascade geology in the contributing area. This analysis illustrates how geology exerts a dominant control on flow regimes in this region and suggests that a geological framework provides a useful basis for interpreting and extrapolating hydrologic behavior. *INDEX TERMS:* 1860 Hydrology: Runoff and streamflow; 1824 Hydrology: Geomorphology (1625); 1884 Hydrology: Water supply; *KEYWORDS:* geologic framework, low flow, Oregon Cascades, recession analysis

Citation: Tague, C., and G. E. Grant (2004), A geological framework for interpreting the low-flow regimes of Cascade streams, Willamette River Basin, Oregon, *Water Resour. Res.*, *40*, W04303, doi:10.1029/2003WR002629.

1. Introduction

[2] Predicting streamflows in ungauged catchments is emerging as a major scientific and societal challenge, prompting the International Association of Hydrological Sciences (IAHS) to declare the years 2003–2012 as the IAHS Decade on Predictions in Ungauged Basins (PUB). Providing information on distributed streamflow is often limited by the availability and spatial distribution of long term streamflow records. Within the United States, stream gauge networks are often sparse in large tracts of undeveloped land and wilderness areas. The western slopes of the Cascade Mountains in Oregon are such a region. Here the sharply seasonal Mediterranean climate results in high winter precipitation and an extended summer drought, and translates into a streamflow pattern of high winter peaks and very low summer flows. There is, however, considerable spatial variability in the degree to which streamflow reflects the seasonal precipitation pattern, with some streams having muted winter peaks and sustained high summer base flows [*Grant*, 1997]. Climate alone cannot explain this behavior. Moreover, the existing streamflow network does not adequately capture this variability, in large part because the importance of the spatial structure of streamflow production in this region has not been recognized until now.

[3] In this paper, we characterize flow regimes of western Oregon based on a geological framework. Conceptually, our approach follows *Winter* [2001], who advocates hydrologic comparison based on geologic-geomorphic landscape attributes. We examine streamflow regimes in the westward draining tributaries of the Willamette River system and systematically relate spatial differences in streamflow to differences in geology and geomorphology within the region. In particular we characterize flow regimes with respect to a broad geologic partitioning of the Cascade Mountains into the older, deeply dissected Western Cascades and the younger, relatively undissected High Cascades [*Sherrod and Smith*, 2000; *Walker and MacLeod*, 1991]. The lateral contiguity of two lithologically similar but geomorphically and age-distinct geological terranes provides a unique opportunity to examine geological control of hydrologic regimes at the landscape scale.

[4] Using data compiled from long-term streamflow records for both High Cascade and Western Cascade streams, we examine a population of streamflow volumes, hydrograph recession curves, and other time series measures. We also examine the extent to which flow regimes of the larger tributaries of the Willamette and main stem Willamette reflect this underlying geological framework. We focus on summer base flow responses because these flows most dramatically highlight differences between the two geologic provinces, and have significant ramifications for water resource management and the ecology of the region.

2. Background

2.1. Regional Setting

[5] The western slopes of Oregon's Cascade Mountains are drained by large westward flowing rivers that are

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tributaries to the northward flowing Willamette River. Within the Cascades, these large rivers generally flow perpendicular to the strike of two distinct geologic provinces: the Western and High Cascades (Figure 1). In both provinces 80% of the precipitation falls during the winter months. Most of this precipitation falls as snow above 1500 m and as rain below 400 m, with a mix of rain and snow at intermediate elevations. By virtue of their higher elevations, the High Cascades are more snow-dominated than the Western Cascades, although the highest elevations of the Western Cascades typically retain snowpacks until late into the spring, similar to the High Cascades. Winter storms for both regions result from broad frontal systems; convective systems and thunderstorms are generally limited to summer months and though locally intense represent a very small fraction of the annual water budget.

[6] The Western Cascades are dominated by deeply weathered, layered, basaltic and andesite lavas and volcaniclastic flows of mostly Miocene age. The steep, highly dissected landscape of the Western Cascades ranges in elevation from 400 to 1800 m and reflects significant erosion by fluvial, glacial, and mass movement processes. The region is typically well-drained, with soils 1–3 m in depth of moderate to high surface hydraulic conductivities grading vertically to shallow subsurface confining layers of clay, saprolite and unweathered bedrock of generally low permeability. Drainage densities are high, averaging 3 km/km^2, further reflecting an efficient well-organized drainage system [*Wemple et al.*, 1996].

[7] The High Cascades form a broad volcanic platform, fault-bounded in places to the west and east, and represent a much younger geological terrane. Higher in elevation but lower in relief than the Western Cascades, the High Cascades primarily reflect recent constructional volcanism rather than erosional forms. Rock type is dominated by low gradient basaltic and andesitic lava flows, cinders, pumice, and volcanic ash, mostly from shield volcanoes, cones, and vents of Plio-Pleistocene age or younger. Blocky aa-type basalt flows are often visible at the surface in areas of the High Cascades. The young age of the surficial deposits results in poor soil development. Surface and subsurface hydraulic conductivities in young volcanic deposits are exceptionally high due to highly porous and permeable volcanic layers. Many areas of the High Cascades appear to lack surface drainage systems, and drainage density in the High Cascade province is significantly lower than in the Western Cascade province, averaging 1–2 km/km^2 [*Grant*, 1997]. Several High Cascade streams are headed by large, voluminous springs, indicating the existence of extensive, well-developed subsurface drainage systems.

2.2. Previous Research on Cascade Mountain Hydrology

[8] The earliest work on the hydrology of the Cascades is probably that of *Stearns* [1929], who documented the importance of spring flow from deep volcanic aquifers as contributing to the base flow of the McKenzie River. Most of the hydrologic research since then, including virtually all studies of the impacts of forest management on streamflow, has focused on Western Cascade systems and has demonstrated the importance of shallow, rapid subsurface flow as a factor contributing to high peak flows and flow variability [*Rothacher*, 1965, 1970, 1973; *Harr*, 1976a, 1976b, 1986; *Harr et al.*, 1975, 1982; *Jones and Grant*, 1996].

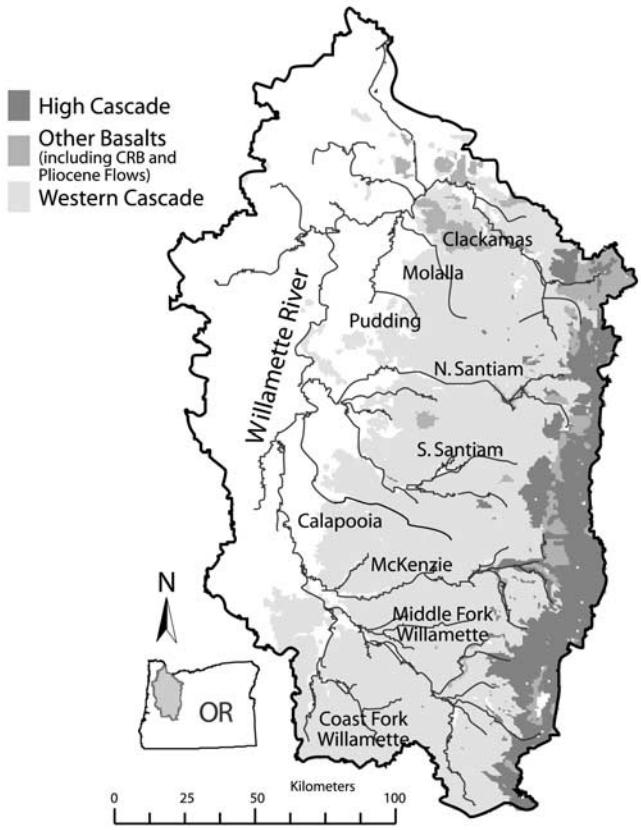

Figure 1. Willamette River Basin, Oregon, showing approximate location of High and Western Cascade geologic divide. Gray scale represents percent High Cascade geology in contributing area of east-west trending subbasins.

[9] High Cascade streams, in contrast, have received much less attention. Virtually all hydrologic research has focused on characterizing High Cascade snowmelt and spring-dominated streams on the eastern slopes of the range [*Manga*, 1996, 1997, 1999; *Gannett et al.*, 2003]. Although they share a broadly similar geology, there are important differences between the eastern and western slopes of the Cascades particularly with respect to the amount of annual precipitation (westside ~2000 to 3800 mm; eastside ~750–1650 mm [*Taylor and Hannan*, 1999]).

3. Methods

3.1. Geological Classification

[10] For the purposes of this study we classified rock units as High Cascade or Western Cascade based on rock type and age, using a 1:500,000 scale geologic map of Oregon [*Walker and MacLeod*, 1991] (Figure 1). Volcanic rocks greater than 8 Myr old were classified as Western Cascade, volcanic rocks younger than 2 Myr old were classified as High Cascade, and rocks between 2 and 8 Myr old were classified in one or the other category based on topographic position (i.e., ridge-capping basalts) or geography (i.e., proximity to High Cascade vents or

Table 1. Watersheds

Basin and Watershed	USGS Gauge Number	Drainage Area, mi^2	Elevation, feet	Percent High Cascade	Period of Record	Mean August, mm/month	Mean Annual, mm/year	Slope b	Intercept a	R2	RMSE	n
Middle Fork Willamette												
Fall	14150300	118	844	0%	1963.09.01–1999.09.30	11.23	1210.21	1.39	−3.40	0.78	0.93	3341
Hills	14144900	52.7	1631	9%	1958.10.01–1981.10.01	17.96	1433.72	1.53	−3.90	0.74	0.88	3211
Salmon	14146500	117	1462	52%	1986.10.01–1994.06.13	36.89	2150.63	2.04	−5.56	0.70	0.89	1892
Salt	14146000	113	1246	63%	1933.10.01–1951.09.30	30.68	1130.31	2.02	−5.33	0.64	0.95	3175
McKenzie												
Gate	14163000	47.6	764	0%	1966.10.01–1990.09.30	17.23	1103.92	1.46	−3.78	0.78	0.87	3313
Blue (at Tidbits)	14161100	45.8	1387	3%	1963.09.01–1999.09.30	13.60	2130.37	1.38	−3.50	0.80	0.90	3251
Blue	14161000	11.5	1960	3%	1947.10.01–1955.09.30	19.54	1700.99	1.20	−3.31	0.75	0.87	1950
Lookout	14161500	24.1	1377	16%	1963.09.01–1999.09.30	17.76	1689.55	1.42	−3.81	0.79	0.87	3226
Springfield[a]	14164000	1066	554	40%	1911.05.01–1915.03.31	56.15	2829.25	2.06	−5.89	0.61	0.85	2008
Coburg[a]	14165500	1337	392	46%	1944.10.01–1972.09.30	49.57	2678.66	2.18	−6.20	0.73	0.89	3268
Walterville[a]	14163900	1081	600	58%	1989.10.01–1999.09.30	32.94	1850.81	1.87	−4.89	0.52	1.36	2292
Leaburg[a]	14163150	1030	710	61%	1989.10.01–1999.09.30	30.28	1787.63	1.88	−4.82	0.54	1.32	2396
Vida[a]	14162500	930	856	68%	1924.10.01–1999.09.30	71.32	1750.04	2.44	−6.87	0.69	0.93	3080
S.F. McKenzie (above Cougar)	14159200	160	1710	68%	1957.10.01–1987.09.30	44.44	1191.64	2.30	−6.32	0.71	0.94	3320
Horse	14159100	149	1426	83%	1962.10.01–1969.09.30	59.63	1532.56	2.73	−7.59	0.60	0.89	1649
Mckenzie Bridge[a]	14159000	348	1419	88%	1910.10.01–1994.09.30	101.40	2084.72	3.02	−9.28	0.53	0.83	2458
Clear[a]	14158500	92.4	3015	95%	1937.10.01–1999.09.30	96.59	2853.57	2.10	−7.23	0.60	0.76	3421
Belknap[a]	14158700	146	2602	95%	1957.10.01–1962.09.30	93.17	1485.27	3.16	−9.85	0.63	0.74	1220
South Santiam												
Quartzville	14185900	99.2	1050	3%	1965.08.10–1999.09.30	43.39	1837.78	1.38	−3.47	0.80	0.93	3321
North Santiam												
L.N. Santiam	14182500	112	655	5%	1931.10.01–1999.09.30	16.59	2003.09	1.37	−3.42	0.81	0.90	3268
E. Humbug	14178700	7.32	2050	0%	1978.08.01–1994.07.10	15.01	1316.71	1.49	−3.81	0.82	0.86	3346
Breitenbush	14179000	108	1574	46%	1932.06.01–1987.10.01	46.27	2350.72	1.82	−5.06	0.72	0.91	3313
Santiam	14178000	216	1591	78%	1928.10.01–1999.09.30	64.57	1877.80	2.24	−6.51	0.67	0.90	3215
Clackamas												
Clackamas	14208000	136	2040	82%	1920.04.01–1970.09.30	56.13	1989.92	2.69	−7.46	0.67	0.90	3105
Fish	14209700	45.2	940	3%	1963.09.01–1999.09.30	12.34	1697.19	1.46	−3.54	0.84	0.82	2368
Oak	14208500	54	3140	85%	1915.10.01–1928.09.30	79.97	2091.87	2.30	−7.20	0.47	0.86	2264
Roaring	14209600	42.4	1040	30%	1966.01.28–1968.09.30	41.91	1370.95	1.74	−4.83	0.61	0.94	622

[a]Gauge on main stem.

volcanic centers, location with respect to north-south bounding faults).

3.2. Correspondence Between Geology and Streamflow Volumes

[11] Streamflow records for 22 headwater (third to fifth order) streams from the Western Cascade and High Cascade provinces in the Willamette drainage basin were obtained from the USGS gauge network (Table 1). Historically the USGS has maintained a much denser network of gauges in the Western as opposed to High Cascade region, primarily to predict flood discharges and inflows to reservoirs. All available USGS streamflow sites that contain significant High Cascade contributing area were included in this study, while Western Cascade sites spanning a range of drainage areas were randomly selected to represent this geologic province. With the exception of Oak Grove Fork (site 14208500), no dams or diversions are located above these sites. On Oak Grove Fork, the small storage facility at Timothy Lake is primarily operated as run-of-river and does not significantly affect streamflows. To explore higher-order stream response that integrates both High Cascade and Western Cascade contributing areas, we also included records from 6 USGS gauges located along the main stem of the McKenzie. For each of the available gauges standard long-term low flow statistics, including mean August and mean annual flow, were computed and compared with the proportion of High Cascade geology in the contributing area. These measures were used to describe differences in the magnitude of total and summer flow within the region.

3.3. Recession Analysis

[12] *Brutsaert and Niebert* [1977] developed a method for estimating soil and geomorphic parameters from low flow analysis based on analytical solutions to the Boussinesq equation. The Boussinesq equation describes flow, Q, from an unconfined, horizontal aquifer; Brutsaert and Niebert related parameters a and b in the recession equation (1) to geomorphic and soil characteristics of the aquifer:

$$\frac{dQ}{dt} = -aQ^b \tag{1}$$

Formal recession analysis [*Brutsaert and Niebert*, 1977; *Brutsaert and Lopez*, 1998] requires both that the watershed be reasonably conceptualized as a single unconfined aquifer; and the characteristic response time of the aquifer be less than the period over which significant recharge does not occur. However, *Manga* [1999] found that for an eastside Cascade spring system, aquifer response time was longer than the period without significant recharge. In spite of negligible High Cascade summer precipitation, the period without significant recharge is shorter than might be expected because significant snowmelt recharge typically continues into the summer months. Further, exploratory analysis of recession behavior, as discussed below, suggests

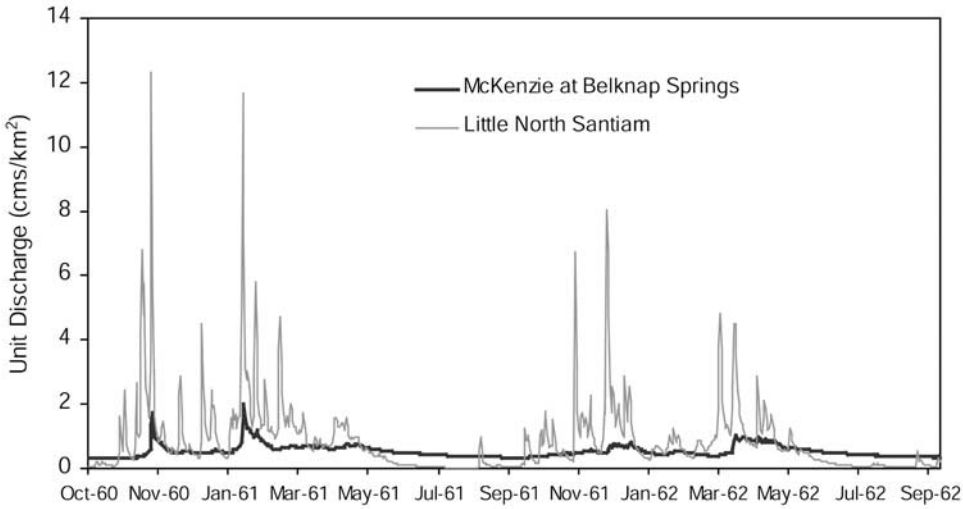

Figure 2. Daily streamflow hydrographs, normalized by drainage area, for a predominantly High Cascade (McKenzie at Belknap) and Western Cascade (Little North Santiam) rivers.

that High Cascades catchments may be better conceptualized as a system of two aquifers (surface and deeper groundwater) rather than as a single aquifer.

[13] Although prerequisite conditions for formal recession analysis were not met in this case, exploratory analysis of the relationship between log(dQ) and log(Q) provides insight into system behavior and may indicate fundamental differences in controlling processes. In particular, changes in the log(dQ) versus log(Q) relationship over the distribution of flows may indicate differences in dominant streamflow generation processes – both between different catchments and for different streamflow periods in the same catchment.

[14] If long term (multiple year) historical streamflow records are used to compute a mean slope of the log(dQ)/log(Q) relationship, this slope reflects the interaction among the time-distribution of recharge, the characteristic response time of the system, and aquifer hydraulic characteristics. Since seasonal patterns of precipitation are relatively similar across the High/Western Cascade region cross-basin differences in average recession behavior (i.e., slope of the logdQ/Q relationship) represent the combined effects of differences in snowmelt-driven recharge and watershed drainage properties. The maximum recession rate for a given streamflow, as described by the upper envelope of the log(dQ)/logQ relationship, should indicate the response of the system with the least impact from previous recharge events. These values should approach the catchment response where time without significant recharge is longer than the characteristic response time of the system. The slope of this envelope curve should therefore approach the recession behavior due primarily to underlying aquifer characteristics.

[15] Hydrograph recessions for each site were extracted from historical streamflow records, with a recession period defined as any period following a recharge event (defined as a decrease in daily 3-day averaged streamflow). Log(dQ/dt) versus log(Q) relationships for all recession periods were plotted and fit to a linear least squares regression model for each site. A first-order difference was used to approximate dQ. The resulting slope and intercept (b and a, respectively, in equation (1)) for all sites was then plotted against proportion of High Cascade geology to examine the extent to which geology defines mean basin recession characteristics.

3.4. Cross-Correlation Analysis

[16] We evaluated the difference in timing of response to winter recharge events between the Western and High Cascades. Visual analysis of High Cascade stream hydrographs suggested a delayed and muted response to winter recharge events relative to Western Cascade systems (Figure 2). Quantification of this delay thus provides another metric to assess how differences in snowmelt and geology define hydrologic response between the two systems. *Manga* [1999], following *Padilla and Pulido-Bosch* [1995], used cross-correlation between spring discharge and discharge from a neighboring surface water-dominated stream to estimate the time lag associated with the spring system. In Manga's study, discharge from the surface water-dominated system was used as a proxy for recharge. Although we did not have neighboring streams with contrasting subsurface and surface hydrology, in this study we estimated the average delay associated with High Cascade systems relative to Western Cascade systems using a similar approach.

[17] Five pairs of low-order High Cascade and Western Cascade streams were selected based on (1) high proportion of either High or Western Cascade geology in contributing area, (2) availability of overlapping time periods for streamflow records, and (3) spatial proximity. Cross correlation between the High Cascade and Western Cascade streams, and autocorrelation for the Western Cascades stream, were computed for each pair using methods described by *Box and Jenkins* [1976]. The average lag between the Western and High Cascade streams was estimated as the shift (in days) of the center of mass of the cross correlation function relative to the autocorrelation function. The center of mass was computed over the range of lags with a positive temporal correlation.

[18] To examine time lag response in higher-order streams incorporating both High Cascade and Western

Cascade influences in their drainage area, this analysis was repeated for the 6 sites along the main stem McKenzie. In this case, an arbitrary Western Cascade stream (Lookout Creek) was selected as the reference stream, and relative delays were determined for each of the 6 sites. The relationship between this delay and percent High Cascade contributing area was then determined.

4. Results

[19] Unit area hydrographs for High Cascade and Western Cascade streams with similar drainage areas reveal the contrasting hydrologic regimes of the two regions (Figure 2). The High Cascade hydrograph (McKenzie River at Belknap) depicts much more uniform flows with muted winter peaks, slower rates of recession, and higher summer base flows that remain nearly constant throughout the summer dry season. Winter flows are only 3–4 times higher than summer flows. In contrast, the Western Cascade stream (Little North Santiam at Mehama) exhibits a much flashier and more variable hydrograph, with winter peak flows that are several orders of magnitude greater than summer base flows.

4.1. Correspondence Between Geology and Streamflow Volumes

[20] Historical averages of low flow volumes show a strong relationship with geology for both low- and higher-order streams. Low-order streams that are predominately sourced in the High Cascades maintain 4–5 times the summer streamflow volumes (per unit drainage area) relative to those primarily sourced in the Western Cascades (Table 1 and Figure 3). Further, when streams draining areas with both High Cascade and Western Cascade rocks are examined, the log-transformed mean August streamflow, normalized by drainage area, shows a near-linear relationship ($R^2 = 0.76$; least squares linear regression is significant at 1% level) with the proportion of High Cascade geology in the contributing area (Figure 3). Mean annual flow, on the other hand, shows no significant relationship with geology which is not surprising given similarities in total annual precipitation over the two regions.

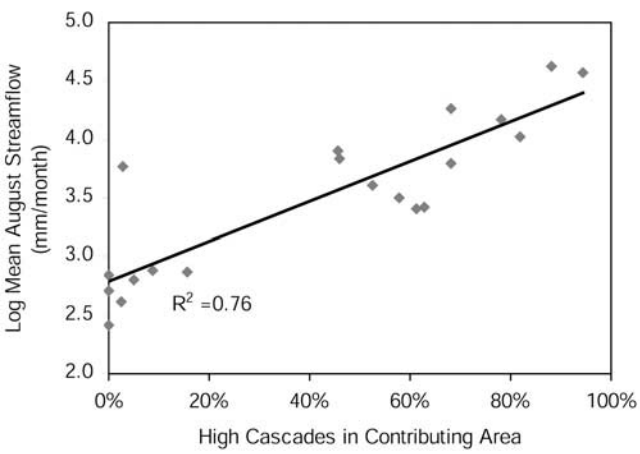

Figure 3. Relationship between mean August streamflow and percent High Cascade geology in contributing area for low-order streams.

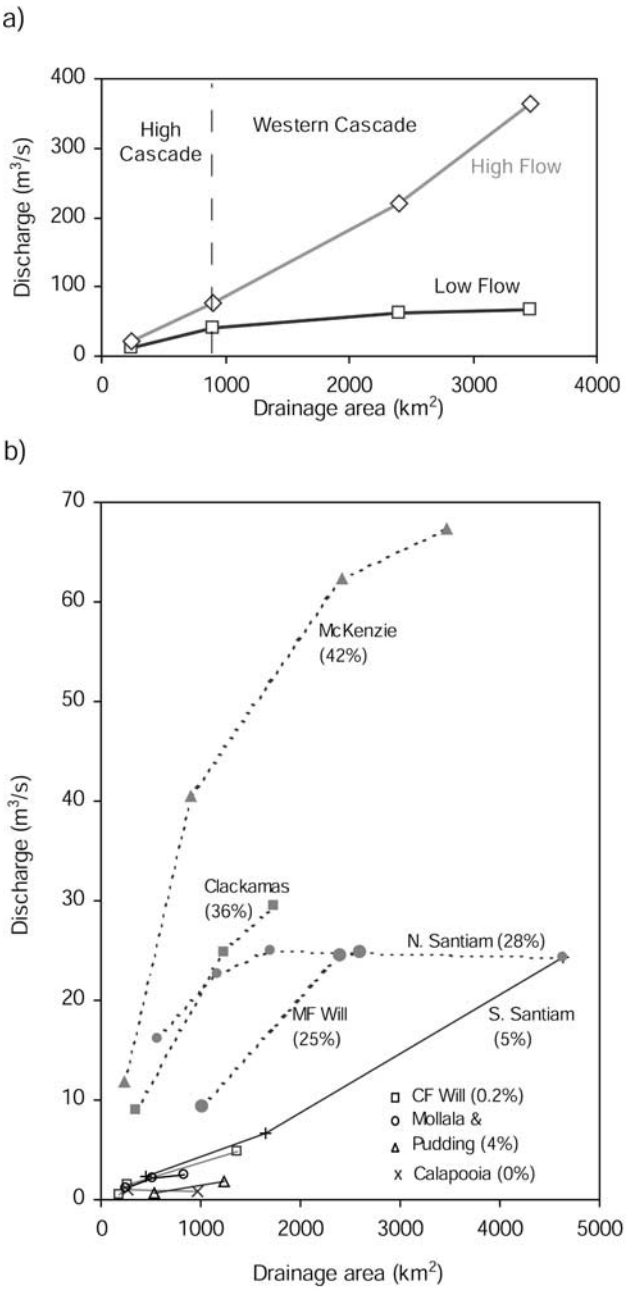

Figure 4. Discharge-drainage area relations showing impact of High Cascade contributions for (a) gauges along the McKenzie River at high (1 March 1950) and low (1 September 1950) flow and (b) east-west trending subbasins of the Willamette at low flow (1 September 1950). Percentages of High Cascade basin area shown in parentheses.

[21] Larger streams such as the McKenzie amass an increasing proportion of Western Cascade geology with longitudinal distance downstream, resulting in a nonlinear discharge-drainage area relationship (Figure 4a). During the summer, most of the water in the McKenzie is sourced from the High Cascades, producing a convex upward trend. During the winter wet season, on the other hand, most streamflow is derived from the surface and shallow subsurface runoff system in the Western Cascades, producing a

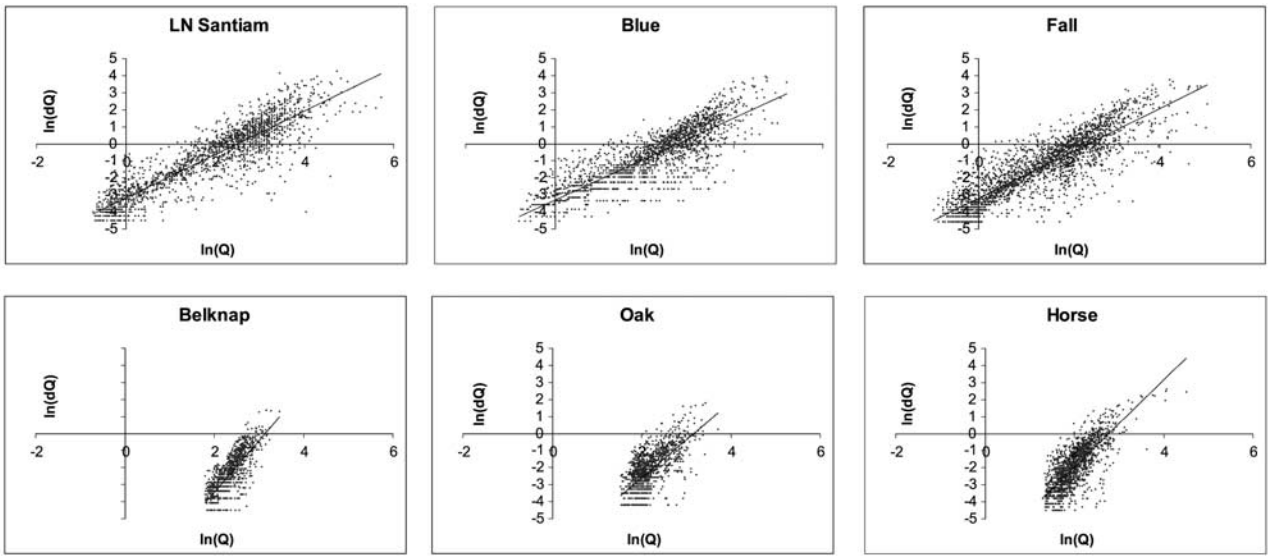

Figure 5. Log(dQ) versus Log(Q) relationships for three predominantly Western Cascade (LN Santiam, Blue, and Fall) and three predominately High Cascade (Belknap, Oak, and Horse) streams.

concave upward relationship between drainage area and discharge. The shape of the discharge versus drainage area curve is quite diagnostic for the proportion of basin area classified as High Cascade for other westward flowing Willamette basins as well (Figure 4b). Basins with a high proportion of High Cascade geology show a characteristic convex upward trend (i.e., McKenzie), with the inflection denoting the boundary between the High and Western Cascade provinces. Basins sourced entirely within the Western Cascades (i.e., S. Santiam), on the other hand, display a linear increase of discharge with drainage area.

4.2. Recession Analysis

[22] The two provinces also differ in characteristic recession behavior, as revealed by the relationship between log(dQ) and log(Q) and the associated linear regression models across the continuum of High and Western Cascade streams. Both stream types maintain a reasonably log-log linear relationship between flow and recession rate, although High Cascade streams appear to have a curvilinear upper envelope, suggesting that the rate of change of flow decreases at higher flows (Figure 5).

[23] These recession characteristics suggest that High Cascade streams more closely resemble the flow behavior of Western Cascade streams at particularly high flows, as indicated by the reduced slope of the log (dQ) versus log (Q) relationship. This pattern of response is consistent with an interpretation of the High Cascade system as comprised of a deep aquifer that dominates the low flow end of the curve, with some shallower subsurface flow paths that become active at higher flows, while Western Cascade response almost entirely reflects the dominance of shallow subsurface flow paths. Intercepts also differ between Western and High Cascade streams with higher intercepts (less negative) associated with the Western Cascades. A higher intercept in the log(dQ) versus log(Q) relationship indicates more rapid recession and thus a more efficient drainage system. Steeper hillslopes and higher drainage densities contribute to this efficiency. In contrast, the many spring-fed High Cascade streams tend to have very flat recessions at the low flow end, hence lower intercepts.

[24] *Brutsaert and Niebert* [1977] argue that the Boussineseq equation will produce a slope of 3 in the log(dQ)/log(Q) relationship for short-time solutions, and 1.5 for longer time solutions. Thus the log(dQ)/log(Q) behavior of

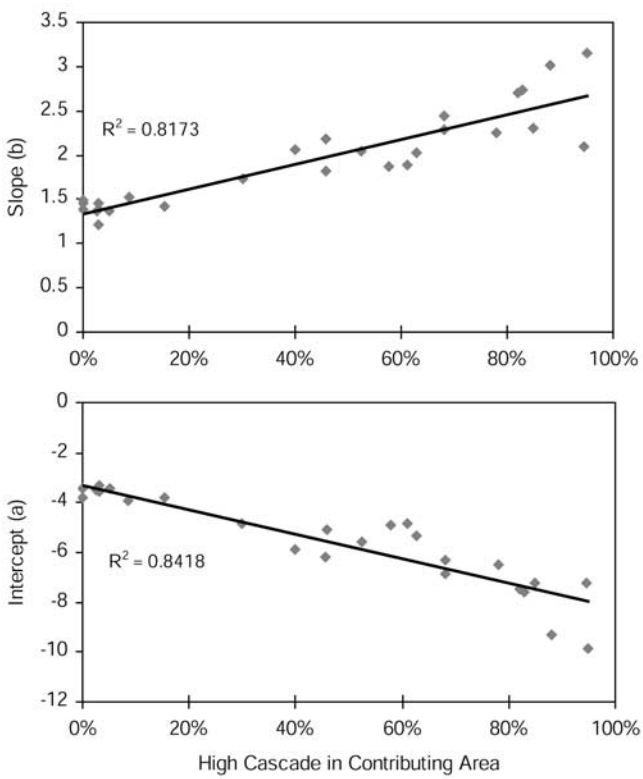

Figure 6. Average slope b and intercept a of log(dQ)/log(Q) relationship with percent High Cascade contributing area.

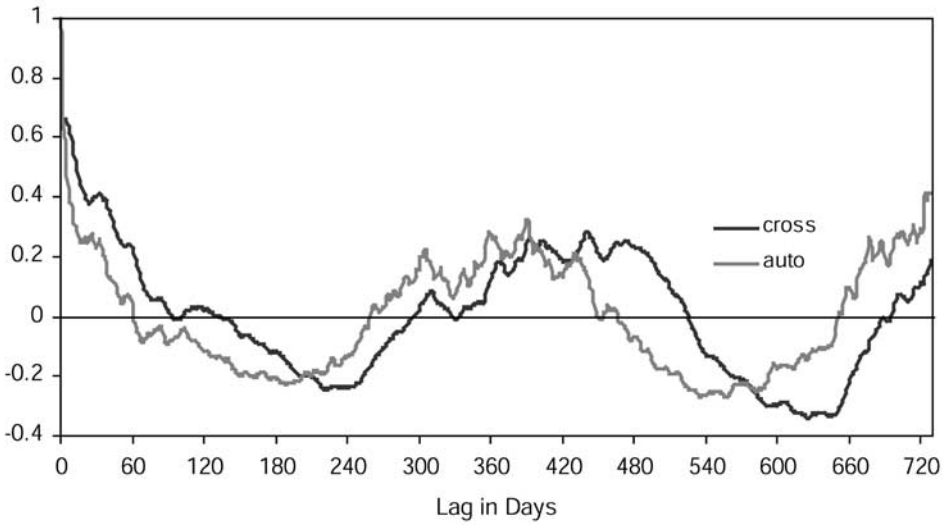

Figure 7. Cross-correlation functions for McKenzie at Clear Lake (High Cascade) against Blue River (Western Cascade); showing shift in days relative to autocorrelation function for Blue River.

systems that respond more quickly (i.e., steep, shallow subsurface aquifers) will generally reflect a slope of 1.5 corresponding to the longer time solution. Mean slope values for High Cascade dominated streams range between 2–3, while slopes for Western Cascade streams are closer to 1.5. High Cascade systems therefore suggest response characteristics of an aquifer that remains close to fully saturated while the mean slope of the Western Cascade streams reflect conditions that are less than fully saturated. At very high flows, slopes of the High Cascade relationship tend to reduce; suggesting the transition to a different (shallow subsurface) flow system with much shorter timescales.

[25] We emphasize that in addition to geologic controls on rock permeability and aquifer characteristics, recession behavior of High Cascade system may result from the greater prevalence of seasonal snowmelt as opposed to rain and rain-on-snow as the primary sources of recharge in the often lower elevation Western Cascades. However, parameters estimated for relatively high elevation Western Cascade streams, such as East Humbug, still fall within the range expected for Western Cascade streams (Table 1). This suggests that geology is the dominant factor controlling Western and High Cascade streamflow distinctions.

[26] Further evidence of the extent of geological control is implied by the mean responses of the log(dQ)/log(Q) relationship across a population of streams with varying proportions of High/Western geology and elevations (Figure 6). The strong linear relationship between recession characteristics (slope and intercept) and percent High Cascade geology, regardless of elevation, suggests that properties related to the geology exert first-order controls on recession behavior.

4.3. Cross-Correlation Analysis

[27] Consistent with the slower rates of recession associated with High Cascade systems, the timing of response to winter recharge is delayed for High Cascade systems. This delay is evident in the comparison between the cross-correlation function (between High and Western Cascade streams) and the autocorrelation function associated with the Western Cascade streams. Figure 7 provides an illustrative example; other pairs behave similarly.

[28] When delay is quantified as the difference in center of mass between the cross and autocorrelation function, the response of High Cascade streams is delayed, on average, 30 days relative to Western Cascade streams (Table 2). These values are significantly shorter than the 47–137 day time delay estimated by *Manga* [1999] in a similar analysis that compared runoff and spring-dominated streams on the eastern side of the Cascades. The difference may lie in the steeper topography, hence assumed hydraulic gradients, on the westside of the Cascade crest, resulting in more rapid response. At larger scales, for a series of streams along the McKenzie, relative to a reference Western Cascade stream (Lookout Creek), delay increases linearly as proportion of High Cascades increases (Figure 8).

5. Discussion

[29] Using a geologic framework as a basis for hydrograph analysis provides a broad scale characterization of flow regimes at multiple scales along the western side of the Oregon Cascades. By classifying the region into High Cascade and Western Cascade geologic provinces, two end-member hydrologic behaviors emerge that differ in terms of magnitudes of summer low flows, recession dynamics and the timing of seasonal response to winter recharge. High Cascade end-members show total annual

Table 2. High Versus Western Lag Time

Western	High	Lag, days
East Humbug	Breitenbush	6
L. N. Santiam	N. Santiam	25
Lookout	SF McKenzie	14
Molalla	Clackamas	34
Fall Creek	Salmon Creek	22

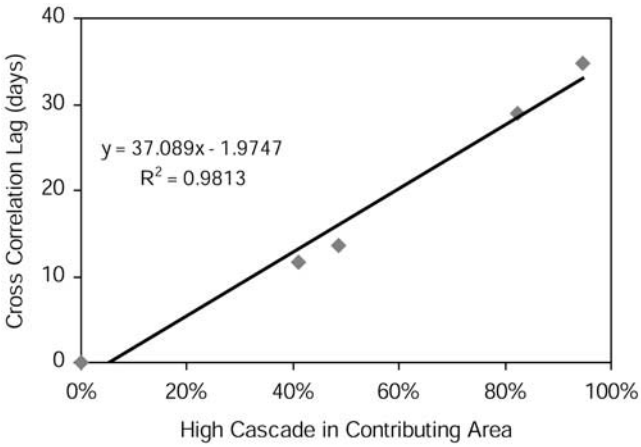

Figure 8. Estimation of lag (difference between auto and cross correlation function) between Lookout Creek (Western Cascade) and streams along the McKenzie with varying proportions of High Cascade contributing area.

flows comparable to Western Cascade end-members but 4 to 5 times higher summer low flows, when normalized by drainage area. High Cascade end-members also show slower recession rates and evidence of two-phase recession behavior that includes a relatively fast response to winter storm events, but is dominated by slower and deeper groundwater flow. Finally, High Cascade streams reflect a 30–40 day delay in the timing of response to winter recharge.

[30] In streams that include both geologic types in their contributing area, there is a surprisingly consistent and predictable relationship between the relative proportion of High Cascade and Western Cascade geologies and key aspects of hydrologic response. Total summer monthly streamflow volumes, slope and intercept of master recession curves, and relative delay of response to winter recharge are all linearly related to the percent of High Cascade geology in the contributing area. These results give us some confidence that useful quantitative estimates of low flow hydrographs can be extrapolated from gauged to ungauged catchments in this area, using a geologic framework as the basis for extrapolation. One caveat is that these values represent historical long term averages, and there may be variation in these relationships under different climatic conditions, i.e., between wet and dry years.

[31] The above analysis suggests two distinctive hydrologic mechanisms that control base flow response in this region. The geologic partitioning into High Cascade and Western Cascade to some extent combines the effects of elevation-driven differences in rain- versus snow-dominated precipitation, and geologic controls on drainage efficiency. The linear response of both timing and magnitude of flow regime to percent High versus Western Cascade geology, regardless of mean basin elevation, suggests that geology has a strong direct (i.e., via flow path, hydraulic gradient and conductivity) control on the response. The observed streamflow behavior is consistent with an interpretation of the Western Cascades as dominated by a well-developed flow network of shallow subsurface flow paths, along steep gradients with high lateral conductivities. High Cascade behavior is consistent with a deeper groundwater system with some rapidly drained shallow subsurface flow paths accessed during high flow periods. Field surveys showing the importance of large springs as primary sources for many High Cascade streams support this interpretation [*Stearns*, 1929; *Ingebritsen et al.*, 1992; *Manga*, 1996, 1997, 1999; *Grant and Tague*, 2002]. Further research using isotopic tracers and other techniques is needed to better resolve these flow path distinctions as well as the relative importance of snowmelt as a key control.

6. Conclusion

[32] Geology and geomorphology are often the dominant controls on flow regimes through their direct effect on hydrologic pathways, storage properties, and relief, and indirectly through their effect on meteorologic forcing. Analysis of summer streamflow regimes in the Oregon Cascades suggests a geological framework provides a useful basis for interpreting and extrapolating hydrologic regimes in this region. Although the mountainous volcanic landscapes of the western slopes of the Cascades have many distinctive attributes that lend themselves well to this kind of analysis, we maintain that the degree to which geology affects streamflow in this region is not unique. This paper provides an illustrative example that suggests that progress toward resolving the problem of predicting streamflows in ungauged basins can be made by explicitly structuring the analysis of streamflow using geo-hydrologic landscape types: broad regional areas defined by similarity in the physical and hydraulic properties of underlying rocks, history of landscape evolution, and key processes mediating flow. Results from this example suggest that a major task within the Predictions in Ungauged Basins initiative may be to identify these geo-hydrologic landscape types and develop a multiprong analysis to evaluate their relationships with flow regimes.

[33] **Acknowledgments.** This research was supported by NCASI and the Oregon Headwaters Research Consortium. We thank Shannon Hayes, Mike Farrell, Sarah Lewis, and Michael Manga for contributions to this work. We also wish to acknowledge the National Center for Ecological Analysis and Synthesis for hosting the workshop that provided the initial inspiration for this work.

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C. Tague, Department of Geography, San Diego State University, San Diego, CA 92182, USA. (ctague@mail.sdsu.edu)

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Date

7/15/2024

First Name *

Diana

Last Name *

Barbera

Are you a resident of the City of DuPont, WA? *

- (●) Yes
- ( ) No

Are you a business owner? *

- ( ) Yes
- (●) No

Are you part of an Agency or Organization? *

- ( ) Yes
- ( ) No
- (●) Not relevant to my input

If you have concerns regarding the EARTH, please describe them below.

We must be the best stewards of the land entrusted in our care, for the good of our community, for the good of the environment, for future generations wishing to drink clean water and breath clean air.

1 EA

If you have concerns regarding the AIR QUALITY, please describe them below.

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.

Allowing CalPortland to drain our aquifer to mine under the water table is short-sighted and foolish.

We underestimate the importance of clean water.

In the future, clean, drinkable water will become an increasingly scarce and precious resource. Our water is already contaminated by PFAS "forever chemicals" from JBLM. Withdrawing vast amounts of ground water will pull more pollutants towards our drinking water sources. There are huge toxic plumes from JBLM that threaten our water supply.

In some areas lack of potable water already is at a critical level. With climate change, it will become worse. Thurston County limits development due to a lack of water.

The lack of water is already a harsh reality in much of Washington. The Washington State Department of Ecology declared a drought emergency April 16, 2024, which is really a continuation of 2023's drought emergency. The department makes such a declaration when the state's water supply is less than 75% of normal. Water systems in Clallam County and Whatcom County are now trucking in water to meet demand. Ecology anticipates that water may need to be trucked into the Olympic Peninsula this summer. Washington has declared drought in six of the last 10 years.

2 DS

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.

We underestimate the importance of our trees and our prairie. How can we allow this rare oak prairie habitat to be destroyed?

Our prairies support a variety of plants and animals – some of which are listed as threatened or endangered under the federal Endangered Species Act. This rare ecosystem is home to many of Washington's most endangered species, and should honestly be one of DuPont's highest conservation priorities.

Prairies are one of the rarest ecosystems in Washington State. Once common in the South Puget Sound, prairie and oak woodlands habitats are now almost completely wiped out, with just 3% of original prairies remaining. Created by glaciers 15,000 years ago which left behind gravelly soils, the same gravel that Cal Portland wants to extract for their own profit to the detriment of our community and the endangered flora and fauna that currently survive there.

3 EA

The loss of trees and habitat could negatively affect the Puget Sound. Katsuhiko Matsunaga, a marine chemist at Hokkaido University in Japan, found that when tree leaves decompose, they leach acids into the ocean that help fertilize plankton. When plankton flourish, so does the rest of the marine food chain. In a campaign called Forests Are Lovers of the Sea, fishermen have replanted forests along coasts and rivers to help bring back fish and oyster stocks. And it worked, they have returned.

Trees act as nature's water filters, capable of cleaning up toxic waste, mainly through communities of microbes around tree roots that clean water in exchange for nutrients, a process known as phytoremediation. Tree leaves and needles also filter air pollution and clean the air and provide oxygen. Trees help to cool our environment and mitigate the effects of a warming planet.

If you have concerns regarding NOISE, please describe them below.

If you have concerns regarding LAND USE, please describe them below.

We must strategically conserve our local natural resources to benefit residents and the well being of our future.

4 EA

This plan to dewater our aquifer is wrong and the opposite of what we should be doing in DuPont to ensure a healthy DuPont for all, not just short-term corporate profits.

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

If you have concerns regarding TRANSPORTATION, please describe them below.

If you have OTHER concerns not listed above, please describe them below.

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

(SEPA2021-002 comment period 6/14/2024-7/15/2024)

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Date
7/21/2024

First Name *
Sandra

Last Name *
Barr

Are you a resident of the City of DuPont, WA? *
- (●) Yes
- ( ) No

Are you a business owner? *
- ( ) Yes
- (●) No

Are you part of an Agency or Organization? *
- ( ) Yes
- (●) No
- ( ) Not relevant to my input

If you have concerns regarding the EARTH, please describe them below.

If you have concerns regarding the AIR QUALITY, please describe them below.

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.
I am concerned that the project will destroy the beauty and serenity of the Sequalitchew Creek which is my very favorite place in Dupont.

1 DS EA

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.

If you have concerns regarding NOISE, please describe them below.

If you have concerns regarding LAND USE, please describe them below.

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

If you have concerns regarding TRANSPORTATION, please describe them below.

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Date
7/2/2024

First Name *
Elijah

Last Name *
Barrientos

Are you a resident of the City of DuPont, WA? *
- (●) Yes
- ( ) No

Are you a business owner? *
- ( ) Yes
- (●) No

Are you part of an Agency or Organization? *
- ( ) Yes
- (●) No
- ( ) Not relevant to my input

If you have concerns regarding the EARTH, please describe them below.

If you have concerns regarding the AIR QUALITY, please describe them below.

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.

Dear Director Kincaid,

I am extremely concerned about the proposed CalPortland South Parcel mine expansion and its impact on the groundwater level due to dewatering the Vashon Aquifer. This could significantly affect surrounding vegetation and increase fire danger for our residents, homes, and businesses. It would dry up the seeps along the Sequalitchew Creek Trail, causing the hillside slopes to dry up. I walk this trail with my dogs every week. I love to hear the babbling of the Sequalitchew Creek alongside the trail. If the South Parcel mine expansion receives a permit the creek water alongside the trail would go dry for almost half of the year. Currently, the underground water from the Vashon Aquifer feeds the lush hillside as well as the creek and our wetlands. Please DO NOT approve a mining permit that will destroy our stream, our hillside, and our wetlands IN PERPETUITY. No mitigations exist, nor is any mitigation proposed, that would protect our environment.

The projected drop in the groundwater level of up to 9 feet in Edmonds Marsh is of specific concern. Other areas of concern include the drop in groundwater level in Pond Lake, wetlands 8, 9, and 10, and Old Fort Lake. Additionally, the elimination of the Kettle Wetland and the drying up of seeps and springs feeding Sequalitchew Creek are troubling. This drop in groundwater level will likely dry out the vegetation surrounding the City of DuPont. Climate conditions have worsened since the 2011 Settlement Agreement was prepared. The City of DuPont is surrounded by forests, and climate change is already increasing the risk of fire to our residents. The resulting decrease in the groundwater level from the mine expansion will likely put DuPont residents at an even greater risk of fire danger.

Restoring Sequalitchew Creek does not have to depend on dewatering the Vashon Aquifer. It should be restored without dewatering the Vashon Aquifer. In fact, CalPortland could be a great community partner by funding the restoration WITHOUT dewatering the aquifer. As outlined above, the decrease in groundwater level throughout the area will likely have a significant negative environmental impact on our wetlands, vegetation, and wildlife.

Thank you!
Concerned Citizen

1 DS EA

2 DS

3 DS EA

4 DS EA

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.

If you have concerns regarding NOISE, please describe them below.

If you have concerns regarding LAND USE, please describe them below.

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

If you have concerns regarding TRANSPORTATION, please describe them below.

If you have OTHER concerns not listed above, please describe them below.

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

(SEPA2021-002 comment period 6/14/2024-7/15/2024)

RECEIVED
JUL 11 2024
CITY OF DUPONT

To Director Barb Kincaid, July 8, 2024

This letter is in regards to the Pioneer Aggregates South Parcel Project.

For the following reasons, it is my recommendation to adopt Scenario A, No Action- continuation of existing conditions.

1. Cal Portland has stated that with this alternative they can continue to operate for up to 10 years. This will allow the governing bodies to re-evaluate any future prospect to mining.

2. Pioneer Aggregates leases the land they are currently mining from Weyerhaeuser. Weyerhaeuser is a committed steward of our forests, which provide broad societal and ecological benefits such as clean water and air, wildlife habitat, and opportunities for recreation. The Pioneer Aggregates South Parcel Project is clearly in contrast to the landowners own conservation goals.

1 EA

3. Using the Washington State Growth Management Act for the **"Proposed action Alternative 1"** is not a valid reason to destroy a significant natural resource. There are approximately 24 active permitted Sand and Gravel mines within Pierce County. The current plan for the South Parcel is to drill 66 wells along the property boundary and just 100 feet from the Sequalitchew creek bed. This will dewater the Vashon Aquifer. In this current plan clean potable water from the aquifer will be used to wash the rock. The water from the wells is then to be deposited into the current mine. The original 2011 agreement was to deposit the water into Edmonds Marsh.

2 DS Cal

4. Climate Change. Washington State has been in a continual drought pattern for the past decade. **An Aquifer is not replaceable**. With our lack of snowfall in the winter months and the higher temperatures in the summer we could see significant changes in our natural environment and water supply in and surrounding the city of DuPont without the dewatering of the Aquifer. In the current plan the setbacks for around water sources should be increased to at least 300 feet.

3 DS

5. Much of the current proposal is based on old and outdated information and the State of Washington environmental regulations are currently changing. The City of DuPont is also in the process of updating Comprehensive Plan and zoning requirements for future development.

4 DS Cal

6. A Conifer forest covers most of the Expansion Area of the site which is 188 acres that would be cleared for mining. A total of 116 mature trees will be removed. The DEIS states that the canopy coverage of the trees within the forest does not meet the required WDFW criteria for priority habitat. With our current climate and limited forest areas in and around DuPont any canopy coverage is better than no coverage and should be re-evaluated. The proposal of replacing the landmark trees without the ground water to support them is not a viable plan. Our current foliage cannot survive with rainwater alone. Already the younger trees and foliage that do not

5 EA Cal

receive regular watering within the city are displaying stress and becoming susceptible to decease and fire.

5 cont

7. In their own words; The Kettle Wetland will be eliminated and reduce bird breeding, wintering, and migration habitat. In the proposed plan the East and West Edmond Marsh and the dependant wildlife will be drastically impacted. Groundwater seeps that support the hydrology of these wetland would be reduced, resulting in a reduction of loss of wetland habitat. This will eventually convert the wetland habitats to shrub-scrub habitat. The majority of individual mammals would disperse into adjoining habitats. However, some of the individual mammals could perish.

6 EA

8. The Western Gray Squirrel is a state threatened species, and is documented within the site vicinity. This species favors Garry Oak woodlands as prime habitat. This species also forages with coniferous forests that occur near and Garry Oak trees. The City of DuPont is well known for the preservation of the Garry Oak Trees. The DEIS suggests that the Western Gray Squirrel population on JBLM is not likely to migrate into the south parcel because of the freeway. The DEIS neglected to state that JBLM land abuts the current mining operation and that there are under freeway passages for wildlife to transition through. As has been reported with many other animal species this is not a valid scientific reason for not identifying Western Gray Squirrels in the area.

7 Cal EA

9. The South Parcel is mapped by WDFW as priority habitat biodiversity areas and corridor. The Forested riparian habitat of Sequalitchew Creek and the forested hillsides of Puget Sound near where mining is proposed are also mapped as priority habitat biodiversity areas and corridor.

8 EA Cal

10. There are no binding words that state when they close the operation that they will do any of the proposed repairs to the land stated within the DEIS. The Forest would take generations to repair and the wetlands would never be the same.

9 Cal

11. On January 14, 2014 The South Puget Sound Salmon Enhancement Group made recommendations for a restoration plan for the Sequalitchew Creek Watershed. After reviewing this plan I found it to be a sound comprehensive plan for the future of the Watershed. This plan is not based on any future mining operation. This restoration plan is expensive and will take time and resources to implement. This plan can be adopted as a separate future proposal. I feel that the resources can be achieved without the financial input from Cal Portland and should not be the purpose to approve the mine expansion.

10 DS Cal

Thank you for allowing community input into this process.

Resident of DuPont
Robin Barrow

RECEIVED
JUL 11 2024
CITY OF DUPONT

To Director Barb Kincaid, July 10, 2024

This letter is in regards to the Pioneer Aggregates South Parcel Project.

This letter addresses Chapter 3; Plants and Animals; Page 3.6-11 and 3.6-12.

Washington Department of Fish and Wildlife Priority Species

The Western Gray Squirrel (Sciurus Griseus), was listed as an endangered species on November 17, 2023. The population is suspected to be as little as 450 to 1400 within the state. There is only one area west of the Cascade Mountains where these squirrels are found. This squirrel favors the Oregon White Oak also known as the Garry Oak (Quercus Garryana), woodlands as prime habitat. This habitat occurs within the South Parcel area as well as adjacent sites within the DuPont City Limits. This squirrel also forages within coniferous forests that occur near Garry Oak trees.

The Chapter in the DEIS has incorrectly stated that the habitat for the Western Gray Squirrel is not present on the South Parcel or the surround area because it cannot cross the interstate. This is a false statement. There is an abundant habitat both within the project area and in the surrounding forests. The Western Gray Squirrel has been identified within the DuPont City Limits. They are known to travel anywhere from 8 to 14 miles to forage. This population of squirrel was introduced to the southern Puget Trough in 2007 on Joint Base Lewis McCord. The Washington Fish and Wildlife have worked closely with the Forest Management on the base and the population of the squirrel is stable. However, as an Endangered Species we must continue to protect this valuable habitat. The trees on the South Parcel are the perfect mix of habitat for the Western Gray Squirrel and should not be disturbed. The Western Gray Squirrel sleeps in tree nests during the winter and only venture out in the early morning and evening. Instead of hibernating, they rely on sheltered nests in trees and fat reserves and stored food to survive the long winter. In this area the winters are not as harsh as mountain regions such as east of the Cascade Mountains. This allows for better habitat survival. With the help of the WDFW and JBLM Forestry Management we can increase the habitat of the Western Gray Squirrel and ensure its survival in the Puget Sound area. To help preserve their habitat we can protect oak and conifer tree stands from development, wildfires and harmful timber practices. Use signing to reduce road mortality and educate our community on how to protect these squirrels. We can provide shelters by leaving large trees for them to nest in.

1 Cal EA

There are penalties for taking of individual mammals designated as Endangered. 1st conviction is a gross misdemeanor, 2nd conviction is 5 years is a class C Felony.

Please take the Endangered Western Gray Squirrel and this valuable Habitat here in the City of DuPont into consideration when considering any development or the mining project.

Thank You,
Robin Barrow

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Date
7/2/2024

First Name *
Stephanie

Last Name *
Bishop

Are you a resident of the City of DuPont, WA? *
- (●) Yes
- ( ) No

Are you a business owner? *
- ( ) Yes
- (●) No

Are you part of an Agency or Organization? *
- ( ) Yes
- (●) No
- ( ) Not relevant to my input

If you have concerns regarding the EARTH, please describe them below.
yes

If you have concerns regarding the AIR QUALITY, please describe them below.
no

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.
no

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.
yes

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.
yes

If you have concerns regarding NOISE, please describe them below.
yes

If you have concerns regarding LAND USE, please describe them below.
yes

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.
yes

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

yes

If you have concerns regarding TRANSPORTATION, please describe them below.

no

If you have OTHER concerns not listed above, please describe them below.

Please conserve the land for the animals. The citizens of Dupont cherish the trail and the trail also brings in nature lovers from outside, which helps with revenue for businesses.

1
EA

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

(SEPA2021-002 comment period 6/14/2024-7/15/2024)

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Date

7/15/2024

First Name *

Jean

Last Name *

Bivens

Are you a resident of the City of DuPont, WA? *

- (●) Yes
- ( ) No

Are you a business owner? *

- ( ) Yes
- (●) No

Are you part of an Agency or Organization? *

- ( ) Yes
- (●) No
- ( ) Not relevant to my input

If you have concerns regarding the EARTH, please describe them below.

Once again we are in the midst of a heat wave ,lack of water (Mercer island) ,fires, people setting fires ....houses are close here , we moved here for the rain .... Animals and birds are counting on our fresh water availability as are we . The thought that some money chasing Goliath can literally go in and" steal "our water so easily with little regard for the people that live here is troubling..... Money talks .I hope David has a chance at winning this mess .

1 EA

If you have concerns regarding the AIR QUALITY, please describe them below.

I have allergy issues with dust , daughter in law, has asthma and our grandson born at 341/2 week has tiny little lungs that need fresh air ....

2 EA

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.

The loss of the aquifier is terrifying , where are we magically going to come up with a basic human need just like air above . Honestly who willingly , joyfully would sign up for something that is there to protect us .... Not the people here that value our communities well being ..... but the people who don't live here, don't care about out local situation , but come from close and faraway places to take advantage of our limited natural resources. Our aquifier is needed to keep our ecological balance in check .... Really don't look forward to becoming the next California/Vegas dust bowl , would love to have a a healthy environment for our grandchildren to enjoy .

3 DS

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.

We have lived here for 7 years . In that short time we have noticed the number of birds has lessened in our backyard fewer small animals, walking the trails. we need the trees to help eat up the carbon dioxide we already have, due to our proximity to I-5. Plus all the traffic going back to the big boxes .....we need those TREES.

4 EA

If you have concerns regarding NOISE, please describe them below.

I mean we already are off I 5 ....do we want anymore noise ? I think not . But more concerned about air and water .....

5 EA

If you have concerns regarding LAND USE, please describe them below.

Something having a lot less impact on our local resources and quality of life . Additional Dirt, dust and noise . How exactly will this benefit the people of DuPont ? I would be willing to pay a bit more in taxes to keep the way of life here ....just don't know why any locals would want to have any developer using our natural resources, under our homes , schools and businesses, pretending like they are doing us a favor .? No thank you ! We are a Small town . We should have a say in what happens here .

6 EA

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.

Aesthetics would be to leave it in its natural state ,..... can't beat the beautiful trees , blue skies and let the creek run to nurture the animals and birds . Love hearing the soft rippling of the water .... Which is why that aquifier and marsh are so important .

7 EA

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

If you have concerns regarding TRANSPORTATION, please describe them below.

If you have OTHER concerns not listed above, please describe them below.

It is not just the people that live here that are affected by this terrible idea .... Many people from outlying communities , and people passing through enjoy walking the sequalitchew trail with friends and family getting fresh air and exercise .we need more places like this . To take away this all positive, local opportunity is horrific .Bottom lines though , it's all about fresh air and water .....

8 EA

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

(SEPA2021-002 comment period 6/14/2024-7/15/2024)

Pioneer Aggregates South Parcel Draft Environmental Impact Statement (EIS)

Comment Form

Input from the public regarding the Pioneer Aggregates South Parcel Project EIS is welcome. Please submit this form to share your comments. Note: Submitted comment forms are subject to the Public Records Act (RCW 42.56).

Date
7/5/2024

First Name *
Carol

Last Name *
Bjork

Are you a resident of the City of DuPont, WA? *
- ○ Yes
- ◉ No

What city do you reside in?
University Place WA

Are you a business owner? *
- ○ Yes
- ◉ No

Are you part of an Agency or Organization? *
- ○ Yes
- ○ No
- ◉ Not relevant to my input

If you have concerns regarding the EARTH, please describe them below.

If you have concerns regarding the AIR QUALITY, please describe them below.

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.

How short-sighted does someone have to be to realize that this is a truly terrible idea?!?
The damage to the marshes will be irreversible. Marshes are important not only for the wildlife that depend on that environment but also for keeping a more stable humidity level in that area which becomes more and more important as our climate continues to warm.

1 DS EA

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.

Another terrible outcome for our area streams, particularly Sequalichew Creek. Not only does that creek provide water for the wetlands below but that whole area is an important part of your park system and provides a cool and green place for many of us to go as our world continues to warm.

2 DS EA

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.

Same as comments above.

3 DS EA

If you have concerns regarding NOISE, please describe them below.

If you have concerns regarding LAND USE, please describe them below.

Please keep in mind that one company's profits are temporary but these changes to our environment are permanent.

4 DS EA

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

If you have concerns regarding TRANSPORTATION, please describe them below.

If you have OTHER concerns not listed above, please describe them below.

Even though I don't live in Dupont, I come there often to enjoy your parks, restaurants, and merchants.
Please do everything you can to keep this from happening!

5
EA

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below.
Only one document may be uploaded.

(SEPA2021-002 comment period 6/14/2024-7/15/2024)

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Date
7/9/2024

First Name *
Brandon

Last Name *
Black

Are you a resident of the City of DuPont, WA? *
- (●) Yes
- ( ) No

Are you a business owner? *
- ( ) Yes
- (●) No

Are you part of an Agency or Organization? *
- ( ) Yes
- (●) No
- ( ) Not relevant to my input

If you have concerns regarding the EARTH, please describe them below.
If you drain the water then the plants and soil in the area will also dry up. Killing plants for some gravel is not acceptable. 1 DS EA

If you have concerns regarding the AIR QUALITY, please describe them below.

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.
Yes don't drain the water. We don't know the long effects of doing this. 2 DS EA

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.
We have multiple animals in the area that use this water as a living resource. 3 EA

If you have concerns regarding NOISE, please describe them below.
Yes I don't want loud trucks picking up gravel nor do I want to see them in a beautiful community. 4 EA

If you have concerns regarding LAND USE, please describe them below.

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.
Drying up the water will make plants die. Also the water is a beautiful site that DuPont should be proud of. 5 EA

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

If you have concerns regarding TRANSPORTATION, please describe them below.

If you have OTHER concerns not listed above, please describe them below.

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

(SEPA2021-002 comment period 6/14/2024-7/15/2024)

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Date

7/21/2024

First Name *

Kyle

Last Name *

Borne

Are you a resident of the City of DuPont, WA? *

- (●) Yes
- ( ) No

Are you a business owner? *

- ( ) Yes
- (●) No

Are you part of an Agency or Organization? *

- ( ) Yes
- (●) No
- ( ) Not relevant to my input

If you have concerns regarding the EARTH, please describe them below.

The implications of drying up the Vashon Aquifer and the West Edmonds Marsh will negatively impact the ecosystem which makes the Sequalitchew Creek trail such an enjoyable walk.

1 DS

If you have concerns regarding the AIR QUALITY, please describe them below.

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.

One of the things that set Dupont apart for us when we moved here 15 years ago was the abundance of trails through the lush forests of western Washington. If the water disappears and the creek is dry for half the year, I'm concerned it'll ruin one of the best trails in the NW

2 DS EA

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.

If you have concerns regarding NOISE, please describe them below.

Also I don't want to listen to heavy machinery when I'm trying to enjoy a walk through nature.

3 EA

If you have concerns regarding LAND USE, please describe them below.

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

If you have concerns regarding TRANSPORTATION, please describe them below.

If you have OTHER concerns not listed above, please describe them below.

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

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Date
7/13/2024

First Name *
Danielle

Last Name *
Bradley

Are you a resident of the City of DuPont, WA? *
- ○ Yes
- ◉ No

What city do you reside in?
Federal Way

Are you a business owner? *
- ○ Yes
- ◉ No

Are you part of an Agency or Organization? *
- ○ Yes
- ◉ No
- ○ Not relevant to my input

If you have concerns regarding the EARTH, please describe them below.

If you have concerns regarding the AIR QUALITY, please describe them below.

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.
Lowering the water table will cause native plants and animals to suffer.

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.
Lowering the water table will cause native plants and animals to suffer.

1
EA

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.
Lowering the water table will cause native plants and animals to suffer.

If you have concerns regarding NOISE, please describe them below.

If you have concerns regarding LAND USE, please describe them below.

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

If you have concerns regarding TRANSPORTATION, please describe them below.

If you have OTHER concerns not listed above, please describe them below.

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

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Date
7/21/2024

First Name *
David

Last Name *
Bradt

Are you a resident of the City of DuPont, WA? *
- (●) Yes
- ( ) No

Are you a business owner? *
- ( ) Yes
- (●) No

Are you part of an Agency or Organization? *
- ( ) Yes
- (●) No
- ( ) Not relevant to my input

If you have concerns regarding the EARTH, please describe them below.

If you have concerns regarding the AIR QUALITY, please describe them below.

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.
According to my research, Pioneer Aggregates is own by a Japanese corporation. Sacrificing the quality of DuPont's groundwater/aquifer, surface water and plant life/animal life to enrich a foreign corporation would be very irresponsible .

1 EA

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.
See above

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.
See above

2 EA

If you have concerns regarding NOISE, please describe them below.
Another important issue to consider. Quality of life, pure and simple.

If you have concerns regarding LAND USE, please describe them below.

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

If you have concerns regarding TRANSPORTATION, please describe them below.

If you have OTHER concerns not listed above, please describe them below.

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

(SEPA2021-002 comment period 6/14/2024-7/15/2024)

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Date

7/13/2024

First Name *

Michelle

Last Name *

Brandon

Are you a resident of the City of DuPont, WA? *

- (●) Yes
- ( ) No

Are you a business owner? *

- ( ) Yes
- (●) No

Are you part of an Agency or Organization? *

- ( ) Yes
- (●) No
- ( ) Not relevant to my input

If you have concerns regarding the EARTH, please describe them below.

I am extremely concerned about the proposed CalPortland South Parcel mine expansion and its impact on the groundwater level due to dewatering the Vashon Aquifer. This could significantly affect surrounding vegetation and increase fire danger for our residents, homes, and businesses. It would dry up the seeps along the Sequalitchew Creek Trail, causing the hillside slopes to dry up. I walk this trail with my dogs frequently . I love to hear the babbling of the Sequalitchew Creek alongside the trail especially after it has rained. If the South Parcel mine expansion receives a permit the creek water alongside the trail would go dry for almost half of the year. Currently, the underground water from the Vashon Aquifer feeds the lush hillside as well as the creek and our wetlands. Please DO NOT approve a mining permit that will destroy our stream, our hillside, and our wetlands IN PERPETUITY. No mitigations exist, nor is any mitigation proposed, that would protect our environment.

1 EA DS

If you have concerns regarding the AIR QUALITY, please describe them below.

All the truck traffic from cal Portland trucks (if approved) will be bad for our air quality. On hot days we can smell terrible smells (low tide) if this creek is drained will it produce similar smells?

2 EA

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.

The projected drop in the groundwater level of up to 9 feet in Edmonds Marsh is of specific concern. Other areas of concern include the drop in groundwater level in Pond Lake, wetlands 8, 9, and 10, and Old Fort Lake. Additionally, the elimination of the Kettle Wetland and the drying up of seeps and springs feeding Sequalitchew Creek are troubling. This drop in groundwater level will likely dry out the vegetation surrounding the City of DuPont.

3 DS

Climate conditions have worsened since the 2011 Settlement Agreement was prepared. The City of DuPont is surrounded by forests, and climate change is already increasing the risk of fire to our residents. The resulting decrease in the groundwater level from the mine expansion will likely put DuPont residents at an even greater risk of fire danger.

4 DS Cal City EA

Restoring Sequalitchew Creek does not have to depend on dewatering the Vashon Aquifer. It should be restored without dewatering the Vashon Aquifer. In fact, CalPortland could be a great community partner by funding the restoration WITHOUT dewatering the aquifer. As outlined above, the decrease in groundwater level throughout the area will likely have a significant negative environmental impact on our wetlands, vegetation, and wildlife.

5 DS Cal City EA

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.

The projected drop in the groundwater level of up to 9 feet in Edmonds Marsh is of specific concern. Other areas of concern include the drop in groundwater level in Pond Lake, wetlands 8, 9, and 10, and Old Fort Lake. Additionally, the elimination of the Kettle Wetland and the drying up of seeps and springs feeding Sequalitchew Creek are troubling. This drop in groundwater level will likely dry out the vegetation surrounding the City of DuPont.

Climate conditions have worsened since the 2011 Settlement Agreement was prepared. The City of DuPont is surrounded by forests, and climate change is already increasing the risk of fire to our residents. The resulting decrease in the groundwater level from the mine expansion will likely put DuPont residents at an even greater risk of fire danger.

Restoring Sequalitchew Creek does not have to depend on dewatering the Vashon Aquifer. It should be restored without dewatering the Vashon Aquifer. In fact, CalPortland could be a great community partner by funding the restoration WITHOUT dewatering the aquifer. As outlined above, the decrease in groundwater level throughout the area will likely have a significant negative environmental impact on our wetlands, vegetation, and wildlife.

6 EA

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.

The projected drop in the groundwater level of up to 9 feet in Edmonds Marsh is of specific concern. Other areas of concern include the drop in groundwater level in Pond Lake, wetlands 8, 9, and 10, and Old Fort Lake. Additionally, the elimination of the Kettle Wetland and the drying up of seeps and springs feeding Sequalitchew Creek are troubling. This drop in groundwater level will likely dry out the vegetation surrounding the City of DuPont.

Climate conditions have worsened since the 2011 Settlement Agreement was prepared. The City of DuPont is surrounded by forests, and climate change is already increasing the risk of fire to our residents. The resulting decrease in the groundwater level from the mine expansion will likely put DuPont residents at an even greater risk of fire danger.

Restoring Sequalitchew Creek does not have to depend on dewatering the Vashon Aquifer. It should be restored without dewatering the Vashon Aquifer. In fact, CalPortland could be a great community partner by funding the restoration WITHOUT dewatering the aquifer. As outlined above, the decrease in groundwater level throughout the area will likely have a significant negative environmental impact on our wetlands, vegetation, and wildlife.

7 EA

If you have concerns regarding NOISE, please describe them below.

I feel if this is approved the noise will be increased. Will they be operational 24/7? We already get lots of noise from warehouse delivery trucks. We don't need anymore trucks which creates noise and pollution

8 EA

If you have concerns regarding LAND USE, please describe them below.

Currently the trail is one of the wonders of dupont. If this project is allowed to move forward it will change the serene nature of the land area.

9 EA

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.

Our creek trail is one of the most serene and peaceful trails in the area. Please don't allow this visual paradise to be changed. It's home to so much wildlife

10 EA

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

How does the Nisqually tribe feel about this project? This area has lots of history and cultural significance it would be a shame to have this effected if the project is allowed to move forward

11 EA

If you have concerns regarding TRANSPORTATION, please describe them below.

Having this project (if approved) so near condos/homes would be so sad. We don't need anymore truck traffic

12 EA

If you have OTHER concerns not listed above, please describe them below.

Please DO NOT ALLOW CAL PORTLAND do this to our creek! This creek/trail is used by ALOT of people and they should not be allowed to move forward with this project!

13 EA

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

(SEPA2021-002 comment period 6/14/2024-7/15/2024)

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Date
7/12/2024

First Name *
Alicia

Last Name *
Brewer

Are you a resident of the City of DuPont, WA? *
- (●) Yes
- ( ) No

Are you a business owner? *
- ( ) Yes
- (●) No

Are you part of an Agency or Organization? *
- ( ) Yes
- ( ) No
- (●) Not relevant to my input

If you have concerns regarding the EARTH, please describe them below.

If you have concerns regarding the AIR QUALITY, please describe them below.

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.

If you have concerns regarding NOISE, please describe them below.

If you have concerns regarding LAND USE, please describe them below.

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

If you have concerns regarding TRANSPORTATION, please describe them below.

If you have OTHER concerns not listed above, please describe them below.

1
EA

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

inbound6068401043315168253.docx 14.6KB

(SEPA2021-002 comment period 6/14/2024-7/15/2024)

Public Statement Against Mining Based on the Draft Environmental Impact Statement

Dear Members of the City Council and Community of DuPont,

As a long-term resident of DuPont since 2013 and a current master's degree candidate in environmental science policy and management, I am deeply concerned about the proposed mining expansion detailed in the Draft Environmental Impact Statement (DEIS) for the Pioneer Aggregates South Parcel Project. This project plans to extend mining operations to previously undisturbed areas and to deepen mining activities within existing sites. The dewatering process, which involves the removal of significant amounts of groundwater from the Vashon Aquifer, poses a severe threat to our local water systems. Specifically, this will cause Sequalitchew Creek to dry up for nearly five months each year. Sequalitchew Creek is not just a waterway; it is a vital ecological asset and a cherished natural feature of our community. Its seasonal flows support a diverse array of wildlife and contribute to the overall health of our local ecosystem.

1
DS
EA

The DEIS identifies several significant adverse impacts associated with this project. Key concerns include:

- **Environmental Degradation**: The expansion into previously undisturbed areas threatens local ecosystems, including plant and animal habitats. Such disruption can lead to long-term ecological imbalances.
- **Water Quality Risks**: Both groundwater and surface water resources are at risk of contamination from mining activities. The DEIS highlights potential negative impacts on water quality, which could affect residents and wildlife reliant on these water sources.
- **Increased Air Pollution**: The project is expected to elevate levels of dust and other airborne pollutants, impacting air quality, and posing health risks to nearby communities.
- **Noise Pollution**: The increase in mining activities will result in higher noise levels, affecting the quality of life for residents in the surrounding areas.
- **Visual and Aesthetic Impact**: The expansion of the mining site will alter the landscape significantly, diminishing the natural beauty of our community and potentially affecting property values.

2
EA

The proposed Pioneer Aggregates South Parcel Project must not be allowed to prioritize profit over the well-being of our environment and community. We urge the decision-makers to consider the long-term impacts of this project and to protect our natural

3
EA

resources by denying the dewatering request. Given these substantial environmental and social impacts, I urge the City of DuPont to reconsider this project. Sustainable alternatives that do not compromise our environment and public health should be prioritized. Protecting our natural resources and supporting the well-being of our community must remain our top priority.

3 cont.

Let us come together to ensure that our community and environment are preserved for future generations.

Sincerely,

Alicia Brewer

504 Louviers Ave

DuPont, WA 98327

Pioneer Aggregates South Parcel Draft Environmental Impact Statement (EIS)

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Date
7/21/2024

First Name *
Angela

Last Name *
Brinkhaus

Are you a resident of the City of DuPont, WA? *
- (●) Yes
- ( ) No

Are you a business owner? *
- ( ) Yes
- (●) No

Are you part of an Agency or Organization? *
- ( ) Yes
- ( ) No
- (●) Not relevant to my input

If you have concerns regarding the EARTH, please describe them below.

If you have concerns regarding the AIR QUALITY, please describe them below.

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.

We strongly oppose the expansion of cal Portland mining! We have lived in DuPont for 24 years and use the tails daily. It's what makes DuPont so special! We request that everything possible be done to stop their expansion.

1
EA

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.

If you have concerns regarding NOISE, please describe them below.

If you have concerns regarding LAND USE, please describe them below.

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

If you have concerns regarding TRANSPORTATION, please describe them below.

If you have OTHER concerns not listed above, please describe them below.

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

(SEPA2021-002 comment period 6/14/2024-7/15/2024)

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Date

7/7/2024

First Name *

Benton

Last Name *

Bristol

Are you a resident of the City of DuPont, WA? *

- (●) Yes
- ( ) No

Are you a business owner? *

- ( ) Yes
- (●) No

Are you part of an Agency or Organization? *

- ( ) Yes
- ( ) No
- (●) Not relevant to my input

If you have concerns regarding the EARTH, please describe them below.

I've lived in DuPont for 6 years now and the Sequalitchew Trail is one of the greatest things in this town. The water, wildlife, and lush, green shrubbery are what make it so wonderful. Please do not allow another beautiful place be sullied in the name of profit.

1
EA

If you have concerns regarding the AIR QUALITY, please describe them below.

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.

If you have concerns regarding NOISE, please describe them below.

If you have concerns regarding LAND USE, please describe them below.

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

If you have concerns regarding TRANSPORTATION, please describe them below.

If you have OTHER concerns not listed above, please describe them below.

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

(SEPA2021-002 comment period 6/14/2024-7/15/2024)

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Date

7/20/2024

First Name *

Meredyth

Last Name *

Buckner

Are you a resident of the City of DuPont, WA? *

- (●) Yes
- ( ) No

Are you a business owner? *

- ( ) Yes
- (●) No

Are you part of an Agency or Organization? *

- ( ) Yes
- (●) No
- ( ) Not relevant to my input

If you have concerns regarding the EARTH, please describe them below.

The DEIS for the proposed dewatering of the Vashon Aquifer to mine more gravel in DuPont states clearly that, “Drawdown of the Vashon Aquifer is anticipated to affect groundwater and surface water features (streams and wetlands) within a one to two-mile radius from the proposed mine site.”

Fire concern CalPortland’s request to dewater the Vashon Aquifer will destroy our wetlands, marshes, creek, and surrounding environment.

1 DS

If you have concerns regarding the AIR QUALITY, please describe them below.

CalPortland mining will increase particulate matter in our surrounding residential areas. This will affect our a vulnerable population of young and elderly with respiratory health issues. The dust surrounding the existing mine speaks for itself.

2 EA

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.

Dewatering the aquifer is against Dupont city law. There is no mitigation.

3 DS City

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.

The DuPont Municipal Code 25.105.050 Critical Areas clearly states:

“Wetlands in DuPont have a positive effect on water quality downstream or in aquifers by removing pollutants through the processes of sediment trapping, nutrient removal, and chemical detoxification. Wetlands also regulate the flow, retention, and release of stormwater to surface and groundwater systems."

4 EA

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.

The decrease in groundwater will lead to the loss of vegetation, loss of stream flow, loss of habitat, and decreased ability to remove pollutants. It will add drought-like conditions to the Sequalitchew Creek Ravine.

5 DS

If you have concerns regarding NOISE, please describe them below.

It will impact the community garden surrounding area.

6 EA

If you have concerns regarding LAND USE, please describe them below.

It is way too close to residential living area. It is way too close to our Dupont community garden. This garden donates 50% of produce grown to food banks in Thurston and Pierce county. What impact will pollution from the mine have on these surroundinh areas.

7 EA

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.

It will permanently change the master planned community of Dupont from inception.

8 EA

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

ANOTHER OFFICE/WAREHOUSE HAS BEEN APPROVED
FOR DuPONT (LOT Y)
Construction will require relocating the Sequalitchew Creek trail and elimination of many evergreen trees. Just imagine what that concrete structure will look like across from our civic center. The concrete floor will permanently cover and eliminate access to the original historic and prehistoric sites that are important to our local cultural heritage. And, of course, the truck traffic is just going to be outstanding.

9 EA

If you have concerns regarding TRANSPORTATION, please describe them below.

Increased truck traffic and vehicle exhaust pollution from it on Powerline road and Center Drive

10 EA

If you have OTHER concerns not listed above, please describe them below.

West Edmonds Marsh groundwater level will decrease by 9 feet

• Pond Lake water level will be reduced by 2 feet

• Wetlands number 8, 9, and 10 water levels will be reduced by 1 foot

• Old Fort Lake will be reduced by 0.05 feet

• The Kettle Wetland will be eliminated

• The seeps and springs that feed Sequalitchew Creek will dry up

11 DS

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

IMG_4041.jpeg 1.32MB

(SEPA2021-002 comment period 6/14/2024-7/15/2024)

Pioneer Aggregates South Parcel Draft Environmental Impact Statement (EIS)

Comment Form

Input from the public regarding the Pioneer Aggregates South Parcel Project EIS is welcome. Please submit this form to share your comments. Note: Submitted comment forms are subject to the Public Records Act (RCW 42.56).

Date
6/27/2024

First Name *
Elizabeth

Last Name *
Bundt

Are you a resident of the City of DuPont, WA? *
- (●) Yes
- ( ) No

Are you a business owner? *
- ( ) Yes
- (●) No

Are you part of an Agency or Organization? *
- ( ) Yes
- (●) No
- ( ) Not relevant to my input

If you have concerns regarding the EARTH, please describe them below.
I'm not okay with the impact this will have on the vegetation on our city's precious Sequalitchew creek waterway

1 EA

If you have concerns regarding the AIR QUALITY, please describe them below.
Will increase risk of wildfire

2 EA

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.
Limited resources do NOT want to expend on a mining land stripping operation

3 EA

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.
Sequalitchew creek is beautiful year round. This will have a HIGE adverse impact on that

4 EA

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.

If you have concerns regarding NOISE, please describe them below.
More mining inevitably leads to more noise on the quiet trails and homes of Dupont

5 EA

If you have concerns regarding LAND USE, please describe them below.

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

If you have concerns regarding TRANSPORTATION, please describe them below.

If you have OTHER concerns not listed above, please describe them below.

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

(SEPA2021-002 comment period 6/14/2024-7/15/2024)

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Comment Form

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Date
7/2/2024

First Name *
Elizabeth

Last Name *
Bundt

Are you a resident of the City of DuPont, WA? *
- (●) Yes
- ( ) No

Are you a business owner? *
- ( ) Yes
- (●) No

Are you part of an Agency or Organization? *
- ( ) Yes
- (●) No
- ( ) Not relevant to my input

If you have concerns regarding the EARTH, please describe them below.

If you have concerns regarding the AIR QUALITY, please describe them below.

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.
Dewatering the Vashon aquifer will effectively destroy our treasured wetlands and increase wildfire risk across the community. Do NOT let this happen!

1
EA

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.

If you have concerns regarding NOISE, please describe them below.

If you have concerns regarding LAND USE, please describe them below.

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

If you have concerns regarding TRANSPORTATION, please describe them below.

If you have OTHER concerns not listed above, please describe them below.

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

(SEPA2021-002 comment period 6/14/2024-7/15/2024)

Letter 39

Dear Director Kincaid,
I find this so very frustrating that we are "here" once again with the South Parcel mine expansion proposal from CalPortland, that would greatly impact the groundwater level by their dewatering the Vashion Aquifer. We continue to have to fight for our health and well-being in our beautiful city of DuPont, Wa. 1 EA

As I did some research on the effect from gravel pit mining, I found some very interesting facts that negatively affects our health, our eco-system, and the loss of biodiversity.
Here are some of the significant effects that this company has and wants to continue in our city:

RECEIVED
JUL 15 2024
CITY OF DUPONT

Toronto Environmental Alliance
The Environmental Impacts of Aggregate Extraction:
"Pits or quarries requires the removal of virtually all natural vegetation, top soil and subsoil to reach the aggregate underneath. Not only does this lead to a loss of existing animal wildlife, it also leads to a huge loss of biodiversity as plants and aquatic habitats are destroyed. Moreover, adjacent eco-systems are affected by noise, dust, pollution and contaminated water.

Pits and quarries disrupt the existing movement of surface water and groundwater; they interrupt natural water recharge and can lead to reduced quantity and quality of drinking water for residents and wildlife near or downstream from a quarry site. (The runoff depletes the oxygen in the water for the marine life in our Puget Sound.)

Destroyed ecosystems and source water aquifers are irreplaceable. This is not an interim land use. The landscape is blotted with destructive pits and quarries, and species of all kinds endure permanent negative impacts.

Naturally, each pit or quarry has unique characteristics and impacts, but every pit or quarry will degrade the natural environment. For pits or quarries situated on lands designated as ecologically significant, this degradation has an even greater adverse impact. 2 EA

For communities, the displacement of water resources is one of the biggest concerns pits and quarries pose. However, there are many other concerns. Beyond the physical changes to the landscape, the daily barrage of noise, dust and exhaust produced by hundreds of dump trucks hauling aggregate can have serious effects on the health of people living nearby. "

If the floodplain aquifer discharges into the stream, groundwater levels can be lowered because of channel degradation. Lowering the water table can kill riparian vegetation.

What are others danger of gravel pits?
Crystalline Silica Dust.
Breathing crystalline silica dust can cause silicosis, which in severe cases can be disabling, or fatal. The respirable silica dust enters the lungs and causes the formation of scar tissue, reducing the lungs ability to take in oxygen.

These are facts, and when this company and its operation decimates our environment, it is irrevocably damaged and can never be brought back, not the beautiful Sequalitchew Creek, the Kettle Wetland, the Edmonds Marsh, the many birds and mammals, or the multitude of plant life, as well as, our health and well-being.
We are not the only city in the United States that is facing the same dilemma on how to allow businesses to operate within each or our cities. We are seeing, feeling, and are experiencing the negative effects of these mining operations in our own city. And, we are planning to add more than 2000 more housing in our city, which impacts our ability to supply our citizens with clean healthy water. This approval would be disastrous to our city and to the surrounding communities. 3 EA
Please do not grant approval of CalPortland's proposed expansion of their mining operation.

Thank you, Kate and Mike Burch

Kate Burch Michael W Burch
2900 Hyland St. DuPont Wa 98377

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Date

6/26/2024

First Name *

Basia

Last Name *

Cady

Are you a resident of the City of DuPont, WA? *

- (●) Yes
- ( ) No

Are you a business owner? *

- ( ) Yes
- (●) No

Are you part of an Agency or Organization? *

- ( ) Yes
- ( ) No
- (●) Not relevant to my input

If you have concerns regarding the EARTH, please describe them below.

This will devastate our natural vegetation and decrease our access to potable water. We are removing needed protections for our natural wildlife that we are so fortunate to enjoy

1 EA

If you have concerns regarding the AIR QUALITY, please describe them below.

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.

If you have concerns regarding NOISE, please describe them below.

If you have concerns regarding LAND USE, please describe them below.

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

If you have concerns regarding TRANSPORTATION, please describe them below.

If you have OTHER concerns not listed above, please describe them below.

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

(SEPA2021-002 comment period 6/14/2024-7/15/2024)

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Date

7/18/2024

First Name *

Amy

Last Name *

Calahan

Are you a resident of the City of DuPont, WA? *

- (●) Yes
- ( ) No

Are you a business owner? *

- ( ) Yes
- (●) No

Are you part of an Agency or Organization? *

- ( ) Yes
- (●) No
- ( ) Not relevant to my input

If you have concerns regarding the EARTH, please describe them below.

I am.deeply concerned about the environmental degradation liklihood of this project. Specifically related groundwater/aquifer recharge and flora and fauna in Sequalitchew Creek riparian areas and Puget Sound shorelines.

1 DS EA

If you have concerns regarding the AIR QUALITY, please describe them below.

I believe expanding the mining operation will increase air and noise pollution and could compromise sensitive populations

2 EA

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.

This will dramatically impact the aquifer recharge zone and deplete previous water resources. As this are continues to expand we cannot afford to waste water resources on mineral extraction.

3 DS

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.

I love Sequalitchew Creek and visit the trail/beach often. This plan would destroy what is left of this natural and cultural resource

4 EA

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.

The mine expansion would compromise quality habitat for other species

5 EA

If you have concerns regarding NOISE, please describe them below.

Dupont as a landscape has changed (population, community desires, emvironmental stewardship, etc) and needs a serious shift from industry oriented business to maintain and promote the core values of our city.

6 EA

If you have concerns regarding LAND USE, please describe them below.

Dupont needs to decide where are our priorities for the remaining portions of unused land and manage them accordingly.

7 EA

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.

I don't want to look at a gravel mine operation while utilizing public resources (Sequalitchew).

8 EA

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

I would deman a cultural artifact study be completed in this area prior to any development, particularly in relationship to tribal resources

9 EA

If you have concerns regarding TRANSPORTATION, please describe them below.

The last thing we need is MORE trucks driving through our town

10 EA

If you have OTHER concerns not listed above, please describe them below.

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

(SEPA2021-002 comment period 6/14/2024-7/15/2024)

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Date
7/16/2024

First Name *
John

Last Name *
Campbell

Are you a resident of the City of DuPont, WA? *
- ○ Yes
- ◉ No

What city do you reside in?
Mounts rd. Unincorporated Pierce County

Are you a business owner? *
- ○ Yes
- ◉ No

Are you part of an Agency or Organization? *
- ○ Yes
- ◉ No
- ○ Not relevant to my input

If you have concerns regarding the EARTH, please describe them below.

If you have concerns regarding the AIR QUALITY, please describe them below.

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.

I do not support lowering the ground water level to extract more gravel at the pit. This will have long term, negative environmental impacts for short term gains for one company. The Mounts Road community are on wells that are impacted by development in DuPont and any significant reduction in groundwater is of significant concern to us.

1
DS

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.

If you have concerns regarding NOISE, please describe them below.

If you have concerns regarding LAND USE, please describe them below.

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

If you have concerns regarding TRANSPORTATION, please describe them below.

If you have OTHER concerns not listed above, please describe them below.

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

(SEPA2021-002 comment period 6/14/2024-7/15/2024)

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Date
7/2/2024

First Name *
Julia

Last Name *
Canonica

Are you a resident of the City of DuPont, WA? *
- (●) Yes
- ( ) No

Are you a business owner? *
- (●) Yes
- ( ) No

Where do you do business?
Rover self employed

Are you part of an Agency or Organization? *
- ( ) Yes
- (●) No
- ( ) Not relevant to my input

If you have concerns regarding the EARTH, please describe them below.

If you have concerns regarding the AIR QUALITY, please describe them below.

Very concerned about increased fire danger resulting from mine expansion and its impact on the groundwater level due to dewatering the Vashon Aquifer. This could significantly affect surrounding vegetation and increase fire danger for our residents, homes, and businesses. It would dry up the seeps along the Sequalitchew Creek Trail, causing the hillside slopes to dry up.If the South Parcel mine expansion receives a permit the creek water alongside the trail would go dry for almost half of the year. Currently, the underground water from the Vashon Aquifer feeds the lush hillside as well as the creek and our wetlands. Please DO NOT approve a mining permit that will destroy our stream, our hillside, and our wetlands IN PERPETUITY. No mitigations exist, nor is any mitigation proposed, that would protect our environment.
The projected drop in the groundwater level of up to 9 feet in Edmonds Marsh is of specific concern. Other areas of concern include the drop in groundwater level in Pond Lake, wetlands 8, 9, and 10, and Old Fort Lake. Additionally, the elimination of the Kettle Wetland and the drying up of seeps and springs feeding Sequalitchew Creek are troubling. This drop in groundwater level will likely dry out the vegetation surrounding the City of DuPont.

1 DS EA

2 DS

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.

If the South Parcel mine expansion receives a permit the creek water alongside the trail would go dry for almost half of the year. Currently, the underground water from the Vashon Aquifer feeds the lush hillside as well as the creek and our wetlands. Please DO NOT approve a mining permit that will destroy our stream, our hillside, and our wetlands in perpetuity. No mitigations exist, nor is any mitigation proposed, that would protect our environment.
The projected drop in the groundwater level of up to 9 feet in Edmonds Marsh is of specific concern. Other areas of concern include the drop in groundwater level in Pond Lake, wetlands 8, 9, and 10, and Old Fort Lake. Additionally, the elimination of the Kettle Wetland and the drying up of seeps and springs feeding Sequalitchew Creek are troubling. This drop in groundwater level will likely dry out the vegetation surrounding the City of DuPont.

3 DS

4 DS

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.

If you have concerns regarding NOISE, please describe them below.

If you have concerns regarding LAND USE, please describe them below.

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

If you have concerns regarding TRANSPORTATION, please describe them below.

If you have OTHER concerns not listed above, please describe them below.

Climate conditions have worsened since the 2011 Settlement Agreement was prepared. The City of DuPont is surrounded by forests, and climate change is already increasing the risk of fire to our residents. The resulting decrease in the groundwater level from the mine expansion will likely put DuPont residents at an even greater risk of fire danger.

Restoring Sequalitchew Creek does not have to depend on dewatering the Vashon Aquifer. It should be restored without dewatering the Vashon Aquifer. In fact, CalPortland could be a great community partner by funding the restoration WITHOUT dewatering the aquifer. As outlined above, the decrease in groundwater level throughout the area will likely have a significant negative environmental impact on our wetlands, vegetation, and wildlife.

5 City EA

6 DS

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

(SEPA2021-002 comment period 6/14/2024-7/15/2024)

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Date
7/21/2024

First Name *
Pete

Last Name *
Carels

Are you a resident of the City of DuPont, WA? *
- (●) Yes
- ( ) No

Are you a business owner? *
- ( ) Yes
- (●) No

Are you part of an Agency or Organization? *
- ( ) Yes
- (●) No
- ( ) Not relevant to my input

If you have concerns regarding the EARTH, please describe them below.

If you have concerns regarding the AIR QUALITY, please describe them below.

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.
Pollution from construction will impact waterways

1 EA

If you have concerns regarding NOISE, please describe them below.
More people/growth = more noise pollution

2 EA

If you have concerns regarding LAND USE, please describe them below.

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.
Multi level buildings will ruin the natural look of DuPont

3 EA

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

If you have concerns regarding TRANSPORTATION, please describe them below.
Limited in and out roads based on where growth is planned

4 EA

If you have OTHER concerns not listed above, please describe them below.

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

(SEPA2021-002 comment period 6/14/2024-7/15/2024)

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Date
7/4/2024

First Name *
Laura

Last Name *
Carter

Are you a resident of the City of DuPont, WA? *
- (●) Yes
- ( ) No

Are you a business owner? *
- (●) Yes
- ( ) No

Where do you do business?
Home based

Are you part of an Agency or Organization? *
- ( ) Yes
- (●) No
- ( ) Not relevant to my input

If you have concerns regarding the EARTH, please describe them below.
The DuPont geographical boundaries are for the most part beautiful and lead to stunning hidden trails, wildlife and views. The warehouse industry along with other large industry that will interfere with our landscape is devastating. DuPont has the capacity to support small to mid size business and drive more business to existing hotels through incentives and other programs. Why invest in Corporations who have more political power and can change the way this beautiful community looks and feels.

1 EA

If you have concerns regarding the AIR QUALITY, please describe them below.
Additional dust in the air and large vehicle traffic emissions effect air quality and wildlife habitations

2 EA

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.
As stated above; all large corporate industry will change the ecological balance of the DuPont landscape as stated above; all are interconnected

3 EA

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.
All are interconnected, as stated above

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.
All are interconnected as stated above

If you have concerns regarding NOISE, please describe them below.
All are interconnected as stated above

If you have concerns regarding LAND USE, please describe them below.
All are interconnected as stated above

4 EA

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.

All are interconnected as stated above

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

As stated above

If you have concerns regarding TRANSPORTATION, please describe them below.

As stated above

If you have OTHER concerns not listed above, please describe them below.

Please read 1st responses in and relate answers to each following area of concern

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

(SEPA2021-002 comment period 6/14/2024-7/15/2024)

4 cont.

Pioneer Aggregates South Parcel Draft Environmental Impact Statement (EIS)

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Input from the public regarding the Pioneer Aggregates South Parcel Project EIS is welcome. Please submit this form to share your comments. Note: Submitted comment forms are subject to the Public Records Act (RCW 42.56).

Date
7/13/2024

First Name *
Christa

Last Name *
Case

Are you a resident of the City of DuPont, WA? *
- (●) Yes
- ( ) No

Are you a business owner? *
- ( ) Yes
- (●) No

Are you part of an Agency or Organization? *
- ( ) Yes
- (●) No
- ( ) Not relevant to my input

If you have concerns regarding the EARTH, please describe them below.
Mine expansions into a trail that fosters many wild and plant life is detrimental to our ecosystem. 1 EA

If you have concerns regarding the AIR QUALITY, please describe them below.
Mine expansion in our area will deplete the quality of air, which for many of residents could cause severe health implications. 2 EA

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.

If you have concerns regarding NOISE, please describe them below.

If you have concerns regarding LAND USE, please describe them below.

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

If you have concerns regarding TRANSPORTATION, please describe them below.

If you have OTHER concerns not listed above, please describe them below.

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

(SEPA2021-002 comment period 6/14/2024-7/15/2024)

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Date
7/21/2024

First Name *
Eric & Jen

Last Name *
Chandler

Are you a resident of the City of DuPont, WA? *
- Yes
- No

What city do you reside in?

Are you a business owner? *
- Yes
- No

Are you part of an Agency or Organization? *
- Yes
- No
- Not relevant to my input

What is the name of the Agency or Organization?
North American Mycological Association

If you have concerns regarding the EARTH, please describe them below.
PLS SEE ATTACHED LETTER

If you have concerns regarding the AIR QUALITY, please describe them below.
PLS SEE ATTACHED LETTER

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.
PLS SEE ATTACHED LETTER

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.
PLS SEE ATTACHED LETTER

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.
AND FUNGI...ALSO SEE ATTACHED LETTER

If you have concerns regarding NOISE, please describe them below.

If you have concerns regarding LAND USE, please describe them below.
PLS SEE ATTACHED LETTER

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

1
EA

If you have concerns regarding TRANSPORTATION, please describe them below.

If you have OTHER concerns not listed above, please describe them below.

PLS SEE ATTACHED LETTER

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

COMMENTS - Reference Proposed Opening of the South Parcel of the Pioneer Mine for Digging.doc 39.5KB

(SEPA2021-002 comment period 6/14/2024-7/15/2024)

Although we are Lakewood residents we have on several occasions visited ***Sequalitchew Creek Trail*** to find and identify fungi/mushrooms for the ***North American Fungal Diversity Survey***, a ***North American Mycological Association*** (**NAMA**) project, and we have had the pleasure of having discovered several species that are unique to this area.

Be advised, Jen and I are amateur mycologists, belonging to these organizations:

- ***NAMA***
- ***Puget Sound Mycological Society***
- ***South Sound Mushroom Club***,

We have **13 years** of Mushroom Hunting experience behind us, starting in 2011 when we were focusing on edibles. However, starting in 2018 we became much-more interested in non-edible fungi, and since then have found, identified, and recorded *Site Location & Field Details Data*, *Morphological Descriptions*, along with *In-Situ and Detailed Photos* for **459 Fungal observations** on the ***iNaturalist*** website, including **294 First-time Fungal Observations** on unique species. Of those **Fungal Observations**. **129** have achieved a "***Research Grade***" **designation** because **at-least-3** other ***iNaturalist*** **users *have confirmed*** the ***species*** name we provided. We have also found around 12 fungi that had never been identified or rarely recorded for existing n the Pacific Northwest.

So, what got us started in looking at ***all*** fungal specimens we found? On our first foray Jen found what is likely a ***new fungal species***….in fact through DNA testing we discovered that she had discovered the ***very first*** existence and recording of the species ***Hygrocybe phaeoccocinea*** in the Continental US !! Since that time we have used every opportunity to explore anywhere we legally can to find some more rare/new fungal species….that includes the **Sequalitchew Creek area**.

Since 2018 my wife and I have taken FIVE trips to explore both the Eastern and Western areas of ***Sequalitchew Creek***, including the original Nisqually Fort property. During those self-guided trips we have found **30 fungal species** unique to that area **including** some of the grounds that are known as the ***South Parcel, Pioneer Aggregates Mine***.

SEQUALITCHEW CREEK AREA FORAYS:

- 13 OCT 2018, 4 Species
- 18 NOV 2019, 7 Species
- 28 JUN 2020, 6 Species
- 13 APR 2021, 8 Species, including the Mine area
- 19 OCT 2021, 5 Species, excluding the Mine area

1 EA

Now, had we known that a good portion of the area we had previously explored was potentially going to be razed for mine-expansion, we would have spent more time there. Being unaware of that possibility we spent only one foray into that area during the Spring of 2021, yet had a very good impression that grounds there had very-good potential of being

excellent for Fall Fungal Harvests….mainly due the extensive moss-covered areas and plenty of other features that fungus like, particularly good amounts and sizes of conifers, along with copious amounts of Dead fall. Unfortunately, FALL 2021-2023 were a "bust" for fungal pursuits due to inadequate rainfall, and we found that to be the case in nearly all of our favorite foray areas here in WA.

Bottom Line…..we have a very-real apprehension about the potential loss of habitat for fungi and the natural systems they support...of not only the mine area, but surrounding grounds near there. **Remember**….in just ***ONE Spring*** Foray, in what was essentially a poor Spring Mushroom Season, we **still managed to find EIGHT (8) SEPARATE SPECIES in the SOUTH PARCEL AREA**. 2 EA

Considering our 13-years of Pacific NW Fungal Pursuits, with proper weather conditions, we are ***ABSOLUTLEY certain*** we would have found ***many*** who-knows-what Fungal Species, with the distinct possibility of a new species for the Pacific NW, if not the world. And, now, we are possibly going to allow the destruction of this area?

The South Parcel Area Potential. That entire area is covered for-the-most-part by 2nd-growth conifers, predominantly Douglas Firs. The ground itself is thick with moss beds, and underneath that the ground is loaded with nutrients necessary for both Fungal and Floral growth. Based on our 13-years of experience in many Pacific Northwest Fungal Foraging environments, all of these natural features found in the ***South Parcel Area*** are ***perfect for Fungal Growth*****:** from Late August, all the way into January….depending on the weather. In other words, Late Summer thru Early Winter, when the temperature and rains are most-conducive to making the environment ideal for Mycelial growth.

Our major distress is the impact on the forest and water areas this mine-expansion will likely cause as well as the concomitant effects on these **PRIMARY *LIFE*** areas: 3 EA

- Surface/Ground Waters
- Soil Nutrients/Depth
- Fungi (Mushrooms)
- Flora (Plants)
- Fauna (Animals)
- Fisheries
- Air Quality
- Land and Shoreline Use
- Mitigation Measures

Especially concerning is the effect on Fungi….an ***equally*** important element-of-life on our planet. One has to understand that elimination / contamination of areas that support fungi has **WIDE-RANGING ECOLOGICAL IMPLICATIONS**.

One must be aware what the term “fungi” really covers. This general, and usually misunderstood, term is actually referring to the component which is the actual living-being and is called “***MYCELIA***”. What you see in the store, called ***Mushrooms***, is only the edible portion produced by those Mycelia, ***MYCELIA***, are like trees and other plants, BUT they grow either underground or within some entity that feeds it. The Mushrooms they produce and usually visible are the **FRUIT** of the fungal species. These Mushrooms contain what we call ***SPORES***, somewhat like the seeds found in the fruit and vegetables we eat nearly every day.

Fungi feed the land and environment in two ways thru their **Mycelia** (hyphae/roots) that can cover 100’s to even 1000’s of acres underground. There are two ***Primary Types*** of ***Fungi***:

1) **Symbiotic**, where the Mycelia exchange water and nutrients with plants (i.e., trees, bushes, flowers, grass, moss….any living organism that the Mycelia can connect with, (i.e., like roots) providing those living beings with the water and elements necessary for plant growth. This allows plants to perform their absolutely essential work of releasing Oxygen to and removal of Carbon Dioxide of the Earth’s “Air”. The Mycelia, in turn/ receive sugars and other nutrients from the plants. Most interesting is that particular fungi will have a symbiotic relationship with only a certain plant or tree and share it with no other. 4 EA

2) **Saprophytic**, where the Mycelia break down non-living matter (i.e., wood, leaves, cones/seed pods, grass, scat, carcasses…..i.e., dead things) releasing carbon and nitrogen back into the soil, providing nutrition and an environment that is receptive to new plant growth.

For instance, the largest known “living organism” on planet earth is a fungus/mushroom species belonging to the *Armillaria* genus which is living in a mixed-conifer forest in the *Blue Mountains* of northeast Oregon. It is colloquially called the “Oregon Humongous Fungus”, and according to the ***US FOREST SERVICE,*** it has set the record as The ***LARGEST SINGLE LIVING ORGANISM ON EARTH***, covering an area of 2,385 acres, or about 3.7-Square-Miles.

What ‘**IF**’ there is **ANOTHER FUNGUS/MUSHROOM OF EQUAL/MORE-EQUAL IMPORTANCE, LIVING, YET UNDISCOVERED WITHIN THE BOUNDARIES of the *South Parcel of the existing Pioneer Aggregates Mine area***.

Again, based on our 13-years of experience in Fungal Research we are certain that approving this expansion will have serious deleterious effects on the environments of ***BOTH*** the mining parcel as well as surrounding areas that depend on the ecologically important assistance provided by Fungi.

One other consideration….in the most-recent extension of the Dupont Mine, the ***2011 Settlement Agreement for the DuPont Mine Agreement***, indicated several mitigation efforts 5 DS

were ***supposed*** to have been done: "Restoration of Sequalitchew Creek Watershed, and Preservation of Puget Sound Shore-lands and Adjacent Open Space". 5 cont

Well…..***Were they?***

Lastly, but certainly importantly, one needs to remember that Jen and I have just ***barely*** explored the ***Sequalitchew Creek Area*** for existence of Fungi, and even less so for the ***South Parcel***. Also, remember that we have been successful in finding, identifying, and recording details for 30 Fungal Species in those areas. Imagine how many other species we could find with more time. Finally, who knows what ***Sequalitchew Creek***, including the ***South Parcel*** area, might have hiding away in the form of a newly discovered species of Fungi….mayhaps one that could also be of benefit to mankind for some medical life-saving means, such as these?

- ***Psilocybe*:** this mushroom has been proven to be of use in treating our military personnel who are suffering from *PTSD*.
- ***Cordyceps*:** This fungus contains cordycepic acid and cordycepin, which may help stabilize blood sugar metabolism, and increase oxygen use, and produce ATP. It may also protect organs from heart, kidney, and liver disease. Some research suggests that cordyceps has anti-inflammatory and cancer-fighting properties. 6 EA
- ***Pleurotus pulmonarius*:** A hot-water extract of this fungus may reduce the proliferation and invasion of liver cancer cells.
- **Hedgehog mushrooms:** Some believe that Washington's hedgehog mushrooms, such as **H. washingtonianum** and Sweet Tooth (*H. oregonense*), may have anti-tumor and anti-microbial properties.

Other medicinal mushrooms include: Lion's mane, Reishi, Chaga, Shiitake, and Turkey tail.

Remember…..**penicillin** is the product of "**MOLD**" fungi…..these are microscopic fungi that grow in multicellular filaments called ***mycelium,*** which normally appear as fine, white threads on the surface of food, causing discoloration and a fuzzy appearance. Molds can be found indoors and outdoors, and have the important role in nature by breaking down organic matter, a.k.a., saprophytic fungi.

Therefore, considering what has been pointed out above, it would be a travesty to throw away these 313 acres of land to mining for gravel. Such use is limited for human-kind benefits when compared to the benefits that the presence of fungi will have. 7 EA

Pioneer Aggregates South Parcel Draft Environmental Impact Statement (EIS)

Comment Form

Input from the public regarding the Pioneer Aggregates South Parcel Project EIS is welcome. Please submit this form to share your comments. Note: Submitted comment forms are subject to the Public Records Act (RCW 42.56).

Date
6/26/2024

First Name *
Amanda

Last Name *
Childers

Are you a resident of the City of DuPont, WA? *
- (●) Yes
- ( ) No

Are you a business owner? *
- ( ) Yes
- (●) No

Are you part of an Agency or Organization? *
- ( ) Yes
- (●) No
- ( ) Not relevant to my input

If you have concerns regarding the EARTH, please describe them below.
Will effect soil quality

1 EA

If you have concerns regarding the AIR QUALITY, please describe them below.
Will increase PM in the air

2 EA

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.
Will dry out the aquifer, effect drinking water supply and quality

3 DS EA

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.
Will impact the stream and damage wetlands

4 DS EA

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.
Will drastically impact local wildlife

5 EA

If you have concerns regarding NOISE, please describe them below.
Will increase an already problematic noise problem coming from the mining activities near solo point

6 EA

If you have concerns regarding LAND USE, please describe them below.
Land should remain as is

7 EA

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.
Will be an eye sore

8 EA

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

Loss of wildlife to include marine and riparian species. And any other cultural resources

If you have concerns regarding TRANSPORTATION, please describe them below.

If you have OTHER concerns not listed above, please describe them below.

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

(SEPA2021-002 comment period 6/14/2024-7/15/2024)

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Date
7/21/2024

First Name *
Russell

Last Name *
Childers

Are you a resident of the City of DuPont, WA? *

- (●) Yes
- ( ) No

Are you a business owner? *

- ( ) Yes
- (●) No

Are you part of an Agency or Organization? *

- ( ) Yes
- ( ) No
- (●) Not relevant to my input

If you have concerns regarding the EARTH, please describe them below.

If you have concerns regarding the AIR QUALITY, please describe them below.

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.

If you have concerns regarding NOISE, please describe them below.

If you have concerns regarding LAND USE, please describe them below.

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

If you have concerns regarding TRANSPORTATION, please describe them below.

If you have OTHER concerns not listed above, please describe them below.

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

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Date

7/22/2024

First Name *

Ming

Last Name *

Choo

Are you a resident of the City of DuPont, WA? *

- (●) Yes
- ( ) No

Are you a business owner? *

- ( ) Yes
- (●) No

Are you part of an Agency or Organization? *

- ( ) Yes
- ( ) No
- (●) Not relevant to my input

If you have concerns regarding the EARTH, please describe them below.

Having mining in this area will definitely affect the quality of water, earth, and soil that I depended on everyday in DuPont. it is a threat to Mother Earth and my health.

1 EA

If you have concerns regarding the AIR QUALITY, please describe them below.

Having mining in this area will definitely affect the quality of air that I breathe everyday in DuPont. it is a threat to my respiratory health.

2 EA

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.

Having mining in this area will definitely affect the quality of water, earth, and soil that I depended on everyday in DuPont. it is a threat to Mother Earth and my health.

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.

Having mining in this area will definitely affect the quality of water, earth, and soil that I depended on everyday in DuPont. it is a threat to Mother Earth and my health.

3 EA

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.

Having mining in this area will definitely affect the quality of water, earth, and soil that fish, plants and lives depended on everyday in DuPont. it is a threat to Mother Earth and my health.

If you have concerns regarding NOISE, please describe them below.

We already have noise pollution from JBLM and law maintenance everyday here in Dupont, having gravel mining plant will add on to the noise level here on DuPont

4 EA

If you have concerns regarding LAND USE, please describe them below.

We need more plants to give us more oxygen in the air, not gravels and dust.

5 EA

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

If you have concerns regarding TRANSPORTATION, please describe them below.

If you have OTHER concerns not listed above, please describe them below.

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

(SEPA2021-002 comment period 6/14/2024-7/15/2024)

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Date

6/28/2024

First Name *

Julian

Last Name *

Chown

Are you a resident of the City of DuPont, WA? *

- (●) Yes
- ( ) No

Are you a business owner? *

- ( ) Yes
- (●) No

Are you part of an Agency or Organization? *

- ( ) Yes
- (●) No
- ( ) Not relevant to my input

If you have concerns regarding the EARTH, please describe them below.

It doesn't take an environmental scientist to realize the deviation this project would cause. It's unlikely that mere comments can stop this project as it's already underway. If I was in the position of the land owner I can't say I would do the right thing either. Money is money. TLDR: Fucking up the riparian area is a travesty.

1 EA

If you have concerns regarding the AIR QUALITY, please describe them below.

Can't be good

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.

God help us.

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.

The Industrial Revolution and its consequences have become a disaster for the human race.

2 EA

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.

Fuck em

If you have concerns regarding NOISE, please describe them below.

If you have concerns regarding LAND USE, please describe them below.

We should just remove every tree and plant in WA. Create a 100 lane highway.

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

If you have concerns regarding TRANSPORTATION, please describe them below.

If you have OTHER concerns not listed above, please describe them below.

:(

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

(SEPA2021-002 comment period 6/14/2024-7/15/2024)

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Date
7/8/2024

First Name *
Anne

Last Name *
Claassen

Are you a resident of the City of DuPont, WA? *
- (●) Yes
- ( ) No

Are you a business owner? *
- ( ) Yes
- (●) No

Are you part of an Agency or Organization? *
- ( ) Yes
- (●) No
- ( ) Not relevant to my input

If you have concerns regarding the EARTH, please describe them below.

If you have concerns regarding the AIR QUALITY, please describe them below.

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.
Since DuPont relies on aquifers for our potable water, it is imperative that we keep this water supply undamaged and untainted.

1 EA

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.
I am not in favor of draining Sequalichew Creek. This biosphere with the public trail is a gem of DuPont, enjoyed by locals and outsiders alike. Without the water, plants and animals will likely be permanently damaged, completely changing the lush haven it is currently. Our marshes equally have a large range of birds, waterfowl, and animals. This ecosystem is valuable and draining it will also cause irreparable harm.

2 EA

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.
See above

If you have concerns regarding NOISE, please describe them below.

If you have concerns regarding LAND USE, please describe them below.

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

If you have concerns regarding TRANSPORTATION, please describe them below.

If you have OTHER concerns not listed above, please describe them below.

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

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Date

6/26/2024

First Name *

Sean

Last Name *

Clonch

Are you a resident of the City of DuPont, WA? *

- ○ Yes
- ◉ No

What city do you reside in?

Lakewood

Are you a business owner? *

- ○ Yes
- ◉ No

Are you part of an Agency or Organization? *

- ○ Yes
- ◉ No
- ○ Not relevant to my input

If you have concerns regarding the EARTH, please describe them below.

If you have concerns regarding the AIR QUALITY, please describe them below.

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.

If you have concerns regarding NOISE, please describe them below.

If you have concerns regarding LAND USE, please describe them below.

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

If you have concerns regarding TRANSPORTATION, please describe them below.

If you have OTHER concerns not listed above, please describe them below.

This project will negatively impact all aspects listed above. As a long time trail user I say no. And if DuPont Approves this, I will no longer have a reason to come to DuPont and therefore no reason to spend money at local restaurants after my family hikes.

1
EA

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

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Date

7/19/2024

First Name *

Penny

Last Name *

Coffey

Are you a resident of the City of DuPont, WA? *

- (●) Yes
- ( ) No

Are you a business owner? *

- ( ) Yes
- (●) No

Are you part of an Agency or Organization? *

- ( ) Yes
- (●) No
- ( ) Not relevant to my input

If you have concerns regarding the EARTH, please describe them below.

No. This is a vital resource located in the mine area that is needed to build infrastructure and Cities across the Puget Sound Area.

1 EA

If you have concerns regarding the AIR QUALITY, please describe them below.

No; it is controlled by State and US Govt agencies. PSAPCA

2 EA

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.

No; The Vashon Aquifer is a shallow aquifer-approx 90 ft below surface. The Historic Village drew its water supply from it. Since it is shallow it prone to pollutants, when Weyerhaeuser developed NWLanding, they gave the Historic Village the opportunity to hook into the new water system since its source was drawn from a deeper aquifer. The Vashon Aquifer is not a viable source of drinking water for the City. The Vashon aquifer can be seen gushing out the side of the hill into Puget Sound at low tide walking up the beach from the mouth of the Sequalitchew Creek Trail.

3 DS

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.

JBLM/Ft Lewis put in the diversion canal at the head of Sequalitchew Lake to control water levels to protect its drinking water supply from flooding the Springs-due in part to beaver dams. Because of this action, the section of Sequalitchew Creek from West of the lake to the crest of the ravine canyon pretty much went dry. Previously, WDFW would use a daisy cutter to break up the beaver dams in this area. That has ceased. Part of this permit process is- the upper part of Sequalitchew Creek will be restored when the mining is finished in the South parcel. It's a swamp in its current situation.

4 DS

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.

No. Perhaps fish runs will be restored when the restoration of the creek is finished.

5 EA

If you have concerns regarding NOISE, please describe them below.

No

If you have concerns regarding LAND USE, please describe them below.

No.

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.

No. The bluff will remain along Puget Sound.

6 EA

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

No. I believe these types of surveys have to be done before there is removal of soil. And if such is found, it would be dealt with according to State law, as it has been in areas around the Old Fort Site.

7 EA

If you have concerns regarding TRANSPORTATION, please describe them below.

I don't have concerns. The vast majority of transporting material from this area is done by barge; to the Puget Sound area. A traffic study would be done to see if the amount of traffic would increase. Commercial traffic uses Wharf Rd to Steilacoom-DuPont Rd to I-5.

8 EA

If you have OTHER concerns not listed above, please describe them below.

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

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Date
6/26/2024

First Name *
Tammy

Last Name *
Colbert

Are you a resident of the City of DuPont, WA? *
- (●) Yes
- ( ) No

Are you a business owner? *
- (●) Yes
- ( ) No

Where do you do business?

Are you part of an Agency or Organization? *
- ( ) Yes
- ( ) No
- (●) Not relevant to my input

If you have concerns regarding the EARTH, please describe them below.

If you have concerns regarding the AIR QUALITY, please describe them below.

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.
The summers are dry here and I'd we lose the water for 5 months so many animals that rely on the stream will die

1
DS
EA

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.

If you have concerns regarding NOISE, please describe them below.

If you have concerns regarding LAND USE, please describe them below.

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

If you have concerns regarding TRANSPORTATION, please describe them below.

If you have OTHER concerns not listed above, please describe them below.

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

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Date

7/22/2024

First Name *

Gareth

Last Name *

Cooper

Are you a resident of the City of DuPont, WA? *

- (●) Yes
- ( ) No

Are you a business owner? *

- ( ) Yes
- (●) No

Are you part of an Agency or Organization? *

- ( ) Yes
- (●) No
- ( ) Not relevant to my input

If you have concerns regarding the EARTH, please describe them below.

I'm concerned the project may disturb and distribute heavy metals left over from the former DuPont Works Site, allowing them to make their way into the water and area surrounding the project.

1 Cal EA

If you have concerns regarding the AIR QUALITY, please describe them below.

I worry that dust and particulates from the project will drift toward surrounding neighborhoods.

2 EA

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.

I'm concerned that pumping the water from the aquifer will have permanent and unforeseen consequences to the Seqaulitchew Creek area and could potentially spread pollution into our city's groundwater.

3 DS

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.

I'm concerned that pumping the water from the aquifer will have permanent and unforeseen consequences to the Seqaulitchew Creek area. Very little water already flows through Seqaulitchew Creek. Any reduction in that flow would have dire consequences.

4 DS

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.

The removal of that water will degrade the habitat for plants animals and fish that depend on that water for survival. We have already altered or developed much of the area and further development will stress wildlife. Any spills of petroleum products or sediments would decimate fish populations. Reduced water flows would also degrade conditions for salmon spawning and therefore, reduce chances for salmon recovery in the area. The removal of forested lands will remove the habitat that many animals depend upon for survival. We have very few areas like this left in our community.

5 DS EA

If you have concerns regarding NOISE, please describe them below.

This area is close to several established neighborhoods and noise from the project will negatively affect the quality of like for people and families in the area.

6 EA

If you have concerns regarding LAND USE, please describe them below.

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

If you have concerns regarding TRANSPORTATION, please describe them below.

If you have OTHER concerns not listed above, please describe them below.

The quality of life in DuPont is exceptional and much of that comes from the fact that we have protected our undeveloped areas. Seqaulitchew Creek is a beautiful and beloved area for people in our area. Do we really want to risk destroying or degrading this area? The only group who benefits from this plan is CalPortland. Our community will bear the costs and consequences from this development. Once changed, the environment will never be the same. We can never go back to how things were before. We should be protecting the few wild areas we have left from projects like this so that these lands can be enjoyed and by future generations. We must act cautiously and conservatively. This project should not go forward and will negatively affect Seqaulitchew Creek.

7
EA

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

(SEPA2021-002 comment period 6/14/2024-7/15/2024)

Pioneer Aggregates South Parcel Draft Environmental Impact Statement (EIS)

Comment Form

Input from the public regarding the Pioneer Aggregates South Parcel Project EIS is welcome. Please submit this form to share your comments. Note: Submitted comment forms are subject to the Public Records Act (RCW 42.56).

Date
7/21/2024

First Name *
Daniel

Last Name *
Correll

Are you a resident of the City of DuPont, WA? *
- (●) Yes
- ( ) No

Are you a business owner? *
- ( ) Yes
- (●) No

Are you part of an Agency or Organization? *
- ( ) Yes
- (●) No
- ( ) Not relevant to my input

If you have concerns regarding the EARTH, please describe them below.
Please do not expand the zones impacting our area. It is so fragile as it is. Changing the zoning could impact the western gray squirrel and other delicate species. 1 EA

If you have concerns regarding the AIR QUALITY, please describe them below.
Expanding and changing the zones could increase the amount of trucks and heavy equipment moving polluting our air. 2 EA

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.
Ground water run off and leaking equipment could easily contaminate our water and aquifers 3 DS

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.
Do not allow them to expand any at all it could contaminate our streams and wetlands 4 DS EA

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.
This will impact the western gray squirrel if allowed to expand or change the zones 5 EA Cal

If you have concerns regarding NOISE, please describe them below.
I do not want to hear nor tricks and equipment in our area 6 EA

If you have concerns regarding LAND USE, please describe them below.
I do not have confidence they will be good stewards of the land here 7 EA

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.
Expanding will destroy our beautiful area. And make it an ugly pit quarry 8 EA

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

There must be Native American artifacts that will be destroyed if this proposal is approved. These people have traveled the Sequalitchew trail area for thousands of years expanding and changing the zoning will damage undiscovered artifacts.

9
EA

If you have concerns regarding TRANSPORTATION, please describe them below.

More tucks on the roads will be an unfair burden o us residents and cause more traffic

10
EA

If you have OTHER concerns not listed above, please describe them below.

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

(SEPA2021-002 comment period 6/14/2024-7/15/2024)

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Date

7/13/2024

First Name *

Tessa

Last Name *

Credo

Are you a resident of the City of DuPont, WA? *

- (●) Yes
- ( ) No

Are you a business owner? *

- ( ) Yes
- (●) No

Are you part of an Agency or Organization? *

- ( ) Yes
- ( ) No
- (●) Not relevant to my input

If you have concerns regarding the EARTH, please describe them below.

Earth is our HOME. If we continue to neglect, pollute and waste our "HOME", there will be no future for all humankind and animals. Our lives defends on it. Our future defends on it.

1 EA

If you have concerns regarding the AIR QUALITY, please describe them below.

To take care of our Earth, we must take care the air quality. Imagine your home is on fire, your trap, breathing smoke. What would happened next It will affect your breathing and eventually it will kill you. Having poor air quality, eventually it will KILL US ALL.

2 EA

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.

• Sequalitchew Creek will go dry for approximately five months each year during the hottest part of the year.
• The slopes of our beloved Sequalitchew Creek Trail will go dry and vegetation will die as the seeps will be eliminated. The seeps maintain the lush riparian environment and make up the creek flow
• The water table of West Edmond Marsh will be lowered up to 9 feet. Other wetlands in DuPont will be lowered up to two feet
• The City of DuPont has used the Vashon Aquifer as potable drinking water in the past and still has a water right to the aquifer it wants to keep for future growth

3 DS

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.

If you have concerns regarding NOISE, please describe them below.

If you have concerns regarding LAND USE, please describe them below.

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

If you have concerns regarding TRANSPORTATION, please describe them below.

If you have OTHER concerns not listed above, please describe them below.

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

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Date

7/22/2024

First Name *

Colleen

Last Name *

Crewdson

Are you a resident of the City of DuPont, WA? *

- (●) Yes
- ( ) No

Are you a business owner? *

- ( ) Yes
- (●) No

Are you part of an Agency or Organization? *

- ( ) Yes
- (●) No
- ( ) Not relevant to my input

If you have concerns regarding the EARTH, please describe them below.

This city in its infancy spent several years and many dollars mitigating the contaminants of the powder works plant - now you want to destroy one of the most valuable natural resources we have. I am so tired of having our lives controlled by large companies- yes, we can protest, and I am, but will be surprised if it does any good.. please protect Sequalitchew and surrounding areas from this development. 1 EA

If you have concerns regarding the AIR QUALITY, please describe them below.

DuPont is a designated Tree City- the trees improve and sustain the air quality- destroying this habitat reduces the quality of life many of us appreciate and embrace here. 2 EA

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.

Any intrusion on the natural flow of groundwater and acquirer is unacceptable. 3 DS

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.

Most cities in this area have strict rules about destroying wetlands when it comes to development because of the intricacies of the ecosystems, yet this doesn't apply to this project? We are so fortunate to have the natural wetlands we do and should be protecting them, not destroying them. 4 EA

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.

All of the above applies to this project and yes, I have serious concerns about their disruption and destruction. 5 EA

If you have concerns regarding NOISE, please describe them below.

I don't live in the area that would be affected by the noise, but feel this to be a serious concern for those who do. 6 EA

If you have concerns regarding LAND USE, please describe them below.

Northwest Landing was developed as a planned city - use of the land for the gravel mine may not be out of line, but the effects of the project alters areas that should never be touched. 7 EA

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.

I don't know about the visual effects of the plant itself, but I sure as heck don't like the idea of dried up creeks and dead trees- how can that be a positive visual?

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

I don't have a specific concern in this area but expect this would also be a consideration.

If you have concerns regarding TRANSPORTATION, please describe them below.

I'm not sure how transportation would be affected.

If you have OTHER concerns not listed above, please describe them below.

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

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Date
7/21/2024

First Name *
Darcie

Last Name *
Cruz

Are you a resident of the City of DuPont, WA? *
- (●) Yes
- ( ) No

Are you a business owner? *
- ( ) Yes
- (●) No

Are you part of an Agency or Organization? *
- ( ) Yes
- (●) No
- ( ) Not relevant to my input

If you have concerns regarding the EARTH, please describe them below.
Will ruin the squirrel habitats

1 EA

If you have concerns regarding the AIR QUALITY, please describe them below.
Sound is pollution

2 EA

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.
Digging below aquafor is bad for our residents.

3 EA

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.
It's bad for our streams and fish

4 EA

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.

If you have concerns regarding NOISE, please describe them below.

If you have concerns regarding LAND USE, please describe them below.

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

If you have concerns regarding TRANSPORTATION, please describe them below.

If you have OTHER concerns not listed above, please describe them below.

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

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Date

7/21/2024

First Name *

Alexys

Last Name *

Cupper

Are you a resident of the City of DuPont, WA? *

- (●) Yes
- ( ) No

Are you a business owner? *

- ( ) Yes
- (●) No

Are you part of an Agency or Organization? *

- ( ) Yes
- (●) No
- ( ) Not relevant to my input

If you have concerns regarding the EARTH, please describe them below.

If you have concerns regarding the AIR QUALITY, please describe them below.

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.

The aquifer will be limited water for 5 months during the warmest months and will cause the land to be more compacted and unable to absorb water as easily which puts us a greater risk for fires and floods and sinkholes as well as affecting The wildlife and the ecosystem. Decreasing the groundwater in the aquifer can potentially put more contaminants or concentrate contaminents into the groundwater and increase nitrate levels, The soil there has already had a history of contamination and so the groundwater will be more at risk once the new housing development is there if the aquifer is further mined. This negatively impacts the wildlife.

1 DS

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.

Reducing the amount of water to drop the marshes, streams will negatively impact the wildlife and plant life needing the water to survive. Which will cause everything to dry up and die

2 EA

If you have concerns regarding NOISE, please describe them below.

On top of the already loud noises we get from JBLM we will.have building noises and mining noises.

3 EA

If you have concerns regarding LAND USE, please describe them below.

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

If you have concerns regarding TRANSPORTATION, please describe them below.

If you have OTHER concerns not listed above, please describe them below.

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

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Date

7/21/2024

First Name *

Wendy

Last Name *

Davis

Are you a resident of the City of DuPont, WA? *

- (●) Yes
- ( ) No

Are you a business owner? *

- ( ) Yes
- (●) No

Are you part of an Agency or Organization? *

- (●) Yes
- ( ) No
- ( ) Not relevant to my input

What is the name of the Agency or Organization?

Department of Licensing

If you have concerns regarding the EARTH, please describe them below.

If you have concerns regarding the AIR QUALITY, please describe them below.

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.

This project will drive what wildlife we have left after all the big warehouses misplaced them, further into our backyards and parks. I've lived in DuPony for 10 years. Each year I see more and more wildlife involved accidents and in my yard. This could also drive them to look for other suitable locations including crossing I5 causing serious and fatal car accidents.

1 EA

If you have concerns regarding NOISE, please describe them below.

Noise from JBLM is frequent but muffled by the trees we have left here. This project will not only remove some of that sound barrier, but will also add to the noise here.

2 EA

If you have concerns regarding LAND USE, please describe them below.

Same as above for wildlife.

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

If you have concerns regarding TRANSPORTATION, please describe them below.

This project will increase traffic to this small community. Many children have to walk or ride bikes to school here and this could potentially mean an increase in pedestrian vehicle accidents, in addition to the air quality issues this will bring.

If you have OTHER concerns not listed above, please describe them below.

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

(SEPA2021-002 comment period 6/14/2024-7/15/2024)

3
EA

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Date

7/4/2024

First Name *

Ian

Last Name *

Dome

Are you a resident of the City of DuPont, WA? *

- (●) Yes
- ( ) No

Are you a business owner? *

- ( ) Yes
- (●) No

Are you part of an Agency or Organization? *

- ( ) Yes
- ( ) No
- (●) Not relevant to my input

If you have concerns regarding the EARTH, please describe them below.

If you have concerns regarding the AIR QUALITY, please describe them below.

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.

The natural beauty of Sequalitchew Creek was a significant reason why we chose to live in dupont rather than another area. Do not allow any project that inpacts groundwater levels.

1 EA

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.

I have personally seen many animals in Dupont around Sequalitchew Creek and the associated wetlands. Please preserve their habitat in its current state. Dupont's natural beauty and wildlife make it more appealing to potential and current residents.

2 EA

If you have concerns regarding NOISE, please describe them below.

If you have concerns regarding LAND USE, please describe them below.

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

If you have concerns regarding TRANSPORTATION, please describe them below.

If you have OTHER concerns not listed above, please describe them below.

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

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Date
7/22/2024

First Name *
Kazuko

Last Name *
Donahue

Are you a resident of the City of DuPont, WA? *
- (●) Yes
- ( ) No

Are you a business owner? *
- ( ) Yes
- (●) No

Are you part of an Agency or Organization? *
- ( ) Yes
- (●) No
- ( ) Not relevant to my input

If you have concerns regarding the EARTH, please describe them below.

If you have concerns regarding the AIR QUALITY, please describe them below.

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.

If you have concerns regarding NOISE, please describe them below.

If you have concerns regarding LAND USE, please describe them below.

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

If you have concerns regarding TRANSPORTATION, please describe them below.

If you have OTHER concerns not listed above, please describe them below.

I oppose the project.
Having read the Draft Environmental Impact Statement (DEIS) dated June 14, 2024, I see there would be long-lasting or permanent environmental

1
EA
DS

damages arising from the Pioneer Aggregates South Parcel Project, even after considering mitigation measures under the Significant Unavoidable Adverse Impacts (especially, Groundwater, Surface water, Fisheries, Plants & Animals). I find such damages are too substantial to ignore. It may be profitable to the project proposer and bring revenues to the City to spend, but all these profits will be made at the expense of environment. As a resident of DuPont for over 25 years, I say this is a critical moment for us to make a right decision based on the long-term consequences and protect the environment for the future generations to come.

Additionally, there are numerous reports on the irreversible damages from the agricultural and/or industrial use of aquifers, especially in the Midwest states, from drying out much quicker than the estimates studied in the past to exasperating the shortage of water under the harsh climates (heat and drought). I'm not an expert, yet it appears that estimates can be optimistic calculations and the actual courses can be worse, especially when currently unknown factors such as other adverse incidents and disasters take place. Therefore, when I read "... no significant adverse impacts are anticipated..." in the DEIS's sections (such as Earth, Air Quality, Noise, Land Use, Aesthetics, Cultural Resources, etc.) this might be the most educated opinions but yet I feel there's no guarantee that the issues would stay as non-significant in the future.

Thank you,

Kazuko Donahue

1 cont

2 EA

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

(SEPA2021-002 comment period 6/14/2024-7/15/2024)

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Date
7/22/2024

First Name *
Kazuko

Last Name *
Donahue

Are you a resident of the City of DuPont, WA? *
- (●) Yes
- ( ) No

Are you a business owner? *
- ( ) Yes
- (●) No

Are you part of an Agency or Organization? *
- ( ) Yes
- (●) No
- ( ) Not relevant to my input

If you have concerns regarding the EARTH, please describe them below.

If you have concerns regarding the AIR QUALITY, please describe them below.

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.

If you have concerns regarding NOISE, please describe them below.

If you have concerns regarding LAND USE, please describe them below.

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

If you have concerns regarding TRANSPORTATION, please describe them below.

If you have OTHER concerns not listed above, please describe them below.

I oppose the project.
Having read the Draft Environmental Impact Statement (DEIS) dated June 14, 2024, I see there would be long-lasting or permanent environmental

damages arising from the Pioneer Aggregates South Parcel Project, even after considering mitigation measures under the Significant Unavoidable Adverse Impacts (especially, Groundwater, Surface water, Fisheries, Plants & Animals). I find such damages are too substantial to ignore. It may be profitable to the project proposer and bring revenues to the City to spend, but all these profits will be made at the expense of environment. As a resident of DuPont for over 25 years, I say this is a critical moment for us to make a right decision based on the long-term consequences and protect the environment for the future generations to come.

Additionally, there are numerous reports on the irreversible damages from the agricultural and/or industrial use of aquifers, especially in the Midwest states, from drying out much quicker than the estimates studied in the past to exasperating the shortage of water under the harsh climates (heat and drought). I'm not an expert, yet it appears that estimates can be optimistic calculation and the actual course can be worse, especially when currently unknown factors such as other adverse incidents and disasters take place. Therefore, when I read "... no significant adverse impacts are anticipated..." in the DEIS's sections (such as Earth, Air Quality, Noise, Land Use, Aesthetics, Cultural Resources, etc.) this might be the most educated opinions but yet I feel there's no guarantee that the issues would stay as non-significant in the future.

Thank you,

Kazuko Donahue

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

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Date

7/21/2024

First Name *

HEATHER

Last Name *

ECKSTEIN

Are you a resident of the City of DuPont, WA? *

- (●) Yes
- ( ) No

Are you a business owner? *

- ( ) Yes
- (●) No

Are you part of an Agency or Organization? *

- ( ) Yes
- (●) No
- ( ) Not relevant to my input

If you have concerns regarding the EARTH, please describe them below.

I am concerned about the removal of trees and the impact on soil erosion. 1 EA

If you have concerns regarding the AIR QUALITY, please describe them below.

I am concerned about the increased pollution from trucks and crystalline silica or other contaminants impacting our air quality. 2 EA

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.

In our current warming climate, it makes NO SENSE to dewater an aquifer. Western Washington is seeing increasingly hot/dry summers. We need the groundwater and water is becoming increasingly critical to the entire western US. Is there not a risk of saltwater intrusion if the aquifer is dewatered? Is there not a possibility that we forever lose access to this most precious resource? And for what? Corporate profit. Give me a break. 3 DS

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.

I am concerned that we will lose the streams and wetlands that are throughout DuPont.I'm concerned about contamination of our water as well. 4 DS

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.

Loss of streams/wetlands will impact wildlife. Loss of trees will impact wildlife. Industrial noise pollution will impact wildlife. 5 EA

If you have concerns regarding NOISE, please describe them below.

Don't we already have enough noise pollution from the interstate that runs through our backyards? Why should we allow more? 6 EA

If you have concerns regarding LAND USE, please describe them below.

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.

This will negatively impact property values of our homes. The loss of the beautiful forest and the views along the Sequalichew Creek trail is something that will fundamentally change the beauty of our city. 7 EA

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

Ultimately, this land belonged to native peoples who were here long before us. Then this was the site of a Methodist Mission and there is a historical marker in the area. Will there still be access to this marker? Will the site be preserved, maintained, and accessible?

8 EA

If you have concerns regarding TRANSPORTATION, please describe them below.

We have enough of a traffic problem with I-5 and Center Dr. being used as a cut-through. Then you add in construction at Station Dr. and the ridiculous number of warehouses and associated truck traffic. We want to add to this already ridiculous problem? I don't think that's fair to the citizens of DuPont who can't even drive across town without fighting traffic some days.

9 EA

If you have OTHER concerns not listed above, please describe them below.

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

(SEPA2021-002 comment period 6/14/2024-7/15/2024)

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Date

7/21/2024

First Name *

Ann

Last Name *

Eft

Are you a resident of the City of DuPont, WA? *

- (●) Yes
- ( ) No

Are you a business owner? *

- ( ) Yes
- (●) No

Are you part of an Agency or Organization? *

- ( ) Yes
- (●) No
- ( ) Not relevant to my input

If you have concerns regarding the EARTH, please describe them below.

The whole Seq. Creek trail and ecosystem is beautiful and unique to any residential/business community. We would be short sighted fools to sacrifice this pristine area.

1 EA

If you have concerns regarding the AIR QUALITY, please describe them below.

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.

If you have concerns regarding NOISE, please describe them below.

We already hear the metallic grinding and clicking on many nights. It's annoying.

2 EA

If you have concerns regarding LAND USE, please describe them below.

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

If you have concerns regarding TRANSPORTATION, please describe them below.

If you have OTHER concerns not listed above, please describe them below.

All the items listed above make for the wonderful, healthy and unique quality of life here in DuPont. You cannot harm one of these areas without hurting the others.
Destroying the aquifer may do the most permanent damage but obliterating the esthetics and cultural significance of the area is a crime.
The quarry is already obnoxiously loud especially at night. The truck traffic is also just dangerous already.
Please don't let this quarry expansion move forward.

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

(SEPA2021-002 comment period 6/14/2024-7/15/2024)

3
EA

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Date
7/13/2024

First Name *
Amy

Last Name *
Einck

Are you a resident of the City of DuPont, WA? *
- (●) Yes
- ( ) No

Are you a business owner? *
- ( ) Yes
- (●) No

Are you part of an Agency or Organization? *
- ( ) Yes
- ( ) No
- (●) Not relevant to my input

If you have concerns regarding the EARTH, please describe them below.

If you have concerns regarding the AIR QUALITY, please describe them below.

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.
I am concerned to hear that as a citizen/resident of DuPont, I would be one of many who will be losing our rights to this land as a source for potable water.

1 EA

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.
I am deeply concerned about the effect on the city's rights to this source of potable water as well as the effect of the water table lowering up to 9 feet, which would be devastating to the vegetation and habitats of the creek and trail. While there are many devastating effects of natural disasters beyond our control, this would be a completely man-made and irreversible eco disaster that is completely within your power to stop. If you could stop a drought, wouldn't you?

2 DS EA

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.

If you have concerns regarding NOISE, please describe them below.

If you have concerns regarding LAND USE, please describe them below.

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

If you have concerns regarding TRANSPORTATION, please describe them below.

If you have OTHER concerns not listed above, please describe them below.

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

(SEPA2021-002 comment period 6/14/2024-7/15/2024)

Pioneer Aggregates South Parcel Draft Environmental Impact Statement (EIS)

Comment Form

Input from the public regarding the Pioneer Aggregates South Parcel Project EIS is welcome. Please submit this form to share your comments. Note: Submitted comment forms are subject to the Public Records Act (RCW 42.56).

Date
7/21/2024

First Name *
Robert

Last Name *
Einck

Are you a resident of the City of DuPont, WA? *
- (●) Yes
- ( ) No

Are you a business owner? *
- ( ) Yes
- (●) No

Are you part of an Agency or Organization? *
- ( ) Yes
- (●) No
- ( ) Not relevant to my input

If you have concerns regarding the EARTH, please describe them below.

If you have concerns regarding the AIR QUALITY, please describe them below.

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.

If you have concerns regarding NOISE, please describe them below.

I am concerned about noise affecting our quality of life and value of the home I own in DuPont. I purchased in palisades last year specifically to get away from the mortar sounds we heard regularly where we lived before off Hoffman Hill and it scared our dog who is our family. We literally moved/purchased to get a quieter environment and I hear this will affect that. Please do not allow mining.

1
EA

If you have concerns regarding LAND USE, please describe them below.

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

If you have concerns regarding TRANSPORTATION, please describe them below.

If you have OTHER concerns not listed above, please describe them below.

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

(SEPA2021-002 comment period 6/14/2024-7/15/2024)

RECEIVED
JUL 2 2024
CITY OF DUPONT

Letter 71

July 1, 2024

Dear Director Kincaid, please accept my comments on the CalPortland South Parcel Mine Expansion as a part of the record. I have written these comments as a citizen and not as a member of the City Council. I have lived here since 1996 and was friends with Judy Krill, who first sued CalPortland (Lone Star then) in 1994 over the expansion of the gravel mine. When the 1994 agreement was signed, it stated on Page 22, "WRECO and Lone Star agree to seek no permits in the future to mine in a manner that would significantly impact the flow of Sequalitchew Creek". We all felt relieved until 2009 when CalPortland wanted to expand again. Another agreement, the 2011 Settlement Agreement was signed, and after several years of mediation, the Sequalitchew Creek Restoration Plan was added. The small non-profit groups have been fighting CalPortland for years. As the volunteers age, their funds dry up, they can no longer continue the fight. It is very difficult to fight a billion dollar corporation. It is time for our city to take a firm stance and say no to the expansion to protect our environment, unless they want to mine above the aquifer. That is the only acceptable mitigation. Below are my reasons.

Comments Opposing the CalPortland South Parcel Mine Expansion DEIS

Having read the Critical Areas Ordinance and the 2015 Comprehensive Plan, I cannot imagine how the proposed South Parcel Mine Expansion can proceed. Below, I have outlined the pertinent parts of the CAO and the 2015 Comprehensive Plan that address why this proposal should be avoided or minimized to reduce the adverse impacts as

stated in our CAO to protect the public health, safety and welfare of the citizens of DuPont.

DMC Chapter 25.105 Critical Areas

The primary purposes of this chapter are "…to protect the public health, safety and welfare by preventing the adverse environmental impacts of development."

DMC 25.105.010: Directing a policy of no net loss of wetland and stream function, Value, and area within the city.

DMC 25.105.010: Preventing, to the extent practicable, adverse cumulative impacts to water quality, wetlands, stream corridors, and fish and wildlife habitats using best available science.

1 City EA DS

DMC 25.105.010: Encouraging improvements to, and good stewardship of, surface water bodies and watercourses;

DMC 25.105.010: Encouraging improvements to, and good stewardship of, surface water bodies and watercourses;

DMC 25.105.010: Protecting the public from injury, loss of life, property damage or financial loss due to flooding, erosion, landslides, seismic events, soil subsidence or steep slope failures;

2015 Comprehensive Plan

Resource Land Goal LU-10: Recognizes the value of mineral resource extraction while protecting the natural environment's integrity.

2 City EA DS

LU-10.3 Ensure mining activities employ best management practices that protect the long term integrity of the natural environment, water resources, adjacent land uses, and the long term productivity of the resource lands.

Natural Environment Goal NE-1: Protect DuPont's natural environment by meeting the needs of today's citizens without compromising the needs of future generations.

- **NE 1.1** Preserve environmentally sensitive areas and those that are valuable natural and aesthetic resources to the City
- **NE 1.2** Institute and regularly update measures which promote development and construction practices that minimize impacts on the environment
- **NE 1.4** Work with JBLM, The Department of Ecology, Glacier NW, environmental groups, and other affected parties to restore and improve the flow of water through Sequalitchew Creek.

2 cont.

Natural Environment Goal NE-5: Restore historic stream flow, improve habitat conditions, and promote long term preservation efforts within the City.

- **NE 5.1** Maintain and where possible restore and enhance ecological functions and values of the Sequalitchew Creek Watershed, lakes, marshes, streams, wetlands, bluffs, and recognize the potential for passive public access on or at Old Fort Lake

- **NE 5.3**. Maintain important wildlife habitats and function wildlife corridors to link important natural areas such as Edmond Marsh and Sequalitchew Creek.

- **NE.5.5.** Recognize that the Oak Savannah is a unique habitat within the City and region and preserve the highest value oak groupings in the area as open space.

2 cont.

CalPortland's South Parcel proposal has elements, which I have discussed below, that contradict our 2015 Comprehensive Plan and our Critical Areas Ordinance.

GROUNDWATER/AQUIFER

Impact of the South Parcel mine expansion on the Vashon Aquifer and Sequalitchew Creek

The expansion plans are to dewater the Vashon Aquifer, which will severely impact the Sequalitchew Creek Ravine. According to the proposal (page 3.1-14), the seeps and springs that sustain the creek year-round will be drastically reduced or eliminated. The potential consequences of this dewatering are dire:

- **Drying up of vegetation:** The lush vegetation that thrives in wet conditions may struggle or die off. Plants adapted to moisture may wilt, lose leaves, or become dormant.
- **Soil erosion:** Without the binding effect of wet soil, erosion becomes a concern. Rainwater can wash away loose soil particles, leading to gullies and landslides.
- **Cracking and compaction:** As the soil dries, it contracts and cracks, reducing its stability and making it less suitable for supporting plants or structures.
- **Loss of habitat:** Animals and insects that rely on the wet environment may move elsewhere or face challenges finding food and shelter.

3 DS EA

- **Temperature changes in the creek:** The loss of cool groundwater and the drying up of vegetation will lead to significant temperature changes in the creek, affecting aquatic life.
- **Decreased biodiversity:** The impact on groundwater will lead to decreased biodiversity in the ravine.
- **Drying up of the tree canopy:** The extensive tree canopy, which provides shade, cooler temperatures, and habitat for wildlife, will dry up, altering the landscape dramatically.

3 cont.

No mitigation measures in the proposal effectively address the loss of the Vashon Aquifer seeps, leading to the irreversible degradation of the Sequalitchew Creek watershed.

The Sequalitchew Creek Restoration Plan could work without dewatering the Vashon Aquifer. It would be a better plan for the environment and for future generations if groundwater was flowing through the wetlands and creek, along with the water diverted from Sequalitchew Lake.

4 City DS EA

CalPortland could be a good community partner by funding the restoration plan without dewatering the aquifer.

The Sequalitchew Creek ravine lies within a landslide hazard area according to the DMC. The DEIS asserts on page 3.1-14 that "The seeps and springs identified on Figure 3.1-3 are expected to be reduced or dewatered in their entirety, which may reduce the level of landslide hazard susceptibility within the ravine." This assertion

5 EA DS

seems contradictory to the groundwater dynamics associated with dewatering a lush slope in a riparian corridor, which typically leads to instability and potential landslides.

5 cont.

Scientific research on groundwater dynamics demonstrates that when a naturally wet and lush steep hillside dries up, significant changes occur due to the lack of moisture:

- **Vegetation Stress:** Plants accustomed to moist conditions may struggle, wilt, lose leaves, or become dormant.
- **Soil Erosion:** Without the cohesive effect of moist soil, erosion becomes a concern as rainwater washes away loose soil particles, potentially causing gullies and landslides.
- **Cracking and Compaction:** Drying soil contracts and cracks, reducing stability and suitability for supporting plants and structures.

6 EA Cal DS

This understanding of ground hydrology contradicts the DEIS statement on page 3.1-17, paragraph 2, which suggests that mining could decrease seeps and springs in the Sequalitchew Creek ravine, potentially improving slope stability.

Impact of the South Parcel mine expansion on the Wetlands

The proposal also threatens five wetlands, one will be eliminated, and four others will experience significant water level reductions. Proposed mitigation measures, such as redirecting surface water from Sequalitchew Lake, are insufficient and only partially available for about six or seven months of the year. During dry months, wetlands will remain low or dry up, exacerbating the impact on shallow wetlands dependent on the Vashon Aquifer and rainwater.

7 EA DS

I struggle to understand how depleting the Vashon Aquifer, which will permanently lower the water level in West Edmond Marsh by 9 feet and reduce the water table in four other wetlands by 1 to 2 feet, especially when they already dry out in summer, along with the elimination of one wetland and the drying up of seeps that sustain Sequalitchew Creek year-round, can be considered responsible stewardship of our surface water bodies and watercourses. This proposal will cause irreversible damage to our wetlands and stream, impacting both the quantity and quality of water available to wildlife, fish, and other species, while also diminishing the quality of life for humans.

8 DS EA City

The proposed mitigation, which suggests diverting surface water from the diversion canal through Edmond Marsh and down the creek for perhaps six months of the year, contingent on sufficient water availability from JBLM, falls short of promoting good stewardship of our surface water bodies and watercourses.

Environmental and Climatic Concerns

Since the 2011 Settlement Agreement, climate conditions have worsened, with longer dry periods, hotter temperatures, and increased aridity. From 2011-2023, temperatures in the Seattle area have risen by 1.06°F, and precipitation has decreased by 9.9% according to data from the University of Washington Climate Impacts Group: https://climate.washington.edu/climate-data/trendanalysisapp/. The proposed dewatering will exacerbate these issues, leading to dire environmental consequences for DuPont now and in the future.

9 EA Cal DS City

Moreover, the DEIS fails to address the potential fire hazards that could result from the Sequalitchew Creek Ravine becoming a dry tinderbox. With increasing temperatures

10 EA Cal DS

and reduced rainfall, the risk of wildfires is significantly heightened. Dry vegetation and lack of moisture will create ideal conditions for fires to ignite and spread, posing a severe threat to the local ecosystem and public safety.

10 cont.

PLANTS AND ANIMALS

The dewatering of the Vashon Aquifer will have severe consequences on the environment within a two-mile radius of the mine site. The wetlands affected by this dewatering are surrounded by large trees, including Western Red Cedars, Garry Oaks, Douglas Firs, Madronas, and other essential trees and shrubs. The plants and trees provide critical habitat for wildlife, offer shade, and help purify the air. If the water supporting these trees and shrubs is removed by the dewatering, the effects will be devastating. The landscape will transform from one with towering trees that provide shade, a cooler climate, and habitats for wildlife to a dry, barren area due to the lack of groundwater.

11 EA Cal

The proposal clearly states the impacts on groundwater levels:

- West Edmonds Marsh groundwater level will decrease by 9 feet.
- Pond Lake water level will be reduced by 2 feet.
- Wetlands 8, 9, and 10 will see a reduction of 1 foot in water level.
- Old Fort Lake water level will be reduced by 0.05 feet.
- The Kettle Wetland will be eliminated.
- The seeps and springs that feed Sequalitchew Creek will dry up.

12 EA Cal

These reductions in groundwater levels will be permanent.

In addition, the project will eliminate a 146-acre forest. Trees in this forest play a crucial role in removing carbon, lowering air temperatures, absorbing sound, providing critical habitats for birds and animals, and improving air quality. This forest is needed for the reasons stated above, as our climate becomes increasingly hot. The forest includes approximately 81 Douglas Firs, 17 Garry Oaks (a protected species in DuPont), and 10 Western Red Cedars, among others. If the mine is expanded all of these trees will be eliminated.

13 EA

The cumulative impacts of this project on our land, water, air, trees, birds, and animals are profound and permanent. There is no mitigation that can counteract these devastating and long-term effects.

14 EA Cal

In conclusion, the environmental assessments outlined in the DEIS present conflicting assertions regarding the impacts of dewatering the Vashon Aquifer on the Sequalitchew Creek ravine. While the DEIS suggests a potential reduction in landslide hazard susceptibility, scientific understanding of groundwater dynamics indicates that such actions could destabilize the steep, lush slopes of the ravine, leading to increased risks of erosion and landslides. Moreover, the DEIS overlooks the significant fire hazards that may arise if the ravine becomes dry and susceptible to ignition.

15 EA Cal

Given these critical environmental concerns and the principles outlined in DMC 25.105.020, which advocate for prioritizing avoidance and reduction of adverse impacts on critical areas, as well as our Comprehensive Plan, I strongly urge the denial of the permit for mining the South Parcel. The proposed mitigation measures, including the Sequalitchew Creek Restoration Plan, do not adequately address the irreversible harm

16 EA City

that would negatively impact our wetlands, streams, and overall ecosystem integrity. The only mitigation that would be acceptable is to mine above the aquifer. This will not save the forest, but it will save the water in our wetlands, stream and ravine.

Our community's 2015 Comprehensive Plan underscores the importance of safeguarding our natural environment for present and future generations. How is dewatering of the Vashon Aquifer, with all the detrimental impacts in perpetuity, protecting the natural environment's integrity, as stated in LU Goal 10? 16 cont.

To uphold these commitments and protect our critical resources, I respectfully request that the permit to mine the South Parcel be denied. Let us prioritize sustainable development practices that align with our environmental values and ensure the preservation of DuPont's natural heritage.

Beth Elliott

1485 Kittson Street, DuPont

RECEIVED
JUL 22 2024

Letter 72

Attn: Barb Kincaid

CITY OF DUPONT

7/21/2024

As of today, Sequalitchew Creek from its Source down to Puget Sound, is likely further from being restored to historic flow levels than ever before...and certainly worse off than 20 years ago when I began to be involved after fortuitously encountering the confluence when boating on Puget Sound. (back then there were fences and gates at the top and bottom restricting access to the canyon) Over my years of grass roots community advocacy for the preservation and betterment of the natural wonders within our city, Sequalitchew creek and its canyon, the Puget sound shoreline and bluffs, and Old Fort Lake have always been the Jewels in DuPont's crown!

1 DS Cal

These areas have been so degraded by the process of human determinations of non-significance and mitigations done elsewhere to allow negative actions where it really mattered, its no wonder that the fish don't return, the trees die and fall over, and the invasives inhabit. When will it stop? When will restoration of a natural feature be done to undo what has been previously compromised over, in order to move it back toward what it formerly was, what it could be, what it should be, not as a means to an end. I resent the carrot and stick methodology that the applicant Pioneer Aggregates/Glacier Northwest/CalPortland has followed in order to hold any beneficial action within the watershed hostage until such time as it can be used as a bargaining chip to withdraw more gravel. WITHOUT THE AQUIFER SEQUALITCHEW DIES FOREVER.

2 DS

I actually think Mining should be allowed to the maximum extent **in so far as it has no impacts <u>outside of the property boundary</u>.** To think... that I, a citizen property owner, would have the audacity and ability to take an action that would affect my neighbors property adversely, basically without their consent is preposterous. I do not consent to dewatering below my properties here in DuPont, and as a resident I object to dewatering under publicly owned city property which is held for the benefit of all flora and fauna, and those who live and visit here. Sequalitchew creek and associated wetlands being dewatered anywhere in the basin is unacceptable, and flows in the canyon being reduced by 79% more than the current meager flows is ludicrous. WITHOUT THE AQUIFER SEQUALITCHEW DIES FOREVER

3 DS

I sat on the Restoration Planning committee as the Chair of the Sequalitchew Creek Watershed Council, along with the NDA, Mining Consultants, SPCSEG and the Tribe. After almost a year of discussions, deliberations and feedback, when it came time to vote, our organization voted **against** the plan. Primarily because the restoration plan didn't go far enough to 1. **restore historic flows**, advocated exchanging 2. **warmer surface water in place of cooler aquifer water** within the creek and marsh flows, didn't address the 3. **beaver management solution long term**, and also failed to have 4. **community opportunities to participate**. This updated proposal hasn't changed much.

4 DS

1. It doesn't get back to historic flows, and grossly underestimates the CFM gains which could be made up if the cork isn't popped on the Aquifer.

2. No fish expert would ever advocate for warmer turbid surface water over colder, cleaner, subsurface water, which is what target species need to return.

3. Old time residents of DuPont will share stories of large salmonoid fish in Edmonds marsh as late as 1997-2000. What has changed since there was last fish here? **No active beaver management strategy** either on DuPont land or Ft. Lewis, and the **installation of center drive, and bulldozing away of topsoils up to the wooden bridge**. These actions and inactions allowed at least 3 distinct beaver family groups to

raise the water level of the marshes while building at least 9 large dams, killing the surrounding trees, and causing the water to mostly flow backward. And at the west end of Edmond marsh the creek went sub surface past Center drive and disconnected the canyon from the marsh on the surface. While the construction diagrams of the bridges, stream rebuilding and construction work is impressive cherries on top... the whole plan hinges on ACTIVE 24/7/365 beaver management. Those pond levelers will quickly be blocked up, the beaver will adapt and things will revert to how they are now. I am a WCO for Washington State Dept of Fish and Wildlife with 10 years experience, I've been in plenty of watersheds dealing with beavers, and it takes constant, pro-active management strategies in order to keep the water flowing. This plan while "adaptive" doesn't have the guts to do what needs to be done to make progress.

4 cont

4. Since Mayor Jenkins and Administrator McDonald any meaningful grass roots efforts have been tied up under threat of lawsuit or in the "process" or revised Settlement Agreement, relegated instead to the paid "experts" and the minimum effort necessary to secure access to the gravel. Lets not be fooled, this whole process is **not a restoration plan for Sequalitchew**...it's **a Mining plan that needs to deal with a dewatering issue**. The original Settlement Agreement had language that the applicant wouldn't seek to mine deeper, but before the ink had dried there were monitoring wells being placed on public property, property lines being drawn to access the middle of the creek where the water could be dumped either thru "micro-tunnels" or previously in a northern tributary, and political climate being tested to accommodate a revision.

5 City Cal DS

Human induced dewatering of an Aquifer is never a good idea. Google searches reveal that it's a similar threat as Climate Change. How a 6 month test regimen could be expected to accurately determine these localized changes without seeing each of the 4 seasons is unlikely. Subsequent mining would likely take decades where the aquifer would be depressed, a wholesale collapse of the vegetation is likely at the seeps. I've seen the localized dewatering effort which took place as part of the Amazon building access road off of Bronson St. They had pumps going in order to get the sewer and water lines onto the property in the dry, while they pumped the water table down and infiltrated the water elsewhere. That was a lot of water and the volume which will need to be pumped by 60 wells would likely fill 200 Olympic size swimming pools every 24 hours. That is a huge amount of water which will dry out marches, kills vegetation when the roots go dry, likely contribute to Land Subsidence, leave massive groundwater and surface water infiltration issues for the city to deal with after the gravel is gone...forever. The wetted hillside instability will never be compatible with the planned Sequalitchew village housing area, that tax base will be lost forever. Land subsidence is a real possibility, my properties would be affected and they would be responsible for impacts throughout the affected housing areas and also warehouses around the area exhibiting visible cracks on the massive slab on grade floors.

6 DS Cal

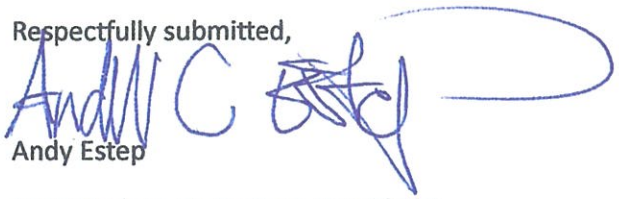
I have lived, worked and played in DuPont for 23 years, served on City Council, Parks Agency, and as the Chair to the Sequalitchew Creek Watershed Council, been mentored by signatories of the original settlement agreement, attended countless days and hours of gatherings, meetings, briefings, community awareness functions, poured over boxes and boxes of documents, questioned processes, been through Edmonds marsh by canoe, hip-waders, provided firsthand information to consultants for the applicant, walked on trails, and bushwacked everywhere else I could, walked on beaver dams, done restoration projects up and down Sequalitchew canyon and attempted to bring about other projects of benefit.

7 EA

To those considering this plan for approval, go ahead and allow mining on the leased and owned property, **but there should be no impacts outside of the mining boundaries**, its not our fault there is an Aquifer in the way! Once the aquifer is breached it can't be put back, any "restoration" work isn't restoring, its mitigating, it doesn't make it better where it matters, which is groundwater, it just adds surface water and takes the groundwater...not a viable exchange for the restoration plan. Once it happens there is no putting it back, **it's going to weep like a giant wound on the landscape**. What is proposed cannot be reversed and the effects will be long lasting and permanent. No good can come from it, except a monetary benefit to the mining company. Long term... **citizens will be stuck with a huge unstable, unusable weeping wall and permanent water infiltration issues in the bottom of the hole, and WITHOUT THE AQUIFER SEQUALITCHEW DIES FOREVER.**

8
DS
EA

Respectfully submitted,



Andy Estep

1398 Hudson St. DuPont. WA 98327

(253)370-1883

Anna Marie Etzkorn
1198 Aldrich Place
DuPont, WA 98327
(253) 229-5997
annaetz@yahoo.com

RECEIVED
JUL 22 2024
CITY OF DUPONT

July 22, 2024

Barb Kincaid
The City of DuPont
1700 Civic Dr
DuPont, WA 98327

Dear Ms. Kincaid,

I am very concerned that the proposed expansion of the CalPortland mine will severely and negatively affect the city of DuPont and its residents.

The environmental repercussions of the expansion are worrying. I hate to think of additional loss of forest habitat and removal of landmark trees. Forests are of high importance with regard to managing greenhouse gasses. The four-part dewatering plan is frightening, and I cannot imagine that the Sequalitchew Creek and Edmonds Marsh would ever be able to recover, despite the proposed "careful monitoring" of each dewatering and mining step. 1 EA

This community thrives because our access to natural beauty is preserved. The trail system in DuPont and the beloved Sequalitchew Creek trail are gems that I did not know about when I bought a home in DuPont, but I have come to champion these things as part of what makes DuPont so special and unlike surrounding areas. When I attended the CalPortland open house in August 2023, I was very pleased to learn about the Sequalitchew Restoration Project that was being funded by them, and I was excited by the promise of what a restored creek could bring to the area.. I now see that implementing this restoration project seems to be in jeopardy if the south parcel is mined as proposed. 2 DS EA

I plead with the city not to approve the expanded mine proposal. I realize that restricting the mine will have financial repercussions for the city, but I would gladly take on additional homeowner taxes in exchange for retention of our surrounding natural landscape. 3 EA

Sincerely,

Anna Marie Etzkorn

Anna Marie Etzkorn

Pioneer Aggregates South Parcel Draft Environmental Impact Statement (EIS)

Comment Form

Input from the public regarding the Pioneer Aggregates South Parcel Project EIS is welcome. Please submit this form to share your comments. Note: Submitted comment forms are subject to the Public Records Act (RCW 42.56).

Date
7/19/2024

First Name *
Robert

Last Name *
Farrell

Are you a resident of the City of DuPont, WA? *
- (●) Yes
- ( ) No

Are you a business owner? *
- ( ) Yes
- (●) No

Are you part of an Agency or Organization? *
- ( ) Yes
- (●) No
- ( ) Not relevant to my input

If you have concerns regarding the EARTH, please describe them below.

If you have concerns regarding the AIR QUALITY, please describe them below.

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.

Piercing the aquifer cannot be undone. To pierce and drain the aquifer in a business pursuit is unconscionable. The known short, and long-term damage to the environment is great and the potential adverse impact is even greater.

1
DS

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.

If you have concerns regarding NOISE, please describe them below.

If you have concerns regarding LAND USE, please describe them below.

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

If you have concerns regarding TRANSPORTATION, please describe them below.

If you have OTHER concerns not listed above, please describe them below.

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

(SEPA2021-002 comment period 6/14/2024-7/15/2024)

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Date

7/22/2024

First Name *

Jessica

Last Name *

Fester

Are you a resident of the City of DuPont, WA? *

- (●) Yes
- ( ) No

Are you a business owner? *

- (●) Yes
- ( ) No

Where do you do business?

Dupont

Are you part of an Agency or Organization? *

- ( ) Yes
- ( ) No
- (●) Not relevant to my input

If you have concerns regarding the EARTH, please describe them below.

I have concerns that with the increase of fire and hotter temperatures that reducing the water to our vegetation and removing the Gary Oaks (adult trees have fire-resistant bark) will increase the likelihood of a fire that will affect all of DuPont.

1 EA

If you have concerns regarding the AIR QUALITY, please describe them below.

With the loss of vegetation from the loss of stream flows it will decrease the pollutants able to be removed from the ground and air.

2 EA

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.

Dewatering the aquifer is against DuPont Municipal Code 25.105.050 which spells out the many benefits that the aquifers have on our area to include the reduction of pollution. Decreasing or removing this water forever is not in the best interest of anyone.

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.

Code 25.105.050 of the DMC specifically spells out the importance of our aquifers and streams and the importance of them. Allowing this expansion will do damage to DuPont ok many different levels and will be permanent.

3 DS City EA

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.

Many species of fish, plants, and animals will be affected by the loss of the wetlands, streams, and aquifer. Including several species of endangered animals and plants to include the Gary Oaks and Western Gray Squirrel. The gray squirrel depends on tHe Gary Oaks for their habitat but the mature Gary Oaks also provide fire protection. It would serve us all to not only protect these trees but also to propagate more for further protection from fire in the future.

4 EA

If you have concerns regarding NOISE, please describe them below.

If you have concerns regarding LAND USE, please describe them below.

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

If you have concerns regarding TRANSPORTATION, please describe them below.

If you have OTHER concerns not listed above, please describe them below.

Please consider that allowing the dewatering of the aquifer will have long lasting and permanent negative affects on our water, nature, and safety from heat and fire. It may also affect our property values and increase pollution.

5
DS

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

(SEPA2021-002 comment period 6/14/2024-7/15/2024)

Pioneer Aggregates South Parcel Draft Environmental Impact Statement (EIS)

Comment Form

Input from the public regarding the Pioneer Aggregates South Parcel Project EIS is welcome. Please submit this form to share your comments. Note: Submitted comment forms are subject to the Public Records Act (RCW 42.56).

Date

6/25/2024

First Name *

Mark

Last Name *

Fischer

Are you a resident of the City of DuPont, WA? *

- (●) Yes
- ( ) No

Are you a business owner? *

- ( ) Yes
- (●) No

Are you part of an Agency or Organization? *

- ( ) Yes
- (●) No
- ( ) Not relevant to my input

If you have concerns regarding the EARTH, please describe them below.

My concerns are the environmental damage this will cause to our community and the citizenship own this water and I say no to the expansion and draining of of our natural resource.

1 EA

If you have concerns regarding the AIR QUALITY, please describe them below.

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.

Yes, this is our water our natural resource and I say no to it's draining.

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.

Yes

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.

Yes

If you have concerns regarding NOISE, please describe them below.

If you have concerns regarding LAND USE, please describe them below.

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

If you have concerns regarding TRANSPORTATION, please describe them below.

If you have OTHER concerns not listed above, please describe them below.

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

(SEPA2021-002 comment period 6/14/2024-7/15/2024)

Pioneer Aggregates South Parcel Draft Environmental Impact Statement (EIS)

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Date
7/18/2024

First Name *
Mark

Last Name *
Fischer

Are you a resident of the City of DuPont, WA? *
- (●) Yes
- ( ) No

Are you a business owner? *
- ( ) Yes
- (●) No

Are you part of an Agency or Organization? *
- ( ) Yes
- (●) No
- ( ) Not relevant to my input

If you have concerns regarding the EARTH, please describe them below.

If you have concerns regarding the AIR QUALITY, please describe them below.
Air quality will be degraded due to the loss of the wetlands in this area impacting all citizens in Dupont.

1 EA

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.
This ground water cannot be replaced and will impact the community, at some point we might need this ground water for drinking.

2 DS

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.
streams will cease in this area, and the vegetation will die resulting in the increase of wildfires damaging homes and maybe life's.

3 DS EA

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.
Fish/plants and animals will be impacted.

4 EA

If you have concerns regarding NOISE, please describe them below.

If you have concerns regarding LAND USE, please describe them below.

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.

If you have concerns regarding CULTURAL RESOURCES, please describe them below.
This needs to also be studied.

5 EA

If you have concerns regarding TRANSPORTATION, please describe them below.

If you have OTHER concerns not listed above, please describe them below.

Overall, I oppose the mine dewatering the aquafer. It is time to say no to anyone and big business. This will impact the quality of life to our town, it will see an excodus of people from the town, and will devalue our homes. No to this expansion of the mine, I am okay with them leaving time to say No.

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

(SEPA2021-002 comment period 6/14/2024-7/15/2024)

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Date

6/26/2024

First Name *

Christopher

Last Name *

Fletcher

Are you a resident of the City of DuPont, WA? *

- (●) Yes
- ( ) No

Are you a business owner? *

- ( ) Yes
- (●) No

Are you part of an Agency or Organization? *

- (●) Yes
- ( ) No
- ( ) Not relevant to my input

What is the name of the Agency or Organization?

Parks and Rec Commission

If you have concerns regarding the EARTH, please describe them below.

I'm always concerned about the Earth and try to do my best to mitigate problems associated with pollution etc. I admin a FB page DuPont Serving the Community where I try to encourage fellow residents to be good stewards of the only Earth we have. This should be everybody's concern

1 EA

If you have concerns regarding the AIR QUALITY, please describe them below.

Absolutely, I like to breath! Fortunately in DuPont enjoys fairly decent air quality. Problems from smoke generated from wild fires and fire pits do affect the air quality. So does Industry.

2 EA

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.

Absolutely. Not just for humans but for Wildlife. I've read expanding the mining operation would drain the Vashon Aquifer and the Sequalitchew Creek. This would be devastating to our local ecology. Not long ago I ran into people testing the waters with the purpose of salmon swimming again in the creek. The creek should be allowed to flow freely like it used to before they dammed diked and diverted it. I AM AGAINST THE MINE EXPANSION.

3 DS EA

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.

Absolutely. We need safe drinking water. The city is taking steps to remove PCAS from the water. We don't need mines, industry polluting out drinking water.

4 EA

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.

Absolutely. We're fighting a losing battle to save the Orca and other birds and mammals in the Puget Sound area. We don't need mines taking away the water needed for our wildlife

5 EA

If you have concerns regarding NOISE, please describe them below.

All the time, love DuPont where we can sit outside to the quiet and peace we enjoy. Leaving windows open while we sleep. We do have noise from JBLM but only at certain times plus it's essential to national defense. I am an Air Force veteran and used to the sounds of the military.

6 EA

If you have concerns regarding LAND USE, please describe them below.

Yes, single family housing only with possible retail space should be built. No warehouses, light or heavy industry facilities. No low income multifamily dwelling's. Keep DuPont the pleasing aesthetic and safe place to live.

7 EA

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.

Absolutely DuPont is a beautiful small town. This is the reason I bought a house here and made it my forever home. We should do our best to maintain it that way. No MINES.

8 EA

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

Of course we should cognizant to cultural resources. Particularly the local tribes who lived here way before we turned up. We should restrict metal detecting to authorized personnel who are not going to profit or destroy cultural resources.

9 EA

If you have concerns regarding TRANSPORTATION, please describe them below.

I would like to train and bus services more often from DuPont. I'm a senior and hate the drive to Seattle. Can't go on a weekend, no public transport. There is a concern of the riff raff this may bring though.

10 EA

If you have OTHER concerns not listed above, please describe them below.

No MINE expansion. No Warehouses, No Light/Heavy Industry. Help preserve DuPont as the utopia I feel it is.

11 EA

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

(SEPA2021-002 comment period 6/14/2024-7/15/2024)

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Date

7/22/2024

First Name *

Jeff

Last Name *

Foe

Are you a resident of the City of DuPont, WA? *

- (●) Yes
- ( ) No

Are you a business owner? *

- ( ) Yes
- (●) No

Are you part of an Agency or Organization? *

- ( ) Yes
- ( ) No
- (●) Not relevant to my input

If you have concerns regarding the EARTH, please describe them below.

I strongly oppose CalPortland's request to drain the aquifer to mine gravel. Water is life, the consequences of such an extreme action are difficult to predict. Therefore, a conservative approach is warranted, to ensure the citizens of DuPont have an accessible and reliable water source now and in the future. Additionally, the effects of the mining will have a huge impact on the quality of life of those who reside in the immediate vicinity of the mining activity: increase in noise, loss of forest canopy, loss of wild animal habitat. These are some of the special attractions to living in DuPont, once they are gone we become just another city in the state of Washington.

1 EA

If you have concerns regarding the AIR QUALITY, please describe them below.

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.

Water is life, the consequences of such an extreme action are difficult to predict. Therefore, a conservative approach is warranted, to ensure the citizens of DuPont have an accessible and reliable water source now and in the future.

2 DS EA

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.

Water is life, the consequences of such an extreme action are difficult to predict. Therefore, a conservative approach is warranted, to ensure the citizens of DuPont have an accessible and reliable water source now and in the future.

3 DS EA

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.

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4 EA

If you have concerns regarding NOISE, please describe them below.

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5 EA

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6 EA

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.

I strongly oppose CalPortland's request to drain the aquifer to mine gravel. Water is life, the consequences of such an extreme action are difficult to predict. Therefore, a conservative approach is warranted, to ensure the citizens of DuPont have an accessible and reliable water source now and in the future. Additionally, the effects of the mining will have a huge impact on the quality of life of those who reside in the immediate vicinity of the mining activity: increase in noise, loss of forest canopy, loss of wild animal habitat. These are some of the special attractions to living in DuPont, once they are gone we become just another city in the state of Washington.

7 EA

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

If you have concerns regarding TRANSPORTATION, please describe them below.

If you have OTHER concerns not listed above, please describe them below.

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

(SEPA2021-002 comment period 6/14/2024-7/15/2024)

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Date

7/22/2024

First Name *

Pamela

Last Name *

Foe

Are you a resident of the City of DuPont, WA? *

- (●) Yes
- ( ) No

Are you a business owner? *

- ( ) Yes
- (●) No

Are you part of an Agency or Organization? *

- ( ) Yes
- ( ) No
- (●) Not relevant to my input

If you have concerns regarding the EARTH, please describe them below.

Global warming! The earth needs more protection (trees), not less.

1 EA

If you have concerns regarding the AIR QUALITY, please describe them below.

Trees are also important for our air quality. If we keep removing them, we are directly impacting the air quality for all people and critters in Dupont.

2 EA

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.

Draining the aquifer directly impacts water available to our citizens. With summers getting hotter, even more water will be needed in the future, especially with the addition of more housing and business around the golf course.

3 DS EA

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.

All of our earth water systems are interconnected and co-dependent. We can't possibly know the full, future impact this project will have on our quality of living.

4 DS EA

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.

Again, people (and domestic and wildlife) are all impacted by rising temperatures, air quality and water quality & availability.

5 EA

If you have concerns regarding NOISE, please describe them below.

Noise from the machinery will directly and negatively impact those living nearer to that area (including wildlife). And, just like the Interstate, even those not close will be effected depending on the wind.

6 EA

If you have concerns regarding LAND USE, please describe them below.

There is no benefit to any people, plants or animals from degrading the land. Draining the aquifer, drilling/blasting the countryside will do nothing but disrupt our beautiful, quiet town.

7 EA

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.

For those who like to walk the trails &/or go off trail, the beauty of nature will be spoiled.

8
EA

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

If you have concerns regarding TRANSPORTATION, please describe them below.

If you have OTHER concerns not listed above, please describe them below.

Just an FYSA. I convinced my husband to move to Dupont when he retired because I loved the small town feel, natural beauty and peacefulness. The more we develop, build, destroy and negatively impact this city, the more I regret that decision.

9
EA

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

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Date
7/10/2024

First Name *
John

Last Name *
Fot

Are you a resident of the City of DuPont, WA? *
- Yes
- No

What city do you reside in?

Are you a business owner? *
- Yes
- No

Are you part of an Agency or Organization? *
- Yes
- No
- Not relevant to my input

What is the name of the Agency or Organization?

If you have concerns regarding the EARTH, please describe them below.
Dewatering may cause additional ground settling in previously developed areas. This could impact the foundations for buildings in the industrial park and the liner for Landfill 5. Additional discussion is warranted regarding impacts to the industrial park and Landfill 5.

1 Cal EA

If you have concerns regarding the AIR QUALITY, please describe them below.

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.
Dewatering will cause potentially contaminated water from under Landfill 5 to migrate toward the mine site. More consideration needs to be given to the impacts to Landfill 5.

2 Cal DS

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.

If you have concerns regarding NOISE, please describe them below.

If you have concerns regarding LAND USE, please describe them below.

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

If you have concerns regarding TRANSPORTATION, please describe them below.

If you have OTHER concerns not listed above, please describe them below.

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

(SEPA2021-002 comment period 6/14/2024-7/15/2024)

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Date
7/10/2024

First Name *
Kristy

Last Name *
Francis

Are you a resident of the City of DuPont, WA? *
- (●) Yes
- ( ) No

Are you a business owner? *
- ( ) Yes
- (●) No

Are you part of an Agency or Organization? *
- ( ) Yes
- (●) No
- ( ) Not relevant to my input

If you have concerns regarding the EARTH, please describe them below.

If you have concerns regarding the AIR QUALITY, please describe them below.

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.

My concern regarding the wetlands is that with the water table dropping especially during the driest time of the year it will lead to significant amounts of vegetation will dying. This will not just impacting the plants, animals, general beauty/enjoyment of the area to include trails but also significantly increase fire risk to the entire town. This not only makes the area less desirable but could be devastating to property value along with increasing fire risk to the area.

1 DS EA

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.

If you have concerns regarding NOISE, please describe them below.

If you have concerns regarding LAND USE, please describe them below.

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.

Decreasing vegetation to our area/trails will make part of what makes DuPont so enjoyable a much less desirable place to live/visit.

2 EA

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

If you have concerns regarding TRANSPORTATION, please describe them below.

If you have OTHER concerns not listed above, please describe them below.

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

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Date

6/29/2024

First Name *

Angela

Last Name *

Gesacion

Are you a resident of the City of DuPont, WA? *

- (●) Yes
- ( ) No

Are you a business owner? *

- ( ) Yes
- (●) No

Are you part of an Agency or Organization? *

- ( ) Yes
- ( ) No
- (●) Not relevant to my input

If you have concerns regarding the EARTH, please describe them below.

The beauty of the Sequalichew creek area has been one of my favorite places in DuPont and surrounding areas for the last 10 years. Further mining uphill from this gem will ruin the area in so many ways. The serene noise of the creek running between the hills will be drowned out by industrial noise. The hillsides covered with greenery and beautiful trees could dry up and ruin even the structure of the hillsides.

1 EA

If you have concerns regarding the AIR QUALITY, please describe them below.

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.

If you have concerns regarding NOISE, please describe them below.

The creek should be the only thing heard as you walk down the trail that could be a top trail in all of the Puget Sound.

2 EA

If you have concerns regarding LAND USE, please describe them below.

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

If you have concerns regarding TRANSPORTATION, please describe them below.

If you have OTHER concerns not listed above, please describe them below.

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

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Date

7/4/2024

First Name *

Philip

Last Name *

Goering

Are you a resident of the City of DuPont, WA? *

- (●) Yes
- ( ) No

Are you a business owner? *

- ( ) Yes
- (●) No

Are you part of an Agency or Organization? *

- ( ) Yes
- (●) No
- ( ) Not relevant to my input

If you have concerns regarding the EARTH, please describe them below.

EPA studies on leaching through deeper mining?

1 EA

If you have concerns regarding the AIR QUALITY, please describe them below.

Only as fire risk rating will increase with loss of freshwater city source and likely stressed vegetation.

2 EA

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.

Very strong concerns on aquifer drainage, including resultant brackish infiltration and subsequent impacts on water availability for a growing community. There are secondary concerns on the downward watershed areas. Doing so may truly eliminate any freshwater sources for the city. What were the hydrology study predictions? What were the models used for these predictions? Was DuPont city leadership made aware of these concerns? If so, What was their risk calculation and anticipated mitigation strategy? Strongly recommend involving USGS and UW professors with research in this area before you make an irreversible and catastrophic decision.

Please make public and easily accessible Who did the environmental studies, and what were their credentials? Interested and supporting parties and constituents? Timeframe projected for modelling.

3 DS City EA

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.

Similar comments to above, but generally less impactful. This will likely be noticed earlier by public before DuPont ceases to have reliable water service from above. There is a real risk of decreased downstream trickle secondary to opened capacity for aquifer to refill and subsequent vegetative stress. As this may impact the local trails, consider lost revenue to housing when community attractiveness standards decline. The green trails are a selling point to newcomers,.

4 DS EA

Regardless, recommend discussion with Nisqually nation due to their historic origins to this area.

5 EA City

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.

Related to above, salt water infiltration will impact bordering biomes once aquifer is drained.

6 DS EA

If you have concerns regarding NOISE, please describe them below.

None.

If you have concerns regarding LAND USE, please describe them below.

I'm not as related above.

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.

As above. Is more an economics issue per se. Housing values will drop with stressed vegetation and loss of aesthetic attractions.

7
EA

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

Sequalitchew trail as mentioned above.

8
EA

If you have concerns regarding TRANSPORTATION, please describe them below.

If you have OTHER concerns not listed above, please describe them below.

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

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Date
7/13/2024

First Name *
Dreama

Last Name *
Goosetree

Are you a resident of the City of DuPont, WA? *
- ○ Yes
- ◉ No

What city do you reside in?
JBLM

Are you a business owner? *
- ○ Yes
- ◉ No

Are you part of an Agency or Organization? *
- ○ Yes
- ◉ No
- ○ Not relevant to my input

If you have concerns regarding the EARTH, please describe them below.

If you have concerns regarding the AIR QUALITY, please describe them below.

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.

Accessing the aquifer to expand the gravel mine is not a good idea. Lowering the water table, and the access to potable water during the hottest months of the year could cause devastating effects down tbe road.

1 EA

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.

Reducing the wetlands and streams by accessing the Vashon Aquifer will result in a domino effect and losing green areas, increasing temps, higher cooling and heating costs, and less wildlife.

2 DS EA

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.

If you have concerns regarding NOISE, please describe them below.

If you have concerns regarding LAND USE, please describe them below.

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

If you have concerns regarding TRANSPORTATION, please describe them below.

If you have OTHER concerns not listed above, please describe them below.

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Date
7/14/2024

First Name *
David

Last Name *
Gowenlock

Are you a resident of the City of DuPont, WA? *
- (●) Yes
- ( ) No

Are you a business owner? *
- ( ) Yes
- (●) No

Are you part of an Agency or Organization? *
- ( ) Yes
- ( ) No
- (●) Not relevant to my input

If you have concerns regarding the EARTH, please describe them below.

If you have concerns regarding the AIR QUALITY, please describe them below.

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.

I urge the city to oppose dewatering the aquifer for the sole immediate financial interest of a business vs. the long term quality of life for the citizens and visitors to DuPont. Additionally we have an obligation to protect the area for the indigenous wildlife that depends on it. This self serving request is unconscionable and should be decisively rejected!

1
EA

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.

If you have concerns regarding NOISE, please describe them below.

If you have concerns regarding LAND USE, please describe them below.

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

If you have concerns regarding TRANSPORTATION, please describe them below.

If you have OTHER concerns not listed above, please describe them below.

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

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Date
7/14/2024

First Name *
Linda

Last Name *
Gowenlock

Are you a resident of the City of DuPont, WA? *
- (●) Yes
- ( ) No

Are you a business owner? *
- ( ) Yes
- (●) No

Are you part of an Agency or Organization? *
- ( ) Yes
- ( ) No
- (●) Not relevant to my input

If you have concerns regarding the EARTH, please describe them below.

If you have concerns regarding the AIR QUALITY, please describe them below.

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.

Please do not allow them to dewater the aquifer. The only benefits are the financial interests of this company. There are no short term or long term benefits to DuPont and will only be another legacy of business interest negatively impacting the quality of life for our residents and visitors.

1
EA

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.

If you have concerns regarding NOISE, please describe them below.

If you have concerns regarding LAND USE, please describe them below.

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

If you have concerns regarding TRANSPORTATION, please describe them below.

If you have OTHER concerns not listed above, please describe them below.

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

(SEPA2021-002 comment period 6/14/2024-7/15/2024)

Pioneer Aggregates South Parcel Draft Environmental Impact Statement (EIS)

Comment Form

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Date

7/21/2024

First Name *

Linda

Last Name *

Gowenlock

Are you a resident of the City of DuPont, WA? *

- (●) Yes
- ( ) No

Are you a business owner? *

- ( ) Yes
- (●) No

Are you part of an Agency or Organization? *

- ( ) Yes
- (●) No
- ( ) Not relevant to my input

If you have concerns regarding the EARTH, please describe them below.

If you have concerns regarding the AIR QUALITY, please describe them below.

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.

I have concerns that this company will deplete groundwater solely to make a profit at both the short term and long term expenses of our community. This action will not make DuPont a better place to live and the company is the only one to benefit. Please do not approve this request.

1 EA

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.

If you have concerns regarding NOISE, please describe them below.

If you have concerns regarding LAND USE, please describe them below.

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

If you have concerns regarding TRANSPORTATION, please describe them below.

If you have OTHER concerns not listed above, please describe them below.

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

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Date
7/18/2024

First Name *
Rhoda

Last Name *
Granum

Are you a resident of the City of DuPont, WA? *
- (●) Yes
- ( ) No

Are you a business owner? *
- ( ) Yes
- (●) No

Are you part of an Agency or Organization? *
- ( ) Yes
- ( ) No
- (●) Not relevant to my input

If you have concerns regarding the EARTH, please describe them below.
All of the concerns I list below regrard the EARTH.

1 EA

If you have concerns regarding the AIR QUALITY, please describe them below.
The loss of vegetation from the dewatering of the Vashon Aquifer and subsequent impacts to the Sequalitchew Creek will not only increase the fire risk and the impact to air quality from fires but also lessen the vegetation in the area that aids in keeping good air quality.

2 DS EA

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.
The Vashon Aquifer is an important water resource for Dupont, has been used in the past and could be needed in the future for our growing city population. Dewatering this resource for a company to make a profit is a terrible idea.

3 DS

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.
Losing wetlands, creeks and marshes is detrimental to the aquatic species, land animals and plants in the area. Many places are concentrating on bringing back wetlands, streams and marshes, not destroying them.

4 EA

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.
Loss of water resources will be detrimental to the fish/plants and animals in the area. This loss of water resource could potentially drive the wildlife further into habited areas and cause more conflict and loss of species in the area.

5 EA

If you have concerns regarding NOISE, please describe them below.
Gravel mining is not a quiet business.

6 EA

If you have concerns regarding LAND USE, please describe them below.
This land once destroyed will never be the same

7 EA

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.

See above

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

If you have concerns regarding TRANSPORTATION, please describe them below.

Truck traffic is already a problem. If this adds more then that is a concern.

If you have OTHER concerns not listed above, please describe them below.

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

(SEPA2021-002 comment period 6/14/2024-7/15/2024)

8
EA

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Date
7/19/2024

First Name *
Steffanie

Last Name *
Graves

Are you a resident of the City of DuPont, WA? *
- ○ Yes
- ◉ No

What city do you reside in?
Olympia

Are you a business owner? *
- ○ Yes
- ◉ No

Are you part of an Agency or Organization? *
- ○ Yes
- ◉ No
- ○ Not relevant to my input

If you have concerns regarding the EARTH, please describe them below.
By cutting down trees, animal habitats are being destroyed. Trees help clean the air from pollutants as well. Trees are vital to animals and humans.

1 EA

If you have concerns regarding the AIR QUALITY, please describe them below.

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.
By cutting down trees, animal habitats are being destroyed. The grey squirrel is one of those animals listed as endangered. Trees help clean the air from pollutants as well. Trees are vital to animals and humans.

2 EA

If you have concerns regarding NOISE, please describe them below.

If you have concerns regarding LAND USE, please describe them below.

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

If you have concerns regarding TRANSPORTATION, please describe them below.

If you have OTHER concerns not listed above, please describe them below.

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

(SEPA2021-002 comment period 6/14/2024-7/15/2024)

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Date
7/5/2024

First Name *
Cortney

Last Name *
Greenlaw

Are you a resident of the City of DuPont, WA? *
- ○ Yes
- ◉ No

What city do you reside in?
Lakewood

Are you a business owner? *
- ○ Yes
- ◉ No

Are you part of an Agency or Organization? *
- ○ Yes
- ◉ No
- ○ Not relevant to my input

If you have concerns regarding the EARTH, please describe them below.

We often walk the Sequalitchew trail. The environmental impact of an expanded gravel pit mining would be devastating to everyone who frequents there and not to mention the creatures who call it home. It is time we stand up to big business and say no we need our green spaces. The science that proves that these healthy green spaces are essential to human health and wellbeing are well documented and need to be taken into consideration. We are losing precious greenspace daily and we need to stop.

1
EA

If you have concerns regarding the AIR QUALITY, please describe them below.

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.

If you have concerns regarding NOISE, please describe them below.

If you have concerns regarding LAND USE, please describe them below.

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

If you have concerns regarding TRANSPORTATION, please describe them below.

If you have OTHER concerns not listed above, please describe them below.

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

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Date
7/5/2024

First Name *
Earl

Last Name *
Greenlaw

Are you a resident of the City of DuPont, WA? *
- ○ Yes
- ◉ No

What city do you reside in?
Lakewood

Are you a business owner? *
- ○ Yes
- ◉ No

Are you part of an Agency or Organization? *
- ○ Yes
- ◉ No
- ○ Not relevant to my input

If you have concerns regarding the EARTH, please describe them below.
We often walk the Sequalitchew trail. The environmental impact of an expanded gravel pit mining would be devastating. It is time we stand up to big business and say no and that we need our green spaces. Science proves that these healthy green spaces are essential to human health and wellbeing are well documented and need to be taken into consideration. We are losing precious greenspace daily and we need to stop.

1 EA

If you have concerns regarding the AIR QUALITY, please describe them below.

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.

If you have concerns regarding NOISE, please describe them below.

If you have concerns regarding LAND USE, please describe them below.

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

If you have concerns regarding TRANSPORTATION, please describe them below.

If you have OTHER concerns not listed above, please describe them below.

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

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Date

7/13/2024

First Name *

Tess

Last Name *

Guise

Are you a resident of the City of DuPont, WA? *

- ○ Yes
- ◉ No

What city do you reside in?

McChord AFB

Are you a business owner? *

- ○ Yes
- ◉ No

Are you part of an Agency or Organization? *

- ○ Yes
- ◉ No
- ○ Not relevant to my input

If you have concerns regarding the EARTH, please describe them below.

I just saw that a forum about a gravel mine expanding and causing the Squalitchew creek trail to dry up and harm the beautiful nature. My family. including 2 young kids, use this trail almost every week. The vegetation and atmosphere of the trail are the best parts and if those die off, that trail will be devastating to walk.

1 EA

If you have concerns regarding the AIR QUALITY, please describe them below.

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.

Do not let Squalitchew creek go dry over more gravel. The world is already drastically changing for the worst, this doesn't need to happen. The wild life and human life love that trail and it's gorgeous lush beauty in such a populated area.

2 DS EA

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.

If you have concerns regarding NOISE, please describe them below.

If you have concerns regarding LAND USE, please describe them below.

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

If you have concerns regarding TRANSPORTATION, please describe them below.

If you have OTHER concerns not listed above, please describe them below.

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

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Date
7/13/2024

First Name *
Mary

Last Name *
Gustafson

Are you a resident of the City of DuPont, WA? *
- (●) Yes
- ( ) No

Are you a business owner? *
- ( ) Yes
- (●) No

Are you part of an Agency or Organization? *
- ( ) Yes
- (●) No
- ( ) Not relevant to my input

If you have concerns regarding the EARTH, please describe them below.
We in my household do not want large communities coming in. This area was not meant for this.

1
EA

If you have concerns regarding the AIR QUALITY, please describe them below.

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.

If you have concerns regarding NOISE, please describe them below.

If you have concerns regarding LAND USE, please describe them below.

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

If you have concerns regarding TRANSPORTATION, please describe them below.
This town does not have adequate evacuation routes, to accommodate more infrastructure

2
EA
City

If you have OTHER concerns not listed above, please describe them below.

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

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Date

7/21/2024

First Name *

Shalitta

Last Name *

Habte

Are you a resident of the City of DuPont, WA? *

- (●) Yes
- ( ) No

Are you a business owner? *

- ( ) Yes
- (●) No

Are you part of an Agency or Organization? *

- ( ) Yes
- ( ) No
- (●) Not relevant to my input

If you have concerns regarding the EARTH, please describe them below.

As a community having trees and sufficient water for all is what DuPont been striving to keep. We are a proud community to cut trees and take water from our neighbors would be a mistake. This would cause the neighborhood to become hotter in the summer months. 1 EA

If you have concerns regarding the AIR QUALITY, please describe them below.

By cutting down trees Air Quality would be a tragedy. The people of the community may suffer more allergies and asthma attacks. I myself have both but good air quality helps tamper my symptom's down. 2 EA

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.

As we all know water is a precious why would any community want to give it up as the earth heats up we should think that our ground water helps to keep the area cool. Water is essential to life. 3 EA

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.

The streams and wetland are not only beautiful to humans but is essential for the wildlife the lives in and around Dupont. 4 EA

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.

If we take water and surface streams and wetlands from the wildlife here in DuPont we just become another unsustainable neighborhood. Most of us who live here enjoy seeing squirrels, chipmunks, deers and others. Don't take this beauty away from generations to come because of greed. 5 EA

If you have concerns regarding NOISE, please describe them below.

The only noise I have is human made noise loud cars and the noise from I-5 6 EA

If you have concerns regarding LAND USE, please describe them below.

My concern is how many more warehouse. I moved here to live in peace in a neighborhood that was surrounded with trees and be able to go on walks and ride my bike. Now as I go on my walks I see more trucks that are taking over our roads. 7 EA

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.

Continue to keep our neighborhood clean and maintained which it is being done.

8 EA

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

I don't have any

If you have concerns regarding TRANSPORTATION, please describe them below.

I don't have any

If you have OTHER concerns not listed above, please describe them below.

Please keep our community with its natural beauty keep our trees, natural waters don't let greed take and destroy our neighborhood. It would be a tragedy if we let someone come into our community and take away resources from us.

9 EA

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

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Date
7/2/2024

First Name *
Paige

Last Name *
Hall

Are you a resident of the City of DuPont, WA? *
- ○ Yes
- ◉ No

What city do you reside in?
Steilacoom

Are you a business owner? *
- ○ Yes
- ◉ No

Are you part of an Agency or Organization? *
- ○ Yes
- ◉ No
- ○ Not relevant to my input

If you have concerns regarding the EARTH, please describe them below.

If you have concerns regarding the AIR QUALITY, please describe them below.

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.

Dear Director Kincaid,

I am extremely concerned about the proposed CalPortland South Parcel mine expansion and its impact on the groundwater level due to dewatering the Vashon Aquifer. This could significantly affect surrounding vegetation and increase fire danger for our residents, homes, and businesses. It would dry up the seeps along the Sequalitchew Creek Trail, causing the hillside slopes to dry up. I walk this trail with my dogs every week. I love to hear the babbling of the Sequalitchew Creek alongside the trail. If the South Parcel mine expansion receives a permit the creek water alongside the trail would go dry for almost half of the year. Currently, the underground water from the Vashon Aquifer feeds the lush hillside as well as the creek and our wetlands. Please DO NOT approve a mining permit that will destroy our stream, our hillside, and our wetlands IN PERPETUITY. No mitigations exist, nor is any mitigation proposed, that would protect our environment. 1 DS

The projected drop in the groundwater level of up to 9 feet in Edmonds Marsh is of specific concern. Other areas of concern include the drop in groundwater level in Pond Lake, wetlands 8, 9, and 10, and Old Fort Lake. Additionally, the elimination of the Kettle Wetland and the drying up of seeps and springs feeding Sequalitchew Creek are troubling. This drop in groundwater level will likely dry out the vegetation surrounding the City of DuPont. 2 DS EA

Climate conditions have worsened since the 2011 Settlement Agreement was prepared. The City of DuPont is surrounded by forests, and climate change is already increasing the risk of fire to our residents. The resulting decrease in the groundwater level from the mine expansion will likely put DuPont residents at an even greater risk of fire danger. 3 DS City

Restoring Sequalitchew Creek does not have to depend on dewatering the Vashon Aquifer. It should be restored without dewatering the Vashon Aquifer. In fact, CalPortland could be a great community partner by funding the restoration WITHOUT dewatering the aquifer. As outlined above, the decrease in groundwater level throughout the area will likely have a significant negative environmental impact on our wetlands, vegetation, and wildlife. 4 DS City

Thank you!

Concerned Citizen

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.

If you have concerns regarding NOISE, please describe them below.

If you have concerns regarding LAND USE, please describe them below.

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

If you have concerns regarding TRANSPORTATION, please describe them below.

If you have OTHER concerns not listed above, please describe them below.

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

(SEPA2021-002 comment period 6/14/2024-7/15/2024)

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Date
7/2/2024

First Name *
Tyler

Last Name *
Hall

Are you a resident of the City of DuPont, WA? *
- ○ Yes
- ◉ No

What city do you reside in?
Steilacoom, WA

Are you a business owner? *
- ○ Yes
- ◉ No

Are you part of an Agency or Organization? *
- ○ Yes
- ◉ No
- ○ Not relevant to my input

If you have concerns regarding the EARTH, please describe them below.
Many native organisms rely on this watershed. All habitat, especially in urban areas, must be protected. Additionally, the communal value of this watershed cannot be over stated. Its loss would be deeply disruptive to our community.

1 EA

If you have concerns regarding the AIR QUALITY, please describe them below.

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.
Mining never has a positive impact on groundwater. Please consider finding an alternative that would not impact Sequalitchew creek.

2 EA

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.
This stream does feed a small estuary which are protected habitat.

3 EA

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.

If you have concerns regarding NOISE, please describe them below.

If you have concerns regarding LAND USE, please describe them below.

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

If you have concerns regarding TRANSPORTATION, please describe them below.

If you have OTHER concerns not listed above, please describe them below.

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

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Date

7/13/2024

First Name *

Crystal

Last Name *

Hampton

Are you a resident of the City of DuPont, WA? *

- ○ Yes
- ◉ No

What city do you reside in?

JBLM

Are you a business owner? *

- ○ Yes
- ◉ No

Are you part of an Agency or Organization? *

- ○ Yes
- ◉ No
- ○ Not relevant to my input

If you have concerns regarding the EARTH, please describe them below.

Pretty concerned that the mining request to use water from the Vashan Aquifer is even being considered. It's noted that it will dry out that area during the summer months is unacceptable. That the only time it doesn't consistently rain here and they'd be using all of the water the vegetation needs to survive.

1 DS EA

If you have concerns regarding the AIR QUALITY, please describe them below.

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.

I thought the City of DuPont protected the natural habitats of wildlife as much as possible. So I'm hoping they do not allow the mining request that would allow them to tap into the Vashan Aquifer. That would not align with what I've come to see as the values of the City of DuPont.

2 EA

If you have concerns regarding NOISE, please describe them below.

If you have concerns regarding LAND USE, please describe them below.

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

If you have concerns regarding TRANSPORTATION, please describe them below.

If you have OTHER concerns not listed above, please describe them below.

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

(SEPA2021-002 comment period 6/14/2024-7/15/2024)

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Date
7/9/2024

First Name *
Amy

Last Name *
Hannon-Papier

Are you a resident of the City of DuPont, WA? *
- (●) Yes
- ( ) No

Are you a business owner? *
- ( ) Yes
- (●) No

Are you part of an Agency or Organization? *
- ( ) Yes
- (●) No
- ( ) Not relevant to my input

If you have concerns regarding the EARTH, please describe them below.
It will lower the quality. 1 EA

If you have concerns regarding the AIR QUALITY, please describe them below.
It will make it worse. 2 EA

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.
It will negatively impact this. 3 EA

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.
It will negatively impact these resources. 4 EA

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.
It will negatively impact them and their natural beauty. 5 EA

If you have concerns regarding NOISE, please describe them below.
Too many semi-trucks in the area already. 6 EA

If you have concerns regarding LAND USE, please describe them below.
Please go elsewhere for this project. 7 EA

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.
It will negatively impact this. 8 EA

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

It will negatively impact this.

If you have concerns regarding TRANSPORTATION, please describe them below.

Too many semi-trucks already, no more, thank you!

If you have OTHER concerns not listed above, please describe them below.

We have enjoyed the living in Dupont for over ten years and we love this area. Please protect it from further industrial development.

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

(SEPA2021-002 comment period 6/14/2024-7/15/2024)

9 EA

10 EA

11 EA

Pioneer Aggregates South Parcel Draft Environmental Impact Statement (EIS)

Comment Form

Input from the public regarding the Pioneer Aggregates South Parcel Project EIS is welcome. Please submit this form to share your comments. Note: Submitted comment forms are subject to the Public Records Act (RCW 42.56).

Date

7/20/2024

First Name *

Cary

Last Name *

Harlow

Are you a resident of the City of DuPont, WA? *

- (●) Yes
- ( ) No

Are you a business owner? *

- ( ) Yes
- (●) No

Are you part of an Agency or Organization? *

- ( ) Yes
- (●) No
- ( ) Not relevant to my input

If you have concerns regarding the EARTH, please describe them below.

Gravel mines leave the earth in a devastated condition. Once the company is gone citizens will be left with the aftermath.

1 EA

If you have concerns regarding the AIR QUALITY, please describe them below.

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.

This is of the upmost importance to this community now and in the future. The time for caring for our water sources is upon us. The leaders of our city need to think in terms of sustaining natural sources not using them up. The idea of dewatering flies in the face of every bit of science we are dealing with currently. Please act accordingly and turn this proposal down. Thank you.

2 DS EA

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.

The Sequalitchew Creek is a diamond in our community. We should always act to care for it as such.

3 EA

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.

See Above

If you have concerns regarding NOISE, please describe them below.

If you have concerns regarding LAND USE, please describe them below.

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

If you have concerns regarding TRANSPORTATION, please describe them below.

If you have OTHER concerns not listed above, please describe them below.

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

(SEPA2021-002 comment period 6/14/2024-7/15/2024)

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Date
6/29/2024

First Name *
Melina

Last Name *
Harrington

Are you a resident of the City of DuPont, WA? *
- (●) Yes
- ( ) No

Are you a business owner? *
- (●) Yes
- ( ) No

Where do you do business?
Mobile, Washington state

Are you part of an Agency or Organization? *
- ( ) Yes
- (●) No
- ( ) Not relevant to my input

If you have concerns regarding the EARTH, please describe them below.

If you have concerns regarding the AIR QUALITY, please describe them below.

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.
This plan for graveling will dewater the aquifer causing severe damage to wild life. Endangering the natural ecosystem by drying up the aquifer for. GeVsl extraction projection threatens the health and stability of our land. This will lead to loss of life and species first and foremost, and then second hand will cause damage to soil health through drying up the ground. This will lead to less stable roots in the ground, less wild life roaming and fertilizing the soil, and ultimately leads to a higher risk of landslides, wild fires, and more polluted waters.

1 DS

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.
Drying up the aquifer is damaging to the wetlands which remains an important participant in a healthy eco system!

2 EA

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.
This project will most definitely disrupt all of the above

3 EA

If you have concerns regarding NOISE, please describe them below.

If you have concerns regarding LAND USE, please describe them below.

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.
Absolutely no one wants to walk down our neighborhood trail that is linked to so much culture and history, and see a literal gravel mine and heavy machinery

4 EA

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

This area is extremely sensitive and has deep cultural roots and much history. This is the little space left that hasn't been developed and destroyed already. It should remain off limits. We have taken enough from this space

5
EA

If you have concerns regarding TRANSPORTATION, please describe them below.

If you have OTHER concerns not listed above, please describe them below.

I just don't think this project is necessary. Which I know doesn't go far when so much money or demand is at play. There must be another way to source gravel without blatantly disrespecting the little space we have saved from our destruction. The sequalitchew creek trail should remain an untouchable place besides trail maintaince and things that are good for the ecosystem here. I don't believe that's 'too much' as we have largely developed the city. Green spaces are essential for our wellbeing. drying up the aquifer is not worth it. It's so important for filtering out all the pollutants being washed down from the city into the sound. Keep our waters clean

6
EA

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

(SEPA2021-002 comment period 6/14/2024-7/15/2024)

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Date

7/22/2024

First Name *

Tyra

Last Name *

Hart

Are you a resident of the City of DuPont, WA? *

- (●) Yes
- ( ) No

Are you a business owner? *

- ( ) Yes
- (●) No

Are you part of an Agency or Organization? *

- ( ) Yes
- ( ) No
- (●) Not relevant to my input

If you have concerns regarding the EARTH, please describe them below.

Climate change is a viable concern and water resources are becoming increasingly more valuable. Any operation that would seek to reduce or eliminate a freshwater resource for corporate profit with little to no meaningful return to the citizens of the community involved should be rejected.

1 EA

If you have concerns regarding the AIR QUALITY, please describe them below.

Without adequate water resources to keep the vegetation in the community thriving, the risk of fire goes up and fire is a leading cause of upper respiratory inflammation. The additional truck traffic and heavy equipment operations from an expanded mining operation further releases pollutants and deteriorates air quality for the immediate vicinity around the site.

2 EA

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.

The aquifer provides needed water resources to our natural habitats throughout the community, but especially to the Sequalitchew trail area and Edmonds Marsh. These areas would suffer greatly from dewatering the aquifer. Further, if plans to develop Old Fort Lake come to fruition, the Vashon Aquifer resources may be needed to bolster the cities supply of freshwater to meet the demands of the additional residents and businesses for that project.

3 DS

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.

The protection of the vegetation and wildlife along the Sequalitchew Trail and Edmonds Marsh has must be a serious consideration before approving the mine expansion and, in my opinion based in the review of the public documents regarding this project, the ends to implement this project do not justify the means. Destruction of the natural areas that make DuPont such a desirable place to live should not be allowed under any circumstances but especially not to increase the interests of private business.

4 EA

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.

See the above comment regarding destruction of natural habitat for corporate profit.

If you have concerns regarding NOISE, please describe them below.

At the best of times, the audible noise from the existing mining operation is a nuisance. Expanding these operations reduces the quality of life for residents of our beautiful town, especially for those in Edmonds Village and the Creekside Village Apartment Community.

5 EA

If you have concerns regarding LAND USE, please describe them below.

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

If you have concerns regarding TRANSPORTATION, please describe them below.

Truck traffic and congestion along DuPont-Steilacoom Rd. is bad enough without exacerbating the problem by expanding the mining operation. Trucks driving illegally through the city where our children play also continues to be a problem. Until more improvements are made to ease congestion from truck traffic, this project should be rejected.

6 EA

If you have OTHER concerns not listed above, please describe them below.

This operation already depletes our community of resources without giving much back in return, save for a minor annual goodwill project that very few care about. As a community, we must work vigilantly to protect our interests and resources so
our city can remain a peaceful, beautiful, desirable place to live. Approving the mine expansion project does not benefit our community in any meaningful way. Rather, this project has the potential to remove many of the features that make DuPont so beautiful and has the potential to hurt existing residents due to decreased property values and increased strain on natural resources and civil resources. The nominal tax revenue brought in by the expansion does not justify the additional burden placed on all residents of DuPont.

7 EA

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

(SEPA2021-002 comment period 6/14/2024-7/15/2024)

BASALITE®
Concrete Products, LLC

June 25th, 2024
Mr. Blair Harter
NW General Manager
Basalite Concrete Products LLC
3299 International Place
Dupont, WA
98327

Barb Kincaid, AICP
Director of Public Services
City of DuPont
1700 Civic Drive
DuPont, WA 98327

RE: Pioneer Aggregates South Parcel Project – SEPA 2021-002

Dear Ms. Kincaid:

I am writing on behalf of Basalite Concrete Products LLC in support of the Pioneer Aggregates South Parcel Project (SEPA 2021-002) and to comment on the recently released Draft Environmental Impact Statement (DEIS).

Basalite Concrete Products Dupont location was established in 1995. The primary reason for the selection of this property is the proximity to raw materials, the Pioneer aggregate site. Basalite Concrete Products manufactures concrete masonry units, pavers, retaining walls, and other concrete accessories. In addition, on the site, we produce Drymix packaged products, such as concrete mix, mortar, grout and specialty packaged construction products. The site employs just over 50 employees with many employees over 25 years at this location. The site runs our own dump trucks to supply ourselves with approximately 24 – 26 loads per day of material coming from the Pioneer site.

In addition to supplying Home Depot and Lowe's, a couple of major projects supplied by this site include Tacoma Community College, Lakes High School, and a variety of DOT Retaining Walls, plus retaining walls at the Home Course.

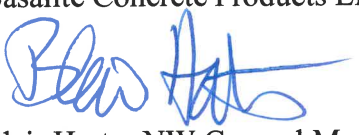
1
EA

In 2018, the Dupont site installed robots on the packaging line. The first use of robots in a concrete block plant in North America, costing millions of dollars. The site is frequently visited from Concrete producers across the Country to see the equipment in use. In fact, I invite your team to come and visit our site.

Not approving the Pioneer Aggregate project would have a significant impact on our business, the employees, and the projects in our pipeline. It is important that regulatory reviewers do not overlook the important economic contribution the Pioneer Aggregates facility makes to the regional economy and the businesses and livelihoods that depend on this resource.

Thank you for taking the time to review and consider these comments.

Sincerely,
Basalite Concrete Products LLC



Blair Harter NW General Manager

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Date
6/26/2024

First Name *
Conrad

Last Name *
Harvey

Are you a resident of the City of DuPont, WA? *
- (●) Yes
- ( ) No

Are you a business owner? *
- ( ) Yes
- (●) No

Are you part of an Agency or Organization? *
- ( ) Yes
- (●) No
- ( ) Not relevant to my input

If you have concerns regarding the EARTH, please describe them below.
Expansion of the quarry is unacceptable. Please do not allow this nor any other expansion in and around the golf course. 1 EA

If you have concerns regarding the AIR QUALITY, please describe them below.
Any expansion of the quarry and or the warehousing in the golf course area will drastically add to pollution of the air and groundwater. 2 EA

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.
See above

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.
See above

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.

If you have concerns regarding NOISE, please describe them below.
I enjoy my morning walks and the noise from the quarry is already distracting. Expanding this can only make it worse. 3 EA

If you have concerns regarding LAND USE, please describe them below.
See above

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

If you have concerns regarding TRANSPORTATION, please describe them below.

If you have OTHER concerns not listed above, please describe them below.

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

(SEPA2021-002 comment period 6/14/2024-7/15/2024)

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Date
7/15/2024

First Name *
April

Last Name *
Hascall

Are you a resident of the City of DuPont, WA? *
- ○ Yes
- ◉ No

What city do you reside in?
Steilacoom

Are you a business owner? *
- ○ Yes
- ◉ No

Are you part of an Agency or Organization? *
- ○ Yes
- ◉ No
- ○ Not relevant to my input

If you have concerns regarding the EARTH, please describe them below.
Main concern is the environmental impacts to natural resources- sequalitchew creek and forests

If you have concerns regarding the AIR QUALITY, please describe them below.
Destruction of forest areas will negatively impact air quality

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.
Mining activities will negatively impact the sequalitchew creek ecosystem

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.
Mining activities will negatively impact the sequalitchew creek ecosystem and animal habitats

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.
Mining activities will negatively impact the sequalitchew creek ecosystem and adjacent forest lands and animal habitats

If you have concerns regarding NOISE, please describe them below.
Noise will impact animal habitats and the trail enjoyment

If you have concerns regarding LAND USE, please describe them below.
Forests and animal habitats ought to be protected.

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.
Natural coast line should be protected to preserve its beauty

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

1
EA

If you have concerns regarding TRANSPORTATION, please describe them below.

If you have OTHER concerns not listed above, please describe them below.

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

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Date

6/28/2024

First Name *

Wyatt

Last Name *

Heck

Are you a resident of the City of DuPont, WA? *

- (●) Yes
- ( ) No

Are you a business owner? *

- ( ) Yes
- (●) No

Are you part of an Agency or Organization? *

- ( ) Yes
- (●) No
- ( ) Not relevant to my input

If you have concerns regarding the EARTH, please describe them below.

I am a retired, disabled veteran, and these trails mean so much to me and my dog and my family if the creek were to dry up and the vegetation die, it would cause me great to stress therefore, I am saying now that I am against the plan. 1 EA

If you have concerns regarding the AIR QUALITY, please describe them below.

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.

I am a retired, disabled veteran, and these trails mean so much to me and my dog and my family if the creek were to dry up and the vegetation die, it would cause me great to stress therefore, I am saying now that I am against the plan. 2 EA

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.

I am a retired, disabled veteran, and these trails mean so much to me and my dog and my family if the creek were to dry up and the vegetation die, it would cause me great to stress therefore, I am saying now that I am against the plan. 3 EA

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.

I am a retired, disabled veteran, and these trails mean so much to me and my dog and my family if the creek were to dry up and the vegetation die, it would cause me great to stress therefore, I am saying now that I am against the plan. 4 EA

If you have concerns regarding NOISE, please describe them below.

If you have concerns regarding LAND USE, please describe them below.

I am a retired, disabled veteran, and these trails mean so much to me and my dog and my family if the creek were to dry up and the vegetation die, it would cause me great to stress therefore, I am saying now that I am against the plan. 5 EA

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

If you have concerns regarding TRANSPORTATION, please describe them below.

If you have OTHER concerns not listed above, please describe them below.

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

(SEPA2021-002 comment period 6/14/2024-7/15/2024)

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Date
6/26/2024

First Name *
Katrin

Last Name *
Hill

Are you a resident of the City of DuPont, WA? *
- (●) Yes
- ( ) No

Are you a business owner? *
- ( ) Yes
- (●) No

Are you part of an Agency or Organization? *
- ( ) Yes
- ( ) No
- (●) Not relevant to my input

If you have concerns regarding the EARTH, please describe them below.
We loose too much nature not every piece of land needs to be built on

1 EA

If you have concerns regarding the AIR QUALITY, please describe them below.
The air wouldn't feel as fresh from all the dust and exhausts

2 EA

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.
The sequalichew trail is beautiful and we need to protect the plants and wildlife who depend on the aquifer. Many plants would dry out and die in the hot and dry summer months and it would be devastating. It should kept natural and not ruined for a business to make money!

3 DS EA

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.
We need to protect them they should stay untouched. They are a huge asset for quality of life for humans, wildlife and plants.

4 EA

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.
They would suffer

5 EA

If you have concerns regarding NOISE, please describe them below.
The trail is so relaxing and noise would ruin the peace walking the trail

6 EA

If you have concerns regarding LAND USE, please describe them below.
We should only allow the minimum requirement by state law and nothing more. Most moved to DuPont for the small town feel and nature. For homes we should build any apartments. Higher end homes and duplexes only.

7 EA City

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

If you have concerns regarding TRANSPORTATION, please describe them below.

Adding as many homes as proposed would cause a big traffic problem. Most families have 2-3 vehicles

If you have OTHER concerns not listed above, please describe them below.

Please keep DuPont safe, protect our natural resources and don't allow building more apartments. We moved here for a family friendly environment and apartments bring in lower income and young residents who don't share the same interests as most people moved here for

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

(SEPA2021-002 comment period 6/14/2024-7/15/2024)

8
EA

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Date

7/13/2024

First Name *

Megan

Last Name *

Hongo

Are you a resident of the City of DuPont, WA? *

- (●) Yes
- ( ) No

Are you a business owner? *

- ( ) Yes
- (●) No

Are you part of an Agency or Organization? *

- ( ) Yes
- (●) No
- ( ) Not relevant to my input

If you have concerns regarding the EARTH, please describe them below.

If you have concerns regarding the AIR QUALITY, please describe them below.

With the removal of healthy vegetation via dewatering our aquifer, we are inviting an increased risk of wildfires to these areas- ones that could have devastating consequences for our communities, including loss of habitats, homes and reducing air quality during the summer months.
Reduction in water levels locally will reduce overall vegetation, that will reduce air quality year round.

1 EA

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.

Dewatering to allow for additional gravel mining will have truly devastating effects on our environment and community.
If the Vashon Aquifer is Dewatered we KNOW the Sequalitchew Creek will go dry for approximately five months each year during the hottest parts of our seasons- increasing risks of drought driven wildfires and destabilizing the ground as roots die off and making them less resilient once rains return. This means the slopes on Sequalitchew Creek Trail will go dry and the established seeps will be eliminated. These seeps maintain the vegetation and proper environment that make the creek flow. The effects to the local water table of West Edmond Marsh is estimated to be lowered up to 9 feet. This would also affect the other wetlands in DuPont will be lowered up to two feet, destroying much needed water habitat for local wildlife populations and destabilizing wildlife predator/prey relationships in the area.

2 DS EA

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.

Dewatering of our aquifer to allow for additional gravel mining will have a long-term negative impact on the areas local wildlife.
Reduction of available water resources will lead to increased wildlife loss as well as citizens seeing more wildlife activity in and around developed communities as wildlife populations seek out new water/vegetation sources. This includes predators who will need more water availability and who will follow their natural prey into populated areas.

3 EA

If you have concerns regarding NOISE, please describe them below.

Additional mining operations will increase noise pollution in the area, increasing traffic as well as more vehicles will be added to accommodate mining activities.

4 EA

If you have concerns regarding LAND USE, please describe them below.

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

Loss of our trails will directly impact the citizens of DuPont; reducing trail access due to environmental impacts, potential of wildfires in the region spreading across newly created drought zones, increased wildlife activity across the city and residential communities, as well as overall reduction of our cities natural habitats in favor of yet another business development at the cost of our access to our land resources.

5 EA

If you have concerns regarding TRANSPORTATION, please describe them below.

If you have OTHER concerns not listed above, please describe them below.

We have to stop the unnecessary development and expansion of large businesses in our community- growth for growths sake is gutting our community destroying the appeal of our city, and is literally killing off our natural habitats despite citizens having made our stance clear. SAVE DUPONT.

6 EA

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

(SEPA2021-002 comment period 6/14/2024-7/15/2024)

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Date

7/3/2024

First Name *

Robert

Last Name *

Horspool

Are you a resident of the City of DuPont, WA? *

- (●) Yes
- ( ) No

Are you a business owner? *

- ( ) Yes
- (●) No

Are you part of an Agency or Organization? *

- ( ) Yes
- ( ) No
- (●) Not relevant to my input

If you have concerns regarding the EARTH, please describe them below.

If you have concerns regarding the AIR QUALITY, please describe them below.

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.

I am very concerned about the effects that n available potable water to the city of Dupont. I am also concerned about the ecological impacts to drying up the Sequalitchew creek ravine.

1 EA

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.

I am concerned that the rich flora and fauna of the Sequalitchew creek ravine will suffer irreparable harm for very minor financial gain relative to the value of the creek ecologically.

2 EA

If you have concerns regarding NOISE, please describe them below.

I live in Creekside village and have concerns about the noise from the project. The current quiet nature of our complex is likely to be disrupted. Especially if mining begins in the southern parcel.

3 EA

If you have concerns regarding LAND USE, please describe them below.

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

If you have concerns regarding TRANSPORTATION, please describe them below.

If you have OTHER concerns not listed above, please describe them below.

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

(SEPA2021-002 comment period 6/14/2024-7/15/2024)

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Date

7/21/2024

First Name *

Karen

Last Name *

Hurst

Are you a resident of the City of DuPont, WA? *

- (●) Yes
- ( ) No

Are you a business owner? *

- ( ) Yes
- (●) No

Are you part of an Agency or Organization? *

- ( ) Yes
- (●) No
- ( ) Not relevant to my input

If you have concerns regarding the EARTH, please describe them below.

We have lived in Dupont Edmonds Village for over 20 years now. Growth is great, however, this kind if growth is unwelcome! You're taking away our beautiful, healthy, life filled community. This is the reason we all live here. Go somewhere else where you are not affecting lives, and environment! NO NO NO! 1 EA

If you have concerns regarding the AIR QUALITY, please describe them below.

Taking all our trees down, ruining the environment for your greedy pockets. Our air quality will diminish rapidly, not to mention fire hazards! 2 EA

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.

The groundwater is what keeps Dupont green, healthy and helps shield us from worse fires/fire seasons. You do not need to develop here! There are plenty of other uninhibited locations for you to destroy! 3 DS

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.

These are natural waterways which must stay intact for a healthy environment! You take this away and you will again be forcing animals and humans out! NO NO NO! 4 DS

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.

It's obvious, you come in, everything is either dead or having to move elsewhere! This is not a healthy choice to destroy Dupont! NO NO NO! 5 EA

If you have concerns regarding NOISE, please describe them below.

Omg! We already have to put up with Amazon and Ft. Lewis. NO MORE! NO NO NO! 6 EA

If you have concerns regarding LAND USE, please describe them below.

We are already over developed. We do not need anything more! NO NO NO 7 EA

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.

Asthetics/Visual? We will be be just another ugly, over industrialized unfriendly place. NO NO NO!!!

8 EA

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

Cultural, it will be all but destroyed if you develop! NO NO NO!

9 EA

If you have concerns regarding TRANSPORTATION, please describe them below.

Dupont is already busy being #1 detour for I-5, we don't need any more transportation issues! NO NO NO!

10 EA

If you have OTHER concerns not listed above, please describe them below.

Leave DUPONT alone, we are a thriving family friendly community. You are not welcome! NO NO NO!

11 EA

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

(SEPA2021-002 comment period 6/14/2024-7/15/2024)

Pioneer Aggregates South Parcel Draft Environmental Impact Statement (EIS)

Comment Form

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Date
7/21/2024

First Name *
Michael

Last Name *
Hurst

Are you a resident of the City of DuPont, WA? *
- (●) Yes
- ( ) No

Are you a business owner? *
- ( ) Yes
- (●) No

Are you part of an Agency or Organization? *
- ( ) Yes
- (●) No
- ( ) Not relevant to my input

If you have concerns regarding the EARTH, please describe them below.
My concerns are over development and taking away habitat for wildlife

1 EA

If you have concerns regarding the AIR QUALITY, please describe them below.
Evey little thing counts the healthy air we breathe mean a healthy life!

2 EA

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.
Over developed land, effects every little thing! This area is OVER DEVELOPED

3 EA

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.
Again over development and runoff effects our environment.

4 EA

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.
Being redundant here! But over development effects us all!

5 EA

If you have concerns regarding NOISE, please describe them below.
There is already to much noise! From Amazon trucks all hours of the night to the increase of traffic and of course those inconsiderate humans that cause this over development and bring it here!

6 EA

If you have concerns regarding LAND USE, please describe them below.
Loss of Habitat should be a concern, am I missing something here? PLEASE educate me!

7 EA

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

If you have concerns regarding TRANSPORTATION, please describe them below.

If you have OTHER concerns not listed above, please describe them below.

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

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Date
7/13/2024

First Name *
Elizabeth

Last Name *
Jellison

Are you a resident of the City of DuPont, WA? *
- ○ Yes
- ◉ No

What city do you reside in?
Lacey, but I have a home in DuPont as well and plan to move back

Are you a business owner? *
- ○ Yes
- ◉ No

Are you part of an Agency or Organization? *
- ○ Yes
- ◉ No
- ○ Not relevant to my input

If you have concerns regarding the EARTH, please describe them below.

If you have concerns regarding the AIR QUALITY, please describe them below.

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.

If you have concerns regarding NOISE, please describe them below.

If you have concerns regarding LAND USE, please describe them below.

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

If you have concerns regarding TRANSPORTATION, please describe them below.

If you have OTHER concerns not listed above, please describe them below.

1
EA

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

text.txt 1.81KB

(SEPA2021-002 comment period 6/14/2024-7/15/2024)

Elizabeth Jellison

2284 Wallace Loop

DuPont, WA

July 13, 2024

Dear Members of the City Council,

I am writing to express my deep concern regarding the proposed expansion of Calportland's mining operations in our community. I believe allowing this expansion would have devastating effects on our water sources, forests, and the overall well-being of our community. 1 EA

The impact on our water resources is particularly alarming. Increased mining activities can lead to contamination of groundwater and surface water, jeopardizing the health and safety of our residents who rely on these sources for drinking water. Furthermore, disruption to natural water flows and sedimentation can harm aquatic habitats and ecosystems, which are vital for maintaining biodiversity in our region. 2 DS EA

The proposed expansion also threatens our forests, which play a crucial role in providing clean air, absorbing carbon dioxide, and supporting wildlife habitats. Clear-cutting and habitat destruction associated with mining operations would irreversibly damage these natural assets that are essential for our community's quality of life. 3 EA

Moreover, the social fabric of our community could suffer significant negative consequences. Noise, dust and other disturbances associated with mining would disrupt the peace and tranquility that residents cherish. Additionally, property values may decline, affecting homeowners and businesses alike. 4 EA

Given these concerns, I urge the City of DuPont to carefully consider the long-term environmental and social impacts of allowing Calportland to expand its mining operations.

Thank you for considering my views on this important matter. I respectfully request that the City Council prioritize the protection of our water, forests, and community well-being in its deliberations on this issue. 5 EA City

Sincerely,

Elizabeth Jellison

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Date

7/7/2024

First Name *

Tania

Last Name *

Johnson

Are you a resident of the City of DuPont, WA? *

- (●) Yes
- ( ) No

Are you a business owner? *

- ( ) Yes
- (●) No

Are you part of an Agency or Organization? *

- ( ) Yes
- (●) No
- ( ) Not relevant to my input

If you have concerns regarding the EARTH, please describe them below.

My main concern is the water, however the information I posted in the water section also applies to the Earth because of the negative impact to the carbon emissions increase.

1 EA

If you have concerns regarding the AIR QUALITY, please describe them below.

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.

My main concern is the water, however the information I posted in the water section also applies to the groundwater.

2 EA

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.

A massive world-wide study of dry riverbeds has found they are contributing more carbon emissions than previously thought. There is a substantial amount of plant litter that accumulates in dry riverbeds and when they flow again this material can breakdown rapidly. "We believe that a single pulse of CO2 emission upon litter rewetting contributes up to 10% of the daily CO2 emission compared to perennial rivers and streams, particularly in temperate climates. What this means is that the contributions of intermittent rivers and streams should be included in global carbon-cycling assessments," said Dr Waltham. Wetlands are ecosystems that are vital both for humankind and nature. They are commonly the most valuable ecosystems in a landscape providing many beneficial ecosystem services. Wetlands play an important role in climate change, because of their capacity to modulate atmospheric concentrations of greenhouse gases such as methane, carbon dioxide and nitrous oxide, which are dominant greenhouse gases contributing to about 60%, 20% and 6% of the global warming potential, respectively (IPCC, 2007). Additionally, changes in physical habitat and food base from river source to mouth profoundly influence biological communities. Besides the scientific evidence that supports constant waterflow all year long, my husband and I walk an average of eight miles a day on Dupont trails. We cross the Edmond Village bridge every day and it angers us every day when we look down to the river/creek and see a bone-dry waterway. Hydrologists have long recognized the interconnected nature of groundwater and surface water. When you mismanage the waterways, you impact the vegetation, water conditions downstream, and animals living in and around the waterway. When we walk down the Sesqualitchew Creek trail, we enjoy the sounds of the water flow and occasionally the sight of birds diving in and out of the water or deer drinking from the stream. Rivers and streams also provide crucial pathways for aquatic and terrestrial organisms to move and migrate to find food and avoid predators. Every time you allow the creek to dry up, you impact the natural conditions, basically devastating local organisms, vegetation, and impacting the creatures that rely on the creek water downstream. You also contribute to climate change and my emotional health in a negative way.

3 EA Cal

4 DS EA

5 EA DS

Please do not approve this! I used the UW library to read through four or five scientific digests and copied some of the text above directly from the sources. You can also find some of the text online in scientific posts.

6
EA

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.

My main concern is the water, however the information I posted in the water section also applies to the fish, plants, and animals.

7
EA

If you have concerns regarding NOISE, please describe them below.

If you have concerns regarding LAND USE, please describe them below.

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

If you have concerns regarding TRANSPORTATION, please describe them below.

If you have OTHER concerns not listed above, please describe them below.

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

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Date

7/5/2024

First Name *

Amanda

Last Name *

Johnston

Are you a resident of the City of DuPont, WA? *

- (●) Yes
- ( ) No

Are you a business owner? *

- ( ) Yes
- (●) No

Are you part of an Agency or Organization? *

- ( ) Yes
- (●) No
- ( ) Not relevant to my input

If you have concerns regarding the EARTH, please describe them below.

If you have concerns regarding the AIR QUALITY, please describe them below.

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.

Allowing this will decrease the water available in seeps, and the creek will run dry when normally it is not. This is a huge increased risk for fires, and will disrupt a gorgeous part of DuPont. This cannot be allowed.

1 DS EA

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.

This will irrevocably change the environment by degrading the amount of water here for ecologically significant durations of time

2 EA

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.

If you have concerns regarding NOISE, please describe them below.

If you have concerns regarding LAND USE, please describe them below.

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.

Will kill many of the beautiful vegetation in the area.

3 EA

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

If you have concerns regarding TRANSPORTATION, please describe them below.

If you have OTHER concerns not listed above, please describe them below.

This is not responsible stewardship of the natural resources here.

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

(SEPA2021-002 comment period 6/14/2024-7/15/2024)

4
EA

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Date

7/21/2024

First Name *

Gisela

Last Name *

Kalicj

Are you a resident of the City of DuPont, WA? *

- (●) Yes
- ( ) No

Are you a business owner? *

- ( ) Yes
- (●) No

Are you part of an Agency or Organization? *

- ( ) Yes
- (●) No
- ( ) Not relevant to my input

If you have concerns regarding the EARTH, please describe them below.

My concerns are that the beautiful and unique ecosystem and trails in DuPont will be heavily impacted or possibly destroyed in its current state by the mining.

1 EA

If you have concerns regarding the AIR QUALITY, please describe them below.

As the ecosystem is likely impacted by the drilling for the mining, trees will be affected as well, which in turn will affect our air quality. I am also concerned about dust pollution.

2 EA

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.

It is difficult to say how much of an impact this all will have on the groundwater, however it is likely that we have not been fully informed about that.

3 DS

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.

I am concerned that the current landscape that makes DuPont such a beautiful place to live in will slowly disappear.

4 EA

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.

Animals will be disturbed in their natural habitat.

5 EA

If you have concerns regarding NOISE, please describe them below.

Mining will surely be causing more noise pollution, which will not only impact DuPont's human inhabitants but also its wildlife.

6 EA

If you have concerns regarding LAND USE, please describe them below.

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

If you have concerns regarding TRANSPORTATION, please describe them below.

If you have OTHER concerns not listed above, please describe them below.

A large amount of DuPont's residents are military members or dependents and are often on the move after a few years. I think a lot of these upcoming changes are unknown to a lot of its inhabitants because of the only temporary living situation for many. Anybody I know loves the trail system in DuPont and it is unique and to be preserved for years and generations to come.

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

(SEPA2021-002 comment period 6/14/2024-7/15/2024)

7
EA

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Date
7/14/2024

First Name *
Heidi

Last Name *
Kennedy

Are you a resident of the City of DuPont, WA? *
- (●) Yes
- ( ) No

Are you a business owner? *
- ( ) Yes
- (●) No

Are you part of an Agency or Organization? *
- ( ) Yes
- ( ) No
- (●) Not relevant to my input

If you have concerns regarding the EARTH, please describe them below.

If you have concerns regarding the AIR QUALITY, please describe them below.

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.

The Vashon Aquifer will be drained for this project. This is unacceptable. The riparian habitat of the Sequalichew Creek basin will be killed. The vegetation and animals that rely on this stream will die off. This is a vital ecological habitat to the endangered species of the Puget Sound. The drinking water for the city of DuPont will be reduced in a time when droughts are becoming more common. This project will harm the people and animals who live in the city of DuPont.

1
EA

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.

If you have concerns regarding NOISE, please describe them below.

If you have concerns regarding LAND USE, please describe them below.

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

If you have concerns regarding TRANSPORTATION, please describe them below.

If you have OTHER concerns not listed above, please describe them below.

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

(SEPA2021-002 comment period 6/14/2024-7/15/2024)

Letter 118

RECEIVED
JUL 15 2021
CITY OF DUPONT

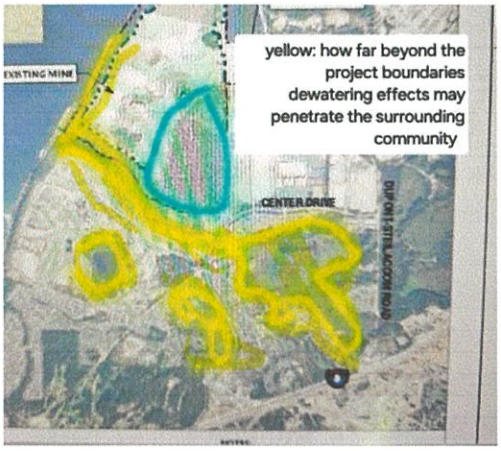
Pioneer Aggregates South Parcel Project, City File No. SEPA2021-002
Attn: Barb Kincaid

Please accept my comments re: the DEIS

Range of Options: There is 1 alternative and a 'no action' with 2 scenarios. Per SEPA handbook, there should be a 'range' of alternatives. The history refers to a range: 'three other possible alternatives - 1- less mining on the South Parcel and/or at the Existing Mine, 2 - preserving the Kettle Wetland, and 3- no dewatering by wells for mining and creation of an interceptor channel southeast of Edmond Marsh' and in 2010 a "Study completed, analyzing 24 alternatives for mining of the North and South Parcels." The project might have been broken down with a second alternative of expanding the mine for the 188 acres without the deepening and catastrophic aquifer breech.

1 EA

Alternative 1 Impacts extend too far beyond private company's project site



The main action option provided is not acceptable; permanent impacts that need mitigation are well outside the boundaries of the project/property to mined. The cumulative effects of Alt 1 will reach far into neighborhoods and time. This private company has rights to work on their property but giving away an entire community's future precious water resources for them to turn a profit in a time of Federally recognized climate crisis and frequent drought does not make sense, especially when only a 'potential' solution is offered. . "The U.S. Geological Survey compares the water stored in the ground to money kept in a bank account" and the mine will make a total withdrawal and no guarantee to replenish it.

2 EA

I would like to see more forecasting information for worst case. "Current drinking wells are not projected to be affected" but we are about to develop 2 more subcommunities and changing climate will drive up our water use not only for drinking but the repeated droughts will cause more need for watering intervention for vegetation. Currently no action alternative 2 is the only water conserving option.

3 DS EA

Restoration Plan: We are told the Alternatives and the Restoration Plan are separate but the plan is referred to 259 times in the DEIS body. Without degrading the aquifer, it appears in Alternative 2 No Action, we could also conduct a restoration plan and from a much less degraded start point: 'There is a potential that the Sequalitchew Creek Restoration Plan could be implemented without the Proposed Action (alternative funding sources would be necessary) and cumulative conditions would be generally similar to Alternative 1'

4 EA

Re:Fish/Salmon, Alternative 1 outcome with the current restoration plan does **not** provide creek flow or temperature to current conditions present today under 'no action' Alternative 2 so alternative 2 would be an improvement e.g. maintaining natural spring flow.

5 DS EA

Consider again the map above. We cannot compromise an entire community's water level, flora and fauna habitat and human enjoyment in the surroundings for 'potential'; the words that need to be used below are **'will restore'**, whatever the cost, whatever it takes for restoration and maintenance especially if the system is so artificial it cannot sustain itself: "The Sequalitchew Creek Restoration Plan has the **potential** to restore an annual average of 12.9 cfs to a 1,200-foot reach of Sequalitchew Creek that currently experiences little to no consistent flow. Seasonally, the flows in this reach following restoration are predicted to be between 2.5-cfs in August up to just over 26 cfs in March"

6 DS

The city should not be left bearing the fiscal burden of failure for a 'potential' solution. Alternative 1 could be presented with multiple restoration scenarios as Alternative 2 is.

7 EA

Fiscal/Costs: 3-12 FISCAL: I feel is not as rosy as stated for Alternative 1. There are direct and indirect fiscal costs of the city on such a project in employee time for project/mitigation compliance that would go well into the future that are not addressed. Some type of significant additional financial assurances of any mitigation project success seems in order. If an artificial water system is effected it will need maintenance and if the restoration plan fails what will the city be left with?

8 City EA

In the Groundwater, Mitigation section the mitigation appears to only cover the mine project in use. The effects of this and any mitigations must cover years, if not a century; research indicates it will cost the entire community long after the mine has pulled up stakes. Again we are losing a long term investment: "The U.S. Geological Survey compares the water stored in the ground to money kept in a bank account"

9 DS

How do we account for possible indirect losses e.g. there is a possible loss of tourist revenues to local business from the regional attraction of Sequalitchew Creek where people buy lunch in town before and after hiking the Creek trail as a more frequently dried up creek with experimental replacement vegetation and more arid look may not have the same refreshing allure to hikers.

10 EA

Adaptive Management mentioned later as part of the restoration plan also appears to require sustained, continuous funding for monitoring and assessment, essentially adding some kind of FTE/more employee hours which are likely permanent since the warranting condition never returns to baseline.
https://www.doi.gov/sites/doi.gov/files/migrated/ppa/upload/TechGuide.pdf

11 City Cal

Noise

3-7 Noise: The noise estimate is incomplete and relies on 'models' which is lazy when **we can ask people** who have lived next to the mine for years and get actual data about the human experience of living like this. I have already done this for another land use project opposite

12 Cal EA

Edmunds village and was surprised when I doorbelled focusing on trucks to learn that yes, people were suffering from truck backing signals but also found disgruntled citizens on Hudson who could not leave their windows open and were unable to sleep at night, including a miserable veteran with PTSD, from clanging, crashing sounds and machinery to me consistent with mine operations by description.

13 EA

Later I personally experienced the potential sudden shock level of noise about to be faced by residents of Creekside Apartments when working at the DuPont Community Garden. At a minimum, less night time construction and mining operation hours and retrofitting Creekside with noise suppression windows and ensuring air conditioning if not present would be necessary mitigations for Alternative 1 and should have been done for Hudson Ave for the original mine operation.

14 Cal

3.7.1 Environment: Noise, the City regulation is too weak to provide residents' quality of life. Small numbers cited e.g. "potential increases of 8 to 16 dBA really add orders of magnitude increase" are explaining a doubling or tripling in decibels is a doubling or tripling in sound power.

15 City EA

Unexpected On/off noises produce a burst across frequencies very disturbing to humans. There is ample evidence of the biological hazards to humans from living in expected/chronic noise and unexpected/brief duration noise that are not captured in the city ordinance but will affect humans in Creekside Apartments and Creek hikers seeking quiet communion with nature may not have been accounted for: This assessment was restricted to **residential** receptor locations potentially affected by increases over existing levels under the Proposed Action.

16 Cal EA

Since the proposal borders a natural area, noise scoping might need to include wildlife? https://stateline.org/2019/10/22/noise-pollution-hurts-wildlife-but-states-have-trouble-turning-down-the-volume/

Trees Alternative 1 has unacceptable landmark tree destruction when we do not meet minimum canopy for climate adaptation. Would the habitat be lost for 10 yrs or a replacement forest created simultaneously. Even so, protected white oaks are included but should not be removed as the canopy of : "oak woodlands provide a mix of feeding, resting, and breeding habitat for many wildlife species. More than 200 vertebrate and a profusion of invertebrate species use Washington's oak woodlands. Some species occur in especially high densities, whereas others are not typically found in Washington. Oaks provide habitat for species that are state listed as Sensitive, Threatened, Endangered, or candidates for these listings.

17 EA

https://wdfw.wa.gov/sites/default/files/publications/02465/wdfw02465.pdf

Other Possible 'Missing, incomplete or incorrect information':

Scenic and Recreation impacts on the human users should be discussed in addition to aesthetics. The human voice which the SEPA process seeks to capture seems to be missing and trail hikers' perspective may be overlooked. They are only mentioned 3 times near the end of the document.

18 Cal EA

Mammals: Update the gray squirrel section reclassified from threatened to endangered as the status has changed. Also, JBLM includes Eagle's Pride golf course to the SW as well as Tatsolo Point and the firing ranges and all of DuPont Steilacoom road which are not separated from DuPont at all. Dismissive language like **'unlikely'** implies no actual investigation of the squirrel's presence: 'once been within the historical range of gray squirrels but is *unlikely* to be occupied by the current population". Actual surveying and current census would allow actual evaluation of options rather than wishful postulation. 19 Cal EA

Amphibians [and other fauna e.g. feeding birds]: Interactions with wetlands are too vague. E.g. if a water body like Pond Lake drops by 2 ft and goes dry a month earlier, aquatic and semiaquatic life, e.g. already threatened NW pond turtles, is impacted e.g.reproduction, spawning, hatchlings and future population and ecosystem survival in our community 20 Cal EA

Insects and bugs, e.g. butterflies, are not addressed as a category that will be impacted.

3.10 Not certain, but seems like the DuPont Historical Society should also have a role here and they are not mentioned. 21 City

Since the proposal borders a natural area, noise scoping might need to include wildlife? https://stateline.org/2019/10/22/noise-pollution-hurts-wildlife-but-states-have-trouble-turning-down-the-volume/ 22 Cal EA

3.8 Land Use. Tree Planting is a discreet act while maintenance and watering are continual. Mitigations should cover both the planting and maintenance through maturity or a specified goal achievement. 23 Cal

3.9 Aesthetics. References the reclamation plan but not enough information here to tell if, as above, it covers a one time act or maintenance until satisfactory, aesthetic maturity has been achieved. 24 Cal

Thanks you for your consideration.

Bridget King, 1473 Kittson St, DuPont WA 98327

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Date

7/21/2024

First Name *

Krista

Last Name *

Kirstien

Are you a resident of the City of DuPont, WA? *

- (●) Yes
- ( ) No

Are you a business owner? *

- ( ) Yes
- (●) No

Are you part of an Agency or Organization? *

- ( ) Yes
- ( ) No
- (●) Not relevant to my input

If you have concerns regarding the EARTH, please describe them below.

I walk the Sequalitchew Trail every morning, 7 days a week. My phone has more video of wildlife and critters than anything else. I regularly see rabbits, squirrels, lizards, snakes, chipmunks, birds of all variation, sea otters, seals, and the thought of their homes being disturbed upsets me greatly. For them whom have been shoved out of so many spaces already, and for me because these walks made it so I came out of the pandemic with grace. I see families getting quality time sharing the outdoors and time together walking the trail as I did when mine were young and even now. I see soldiers using our trails for early morning training and by doing so, getting a glimpse into what Washington has to offer as a duty station. I have seen an eagle fly through the gully above the creek once. I also live at Creekside Village and have for about 6 years now and hate the thought of losing our tranquility behind our apartments and untainted view. I beg if you not to do this. If this happens it will be the final push for us to move from DuPont. Thank you for reading this.

1
EA

If you have concerns regarding the AIR QUALITY, please describe them below.

I walk the Sequalitchew Trail every morning, 7 days a week. My phone has more video of wildlife and critters than anything else. I regularly see rabbits, squirrels, lizards, snakes, chipmunks, birds of all variation, sea otters, seals, and the thought of their homes being disturbed upsets me greatly. For them whom have been shoved out of so many spaces already, and for me because these walks made it so I came out of the pandemic with grace. I see families getting quality time sharing the outdoors and time together walking the trail as I did when mine were young and even now. I see soldiers using our trails for early morning training and by doing so, getting a glimpse into what Washington has to offer as a duty station. I have seen an eagle fly through the gully above the creek once. I also live at Creekside Village and have for about 6 years now and hate the thought of losing our tranquility behind our apartments and untainted view. I beg if you not to do this. If this happens it will be the final push for us to move from DuPont. Thank you for reading this.

2

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.

I walk the Sequalitchew Trail every morning, 7 days a week. My phone has more video of wildlife and critters than anything else. I regularly see rabbits, squirrels, lizards, snakes, chipmunks, birds of all variation, sea otters, seals, and the thought of their homes being disturbed upsets me greatly. For them whom have been shoved out of so many spaces already, and for me because these walks made it so I came out of the pandemic with grace. I see families getting quality time sharing the outdoors and time together walking the trail as I did when mine were young and even now. I see soldiers using our trails for early morning training and by doing so, getting a glimpse into what Washington has to offer as a duty station. I have seen an eagle fly through the gully above the creek once. I also live at Creekside Village and have for about 6 years now and hate the thought of losing our tranquility

behind our apartments and untainted view. I beg if you not to do this. If this happens it will be the final push for us to move from DuPont. Thank you for reading this.

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.

I walk the Sequalitchew Trail every morning, 7 days a week. My phone has more video of wildlife and critters than anything else. I regularly see rabbits, squirrels, lizards, snakes, chipmunks, birds of all variation, sea otters, seals, and the thought of their homes being disturbed upsets me greatly. For them whom have been shoved out of so many spaces already, and for me because these walks made it so I came out of the pandemic with grace. I see families getting quality time sharing the outdoors and time together walking the trail as I did when mine were young and even now. I see soldiers using our trails for early morning training and by doing so, getting a glimpse into what Washington has to offer as a duty station. I have seen an eagle fly through the gully above the creek once. I also live at Creekside Village and have for about 6 years now and hate the thought of losing our tranquility behind our apartments and untainted view. I beg if you not to do this. If this happens it will be the final push for us to move from DuPont. Thank you for reading this.

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.

I walk the Sequalitchew Trail every morning, 7 days a week. My phone has more video of wildlife and critters than anything else. I regularly see rabbits, squirrels, lizards, snakes, chipmunks, birds of all variation, sea otters, seals, and the thought of their homes being disturbed upsets me greatly. For them whom have been shoved out of so many spaces already, and for me because these walks made it so I came out of the pandemic with grace. I see families getting quality time sharing the outdoors and time together walking the trail as I did when mine were young and even now. I see soldiers using our trails for early morning training and by doing so, getting a glimpse into what Washington has to offer as a duty station. I have seen an eagle fly through the gully above the creek once. I also live at Creekside Village and have for about 6 years now and hate the thought of losing our tranquility behind our apartments and untainted view. I beg if you not to do this. If this happens it will be the final push for us to move from DuPont. Thank you for reading this.

If you have concerns regarding NOISE, please describe them below.

I walk the Sequalitchew Trail every morning, 7 days a week. My phone has more video of wildlife and critters than anything else. I regularly see rabbits, squirrels, lizards, snakes, chipmunks, birds of all variation, sea otters, seals, and the thought of their homes being disturbed upsets me greatly. For them whom have been shoved out of so many spaces already, and for me because these walks made it so I came out of the pandemic with grace. I see families getting quality time sharing the outdoors and time together walking the trail as I did when mine were young and even now. I see soldiers using our trails for early morning training and by doing so, getting a glimpse into what Washington has to offer as a duty station. I have seen an eagle fly through the gully above the creek once. I also live at Creekside Village and have for about 6 years now and hate the thought of losing our tranquility behind our apartments and untainted view. I beg if you not to do this. If this happens it will be the final push for us to move from DuPont. Thank you for reading this.

If you have concerns regarding LAND USE, please describe them below.

I walk the Sequalitchew Trail every morning, 7 days a week. My phone has more video of wildlife and critters than anything else. I regularly see rabbits, squirrels, lizards, snakes, chipmunks, birds of all variation, sea otters, seals, and the thought of their homes being disturbed upsets me greatly. For them whom have been shoved out of so many spaces already, and for me because these walks made it so I came out of the pandemic with grace. I see families getting quality time sharing the outdoors and time together walking the trail as I did when mine were young and even now. I see soldiers using our trails for early morning training and by doing so, getting a glimpse into what Washington has to offer as a duty station. I have seen an eagle fly through the gully above the creek once. I also live at Creekside Village and have for about 6 years now and hate the thought of losing our tranquility behind our apartments and untainted view. I beg if you not to do this. If this happens it will be the final push for us to move from DuPont. Thank you for reading this.

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.

I walk the Sequalitchew Trail every morning, 7 days a week. My phone has more video of wildlife and critters than anything else. I regularly see rabbits, squirrels, lizards, snakes, chipmunks, birds of all variation, sea otters, seals, and the thought of their homes being disturbed upsets me greatly. For them whom have been shoved out of so many spaces already, and for me because these walks made it so I came out of the pandemic with grace. I see families getting quality time sharing the outdoors and time together walking the trail as I did when mine were young and even now. I see soldiers using our trails for early morning training and by doing so, getting a glimpse into what Washington has to offer as a duty station. I have seen an eagle fly through the gully above the creek once. I also live at Creekside Village and have for about 6 years now and hate the thought of losing our tranquility behind our apartments and untainted view. I beg if you not to do this. If this happens it will be the final push for us to move from DuPont. Thank you for reading this.

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

I walk the Sequalitchew Trail every morning, 7 days a week. My phone has more video of wildlife and critters than anything else. I regularly see rabbits, squirrels, lizards, snakes, chipmunks, birds of all variation, sea otters, seals, and the thought of their homes being disturbed upsets me greatly. For them whom have been shoved out of so many spaces already, and for me because these walks made it so I came out of the pandemic with grace. I see families getting quality time sharing the outdoors and time together walking the trail as I did when mine were young and even now. I see soldiers using our trails for early morning training and by doing so, getting a glimpse into what Washington has to offer as a duty station. I have seen an eagle fly through the gully above the creek once. I also live at Creekside Village and have for about 6 years now and hate the thought of losing our tranquility behind our apartments and untainted view. I beg if you not to do this. If this happens it will be the final push for us to move from DuPont. Thank you for reading this.

If you have concerns regarding TRANSPORTATION, please describe them below.

I walk the Sequalitchew Trail every morning, 7 days a week. My phone has more video of wildlife and critters than anything else. I regularly see rabbits, squirrels, lizards, snakes, chipmunks, birds of all variation, sea otters, seals, and the thought of their homes being disturbed upsets me greatly. For them whom have been shoved out of so many spaces already, and for me because these walks made it so I came out of the pandemic with grace. I see families getting quality time sharing the outdoors and time together walking the trail as I did when mine were young and even now. I see soldiers using our trails for early morning training and by doing so, getting a glimpse into what Washington has to offer as a duty station. I have seen an eagle fly through the gully above the creek once. I also live at Creekside Village and have for about 6 years now and hate the thought of losing our tranquility behind our apartments and untainted view. I beg if you not to do this. If this happens it will be the final push for us to move from DuPont. Thank you for reading this.

If you have OTHER concerns not listed above, please describe them below.

I walk the Sequalitchew Trail every morning, 7 days a week. My phone has more video of wildlife and critters than anything else. I regularly see rabbits, squirrels, lizards, snakes, chipmunks, birds of all variation, sea otters, seals, and the thought of their homes being disturbed upsets me greatly. For them whom have been shoved out of so many spaces already, and for me because these walks made it so I came out of the pandemic with grace. I see families getting quality time sharing the outdoors and time together walking the trail as I did when mine were young and even now. I see soldiers using our trails for early morning training and by doing so, getting a glimpse into what Washington has to offer as a duty station. I have seen an eagle fly through the gully above the creek once. I also live at Creekside Village and have for about 6 years now and hate the thought of losing our tranquility behind our apartments and untainted view. I beg if you not to do this. If this happens it will be the final push for us to move from DuPont. Thank you for reading this.

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(SEPA2021-002 comment period 6/14/2024-7/15/2024)

Pioneer Aggregates South Parcel Draft Environmental Impact Statement (EIS)

Comment Form

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Date

7/19/2024

First Name *

Elizabeth

Last Name *

Klein

Are you a resident of the City of DuPont, WA? *

- (●) Yes
- ( ) No

Are you a business owner? *

- (●) Yes
- ( ) No

Where do you do business?

From home

Are you part of an Agency or Organization? *

- ( ) Yes
- ( ) No
- (●) Not relevant to my input

If you have concerns regarding the EARTH, please describe them below.

I am highly concerned about the mining and proposed aquifer drawdown due to local mining and the impact it will have on our land and community. There are serious longterm implications for allowing this to project proceed. You should have the interest of the people of Dupont at the forefront of your mind for decision-making, not any personal gain. And.. the people of Dupont do not want to allow the dewatering of our aquifer. Please make the right choice!

1 EA

If you have concerns regarding the AIR QUALITY, please describe them below.

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.

I am highly concerned about the mining and proposed aquifer drawdown due to local mining and the impact it will have on our land and community. There are serious longterm implications for allowing this to project proceed. You should have the interest of the people of Dupont at the forefront of your mind for decision-making, not any personal gain. And.. the people of Dupont do not want to allow the dewatering of our aquifer. Please make the right choice!

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.

I am highly concerned about the mining and proposed aquifer drawdown due to local mining and the impact it will have on our land and community. There are serious longterm implications for allowing this to project proceed. You should have the interest of the people of Dupont at the forefront of your mind for decision-making, not any personal gain. And.. the people of Dupont do not want to allow the dewatering of our aquifer. Please make the right choice!

2 EA

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.

I am highly concerned about the mining and proposed aquifer drawdown due to local mining and the impact it will have on our land and community. There are serious longterm implications for allowing this to project proceed. You should have the interest of the people of Dupont at the forefront of your mind for decision-making, not any personal gain. And.. the people of Dupont do not want to allow the dewatering of our aquifer. Please make the right choice!

If you have concerns regarding NOISE, please describe them below.

If you have concerns regarding LAND USE, please describe them below.

I am highly concerned about the mining and proposed aquifer drawdown due to local mining and the impact it will have on our land and community. There are serious longterm implications for allowing this to project proceed. You should have the interest of the people of Dupont at the forefront of your mind for decision-making, not any personal gain. And.. the people of Dupont do not want to allow the dewatering of our aquifer. Please make the right choice!

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

If you have concerns regarding TRANSPORTATION, please describe them below.

If you have OTHER concerns not listed above, please describe them below.

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

(SEPA2021-002 comment period 6/14/2024-7/15/2024)

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Date
7/4/2024

First Name *
Mark

Last Name *
Koenig

Are you a resident of the City of DuPont, WA? *
- (●) Yes
- ( ) No

Are you a business owner? *
- ( ) Yes
- (●) No

Are you part of an Agency or Organization? *
- ( ) Yes
- (●) No
- ( ) Not relevant to my input

If you have concerns regarding the EARTH, please describe them below.

If you have concerns regarding the AIR QUALITY, please describe them below.

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.

I am concerned about the impact that this project will have on the Sequalitchew Creek water levels. I do not wish to see the creek dry up (even for just a portion of the year) as a result of dewatering the local aquifer.

I would also like to preserve the option to use the aquifer as a potable drinking water source for the City of Dupont. This will allow for business growth as well as keeping our future options open.

1
DS
EA

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.

If you have concerns regarding NOISE, please describe them below.

If you have concerns regarding LAND USE, please describe them below.

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

If you have concerns regarding TRANSPORTATION, please describe them below.

If you have OTHER concerns not listed above, please describe them below.

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

(SEPA2021-002 comment period 6/14/2024-7/15/2024)

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Date

7/13/2024

First Name *

Eric

Last Name *

Koivisto

Are you a resident of the City of DuPont, WA? *

- (●) Yes
- ( ) No

Are you a business owner? *

- ( ) Yes
- (●) No

Are you part of an Agency or Organization? *

- ( ) Yes
- (●) No
- ( ) Not relevant to my input

If you have concerns regarding the EARTH, please describe them below.

Please find another place to dig gravel. This trail is used regularly by student athletes, outdoor enthusiasts, military, and local residents. Tearing up pristine land do a little more gravel seems far too destructive.

1 EA

If you have concerns regarding the AIR QUALITY, please describe them below.

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.

If you have concerns regarding NOISE, please describe them below.

If you have concerns regarding LAND USE, please describe them below.

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

If you have concerns regarding TRANSPORTATION, please describe them below.

If you have OTHER concerns not listed above, please describe them below.

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

(SEPA2021-002 comment period 6/14/2024-7/15/2024)

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Date
7/17/2024

First Name *
Lesli

Last Name *
Koivisto

Are you a resident of the City of DuPont, WA? *
- (●) Yes
- ( ) No

Are you a business owner? *
- ( ) Yes
- (●) No

Are you part of an Agency or Organization? *
- ( ) Yes
- (●) No
- ( ) Not relevant to my input

If you have concerns regarding the EARTH, please describe them below.
Please preserve trails people can enjoy!

If you have concerns regarding the AIR QUALITY, please describe them below.
Taking away so many plants will negatively impact the oxygen in the air.

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.
Please leave sequalichew trail the way it is!

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.
See above comments!

If you have concerns regarding NOISE, please describe them below.

If you have concerns regarding LAND USE, please describe them below.

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

If you have concerns regarding TRANSPORTATION, please describe them below.

1
EA

If you have OTHER concerns not listed above, please describe them below.

Losing this trail would be detrimental to our community!

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

(SEPA2021-002 comment period 6/14/2024-7/15/2024)

2
EA

RECEIVED
JUL 15 2024
CITY OF DUPONT

Letter 124

Dear Director Kincaid,

Sadly, in my 20+ years living in DuPont, it often feels like "circling wolves" are trying to devour our town and our quality of life until absolutely nothing is left. In my 20+ years, I have also seen DuPont citizens successfully rally round to save our city.

Thus, I am extremely concerned about the proposed CalPortland South Parcel mine expansion for several reasons.

1. The impact on the groundwater level due to dewatering the Vashon Aquifer. This could significantly affect surrounding vegetation and increase fire danger for our residents, homes, and businesses. It would dry up the seeps along the Sequalitchew Creek Trail, causing the hillside slopes to dry up. 1 DS

2. The South Pacel the creek water alongside the trail would go dry for almost half of the year. Currently, the underground water from the Vashon Aquifer feeds the lush hillside as well as the creek and our wetlands. Please DO NOT approve a mining permit that will destroy our stream, our hillside, and our wetlands IN PERPETUITY. No mitigations exist, nor is any mitigation proposed that would protect our environment. 2 DS

3. The projected drop in the groundwater level of up to 9 feet in Edmonds Marsh is of specific concern. Other areas of concern include the drop in groundwater level in Pond Lake, wetlands 8, 9, and 10, and Old Fort Lake. Additionally, the elimination of the Kettle Wetland and the drying up of seeps and springs feeding Sequalitchew will likely dry out the vegetation surrounding the City of DuPont. 3 DS

4. Climate conditions have worsened since the 2011 Settlement Agreement was prepared. DuPont is surrounded by forests, and climate change is already increasing the risk of fire to our residents. The resulting decrease in the groundwater level from the mine expansion will likely put DuPont residents at an even greater risk of fire. 4 DS

5. Restoring Sequalitchew Creek does not have to depend on dewatering the Vashon Aquifer. It should be restored without dewatering. In fact, CalPortland could be a great community partner by funding the restoration WITHOUT dewatering the aquifer. 5 Cal

6. This proposed expansion will cause irreversible damage to Dupont's economy. The Sequalichew Creek Trail and adjacent areas are the one thing that sets DuPont far apart from other towns. Visitors consistently come to walk or bike trail systems, frequent business and special events, word of mouth spreads… DuPont thrives. What impact will the resulting environmental destruction have on our families, elders, the children. How many people will move away? What about property values? 6 EA

I imagine when CalPortland looks at DuPont, they don't see forests, wetlands, history, families living, loving, nor a home… they see profit margins. "We see it. We take it. We leave it"

I ask, what will our legacy be?

In Peace,

Karen Konrad - (karenkonrad@aol.com)
2361 McDonald Ave DuPont WA 98321
253-912-4764

Pioneer Aggregates South Parcel Draft Environmental Impact Statement (EIS)

Comment Form

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Date

7/13/2024

First Name *

James

Last Name *

Korkodilos

Are you a resident of the City of DuPont, WA? *

- (●) Yes
- ( ) No

Are you a business owner? *

- ( ) Yes
- (●) No

Are you part of an Agency or Organization? *

- ( ) Yes
- (●) No
- ( ) Not relevant to my input

If you have concerns regarding the EARTH, please describe them below.

If you have concerns regarding the AIR QUALITY, please describe them below.

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.

Through the research I did after seeing the notice, it seems this project will severely impact sequalitchew creek. The impact on the creek does not seem worth the revenue from letting the mine expand.

1 EA

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.

If you have concerns regarding NOISE, please describe them below.

If you have concerns regarding LAND USE, please describe them below.

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.

This is one of the most beautiful locations we have access to in the south sound, and before I lived in DuPont I would frequently come to walk the trail. A big reason I moved here was to be able to enjoy that trail more frequently. I'm surprised this plan is even open for discussion and wasn't immediately struck down, although I imagine that could be due to local rules/laws.

2 EA

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

If you have concerns regarding TRANSPORTATION, please describe them below.

If you have OTHER concerns not listed above, please describe them below.

I don't think anything I could write would adequately articulate how negatively I feel about this project. I do not think anyone who lives in DuPont would disagree that the only entity who would benefit from this is the mine.

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

(SEPA2021-002 comment period 6/14/2024-7/15/2024)

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Date
7/22/2024

First Name *
Elitsa

Last Name *
Kotsakova

Are you a resident of the City of DuPont, WA? *
- (●) Yes
- ( ) No

Are you a business owner? *
- ( ) Yes
- (●) No

Are you part of an Agency or Organization? *
- ( ) Yes
- (●) No
- ( ) Not relevant to my input

If you have concerns regarding the EARTH, please describe them below.
see comment regarding GROUNDWATER/AQUIFER

If you have concerns regarding the AIR QUALITY, please describe them below.

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.
I am concerned that the proposed expansion of the mining operation will materially alter the water ecology of the area, which will have a negative domino effect on the surrounding ecosystems. The old growth forest by Sequalichew Creek is one of the many stunningly beautiful spots in the area. I am one of nearly 10,000 residents in DuPont and we treasure our trails as they afford us respite and recreation near our homes. The system of recreational trails and nature are important to the quality of life in DuPont and deserve protection and consideration. The mining operation should not be allowed to materially alter the ecosystems that surround DuPont.

1 DS EA

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.
see comment regarding GROUNDWATER/AQUIFER

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.
see comment regarding GROUNDWATER/AQUIFER

If you have concerns regarding NOISE, please describe them below.

2 EA

If you have concerns regarding LAND USE, please describe them below.
see comment regarding GROUNDWATER/AQUIFER

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.
see comment regarding GROUNDWATER/AQUIFER

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

If you have concerns regarding TRANSPORTATION, please describe them below.

If you have OTHER concerns not listed above, please describe them below.

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

(SEPA2021-002 comment period 6/14/2024-7/15/2024)

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Date
7/15/2024

First Name *
Anita

Last Name *
Latch

Are you a resident of the City of DuPont, WA? *
- ○ Yes
- ◉ No

What city do you reside in?
Tacoma

Are you a business owner? *
- ○ Yes
- ◉ No

Are you part of an Agency or Organization? *
- ○ Yes
- ◉ No
- ○ Not relevant to my input

If you have concerns regarding the EARTH, please describe them below.

If you have concerns regarding the AIR QUALITY, please describe them below.

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.
Save and preserve the aquifer. The aquifer is part of the commons. We all need water. You can't drink gravel.

1 EA

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.
Animals fish and plants need water which is surface water and/or aquifer.

2 EA

If you have concerns regarding NOISE, please describe them below.

If you have concerns regarding LAND USE, please describe them below.

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

If you have concerns regarding TRANSPORTATION, please describe them below.

If you have OTHER concerns not listed above, please describe them below.

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

(SEPA2021-002 comment period 6/14/2024-7/15/2024)

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Date
7/15/2024

First Name *
Jaime

Last Name *
Lee

Are you a resident of the City of DuPont, WA? *
- ○ Yes
- ◉ No

What city do you reside in?

Are you a business owner? *
- ◉ Yes
- ○ No

Where do you do business?
DuPont, Pierce County, and across the region

Are you part of an Agency or Organization? *
- ◉ Yes
- ○ No
- ○ Not relevant to my input

What is the name of the Agency or Organization?
Lakeside Industries, Inc.

If you have concerns regarding the EARTH, please describe them below.
See attached letter.

If you have concerns regarding the AIR QUALITY, please describe them below.
See attached letter.

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.
See attached letter.

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.
See attached letter.

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.
See attached letter.

If you have concerns regarding NOISE, please describe them below.
See attached letter.

If you have concerns regarding LAND USE, please describe them below.
See attached letter.

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.
See attached letter.

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

1
EA

See attached letter.

If you have concerns regarding TRANSPORTATION, please describe them below.

See attached letter.

If you have OTHER concerns not listed above, please describe them below.

See attached letter.

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

2024-07-15 Pioneer Aggregates DEIS Comment - Letter.pdf 149.96KB

(SEPA2021-002 comment period 6/14/2024-7/15/2024)

1 cont.

LAKESIDE INDUSTRIES

P.O. Box 7016 / Issaquah, WA 98027
ph: 425.313.2600 / lakesideindustries.com

July 15, 2024

Barb Kincaid, AICP
Director of Public Services
City of DuPont
1700 Civic Drive
DuPont, WA 98327

RE: Pioneer Aggregates South Parcel Project – SEPA 2021-002

Dear Ms. Kincaid:

I am writing on behalf of Lakeside Industries, Inc. (Lakeside Industries) in support of the Pioneer Aggregates South Parcel Project (SEPA 2021-002) and to comment on the recently released Draft Environmental Impact Statement (DEIS).

Lakeside Industries is a family-owned asphalt manufacturing and paving company with locally-managed regional divisions spanning Western Washington and Northwest Oregon. Lakeside Industries currently has over 700 employees, including over 500 union employees. Our asphalt plants provide road construction materials to residential, commercial, and industrial properties throughout this community. Pierce County residents drive on roads paved by Lakeside Industries every day.

Lakeside Industries is a customer of the existing Pioneer Aggregates facility, and we rely on the resources from this mine for our asphalt products. The quality and availability of these materials are essential to maintaining our high standards and fulfilling our commitments to our clients. Facilities like Pioneer Aggregates are indispensable in providing the quality sand and gravel necessary for road construction operations. Our industry depends on a steady supply of these materials to build and maintain the infrastructure that supports our community's growth and development.

1
EA

The mining industry plays a significant role in the local and regional economy by supplying essential materials to development projects, offering employment opportunities, and stimulating economic activity in the area. The Pioneer Aggregates facility is situated within the mineral resource overlay and is ideally suited for mining operations. Upon completion of mining, the mined-out lands can be repurposed for various uses, adding long-term value to the community. This adaptive reuse of land is an important aspect of sustainable development.

The existing operation has a proven track record of delivering high-quality materials for businesses and development projects across the region. It is in an ideal location to supply local construction projects. Local sourcing of sand and gravel materials reduces energy consumption, lowers overall costs, and minimizes environmental impacts. Utilizing nearby resources significantly lessens the carbon footprint associated with transporting materials over long distances. Sand and gravel resources are crucial to Washington's infrastructure and development. Adequate supply of these materials is vital for the construction of roads, housing, retail spaces, and commercial developments, all of which are cornerstones of economic growth.

2
EA

The DEIS shows effective mitigation of environmental impacts. Traffic impact from this project on I-5 ramps and city intersections would be negligible, with no adverse impacts projected from the South Parcel proposal. The fiscal analysis indicates that the project would generate a surplus for the City of DuPont, ranging from $18,400 to $125,700, contributing positively to the city's budget. The project includes comprehensive mitigation measures designed to limit environmental impacts, demonstrating a commitment to responsible and sustainable mining practices.

3
EA

In conclusion, Lakeside Industries supports the proposal to expand the Pioneer Aggregates facility. Expansion of this operation is vital to our business, the local economy, and the sustainable growth of our community.

Thank you for considering our perspective on this important matter.

Sincerely,

Jaime Lee
President
Lakeside Industries, Inc.

Pioneer Aggregates South Parcel Draft Environmental Impact Statement (EIS)

Comment Form

Input from the public regarding the Pioneer Aggregates South Parcel Project EIS is welcome. Please submit this form to share your comments. Note: Submitted comment forms are subject to the Public Records Act (RCW 42.56).

Date
7/14/2024

First Name *
Patrick

Last Name *
Lewsi

Are you a resident of the City of DuPont, WA? *
- (●) Yes
- ( ) No

Are you a business owner? *
- (●) Yes
- ( ) No

Where do you do business?
Farrellis McNamaras

Are you part of an Agency or Organization? *
- ( ) Yes
- ( ) No
- (●) Not relevant to my input

If you have concerns regarding the EARTH, please describe them below.
We need to take care of Earth. But do it through and educated lens. 1 EA

If you have concerns regarding the AIR QUALITY, please describe them below.
Air quality must be monitored and improved. Once again be smart and educated and what is best 2 EA

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.
No concerns. Our water is fine i am one of the few who read the report 3 EA

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.
No

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.
We must protect habitat and repair if possible.
We did a lot of damage to Earth before we paid attention. 4 EA

If you have concerns regarding NOISE, please describe them below.
None

If you have concerns regarding LAND USE, please describe them below.
None

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.
None but we should maintain policy to keep our city beautiful. Use responsible planning to do this. 5 EA

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

If you have concerns regarding TRANSPORTATION, please describe them below.

If you have OTHER concerns not listed above, please describe them below.

I'm filling this out because of CAL Portland mine expansion.
I have been to plant and seen their plan.
They will repair fix far more than they will hurt.
Everyone should take a look.
They will replace the creek like it should be. The army moved it in the 60s. Clean topsoil etc.

I would be willing to speak openly at any meeting about this.

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

(SEPA2021-002 comment period 6/14/2024-7/15/2024)

6
EA

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Date
7/17/2024

First Name *
Kristin

Last Name *
Lillegard

Are you a resident of the City of DuPont, WA? *
- ○ Yes
- ◉ No

What city do you reside in?
Tacoma

Are you a business owner? *
- ○ Yes
- ◉ No

Are you part of an Agency or Organization? *
- ○ Yes
- ○ No
- ◉ Not relevant to my input

If you have concerns regarding the EARTH, please describe them below.

If you have concerns regarding the AIR QUALITY, please describe them below.

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.

Please oppose the destruction of Sequalitchew Creek. The Dupont gravel mine operated by CalPortland is seeking permission to "de-water" the Vashon Aquifer adjacent to the creek,this will destroy the creek. Do not let that happen. We are stewards of future generations and we have failed them for 100 years. It's time to preserve and protect. Aquifer destruction leads to a host of problems plainly visible in California. They include sinking land and sink holes. This is short sighted. Say no. I regularly visit Dupont and am working up to buying a home and considering what area. If this goes through I will remove Dupont from consideration.

1 EA

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.

Save wildlife by saving the Vashon aquifer.

If you have concerns regarding NOISE, please describe them below.

If you have concerns regarding LAND USE, please describe them below.

Deny CalPortland's Dupont Gravel Mines request to destroy the Vashon aquifer.

2 EA

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

Watersheds are cultural assets. Save the Vashon aquifer.

If you have concerns regarding TRANSPORTATION, please describe them below.

If you have OTHER concerns not listed above, please describe them below.

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

(SEPA2021-002 comment period 6/14/2024-7/15/2024)

Pioneer Aggregates South Parcel Draft Environmental Impact Statement (EIS)

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Date

6/26/2024

First Name *

Joseph

Last Name *

Limata

Are you a resident of the City of DuPont, WA? *

- (●) Yes
- ( ) No

Are you a business owner? *

- ( ) Yes
- (●) No

Are you part of an Agency or Organization? *

- ( ) Yes
- (●) No
- ( ) Not relevant to my input

If you have concerns regarding the EARTH, please describe them below.

Pits and quarries disrupt the existing movement of surface water and groundwater; they interrupt natural water recharge and can lead to reduced quantity and quality of drinking water for residents and wildlife near or downstream from a quarry site. 1 DS EA

If you have concerns regarding the AIR QUALITY, please describe them below.

Mining can emit particulates into the air, including PM-10 particles, which can pose respiratory health hazards. 2 EA

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.

Pumping groundwater for domestic consumption, irrigation, or mining can cause bodies of water and wetlands to dry up. This can also lead to the death of fish, wildlife, and trees 3 DS

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.

Overdrawing groundwater can cause the land to sink, which can lead to sinkholes or slowly damage large areas. This subsidence can destroy buildings, roads, and underground pipe systems. 4 DS EA

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.

Open-pit mining removes topsoil and vegetation to access materials, which can destroy habitats for animals and plants. Mining can also destroy freshwater and ocean habitats by removing sand and gravel from riverbeds, lakes, and seabeds. 5 EA

If you have concerns regarding NOISE, please describe them below.

If you have concerns regarding LAND USE, please describe them below.

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

If you have concerns regarding TRANSPORTATION, please describe them below.

If you have OTHER concerns not listed above, please describe them below.

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

(SEPA2021-002 comment period 6/14/2024-7/15/2024)

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Date

7/15/2024

First Name *

Marianne

Last Name *

Lincoln

Are you a resident of the City of DuPont, WA? *

- ○ Yes
- ◉ No

What city do you reside in?

Are you a business owner? *

- ○ Yes
- ◉ No

Are you part of an Agency or Organization? *

- ◉ Yes
- ○ No
- ○ Not relevant to my input

What is the name of the Agency or Organization?

Chamber Clover Creek Watershed Council Board

If you have concerns regarding the EARTH, please describe them below.

I live int he Parkland-Spanaway area and have great concerns about our aquifer and the role it plays in groundwater levels pushing up and replenishing the gravel that is more healthy for fish populations that accumulated silt at the bottom of a creek. Sequalitchew is no different that way from the Clover. They are all part of the same watershed. So the proposal to dewater has potential to harm a wider area of the same aquifer, one the City of Dupont does not have jurisdiction over.

1 EA DS

If you have concerns regarding the AIR QUALITY, please describe them below.

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.

The watershed WRIA12 extends over a wider area than just the City of Dupont. Acts that affect it could potentially extend to JBLM, Lakewood, Parkland, Spanaway Frederickson, Graham, and some of South Hill. In Parkland Spanaway we are already seeing the lower groundwater from excessive growth and water use cause our stream to be dry almost 10 months a year now. It used to flow year-round. Sequalitchew needs to be restored for the local fish populations, but to tie dewatering to that is an unfair trade.

2 EA DS

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.

Dams, diversions, pond creation, and other disturbances to the surface water hurt insects that feed birds, lizards, and fish. It affects trees, native bushes that bear fruits, and the overall aesthetic pleasure of a natural environment. As we build these days, those in construction find it easier to strip everything instead of leaving the good things in place. SO many creatures needs to other artifacts int he environment to survive. Who are we to be so arrogant?

3 DS EA

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.

Fish need gravel at the base of their creek, groundwater helps that happen by flowing up and displacing it. Animals, reptiles, and insects are the lower-level food resources for the larger animals, like listed Blue Heron.

4 EA

If you have concerns regarding NOISE, please describe them below.

If you have concerns regarding LAND USE, please describe them below.

I am the Historian for the Descendants of Fort Nisqually Employees Association. Myself and my companions (most are also tribal members), care deeply about the disturbance and destruction in the vicinity of the historic sites. And Fort Nisqually employees themselves are guilty of some of the destruction. We should be learning from past mistakes, not making more. Yes, the historic glaciers from the past left some awesome gravel in the area. But when have we taken enough?

5 EA

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.

Aesthetics, like removing the site where I took a photos of a ghost shaped like Chloe Clark? Impacting the site of the Methodist mIssion. Or the visual of changing the landscape so dramatically, one cannot recognize or imagine how it once looked in the past? For 50 years of my life, I waited to get a chance to see and sense the real site of Fort Nisqually, not the one that I visited at Point Defiance, but the real place where the people operated, worked, lived and died. Opening the Dupont property gave me that chance, but I am sad to see the things you do to it that ruin the experience for us who are sensing individuals. I will not attach, but I can provide the Chloe Clark ghost photo if requested.

6 EA Cal

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

I am the second generation of my family to advocate for caution in the Dupont area regarding cultural artifacts. My mother's name is definitely in the archives of your town expansion. Our property with a miden is in the Nisqually Land Trust now. Impact on future generations should always be a huge consideration.

7 EA

If you have concerns regarding TRANSPORTATION, please describe them below.

NA

If you have OTHER concerns not listed above, please describe them below.

Tribal members would understand this. I am attaching a photo. As I was writing the part about the necessity of insects as part of the food chain, something flew onto my arm. (I am in my house, but just came in from running a weed whacker.) A ladybug flew off my arm and onto my computer. You can see in the photo I am working on my comments. The insects have spoken too.

8 EA

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

20240715_122827.jpg 1.37MB

(SEPA2021-002 comment period 6/14/2024-7/15/2024)

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Date
7/15/2024

First Name *
Alicia

Last Name *
Lopez

Are you a resident of the City of DuPont, WA? *
- ○ Yes
- ◉ No

What city do you reside in?
Lakewood

Are you a business owner? *
- ○ Yes
- ◉ No

Are you part of an Agency or Organization? *
- ◉ Yes
- ○ No
- ○ Not relevant to my input

What is the name of the Agency or Organization?
State Agency

If you have concerns regarding the EARTH, please describe them below.
There is already natural erosion along the trail. Allowing this to happen would expedite the erosion and take away another puget sound access point to locals. The trail is such a hidden gem.

1 EA

If you have concerns regarding the AIR QUALITY, please describe them below.

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.
Native plants.

If you have concerns regarding NOISE, please describe them below.

If you have concerns regarding LAND USE, please describe them below.
This is beautiful area....they should go pollute king county and stay out of pierce.

2 EA

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.
The Amazon facility is already fugly. No need to add to it.

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

If you have concerns regarding TRANSPORTATION, please describe them below.

If you have OTHER concerns not listed above, please describe them below.

We need a grocery store. Not a mine.

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

(SEPA2021-002 comment period 6/14/2024-7/15/2024)

3
EA

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Date
7/22/2024

First Name *
Felita

Last Name *
Luna

Are you a resident of the City of DuPont, WA? *
- (●) Yes
- ( ) No

Are you a business owner? *
- ( ) Yes
- (●) No

Are you part of an Agency or Organization? *
- ( ) Yes
- (●) No
- ( ) Not relevant to my input

If you have concerns regarding the EARTH, please describe them below.
I have concerns about the environmental impacts for the area, animals, and neighbors. 1 EA

If you have concerns regarding the AIR QUALITY, please describe them below.

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.
I'm concerned about the negative effects kn the animals and sea life. 2 EA

If you have concerns regarding NOISE, please describe them below.
Worry it will create more noise for the neighbors and wildlife. 3 EA

If you have concerns regarding LAND USE, please describe them below.

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

If you have concerns regarding TRANSPORTATION, please describe them below.

If you have OTHER concerns not listed above, please describe them below.

Don't like the idea it would effect the trail. So many flock to the trail for relaxation, exercise, hiking, walking, etc

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

(SEPA2021-002 comment period 6/14/2024-7/15/2024)

4
EA

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Date

7/15/2024

First Name *

Tamyra

Last Name *

Lyday

Are you a resident of the City of DuPont, WA? *

- (●) Yes
- ( ) No

Are you a business owner? *

- ( ) Yes
- (●) No

Are you part of an Agency or Organization? *

- ( ) Yes
- (●) No
- ( ) Not relevant to my input

If you have concerns regarding the EARTH, please describe them below.

How much more destruction and/devastating change of natural environment is needed in the name of capital gain?

1 EA

If you have concerns regarding the AIR QUALITY, please describe them below.

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.

Changing the course of natural water & streams is sure to impact all that depend on its existence.

2 EA

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.

This is one of the most important aspects of this project. The impact on fish/plants/animals/birds is one that will no doubt be detrimental for generations to come.

3 EA

If you have concerns regarding NOISE, please describe them below.

If you have concerns regarding LAND USE, please describe them below.

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

As Native (*not a local tribe), what should be treasures & respected, is destroyed for capitalism. As a resident of duPont for 20 years, I've seen time & time again the consideration for surrounding land & that of the town changed & not for the better. Empty buildings, trees uprooted for a golf course? Empty warehouses? More & more housing at astronomical pricing? The beauty of what is natural is slowly being exterminated. And for what? Gravel?

4 EA

If you have concerns regarding TRANSPORTATION, please describe them below.

If you have OTHER concerns not listed above, please describe them below.

I'm not as knowledgeable as many others in this matter but I do understand that this project is wrong. The devastating results will be irreversible. And again, for what, so Cal Portland benefits? Grant you, they do put on the rock find. Thank-you for the opportunity to express my thoughts on this. I hope that it impacts the decision in a positive way, that is to not go forward with this project.

5
EA

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

(SEPA2021-002 comment period 6/14/2024-7/15/2024)

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Date

7/14/2024

First Name *

Zachary

Last Name *

Lyday

Are you a resident of the City of DuPont, WA? *

- (●) Yes
- ( ) No

Are you a business owner? *

- ( ) Yes
- (●) No

Are you part of an Agency or Organization? *

- ( ) Yes
- (●) No
- ( ) Not relevant to my input

If you have concerns regarding the EARTH, please describe them below.

If you have concerns regarding the AIR QUALITY, please describe them below.

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.

When the warehouses on Center Drive and DuPont-Steilacoom Road were put in around 10 years ago I remember for several days after there was an increase of birds flying around my house. All the birds that were displaced from the trees being cut down there were competing to find new homes. I can't imagine how many there will be this time as there will be even fewer places for these animals to relocate to and there could soon be even less places in a few years with other development plans being proposed around the Old Fort Lake subarea plan. There is also the potential that the endangered gray squirrel is living in the forest that would be cut down, taking away even more of its habitat.

1 EA

If you have concerns regarding NOISE, please describe them below.

If you have concerns regarding LAND USE, please describe them below.

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.

One of the comments I hear a lot of people mention about DuPont is how nice it is that there are so many trees and forests nearby that help the town feel more connected to nature. Over the years a lot of them have been cut down which has made the remaining forests more valuable for DuPont to retain this part of its identity. Coming down Center Drive its nice that after a line of warehouses there is large forest near Powerline Road. With that section gone I feel the town would lose part of its charm. With other development plans being proposed, saving as much forest in town is increasing in importance from an aesthetic standpoint as well as from a climate standpoint.

2 EA

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

The area that is proposed for this project is a part of an area that is connected to so many parts of DuPont's history dating back to the Sequalitchew Band. From a historical standpoint, it would be a shame to see an area with such rich history be altered even more than it has been. The history of DuPont is a large part of its identity and this feels like it goes against that.

3
EA

If you have concerns regarding TRANSPORTATION, please describe them below.

If you have OTHER concerns not listed above, please describe them below.

People come from all over the state to walk along the Sequalitchew Trail to either appreciate its natural beauty or to take in its historical significance. When I walk it I enjoy the seclusion it provides. With this proposed expansion it feels like it would hurt peoples enjoyment of the trail. While the project won't be visible from the trail, the change in the animal life there will be felt. Part of the history will feel like it has slipped away. The feeling of being secluded and one with nature won't be the same knowing how close the mine is.

4
EA

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

(SEPA2021-002 comment period 6/14/2024-7/15/2024)

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Date
7/21/2024

First Name *
Kindra

Last Name *
Mazzuca

Are you a resident of the City of DuPont, WA? *
- (●) Yes
- ( ) No

Are you a business owner? *
- ( ) Yes
- (●) No

Are you part of an Agency or Organization? *
- ( ) Yes
- (●) No
- ( ) Not relevant to my input

If you have concerns regarding the EARTH, please describe them below.
The soil in DuPont is already a mess of chemicals from DuPont's historical business activities. 1 EA

If you have concerns regarding the AIR QUALITY, please describe them below.

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.
With how dangerous fire season has become, I worry about further drying out the area and how that could impact local fire danger levels. 2 EA

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.
With how dangerous fire season has become, I worry about further drying out the area and how that could impact local fire danger levels. 3 EA

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.
One of the best things about DuPont is how the wildlife is so present. I love spotting deer and bald eagles as they roam through town between wild spaces. I do not want to loose that natural beauty. 4 EA

If you have concerns regarding NOISE, please describe them below.
Being next to the base, we are exposed to loud noises often. Adding to that with the noise this development would bring seems unnecessary. 5 EA

If you have concerns regarding LAND USE, please describe them below.

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

If you have concerns regarding TRANSPORTATION, please describe them below.

If you have OTHER concerns not listed above, please describe them below.

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

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Date

6/25/2024

First Name *

Shane

Last Name *

McDonald

Are you a resident of the City of DuPont, WA? *

- (●) Yes
- ( ) No

Are you a business owner? *

- ( ) Yes
- (●) No

Are you part of an Agency or Organization? *

- ( ) Yes
- ( ) No
- (●) Not relevant to my input

If you have concerns regarding the EARTH, please describe them below.

If you have concerns regarding the AIR QUALITY, please describe them below.

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.

The Vashon aquifer is only source of fresh water in Sequalitchew Creek during the summer months modifying the ecology of the marsh below. Also my dogs won't get to play in the creek to cool off. Keep the creek!

1 DS EA

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.

If you have concerns regarding NOISE, please describe them below.

If you have concerns regarding LAND USE, please describe them below.

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

If you have concerns regarding TRANSPORTATION, please describe them below.

If you have OTHER concerns not listed above, please describe them below.

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

(SEPA2021-002 comment period 6/14/2024-7/15/2024)

Pioneer Aggregates South Parcel Draft Environmental Impact Statement (EIS)

Comment Form

Input from the public regarding the Pioneer Aggregates South Parcel Project EIS is welcome. Please submit this form to share your comments. Note: Submitted comment forms are subject to the Public Records Act (RCW 42.56).

Date

6/21/2024

First Name *

William

Last Name *

McDonald

Are you a resident of the City of DuPont, WA? *

- (●) Yes
- ( ) No

Are you a business owner? *

- ( ) Yes
- (●) No

Are you part of an Agency or Organization? *

- ( ) Yes
- (●) No
- ( ) Not relevant to my input

If you have concerns regarding the EARTH, please describe them below.

The aggregate in this DuPont mine is a valuable resource for the region. The mine is also located in an area that is ideally separated from residential uses. The mine area when all resources are extracted would make a gorgeous recreation area if a lake were allowed to be formed. 1 EA

If you have concerns regarding the AIR QUALITY, please describe them below.

I have lived in town for almost twenty years and have never felt any air quality impact from the mine. I would want all existing operating procedures that minimize dust to continue. 2 EA

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.

The mine has operated successfully for many years without negative impact to the groundwater or aquifers. My belief is that it appears their plans call for the shallow aquifer will be diverted properly with no impact to the city's wells and water supply. 3 DS

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.

Much history has revolved around restoring Sequalichew Creek. The mining company has expended time and resources to help achieve restoration of the creek and salmon. This is a noble goal but requires good faith by all parties. I have been concerned that environmental stalling has been employed with Cal-Portland. This is not good faith. 4 EA

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.

If you have concerns regarding NOISE, please describe them below.

All protocols that minimize noise and protect residential values in the community should continue. 5 EA

If you have concerns regarding LAND USE, please describe them below.

A high value natural resource exists in our city in the form of aggregate. The comp plan requires that we identify it and protect the resource. You can only mine where the resource exists. Land use planning is designed to protect values and minimize conflicts. I think this mine has proved it can operate with nominal impact.

6 EA

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.

Continue to require buffer areas and visual barriers to essentially isolate the mining operation from other uses in the area.

7 EA

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

Cal-Portland has been a regular contributor to the cultural amenities in our community. I would hope that they would continue to demonstrate their investment in the community.

8 EA

If you have concerns regarding TRANSPORTATION, please describe them below.

The fact that most the aggregate leaves the sight on barge is very positive. With the new exit 119 overpass and I-5 improvements, I think the surface transportation issues will be largely improved.

9 EA

If you have OTHER concerns not listed above, please describe them below.

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

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Date

7/21/2024

First Name *

Lissa

Last Name *

McEvoy

Are you a resident of the City of DuPont, WA? *

- (●) Yes
- ( ) No

Are you a business owner? *

- ( ) Yes
- (●) No

Are you part of an Agency or Organization? *

- ( ) Yes
- ( ) No
- (●) Not relevant to my input

If you have concerns regarding the EARTH, please describe them below.

It would be horrible to see such big machinery and destruction in my backyard. The forest is my peace and gravel mining is not worth taking that away from so many people. 1 EA

If you have concerns regarding the AIR QUALITY, please describe them below.

We shouldn't have to sacrifice air quality for gravel mining. 2 EA

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.

This could not only wreck the stream ecosystem, ground water around the houses but the ocean aswell. 3 EA

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.

The western grey squirrel is now endangered and uses are creek as refuge. Gravel mining would effectively displace them from their habitat entirely 4 EA

If you have concerns regarding NOISE, please describe them below.

It's always loud enough here with artillery and explosions. Living so close to the creek would mean that I would never hear just the sounds of the forest again. 5 EA

If you have concerns regarding LAND USE, please describe them below.

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

If you have concerns regarding TRANSPORTATION, please describe them below.

If you have OTHER concerns not listed above, please describe them below.

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

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Date

6/28/2024

First Name *

Nicole

Last Name *

McNeil

Are you a resident of the City of DuPont, WA? *

- (●) Yes
- ( ) No

Are you a business owner? *

- ( ) Yes
- (●) No

Are you part of an Agency or Organization? *

- ( ) Yes
- (●) No
- ( ) Not relevant to my input

If you have concerns regarding the EARTH, please describe them below.

If you have concerns regarding the AIR QUALITY, please describe them below.

I feel like the dust is getting increasingly worse each year and I can't imagine the mining doesn't have at least some effect. They must ensure a deeper pit doesn't change what's following the wind to toen

1 EA

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.

Since the pit will reduce the aquifer's flow to the creek as planned, there must be a better solution or else it should not go through. The Sequalitchew Creek trail brings so many outsiders to town, as it offers a rainforest-like gentle hike with a wonderful view at the end. If it's just a dusty, dirty trail it won't maintain the coolness in summer or the beautiful surrounding of nature to entice visitors to come, let alone encourage the citizens of DuPont who pick that trail instead of the shortcuts because of its beauty. The shortcuts would absolutely be used more frequently, which could make the hillside unstable and lead to unsafe conditions there too

2 EA DS

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.

If you have concerns regarding NOISE, please describe them below.

In the summer months there's much less of a buffer on sound and it can indeed carry well. Any mining is noisy, and I certainly prefer less prolonged noise

3 EA

If you have concerns regarding LAND USE, please describe them below.

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

If you have concerns regarding TRANSPORTATION, please describe them below.

If you have OTHER concerns not listed above, please describe them below.

When the mining is deemed done, I would love to see portions of it repurposed as something recreational for the townspeople a la the Tenino quarry pool or the Spokane skate ribbon or the Leavenworth skate park. I'm concerned that if we just keep extending, keep extending, keep extending, the mining will never be done

4
EA

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

(SEPA2021-002 comment period 6/14/2024-7/15/2024)

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Date

7/21/2024

First Name *

Doris

Last Name *

Mitcham

Are you a resident of the City of DuPont, WA? *

- (●) Yes
- ( ) No

Are you a business owner? *

- ( ) Yes
- (●) No

Are you part of an Agency or Organization? *

- ( ) Yes
- (●) No
- ( ) Not relevant to my input

If you have concerns regarding the EARTH, please describe them below.

My family loves to walk the Sequalitchew Creek Trail. It's a peaceful area surrounded by trees providing shade on a sunny day and the sound of the creek flowing. I would hate for any of that to change.

1 EA

If you have concerns regarding the AIR QUALITY, please describe them below.

Trees, of course, help with air quality. If you cut them down, you will be affecting the environment.

2 EA

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.

We love the sound of the creek flowing as we walk down the trail. I would hate for the water to dry up. Leave the area as is.

3 EA

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.

Our community has already affected so much of the environment around us. The creek trail is a little bit of the natural environment. Leave it alone. Let the creek continue to flow. Not only do we enjoy it as is, but the animals do as well.

4 EA

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.

It is a natural environment is a community setting. This creek trail should be preserved. It's a place close to home where we can get away and enjoy nature. We can see native plants and animals living in their natural environment.

5 EA

If you have concerns regarding NOISE, please describe them below.

Absolutely concerned about noise. We love the natural environment of the creek trail. It's nature right in our backyard. We can relax as we stroll down the trail and hear the birds and the creek. We don't have to worry about hearing cars, equipment, etc.

6 EA

If you have concerns regarding LAND USE, please describe them below.

As I mentioned before, it's a piece of nature in our own backyard. Leave it alone. Let the creek flow naturally. Let the trees grow. Let the deer, squirrels, birds, etc. have their natural environment.

7 EA

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.

If the trees are cut down and the creek dries up, what's the point of the trail. We like it as is. It's a comforting, quiet, natural environment right in our own backyard. Please don't make any changes.

8 EA

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

N/A

If you have concerns regarding TRANSPORTATION, please describe them below.

The only concern I have about transportation would be the noise that the company would make and the change to the natural environment of the trail. I want to hear the creek and the birds, not vehicles.

9 EA

If you have OTHER concerns not listed above, please describe them below.

We love the trail for the location to our home, for the peaceful environment, for the sound of the creek and the birds chirping. I would hate for any of that to change.

10 EA

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

(SEPA2021-002 comment period 6/14/2024-7/15/2024)

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Date
7/13/2024

First Name *
Cara

Last Name *
Mitchell

Are you a resident of the City of DuPont, WA? *
- (●) Yes
- ( ) No

Are you a business owner? *
- ( ) Yes
- (●) No

Are you part of an Agency or Organization? *
- ( ) Yes
- (●) No
- ( ) Not relevant to my input

If you have concerns regarding the EARTH, please describe them below.

Impacts outside of the development area:
Increased wildfire
Loss of potable water
Loss of water for vegetation for both city properties and personal property owners
Loss of water and wildlife habitat for salmon, orcas, and aquatic life in Nisqually Reach and Salish Sea
impacts to all wildlife including those on the endangered species list.
Impacts to humans with loss of suitable drinking water, property loss

1 EA

If you have concerns regarding the AIR QUALITY, please describe them below.

Please consider HEAL act implications surrounding worsening air quality for all individuals living in DuPont. We are seeing an increase in poor air quality due to wildfire activity. As the water table is lowered substantially in our wetlands and marsh, this is creating an increased risk for wildfire. Loss of trees means loss of vegetation that can clean our air. We live next to I-5 which already has negative impacts on the city. HEAL act maps from ecology shows DuPont at a higher risk NOW because of this. There are serious concerns about how this will worsen if the application is approved.

2 EA

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.

GROUND WATER / AQUIFER
Page 3.3-13, Water Supply
The City of DuPont is in the process of installing giant filters to clean out PFAFs from its existing water supply at the Hoffman Hill and Bell Hill water facilities. This was brought on by contaminated water that entered the water source from JBLM. Future water supply will be in jeopardy if this mine expansion is allowed to move forward. Without water, there is no life. It would be foolish to eliminate any potential future water supply for existing homes and future development. That's exactly what this mine expansion into the south parcel will do if this expansion is allowed to move forward. The cost associated with trucking in water for residents and businesses would be astronomical. This has not been captured in the application, and the city does not have a current revenue stream or a plan in place to pay for such a service.

3 DS City

Page 3.3-20 and 3.3-21 CALCULATED GROUND WATER LEVEL CHANGES:,
The map does not show Center Drive, which is a major road in the city of DuPont. Adjacent to Center Drive are hundreds of homes and businesses in the area where ground water is expected to be lowered. The map is deceiving and not transparent. The lowering of the water table in a residential and wetland area will only increase wildfire threat and stress vegetation more than we've seen in recent years. Is CalPortland going to pay residential

4 DS City

property owners for new watering systems because of the 7-to-18-foot drop in ground water? That's just in the residential section alone. Lowering the water table by draining the Vashon aquifer will dry up Sequalitchew Creek Canyon. It will forever lower the ground water a whopping 69 FEET. This WILL forever change its ecology and kill ALL the wildlife that currently call it home.

4 cont.

USGS has well established cause and effects of dewatering and lowering of a water table in communities across the United States. They identify Groundwater as a valuable resource both in the United States and throughout the world. Groundwater depletion, a term often defined as long-term water-level declines caused by sustained groundwater pumping, is a key issue associated with groundwater use. Many areas of the United States are experiencing groundwater depletion. Is the city of DuPont prepared to deal with the aftermath of dewatering that includes water contamination, sink holes, property loss, increased wildfire risks, increased negative air quality because of the loss of vegetation (due to ongoing drought).

5 DS EA

The application identifies that ground water flows primarily in the Vashon Aquifer and the Sea Level Aquifer. Under the Proposed Action with the Sequalitchew Creek Restoration Plan, unavoidable adverse impacts to the surface water system of the Sequalitchew Creek watershed would include the Vashon Aquifer water table would significantly decrease in the vicinity of the South Parcel. Groundwater levels beneath Edmond Marsh, particularly at the west end of the marsh, would see long-term groundwater level declines of up to 8.73 feet. Groundwater discharge in the Sequalitchew Creek ravine is expected to significantly decrease (by an annual average of up to 83%) during the Proposed Action and is expected to provide on average 79% less baseflow to Sequalitchew Creek following the Proposed Action.

6 DS

The EIS clearly indicates that the drawdown of the Vashon Aquifer is anticipated to affect groundwater and surface water features within a one to two-mile radius from the proposed mine site. This drawdown will have enormous hydrologic impacts to the marsh system and other areas far outside of the development site. It is inconceivable how impacts this far-reaching can even be mitigated.
DuPont official zoning map has Sensitive areas and open space marked throughout the 1-2 mile radius where there will be significant drop in the water table – upwards of 70 feet.

Page 3.3-13
Impacts of Alternatives
Let's discuss the Sequalitchew Creek Restoration Plan. The idea to restore Sequalitchew Creek for salmon and other aquatic habitat is a worthy discussion and investment. AND IT DOES NOT NEED TO BE TIED TO A MINING APPLICATION OR PERMIT. Has funding been identified for the restoration plan? How long will that funding be available? Once the Vashon Aquifer is drained, the city will forever need to be pumping water into the west end of Edmunds Marsh and the Sequalitchew Creek Canyon in perpetuity. This vastly expensive endeavor has zero financial resources dedicated to it. It is not a sustainable option. Dewatering of the aquifer will kill and permanently alter the ecosystems around the city of DuPont and the connectivity between each wetland. This is something the city was designed around. Citizens value shaded trails to run, walk and bike on. DuPont is one of the rare communities that has connectivity for pedestrians and bikes that keeps ecological systems intact. The trees and vegetation around those trails will disappear with the mine expansion into the south parcel. The application, as in 2007, is flawed and will forever alter the city's community values with are found in the city's comprehensive plan. Make this 17 year disaster STOP NOW.

7 DS

Enter the DuPont Municipal Code Open Space District: 25.55.010
The purpose of this district is to recognize those lands which are not intended to be developed due to the presence of wetlands, wetland buffers, steep slopes and other sensitive areas and their buffers as provided in Chapter 25.105 DMC, and recognize lands designated for parks, greenbelts, open space and tree preservation areas and regional storm drainage detention areas in addition to open space and landscape areas as mutually agreed to by the property owner and city. In addition, some open spaces are intended to preserve historic and Native American cultural sites. A network of trails is intended to link open spaces with one another and with other community facilities. (Ord. 02-707 § 1)

8 EA

The Restoration plan and any phased mitigation plan is in direct conflict with DMC 25.55.010 as it will permanently alter a significant portion of DuPont's open space and critical areas. The lowering of the water table will kill the tree canopy and all existing vegetation.

9 EA City

The groundwater contingency mitigation measures proposed on page 3.3-33 are not sustainable for reasons described by the USGS. Pumping groundwater into Edmumds Marsh and Sequalitchew Creek in perpetuity is not feasible or reasonable. Where is the mitigation funding to keep this system operational for 200 years or more? The EIS clearly indicates that the drawdown of the Vashon Aquifer is anticipated to affect groundwater and surface water features within a one to two-mile radius from the proposed mine site. This drawdown will have enormous hydrologic impacts to the marsh system and other areas far outside of the development site. It is inconceivable how impacts this far-reaching can even be mitigated.

10 DS City

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.

It's not clear where the wetland categories are located. In 2007, Sequalitchew Creek Canyon was classified as a class 1 wetland, and it was easy for all to see how each marsh and critical/sensitive area was categorized. This information is missing from the provided documents, and a search function of the pdf's is not available. This needs to be flagged as an issue with not all information is available to comment on. Bell Marsh is listed frequently in the wetlands and ground water sections. It needs to be noted that Bell Marsh is considered a Category 1 wetland in the I-5 Mounts Road to Thorne Lane Corridor Improvements EIS and SEIS.
https://wsdot.wa.gov/sites/default/files/2021-11/I5-JBLM-Vicinity-FINALMay2017EA-ExecutiveSummary.pdf

11 Cal City EA

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.

Areas with which state or federally designated endangered, threatened, and sensitive species have a primary association. Federally designated endangered and threatened species are those fish and wildlife species identified by the U.S. Fish and Wildlife Service and the National Marine Fisheries Service that are in danger of extinction or threatened to become endangered. State designated endangered, threatened, and sensitive species are those fish and wildlife species native to the state of Washington identified by the Department of Fish and Wildlife;

12 EA

If you have concerns regarding NOISE, please describe them below.

Loss of trees will only increase Noise for residents. People living in Edmunds Village and Palisade Village already are impacted at times by noise coming from the mine. Mining the south parcel will only increase the decibles creating a hardship for existing property owners. Keep in mind, the proposal to expand the mine first came in 2007. Northwest Landing was well established. Homeowners were here first. There could also be HEAL act implication to this.

13 EA

If you have concerns regarding LAND USE, please describe them below.

Enter the DuPont Municipal Code Open Space District: 25.55.010
The purpose of this district is to recognize those lands which are not intended to be developed due to the presence of wetlands, wetland buffers, steep slopes and other sensitive areas and their buffers as provided in Chapter 25.105 DMC, and recognize lands designated for parks, greenbelts, open space and tree preservation areas and regional storm drainage detention areas in addition to open space and landscape areas as mutually agreed to by the property owner and city. In addition, some open spaces are intended to preserve historic and Native American cultural sites. A network of trails is intended to link open spaces with one another and with other community facilities. (Ord. 02-707 § 1)
The Restoration plan and any phased mitigation plan is in direct conflict with DMC 25.55.010 as it will permanently alter a significant portion of DuPont's open space and critical areas.

14 EA City

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.

Loss of trees for nearby residential will decrease property value.

15 EA

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

There are historical monuments in the proposed mine expansion area. This needs to be documented.

16 EA

If you have concerns regarding TRANSPORTATION, please describe them below.

Not sure why WSDOT isn't one of the reviewers. This will be an increase in trips on I-5. Current expansion on I-5 will only meet projected ADT through 2045. The department has zero funding for future expansion. Additional mitigation funding will likely be required by the applicant to the state for their impacts on the highway.

17 EA

If you have OTHER concerns not listed above, please describe them below.

Proposed Mitigation is Inadequate. The ground water and surface water mitigation plan to convey intercepted groundwater seepage from the eastern slopes of the proposed mine expansion area to discharge into the ravine section of Sequalitchew Creek or West Edmond Marsh is inadequate. First, it is not clear how this would achieve equivalent or greater biological functions resulting in no net loss of wetland function as required under the city code. Second, the cost of conveying water would be prohibitive. CalPortland is not going to have a permanent presence in the city and the EIS is unclear as to who will pay for water conveyance 25, 50 or 100 years down the road. The impacts of this action are permanent and will impact generations of residents. More broadly, there is also a high likelihood of unexpected consequences from drawing down an aquifer that underlies a large portion of the city, which includes current residential and commercial areas. A substantial mitigation fund should be established in light of unforeseen adverse impacts.

18 DS City EA

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

(SEPA2021-002 comment period 6/14/2024-7/15/2024)

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Date
7/14/2024

First Name *
Jeff

Last Name *
Mitchell

Are you a resident of the City of DuPont, WA? *
- (●) Yes
- ( ) No

Are you a business owner? *
- ( ) Yes
- (●) No

Are you part of an Agency or Organization? *
- ( ) Yes
- (●) No
- ( ) Not relevant to my input

If you have concerns regarding the EARTH, please describe them below.

If you have concerns regarding the AIR QUALITY, please describe them below.

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.

General Principles. In light of climate change and existing water contamination issues (PFAS), DuPont's aquifers are a critical resource for the city and require the highest level of protection. Additionally, the proposed activity by CalPortland is not contained within the development area. The DEIS clearly indicates that the drawdown of the Vashon Aquifer is anticipated to affect groundwater and surface water features within a one to two-mile radius from the proposed mine site. This drawdown will have enormous hydrologic impacts to the marsh system and other areas far outside of the development site. It is inconceivable how impacts this far-reaching, impacting other public and private properties, can even be mitigated. 1 DS

Proposed Mitigation is Inadequate. The ground water and surface water mitigation plan to convey intercepted groundwater seepage from the eastern slopes of the proposed mine expansion area to discharge into the ravine section of Sequalitchew Creek or West Edmond Marsh is inadequate. First, it is not clear how this would achieve equivalent or greater biological functions resulting in no net loss of wetland function as required under the city code. Second, the cost of mechanically conveying water would be prohibitive. CalPortland is not going to have a permanent presence in the city and the DEIS is unclear as to who will pay for water conveyance 25, 50 or 100 years down the road. The impacts of this action are permanent and will impact generations of residents. More broadly, there is also a high likelihood of unexpected consequences from drawing down an aquifer that underlies a large portion of the city, which includes current residential and commercial areas. For example, dewatering can cause the ground to lose structural integrity potentially damaging structures. In short, a substantial mitigation fund should be established in light of unforeseen adverse impacts. Lastly, the restoration plan, which is technically separate from the EIS but is referenced as a source for additional mitigation, would only provide topological modifications to the marsh system. However, the restoration plan, in no way, addresses the permanent and far-reaching negative consequences of infiltrating the Vashon aquifer. 2 DS City

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.

General Principles. In light of climate change and existing water contamination issues (PFAS), DuPont's aquifers are a critical resource for the city and require the highest level of protection. Additionally, the proposed activity by CalPortland is not contained within the development area. The DEIS clearly indicates that the drawdown of the Vashon Aquifer is anticipated to affect groundwater and surface water features within a one to two-mile radius from the proposed mine site. This drawdown will have enormous hydrologic impacts to the marsh system and other areas far outside of the development 3 EA

site. It is inconceivable how impacts this far-reaching, impacting other public and private properties, can even be mitigated.

Proposed Mitigation is Inadequate. The ground water and surface water mitigation plan to convey intercepted groundwater seepage from the eastern slopes of the proposed mine expansion area to discharge into the ravine section of Sequalitchew Creek or West Edmond Marsh is inadequate. First, it is not clear how this would achieve equivalent or greater biological functions resulting in no net loss of wetland function as required under the city code. Second, the cost of mechanically conveying water would be prohibitive. CalPortland is not going to have a permanent presence in the city and the DEIS is unclear as to who will pay for water conveyance 25, 50 or 100 years down the road. The impacts of this action are permanent and will impact generations of residents. More broadly, there is also a high likelihood of unexpected consequences from drawing down an aquifer that underlies a large portion of the city, which includes current residential and commercial areas. For example, dewatering can cause the ground to lose structural integrity potentially damaging structures. In short, a substantial mitigation fund should be established in light of unforeseen adverse impacts. Lastly, the restoration plan, which is technically separate from the EIS but is referenced as a source for additional mitigation, would only provide topological modifications to the marsh system. However, the restoration plan, in no way, addresses the permanent and far-reaching negative consequences of infiltrating the Vashon aquifer.

4
EA

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.

If you have concerns regarding NOISE, please describe them below.

If you have concerns regarding LAND USE, please describe them below.

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

If you have concerns regarding TRANSPORTATION, please describe them below.

If you have OTHER concerns not listed above, please describe them below.

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

(SEPA2021-002 comment period 6/14/2024-7/15/2024)

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Date
7/1/2024

First Name *
Jeneva

Last Name *
Mitchell

Are you a resident of the City of DuPont, WA? *
- ○ Yes
- ◉ No

What city do you reside in?
Steilacoom

Are you a business owner? *
- ○ Yes
- ◉ No

Are you part of an Agency or Organization? *
- ○ Yes
- ◉ No
- ○ Not relevant to my input

If you have concerns regarding the EARTH, please describe them below.
We're doing enough damage ever day leave it alone. Your just a rich greedy democrat

1 EA

If you have concerns regarding the AIR QUALITY, please describe them below.
Our air quality already sucks stop trying to make it unlivable here

2 EA

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.
Our water is already great don't mess with it

3 EA

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.
If this affects any animals homes or existing rivers I'll be pissed

4 EA

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.
Don't disturb any wildlife leave it alone greedy democrats

5 EA

If you have concerns regarding NOISE, please describe them below.
We're already noise we don't need more noise

6 EA

If you have concerns regarding LAND USE, please describe them below.
Stop leave the earth alone

7 EA

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

If you have concerns regarding TRANSPORTATION, please describe them below.

If you have OTHER concerns not listed above, please describe them below.

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

(SEPA2021-002 comment period 6/14/2024-7/15/2024)

Pioneer Aggregates South Parcel Draft Environmental Impact Statement (EIS)

Comment Form

Input from the public regarding the Pioneer Aggregates South Parcel Project EIS is welcome. Please submit this form to share your comments. Note: Submitted comment forms are subject to the Public Records Act (RCW 42.56).

Date
7/13/2024

First Name *
Dayna

Last Name *
Mueller

Are you a resident of the City of DuPont, WA? *
- (●) Yes
- ( ) No

Are you a business owner? *
- (●) Yes
- ( ) No

Where do you do business?
Studio D Salon

Are you part of an Agency or Organization? *
- (●) Yes
- ( ) No
- ( ) Not relevant to my input

What is the name of the Agency or Organization?
DuPont Chamber of Commerce

If you have concerns regarding the EARTH, please describe them below.
The products that I carry in my salon are environmentally friendly. I believe it is our responsibility to leave the Environment better than we found it, We only have one earth.

1 EA

If you have concerns regarding the AIR QUALITY, please describe them below.
Being asthmatic , Air quality is extremely important to me. I know on days where we have fires and where the air quality is bad I struggle more I live in the Pacific Northwest because many times the air quality here is so much better than other places..

2 EA

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.
I wish I understood it more. The trail is Extremely important to our community and businesses because it draws people in to use. But I also understand that people like Bridges and the gravel that comes from Calportland is important to maintain our infrastructure.

3 EA

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.
Water is extremely important to our planet and the streams in wetlands and surface water provide habitat for our animals and water for us... It's a resource that should not be taken for granted.

4 EA

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.
Animals and fish should be protected and care for as we are as humans the protectors of our planet.

5 EA

If you have concerns regarding NOISE, please describe them below.
Noise is subjective as a matter fact, my neighbors don't like the noise that my house creates. I have three kids and we're noisy. However, when I want to sleep, I'll turn on white noise on my TV and when I've lived in big cities, sometimes the sound of traffic is actually comforting because it creates that white noise. Noise is something that is very subjective. .

6 EA

If you have concerns regarding LAND USE, please describe them below.

I believe that people should be more involved in learning about how land is used in their communities it extended the Siri comprehensive plan at the library recently and I think it's interesting. How land use his planned and that honestly citizens can have a great impact on that by talking to their city officials and the people who are developing..

7 EA

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.

I think DuPont is amazing because we have green space and because we have a HOA that make sure that the city looks aesthetically pleasing, however, I've been to cities that develop organically, and I love to see gardens in the front of the house, or other countries where Graffiti is placed in the walls and it's beautiful so again I'd like to just say aesthetics are subjective .

8 EA

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

Because so many things have been taken from our indigenous people, I think cultural resources are extremely important and should be respected. Especially here in Dupont, where our sequela chew tribe lived for so many years before white people ever arrived, and they had a culture that we came and took from them and impose our culture upon them. I do believe more could be done to help protect the resources of the Nisqually in our area.

9 EA

If you have concerns regarding TRANSPORTATION, please describe them below.

I believe transportation should be expanded in the city of Dupont. I'm excited for the train line, even though I'm gonna be old when it's finally done, I wish we had local buses and bike lanes and better trails and transportation should be an absolute. Priority

10 EA

If you have OTHER concerns not listed above, please describe them below.

I think that there seems to be a hard stance between two different factors, but I think there's no reason why people can't work together to just figure this out. Perhaps Cal Portland would like to put money toward protecting the sequoia Trail and making it a national or historical landmark and also a state park and pay for resources keep that up for the public that way people could enjoy it and mine and provide gravel for roads and bridges and things like that which are also necessities.

11 EA

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

(SEPA2021-002 comment period 6/14/2024-7/15/2024)

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Date
7/15/2024

First Name *
Dayna

Last Name *
Mueller

Are you a resident of the City of DuPont, WA? *
- (●) Yes
- ( ) No

Are you a business owner? *
- (●) Yes
- ( ) No

Where do you do business?
Studio D Salin

Are you part of an Agency or Organization? *
- (●) Yes
- ( ) No
- ( ) Not relevant to my input

What is the name of the Agency or Organization?
Dupont Chamber of Commerce

If you have concerns regarding the EARTH, please describe them below.
I'm resubmitting this because somehow I submitted a rough draft typos and all so I'm gonna do this again. This is my official statement.... Yes, I think with global warming, and human impact we are seeing Wildlife, habitation, water issues for communities, oceans, rising, really big impacts on our earth. 1 EA

If you have concerns regarding the AIR QUALITY, please describe them below.
Being an asthmatic, air quality is very important to me. As we've been having so many fires in the last several years, I have been majorly impacted by our air quality here in the Pacific Northwest. Developing nations, such as China and India suffer from terrible air quality every day I worry about the children of the world and their future. 2 EA

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.
Groundwater is always a concern. As we've seen companies in Michigan, or in developing nations that suffer with poor water, and chemicals in the water it is Scary. I believe there are a lot of people that are only concerned about money and not about the health of humanity. I am not sure about what is happening with here in Dupont, I do know that businesses also deserve a chance. But I am a big advocate for the environment and you can see that in my Salon business I carry only eco-friendly lines. 3 DS EA

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.
I believe these are very fragile systems and that humans have a great impact on them and we've seen our salmon impacted by dams. Wetlands are particularly fragile. And here in Dupont, we have a lot of these things, and we have a unique beauty for our city. 4 EA DS

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.
We as humans have a stewardship of the earth and we have greatly impacted Fish and plants already. We should greatly review the things that we do to our city to make sure that these things are not impacted, but again, however we also live in country where we need infrastructure, and as I understand it, Calportland is providing many of that resources for us to live every day life and I would love to see if there was someway we could come to an agreement to protect the environment, but also provide for our lifestyles 5 EA

If you have concerns regarding NOISE, please describe them below.

As I stated previously, I don't mind white noise... We deal with a lot of noise already from the military base. And the freeway.

6 EA

If you have concerns regarding LAND USE, please describe them below.

Landis use important here in DuPont, We are very planned out community, but I feel the city is doing a good job with planning.

7 EA

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.

We have a very planned out city with green space. I would hate to see that impacted, and I think it's important that our trail remain aesthetically pleasing, though I feel it could be improved and possibly a sponsorship could be arranged with Calportland in the state to make the trail Estate park as historical landmark ... Perhaps with A visitor center where we can learn about the environments and history of our trail and draw people into the community and perhaps Portland would be helping to pay with for that if they get to mine.

8 EA

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

When Europeans are white man landed here on the northwest landing in the Puget Sound cultural resources of Nisqually were greatly impacted. The development and advance of the West Change everything for indigenous people, and I never believe we have fulfilled an obligation to return what was theirs. In regards to our trail, there's a lot of history that needs to be protected

9 EA

If you have concerns regarding TRANSPORTATION, please describe them below.

I believe we need better transportation here in Dupont to include buses perhaps with Pierce County and I'm very excited about our train line.

10 EA

If you have OTHER concerns not listed above, please describe them below.

I truly believe that this is not a black or white situation and that we could come to some sort of agreement that would help everyone in this situation. Environment and our infrastructure can be held up and business flourish.

11 EA

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

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Date

7/15/2024

First Name *

Anne

Last Name *

Muir

Are you a resident of the City of DuPont, WA? *

- (●) Yes
- ( ) No

Are you a business owner? *

- ( ) Yes
- (●) No

Are you part of an Agency or Organization? *

- ( ) Yes
- (●) No
- ( ) Not relevant to my input

If you have concerns regarding the EARTH, please describe them below.

Additional mining that would create hazardous conditions should an earthquake occur and that could adversely impact that surrounding area even with blasting are not acceptable. Additional possible pollution escape into the delicate Puget Sound ecosystem is also not acceptable. 1 EA

If you have concerns regarding the AIR QUALITY, please describe them below.

Mining will create additional dust and debris in the area, particularly in the summer months where we see decreased air quality due to fire season. Why decrease air quality, particularly near schools? There is no reason to do this. 2 EA

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.

Reducing water flow and dewatering an aquifer for mining is unacceptable. The impact on the town and the flora and fauna of the surrounding areas seems to be underestimated. In a time where many communities are looking to restore the flow of creeks to encourage salmon spawning, DuPont seems to be doing everything possible to further destroy water sources, increase fire danger, and degrade the Sequalitchew trail and surrounding wilderness areas even further. 3 DS EA

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.

Wetlands provide a critical habitat and environmental protections. Changing flow rates and relocating wetlands irrevocably changes the ecosystem and destroys critical habitat. Agains, you will destroy habitat that cannot be remade for the interests of a commercial company that will in no way benefit DuPont residents. 4 DS EA

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.

Habitat loss is already an issue in DuPont and the animals present are competing for little space. This means that humans will have more interactions with bears, deer, and coyotes within the town, increasing the danger. Again, relocated habitat doesn't always mean that you maintain the critical biodiversity from the original area. We have see , across the nation, a massive drop I insect life and this, biodiversity. Reducing water flow and destroying habitat will amplify these issues and the mining should not proceed. 5 EA

If you have concerns regarding NOISE, please describe them below.

I already deal with explosions from JBLM trading, let's not add additional explosives for type purpose of stripping the earth.

6 EA

If you have concerns regarding LAND USE, please describe them below.

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

We stole the land from the Nisqually and are now stripping it bare. We have no idea what valuable sites we could be destroying with this mine.

7 EA

If you have concerns regarding TRANSPORTATION, please describe them below.

No more trucks driving through our city! When we have back-ups on I-5 the air quality gets dramatically worse. Large vehicles impact the roads and create unsafe conditions for other drivers and pedestrians.

8 EA

If you have OTHER concerns not listed above, please describe them below.

DuPont should be working with JBLM to restore Sequalitchew creek and the salmon runs that were on e there; not working to dryer the aquifer and clear cut more trees. We should look to re-establish as much forested land with native species versus encouraging the growth of invasive species with changes to the aquifer and wetlands. Please do not approve this project. I can see no benefits to DuPont residents, only downsides. The city has a history of approving light industrial and other projects that seemingly do not benefit residents, only add to noise, traffic, and a loss of natural areas. With only two ways to get to I-5, we do not need to be adding to these issues. We do not need to increase fire danger by lowering water levels and water flow and putting a possible source of drinking water in danger. Shame on the city for even considering this proposal.

9 DS EA

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

(SEPA2021-002 comment period 6/14/2024-7/15/2024)

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Date
7/15/2024

First Name *
Jane

Last Name *
Nauth

Are you a resident of the City of DuPont, WA? *
- (●) Yes
- ( ) No

Are you a business owner? *
- ( ) Yes
- (●) No

Are you part of an Agency or Organization? *
- ( ) Yes
- (●) No
- ( ) Not relevant to my input

If you have concerns regarding the EARTH, please describe them below.

If you have concerns regarding the AIR QUALITY, please describe them below.

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.
What guarantee do we have that it will not create problems with our groundwater? And if it does, who will be held accountable. Are all tests done and can be viewed?

1 DS

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.
We have wild life that live there. What studies have been done to protect them?

2 EA

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.
Yes, I do have concerns. Animals and creatures keep losing their homes because of growth. We see coyotes walking down the street like off leash dogs.

3 EA

If you have concerns regarding NOISE, please describe them below.

If you have concerns regarding LAND USE, please describe them below.

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.
We, as well as others, not just folks from Dupont have enjoyed hikes through this lovely area. It's a learning lesson for small children about nature. The creek is lovely as it is, undisturbed.

4 EA

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

If you have concerns regarding TRANSPORTATION, please describe them below.

If you have OTHER concerns not listed above, please describe them below.

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

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Date
7/22/2024

First Name *
Karen

Last Name *
Nolan

Are you a resident of the City of DuPont, WA? *
- (●) Yes
- ( ) No

Are you a business owner? *
- ( ) Yes
- (●) No

Are you part of an Agency or Organization? *
- ( ) Yes
- (●) No
- ( ) Not relevant to my input

If you have concerns regarding the EARTH, please describe them below.
The act to dewater the aquifer shows extreme disregard for life in our city of DuPont, including human, wildlife, flora, fauna, and water. 1 EA

If you have concerns regarding the AIR QUALITY, please describe them below.
The same effects for the EARTH apply to AIR QUALITY 2 EA

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.
We need pure, clean water, not contaminated from mining residue. 3 EA

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.
We need the few streams we have all of us and all of nature. 4 EA

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.
Many species of birds and animals use that area for nesting habitat. This will no longer be available. 5 EA

If you have concerns regarding NOISE, please describe them below.
The noise of mining will greatly disturb the animals and humans in the area. They will no longer come. 6 EA

If you have concerns regarding LAND USE, please describe them below.
We need the land around the Sequalichew Creek to protect it and make it available for future generations. 7 EA

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.
What an ugly sight that will be---barren and industrial! We have beautiful land and nature here. Please don't destroy it! 8 EA

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

There are historical markers along this trail which need to be preserved. Dupont has a rich history. Please don't destroypart of it!

If you have concerns regarding TRANSPORTATION, please describe them below.

This will cause problems with school transportation and make it unsafe for many children walking to school.

If you have OTHER concerns not listed above, please describe them below.

Cal Portland has enough area here already and doesn't need to expand, especially when it involves the wildlife and nature of DuPont, as well as human recreation.

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

(SEPA2021-002 comment period 6/14/2024-7/15/2024)

9 EA

10 EA

11 EA

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Date

7/22/2024

First Name *

William

Last Name *

Noland

Are you a resident of the City of DuPont, WA? *

- (●) Yes
- ( ) No

Are you a business owner? *

- ( ) Yes
- (●) No

Are you part of an Agency or Organization? *

- ( ) Yes
- (●) No
- ( ) Not relevant to my input

If you have concerns regarding the EARTH, please describe them below.

DuPont is in the Cascadia Fault system which has geologically been active in the recent past and is anticipated to be active in the future. The band of land between the Sequalitchew trail and the proposed mine are very narrow in scope. Should we endure another earthquake similar to or exceeding the magnitude of the 2001 7+ event we had, the land could give way hurting the biome. The soil in the Puget Sound has been noted to be at high risk during an earthquake for liquefaction (loosely packed, water-logged sediments at or near the ground surface lose their strength in response to strong ground shaking). The project encroachment should be re-evaluated to provide a wider body of trees to maintain soil integrity.

1 Cal EA

If you have concerns regarding the AIR QUALITY, please describe them below.

None.

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.

None.

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.

None.

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.

We are removing more habitat space and giving nothing back to the community for it. What do the citizens of DuPont get for the removal of forest and natural biome for our species? If the company is going to expand the mine, what will they do for the community? This sounds like a one-sided benefit to industry.

2 EA

If you have concerns regarding NOISE, please describe them below.

The band of trees should be wider (between the project and the trail/community) preventing industrial noise from polluting the Sequalitchew trail area. This project appears to be within 100' of the natural space.

3 EA Cal

If you have concerns regarding LAND USE, please describe them below.

The project appears on the graphics (without distance legend) to be conducting industrial work in close proximity to the Sequalitchew Trail where kids and families frequent and will also abut a housing center which harms the quality of life that so many have come to enjoy from DuPont. If it is necessary for industry to knock down another forest (in addition to the woodlands that are being leveled for housing in the near future), a wider band of tree line should be maintained. This would serve as noise abatement that we citizens are being asked to take on. It would also serve as a buffer against the general eye-sore this project will give us.

4 Cal

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.

We are expanding a giant hold in the ground to access glacial sediments for concrete mixing. We are removing a forest to accommodate this "aesthetic failure." I would still like to know what "WE" citizens of DuPont are recieving from this project?

5 EA

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

We are one step closer to becoming Kent, Washington. A bastion of warehousing, urban sprawl and industrial expansion. I moved to DuPont as it was a special place that did not appear to wipe out all of its natural beauty. Culturally, we are selling our town out.

6 EA

If you have concerns regarding TRANSPORTATION, please describe them below.

If the trucks can stay to the current industrial roads, no issue.

7 EA

If you have OTHER concerns not listed above, please describe them below.

I believe my points have been listed and would be more than willing to talk with the council about them if called upon.

8 EA

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

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Date
6/26/2024

First Name *
Rodney

Last Name *
Nordbye

Are you a resident of the City of DuPont, WA? *
- (●) Yes
- ( ) No

Are you a business owner? *
- ( ) Yes
- (●) No

Are you part of an Agency or Organization? *
- ( ) Yes
- (●) No
- ( ) Not relevant to my input

If you have concerns regarding the EARTH, please describe them below.

If you have concerns regarding the AIR QUALITY, please describe them below.

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.
I strongly encourage Dupont city to not allow dewatering for Gravel.

1 EA

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.

If you have concerns regarding NOISE, please describe them below.

If you have concerns regarding LAND USE, please describe them below.
I strongly encourage Dupont city to not allow dewatering for Gravel.

2 EA

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

If you have concerns regarding TRANSPORTATION, please describe them below.

If you have OTHER concerns not listed above, please describe them below.

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

(SEPA2021-002 comment period 6/14/2024-7/15/2024)

RECEIVED
JUL 2 2024
CITY OF DUPONT

June 30, 2024

Dear Director Kincaid,

Thank you for the opportunity to comment on the Pioneer Aggregates South Parcel Project City File No. SEPA2021-002. I have been a resident of DuPont since August 1996 and reside at 1485 Kittson Street. During my long residency in DuPont, I have followed the development of the dry gravel mining operation to the current proposal to dewater the Vashon Aquifer to mine its water saturated gravel.

Therefore, I favor a recommendation of **No Action** due to the destructive environmental impact that the mine expansion would have on Sequalitchew Creek, the Sequalitchew Creek Trail's slopes, Edmond Marsh, the four other wetlands and a potential source of potable drinking water for DuPont, the Vashon Aquifer.

RCW 90.92 Watershed Planning clearly states that "The purpose of this chapter is to develop a more thorough and cooperative method of determining what the current water resource situation is in each water resource inventory area of the state and *to provide local citizens with the maximum possible input concerning their goals and objectives for water resource management and development.*"

1 EA

The 2011 Settlement Agreement is continually cited as the basis for allowing the South Parcel mine expansion. I have always wondered how a settlement agreement can supersede state law as well as local authority.

Our 2015 DuPont Comprehensive Plan and Critical Area Ordinance (Chapter 25.105) contain provisions that should prevent the issuance of a permit for expanding mining into the South Parcel. Below are key elements from the Comprehensive Plan and the CAO that safeguard the Vashon Aquifer from dewatering.

2 City EA

DMC Chapter 25.105 Critical Areas

The primary purposes of this chapter are "…to protect the public health, safety and welfare by preventing the adverse environmental impacts of development."

DMC 25.105.010: Directing a policy of no net loss of wetland and stream function, Value, and area within the city.

DMC 25.105.010: Preventing, to the extent practicable, adverse cumulative impacts to water quality, wetlands, stream corridors, and fish and wildlife habitats using best available science.

DMC 25.105.010: Protecting the public from injury, loss of life, property damage or financial loss due to flooding, erosion, landslides, seismic events, soil subsidence or steep slope failures.

3 City EA

2015 Comprehensive Plan

Resource Land Goal LU-10: Recognizes the value of mineral resource extraction while protecting the natural environment's integrity. **LU-10.3** Ensure mining activities employ best management practices that protect the long-term integrity of the natural environment, water resources, adjacent land uses, and the long-term productivity of the resource lands.

Natural Environment Goal NE-1: Protect DuPont's natural environment by meeting the needs of today's citizens without compromising the needs of future generations. **NE 1.1** Preserve environmentally sensitive areas and those that are valuable natural and aesthetic resources to the City **NE 1.2** Institute and regularly update measures which promote development and construction practices that minimize impacts on the environment

4 City EA

GROUNDWATER/AQUIFER

I believe this DEIS was written to support CalPortland's quest to dewater the Vashon Aquifer to mine gravel. The DEIS is clear that by dewatering the aquifer, the Sequalitchew Creek Ravine (off-site) will dry up as the seeps and springs are expected to be reduced or dewatered in their entirety, as noted on page 3.1-14. The DEIS also notes that the Sequalitchew Creek ravine is in a landslide hazard area per the DMC. On page 3.1-14, it states, "The seeps and springs identified on Figure 3.1-3 are expected to be reduced or dewatered in their entirety, which may reduce the level of landslide hazard susceptibility within the ravine." Of note is the word "may."

5
EA
DS

The statement that reducing or dewatering the seeps and springs in their entirety "may" reduce the level of landslide susceptibility within the ravine appears to contradict groundwater dynamics associated with dewatering a lush slope in a riparian corridor, which shows dewatering such a slope could lead to instability and landslides.

Effects of Dewatering on Creek Slopes

Foundational science and research in groundwater dynamics show that when a typically wet and lush steep hillside dries up, several changes occur due to the lack of moisture:

6
DS
EA

- **Vegetation Stress:** The lush vegetation that thrived in wet conditions may struggle or die off. Plants adapted to moisture may wilt, lose leaves, or become dormant.
- **Soil Erosion:** Without the binding effect of wet soil, erosion becomes a concern. Rainwater can wash away loose soil particles, leading to gullies and landslides.

- **Cracking and Compaction:** As the soil dries, it contracts and cracks. This can reduce its stability and make it less suitable for supporting plants or structures.
- **Loss of Habitat:** Animals and insects that rely on the wet environment may move elsewhere or face challenges finding food and shelter.

6 cont.

The devastating effects that dewatering will have upon the slopes in perpetuity are glossed over in the impact analysis. The science is available to support the effects of reducing or eliminating the slope seeps. However, this science would not support the goal of dewatering the Vashon Aquifer to mine gravel, which isn't as easy to come by as the gravel they are currently mining in the other parcels.

7 EA DS

I read nothing in the DEIS that provides mitigation that would negate the impact of reducing or dewatering the Vashon Aquifer seeps on the Sequalitchew ravine walls, resulting in:

- Drying up the vegetation on the ravine walls
- No groundwater flowing from the seeps into Sequalitchew Creek
- Temperature changes in the creek due to the loss of cool groundwater
- Decreased biodiversity due to the impact of the loss of groundwater effects in the ravine
- Drying up vegetation along the creek banks

8 EA DS

The Sequalitchew Creek Trail is one of South Puget's Sound recreational treasures. The cool riparian environment and rich history draw visitors to our city. One only needs to look at the full city hall parking lot and talk to visitors on the trail to see how beloved this trail is.

9 EA

Fire Hazards

The DEIS makes no mention of the potential fire hazards that could result from the Sequalitchew Creek Ravine becoming a dry tinderbox. Our climate has become considerably hotter, with less rainfall, since 2011 when the Settlement Agreement was signed, as seen in these data from the University of Washington Climate Impacts Group: https://climate.washington.edu/climate-data/trendanalysisapp/

10
EA
DS
Cal

- **Temperature Increase 2011-2023:** From 2011-2023, temperatures, as captured in the Seattle area, have risen 1.06 F.
- **Precipitation Decrease 2011-2023:** Precipitation has decreased by 9.9% in the same time.

Impact on our Wetlands

The DuPont Municipal Code 25.105.050 Critical areas clearly states: "Wetlands in DuPont also have a positive effect on water quality downstream or in aquifers by removing pollutants through the processes of sediment trapping, nutrient removal, and chemical detoxification. Wetlands also regulate the flow, retention, and release of stormwater to surface and groundwater systems. An equally important concern of the proposal to mine the South Parcel is the impact of the Vashon Aquifer dewatering on our wetlands, marshes, creek, and surrounding environment. In their proposal, it clearly states:

11
DS
EA

- West Edmonds marsh groundwater level will decrease by 9 feet
- Pond Lake water level will be reduced by 2 feet
- Wetlands number 8, 9, and 10 water level will be reduced by 1 foot

- Old Fort Lake will be reduced by 0.05 feet
- The Kettle Wetland will be eliminated
- The seeps and springs that feed Sequalitchew Creek will dry up

11 cont.

These groundwater levels will be reduced forever! The decrease in groundwater will lead to the loss of vegetation, loss of stream flow, loss of habitat, and decreased ability to remove pollutants and will add drought-like conditions to the Sequalitchew Creek Ravine.

Potable Water

The Vashon Aquifer is a potential source of potable water in DuPont. In the past, the Historic Village used the Vashon Aquifer as a drinking water source, and DuPont still has water rights issued in 1948 to the Vashon Aquifer: https://appswr.ecology.wa.gov/docs/waterRights/ScanToWRTS/SWRO1/pdf/SWRO10000202F.pdf

On pg 1-13 of the 2019 DuPont Water System Plan Update, the city states that "City holds water rights for two decommissioned wells in the Historic Village." and notes that they have been decommissioned. On pg. 1-17 the city writes "All of the City's wells operate under municipal water rights that are not automatically subject to relinquishment for non-use. However, a water right could be deemed to be abandoned if no valid point of withdrawal currently exists for the right. *For this reason, the City intends to pursue designation of one or more of its existing wells as a point or points of withdrawal under the El Rancho Madrona and Historic Village water rights.*"

12 EA Cal City

Table 3.13, Projected Water Right Analysis, notes that "Based on these projections it appears that the City of DuPont has adequate annual withdrawal water rights to cover the projected demands for the 20-year planning period." up to 2038. However, in 2024 WA state required the City of DuPont to accommodate growth for an additional 5,000 housing units, with 2.5 people per household on average.

On pg. 3-47 of this report titled "System Deficiencies" the text states, "It is pointed out under the heading *Water Rights Analysis* that the City should protect their existing, currently inactive rights for the El Rancho Madrona well and for the Historic Village wells by adding one or more of their existing active wells as points of withdrawal on those currently inactive rights. Also, in planning for buildout, the City of DuPont will pursue transferring existing water rights for Weyerhaeuser golf course wells to one or more active City wells, and will continue to pursue the new water right application G2-30221." This new water right application was submitted in 2004 and has not been granted yet.

12 cont.

The DEIS merely notes, regarding water supply wells, on page 3.3-29 that "No water supply wells are known to exist in the site area which tap the Vashon Aquifer, and therefore none would be impacted by the Proposed Action." This assertion claim ignores the **history** of DuPont's drinking water sources and the 2019 DuPont Water System Plan Update.

Groundwater rights are the source of major concerns and population viability, across America. A recent NYT investigation is an alarming view of the state of groundwater depletion in America. Why should we even consider dewatering a potential source of potable water in DuPont?

EARTH

Equally damaging, the dewatering of the Vashon Aquifer will impact the earth within a two-mile radius of the mine site. The wetlands impacted by the dewatering are surrounded by large trees: Western Red Cedars, Gary Oaks, Douglas Firs, Madronas, and other trees and shrubs. These trees and shrubs are a vital resource for wildlife. They provide the needed habitat for birds and other species. They provide shade and help purify our air. There will be devastating effects if the water that supports these trees and shrubs is removed. Our landscape will change from one that has towering trees that provide shade, a cooler climate, habitat for wildlife, and a quality of life for humans to one that becomes dry and barren over time due to the lack of groundwater.

13
EA

LACK OF ACCEPTABLE MITIGATIONS TO THE EFFECTS OF DEWATERING THE VASHON AQUIFER

The DEIS clearly states that the Vashon Aquifer dewatering is a Significant and Unavoidable Impact. It offers **NO** mitigation to replace the groundwater that provides the seeps and springs on the Sequalitchew Creek Ravine, which feed the vegetation and provides the flow of groundwater in the stream. It offers NO mitigation to replace the groundwater in our wetlands and marshes which will be reduced anywhere from 9 feet to 0.05 feet, with one wetland being eliminated. The restoration plan is not an acceptable mitigation plan as it will not prevent the loss of the hillside seeps, nor will it provide the year-round flow in the Sequalitchew Creek as is stated in the DEIS. One only needs to look at the diversion canal during the summer and fall months to see that there is no water flowing down the canal from Sequalitchew Lake. As our summers and early fall become hotter and drier, there is no surface water to divert. With the absence of the Vashon Aquifer groundwater the Sequalitchew Creek will go completely dry during the summer and fall

14
DS
Cal
EA

months. This aquifer is the only source of water during these months flowing down the creek. The aquifer seeps keep the slope vegetation healthy, nourish wildlife and provide important habitat for birds, as well as providing a local recreational treasure. With the absence of the groundwater, the temperature in the creek will rise. Groundwater is much cooler than surface water. The temperature of the surface water alone will be too high to support salmon.

14 cont.

The only mitigation offered in the DEIS is a four-step monitoring process for a clearly stated irreversible dewatering procedure. Therefore, the only mitigation offered simply aims to ensure that the already devastating and irreparable impact on our environment does not worsen. This is the definition of environmental insanity.

The city should not be beholden to a 2011 Settlement Agreement that clearly goes against state RCWs, our Comprehensive Plan and our CAO. The Sequalitchew Creek Restoration plan is a shiny, ill-conceived bauble of distraction.

I urge the city to **deny** the permit to expand the South Parcel mining for all the reasons explained above.

15 DS City EA

Judy Norris

1485 Kittson Street

DuPont, WA 98327

253 370 6247

piebaldsatil@gmail.com



Pioneer Aggregates South Parcel Draft Environmental Impact Statement (EIS)

Comment Form

Input from the public regarding the Pioneer Aggregates South Parcel Project EIS is welcome. Please submit this form to share your comments. Note: Submitted comment forms are subject to the Public Records Act (RCW 42.56).

Date

7/6/2024

First Name *

Krista

Last Name *

Novak

Are you a resident of the City of DuPont, WA? *

- (●) Yes
- ( ) No

Are you a business owner? *

- ( ) Yes
- (●) No

Are you part of an Agency or Organization? *

- ( ) Yes
- ( ) No
- (●) Not relevant to my input

If you have concerns regarding the EARTH, please describe them below.

I'm not sure how you can separate the different elements of this project since they are so intertwined. i am concerned that the EARTH will dry up from lack of water which will dry up the slopes of the creek bed and adversely impact the flora and fauna of the area, not to mention the 2 mile radius of EARTH it will dry up. Although the proposal mentions this will be temporary, it will take decades to recover the lost life, both plant and animal.

1 EA Cal

If you have concerns regarding the AIR QUALITY, please describe them below.

It is all related. When loss of trees and other vegetation occurs, it decreases the carbon dioxide put back into our air. Not to mention, the air pollution we would have to deal with for the years/decades it would take for them to complete the mining process of the south parcel. The trail and the surrounding housing do not deserve to have their air quality depleted.

2 EA

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.

The proposal seems to breeze over the impacts of dewatering the aquifer. This puts the slopes of the creek walls at risk for erosion and cracking, leading to instability. Not having the cool groundwater flowing into the creek will change water temperature and lead to changes in the ecosystem.

3 DS EA

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.

Again, all of this is so closely intertwined. The amount of water and the temperature will change during the years/decade it takes to mine the area. This in turn will kill off the vegetation in a 2 mile radius. The proposal makes it sound like "we will put it all back when we are done," when in reality it will be too late. The damage will be done. Currently, in the north parcel where "mitigation" has been done, half the trees they replanted are brown and dying. Who is holding them responsible for putting things back like they were found on the current mine?

4 DS EA

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.

Please see comments above.

If you have concerns regarding NOISE, please describe them below.

The trail users and residents that live near the south parcel will hear noise and mine work for years to come. The peacefulness that the trail provides will be gone. Not only will there be noise from the mine operations, but there will no longer be trees to absorb some of that noise pollution. The trail is the reason many people come to DuPont and frequent our businesses. This will drive people OUT of our town.

5 EA

If you have concerns regarding LAND USE, please describe them below.

See above

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.

I have mentioned my concerns about holding CalPortland accountable for the CURRENT mining operations and their plans to mitigate the northern parcel. Until there is a 100% fool proof plan to mitigate any damage they do, the answer should be NO.

6 EA

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

If you have concerns regarding TRANSPORTATION, please describe them below.

If you have OTHER concerns not listed above, please describe them below.

The format of this comment section almost feels like you purposely want folks to just roll over and give up. Everyone knows that you cannot separate land, air, water, flora and fauna into categories as if they are not tightly woven together. If you alter one, you alter them all. The fragile ecosystem that exists in the Sequalitchew Creek will forever be damaged if you allow this mining expansion. The current proposal breezes over the impacts like they aren't important. Please say NO to this proposal.

7 EA

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

(SEPA2021-002 comment period 6/14/2024-7/15/2024)

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Date

7/11/2024

First Name *

Krista

Last Name *

Novak

Are you a resident of the City of DuPont, WA? *

- (●) Yes
- ( ) No

Are you a business owner? *

- ( ) Yes
- (●) No

Are you part of an Agency or Organization? *

- ( ) Yes
- (●) No
- ( ) Not relevant to my input

If you have concerns regarding the EARTH, please describe them below.

If you have concerns regarding the AIR QUALITY, please describe them below.

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.

A new concern has been brought to my attention about the now endangered gray squirrel. If we are one of the only areas where it remains, taking away a part of its habitat and also a source of its water and food supply is dangerous. I think it is important for this city to study this animal that was not endangered when the original request was made.

1
EA
Cal

If you have concerns regarding NOISE, please describe them below.

If you have concerns regarding LAND USE, please describe them below.

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

If you have concerns regarding TRANSPORTATION, please describe them below.

If you have OTHER concerns not listed above, please describe them below.

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

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Date

7/13/2024

First Name *

Krista

Last Name *

Novak

Are you a resident of the City of DuPont, WA? *

- (●) Yes
- ( ) No

Are you a business owner? *

- ( ) Yes
- (●) No

Are you part of an Agency or Organization? *

- ( ) Yes
- (●) No
- ( ) Not relevant to my input

If you have concerns regarding the EARTH, please describe them below.

I am deeply concerned about the EARTH beyond the project's borders and the lack of a clear plan for after mining is finished. The earth along the creek will dry out, vegetation will be lost and simply replanting trees and brush afterward is insufficient. Our shaded trail could be lost, as well as the vegetation within the 2 mile mentioned area and beyond this as well. How will we cope with this added fire danger? Will CP contribute to our fire department's increase in brush fires?

1 EA

If you have concerns regarding the AIR QUALITY, please describe them below.

My concerns are the same for air quality and noise. I will focus on during the mining, but what mitigations are in place to keep the noise and pollution from the nearby residents, as well as trail walkers seeking peace but hearing gravel and truck noise? Our trail currently has numerous Army units that use it for PT during the week and many hikers use it as well. What is being done to stop them from breathing in fumes, dust and dirt from the mine's work?

2 EA

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.

WATER is my biggest concern and includes both ground water and surface water. We are already dealing with fire danger in our area and decreasing both ground and surface water will create more prime areas for fires and less water resources to put them out. Just yesterday, July 19th there was a brush fire on our bluff that required the assistance of outside agencies and was very difficult to reach. The potential worsening of our fire danger during the hot/dry season is a true concern and a reality.

Removal of ground water extends WAY beyond the mining area and could impact the future growth on lot Y since it will decrease the potable water for our entire community. That aquifer is part of our city's drinking water and we will need it when Lot Y is developed.

3 DS EA

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.

WATER is my biggest concern and includes both ground water and surface water. To decrease the water in the wetlands means the loss of non-migratory animals and the loss of vegetation and trees that house many animals and insects.

The DEIS is completely incorrect when it says that removal of groundwater and surface water will not impact anything outside of the site. The impact will

4 DS

go WELL beyond the mine site itself. That is the nature of water; it provides water for vast areas and depleting the aquifer will have devastating reach, as stated (and disregarded) in the proposal. A 2 mile radius will be drier and plants and animals will die off and migrate.

4 cont

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.

All of these elements are so tightly related, it is impossible to separate them into topics. To decrease the water in the wetlands means the loss of non-migratory animals and the loss of vegetation and trees that house many animals. To take down the trees and brush in the proposed area will force animals out of their current habitat. There is no realistic restoration plan that would bring back the animals, trees, vegetation, insects and bugs that make our current ecosystem survive.

5 EA

If you have concerns regarding NOISE, please describe them below.

My concerns are the same for air quality and noise. I will focus on during the mining, but what mitigations are in place to keep the noise and pollution from the nearby residents, as well as trail walkers seeking peace but hearing gravel and truck noise?

The current residents of Edmonds Village cannot leave their windows open without hearing the sounds from the Amazon warehouses: banging, beeping and noise at all hours. NO THOUGHT was put into the noise problems this would cause and I believe this proposal is guilty of the same negligent planning.

6 EA

If you have concerns regarding LAND USE, please describe them below.

The DEIS mentions there would be no "significant" alterations to land which is untrue. Perhaps no major changes on the actual mining property is true, but the surrounding lands have not been properly considered for the damage that will be done. The slopes of the trail would be dried up during a portion of the year, leaving the vegetation with no water. Why is there no plan to water these plants during the dry months?

7 EA

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.

I worry that the dewatering of the aquifer will impact the beauty of both our trail and the nearby vegetation. People come from all over to enjoy our trail and to picture it brown and dry would make it much less desirable, not to mention when the trees die and there is no shade left, fewer people will come. Currently, numerous units from JBLM use the trail for morning PT and state that it is ideal because of its length, slope and shade. These folks also grab a coffee or breakfast or lunch in town, so they bring our city business as well.

The impact of decreased water will cause much of our city's vegetation to lose a water supply. Will this lead to more dead trees and vegetation within the 2 mile impacted area? And beyond? what is the plan to keep a sufficient water supply for these plants and trees? Or for replacing those that will die?

8 DS EA

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

I am unaware of any specific cultural resources in the project except that depleting the groundwater and leaving less water to the Sequalitchew Creek seems counterproductive to restoring the salmon to the creek. At one poijnt, this was a concern and interest of local tribes.

9 EA

If you have concerns regarding TRANSPORTATION, please describe them below.

Has WSDOT been involved in the proposal of further mining the area? If the mine is expanded it will increase the amount of time these big, heavy trucks are on our roads, which decreases their life expectancy. Will CalPortland contribute to the repair and upkeep of the roads they use?

10 EA

If you have OTHER concerns not listed above, please describe them below.

I am very concerned that the mitigation plans focus on the actual mining area but not the vast area of impacted land around it, as stated in my comments above. The mining of the south parcel severely impacts the outlying areas of our wetlands and water supply, which in turn will decrease the necessary water for vegetation and trees, then impacting the wildlife that live in these areas.

Why is the "Restoration plan" mentioned over 200 times in the DEIS, despite the fact that it is supposed to be separate from the DEIS? And the words "human" and "hiker" are nonexistent in the considerations? Also, I do not want a Restoration Plan that has the "potential" to restore....it NEEDS to restore.

11 EA

The SEPA Handbook requires that an EIS evaluate the proposal, the no-action alternative, and other "reasonable alternatives," yet we have only been given one proposal and a no-action option. Where are the alternatives?

12 EA

I am concerned that the Restoration plan has no specific details on how the restoration will be monitored. Nor does it give sufficient details on what will be done if the restoration doesn't go as planned or add what responsibility Cal Portland has to complete the restoration within certain parameters. For example, if new trees are planted where old trees were removed or died from lack of water supply, what responsibility does CP have to maintain those trees until they are established? (A perfect example is all of the dead trees no one tended to on the corner of DS-Steilacoom Rd and Center DR.) This is a significant area of failure on other projects that have left towns high and dry after companies check the boxes of a restoration plan and leave.

13 City Cal

I highly recommend that this proposal be denied for the above stated reasons.

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

(SEPA2021-002 comment period 6/14/2024-7/15/2024)

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Date
7/9/2024

First Name *
Megan

Last Name *
Ockerman

Are you a resident of the City of DuPont, WA? *
- (●) Yes
- ( ) No

Are you a business owner? *
- ( ) Yes
- (●) No

Are you part of an Agency or Organization? *
- ( ) Yes
- (●) No
- ( ) Not relevant to my input

If you have concerns regarding the EARTH, please describe them below.

If you have concerns regarding the AIR QUALITY, please describe them below.

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.

This project has too many negative impacts to move forward. Sequalitchew Creek will go dry for months during the hottest months of the year and the slopes of the creek's trail will become dry as a result. The water table of West Edmond Marsh will be lowered up to 9 feet and the water tables of other wetlands reduced as well. Wetlands, aquifers, and healthy creek flows are not luxuries, they are vital. Gravel and aggregate mining is important in its own way, but not at the expense of healthy habitats and healthy communities that need to be able to cope with climate change.

1
EA

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.

If you have concerns regarding NOISE, please describe them below.

If you have concerns regarding LAND USE, please describe them below.

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

If you have concerns regarding TRANSPORTATION, please describe them below.

If you have OTHER concerns not listed above, please describe them below.

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

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Date

7/21/2024

First Name *

Leslie

Last Name *

Ogata

Are you a resident of the City of DuPont, WA? *

- (●) Yes
- ( ) No

Are you a business owner? *

- ( ) Yes
- (●) No

Are you part of an Agency or Organization? *

- ( ) Yes
- (●) No
- ( ) Not relevant to my input

If you have concerns regarding the EARTH, please describe them below.

1. Destruction of landscapes and ecosystems
2. Contamination of soil, water, and air with toxic chemicals and heavy metals
3. Displacement of communities and indigenous peoples
4. Use of large amounts of water and energy
5. Generation of large amounts of waste and tailings
6. Acid mine drainage leading to water pollution
7. Impact on wildlife and biodiversity
8. Contribution to deforestation and habitat destruction
9. Social conflicts and human rights violations
10. Long-term environmental degradation and loss of natural resources.

1 EA

If you have concerns regarding the AIR QUALITY, please describe them below.

1. Release of particulate matter, such as dust and ash, into the air, leading to respiratory issues for workers and nearby communities.
2. Emission of harmful gases, such as sulfur dioxide and nitrogen oxides, which contribute to air pollution and acid rain.
3. Generation of volatile organic compounds (VOCs) and hazardous air pollutants (HAPs) that can have adverse health effects on humans and wildlife.
4. Production of greenhouse gases, such as methane and carbon dioxide, which contribute to climate change and global warming.
5. Potential for accidental releases of toxic substances and gases during mining operations or transportation.
6. Impact of blasting and drilling activities on air quality through the release of dust and fumes.
7. Cumulative impacts of multiple mining operations in a region leading to degraded air quality.
8. Health risks associated with long-term exposure to air pollutants from mining activities.

2 EA

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.

1. Contamination of groundwater with toxic chemicals and heavy metals used in mining operations.
2. Acid mine drainage, where sulfuric acid and heavy metals leach from mine waste and tailings into groundwater.
3. Disruption of natural groundwater flow patterns due to excavation and mining activities.
4. Depletion of local aquifers due to excessive water usage for mining operations.
5. Leaching of pollutants from mine waste and tailings into groundwater, affecting water quality.
6. Potential for spills or leaks of hazardous materials, such as fuels or chemicals, contaminating groundwater.

3 DS

7. Impact on nearby wells and water sources used for drinking water and irrigation.
8. Long-term degradation of groundwater quality, affecting ecosystems and human health.
9. Difficulty in remediation and cleanup of contaminated groundwater sources.
10. Potential for subsidence or land instability due to changes in water levels and underground mining activities.

3 cont

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.

1. Contamination of surface water bodies, such as streams, rivers, and lakes, with toxic chemicals and heavy metals from mining activities.
2. Acid mine drainage, where sulfuric acid and heavy metals leach from mine waste and tailings into surface water, leading to water pollution and ecosystem degradation.
3. Sedimentation and erosion of soil from mining operations, impacting water quality and aquatic habitats.
4. Disruption of natural water flow patterns and hydrology due to mining activities.
5. Alteration of stream channels and wetlands, affecting aquatic biodiversity and ecosystem functions.
6. Reduction of water availability and quality for downstream communities and ecosystems.
7. Impact on aquatic life, including fish and other species, due to changes in water quality and habitat destruction.
8. Potential for spills or leaks of hazardous materials, such as fuels or chemicals, contaminating surface water bodies.
9. Difficulty in restoring and mitigating the impacts of mining on surface water and wetland ecosystems.
10. Cumulative impacts of multiple mining operations in a region leading to widespread degradation of surface water resources.

4 DS

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.

1. Destruction of habitats and ecosystems essential for fish, plants, and animals due to mining activities.
2. Disruption of migration routes and breeding grounds for fish and wildlife.
3. Contamination of water bodies with toxic chemicals and heavy metals, impacting aquatic life and plant species.
4. Loss of biodiversity and extinction risk for native species in mined areas.
5. Disturbance and displacement of wildlife populations due to noise, vibrations, and habitat destruction.
6. Acid mine drainage affecting aquatic life and plant species in streams and wetlands.
7. Changes in soil and water quality affecting plant communities and vegetation cover in mined areas.
8. Introduction of invasive species due to disturbances caused by mining activities.
9. Impact on endangered or vulnerable species that rely on the ecosystems affected by mining.
10. Long-term ecological damage and challenges in habitat restoration and conservation efforts in mined areas.

5 EA

If you have concerns regarding NOISE, please describe them below.

1. Disruption of wildlife behavior and communication due to loud noise from mining operations.
2. Negative impacts on sensitive species, such as birds and mammals, that rely on sound for navigation and survival.
3. Disturbance of breeding, nesting, and feeding activities of wildlife near mining sites.
4. Health impacts on humans living near mining operations, including stress, sleep disturbances, and hearing damage.
5. Interference with outdoor recreational activities in the vicinity of mining sites.
6. Disruption of natural soundscape and tranquility in the surrounding environment.
7. Cumulative effects of noise pollution from multiple mining operations in a region.
8. Challenges in mitigating and controlling noise levels from mining activities.
9. Potential conflicts with local communities and stakeholders due to noise pollution.
10. Need for noise monitoring and management plans to minimize impacts on both wildlife and human populations.

6 EA

If you have concerns regarding LAND USE, please describe them below.

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

If you have concerns regarding TRANSPORTATION, please describe them below.

If you have OTHER concerns not listed above, please describe them below.

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

(SEPA2021-002 comment period 6/14/2024-7/15/2024)

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Date

7/14/2024

First Name *

Lynn

Last Name *

Okita

Are you a resident of the City of DuPont, WA? *

- (●) Yes
- ( ) No

Are you a business owner? *

- ( ) Yes
- (●) No

Are you part of an Agency or Organization? *

- ( ) Yes
- (●) No
- ( ) Not relevant to my input

If you have concerns regarding the EARTH, please describe them below.

If you have concerns regarding the AIR QUALITY, please describe them below.

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.

I strongly oppose the the proposed CalPortland South Parcel mine expansion which would dewater the Vashon Aquifer. Dewatering the aquifer would cause a significant drop in the groundwater level in multiple wetlands and two lakes and negatively impact the environment of DuPont. The elimination of the Kettle Wetland and the drying up of seeps and springs feeding Sequalitchew Creek would cause it to dry up for half the year, and surrounding hillside vegetation would subsequently also dry up. The creek and greenery are a major aspect of the enjoyment of the Sequalichew Creek Trail which is enjoyed by both local citizens and out of town visitors.

In summary, the drop in groundwater level throughout the area caused by the mine expansion would negatively impact our wetlands, creek, vegetation, and wildlife - all the things we value about the currently beautiful environment of DuPont. None of these should be sacrificed to benefit private industry!

1
DS

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.

If you have concerns regarding NOISE, please describe them below.

If you have concerns regarding LAND USE, please describe them below.

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

If you have concerns regarding TRANSPORTATION, please describe them below.

If you have OTHER concerns not listed above, please describe them below.

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

(SEPA2021-002 comment period 6/14/2024-7/15/2024)

Pioneer Aggregates South Parcel Draft Environmental Impact Statement (EIS)

Comment Form

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Date

7/14/2024

First Name *

Carol

Last Name *

Oliver

Are you a resident of the City of DuPont, WA? *

- (●) Yes
- ( ) No

Are you a business owner? *

- ( ) Yes
- (●) No

Are you part of an Agency or Organization? *

- ( ) Yes
- (●) No
- ( ) Not relevant to my input

If you have concerns regarding the EARTH, please describe them below.

I moved to this town 24 years ago, mainly because of the trails, parks, and natural beauty. The earth here has a long history of tainted soil, and has managed to overcome this through remediation and planning. I do not want this to change in any way. The citizens here should be the biggest consideration here, not industry.

1 EA

If you have concerns regarding the AIR QUALITY, please describe them below.

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.

The aquifer would be changed for the worse, affecting humans and animals alike, both more important than industrial profits.

2 EA

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.

All of this would be negatively impacted by allowing the proposed changes to our town. The streams and wetlands are an integral component to our enjoyment of it, and should not be allowed to change.

3 EA

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.

I am concerned for all of the lives our town sustains, animals, fish and vegetation. This is their home and ours, and nothing must be allowed to interfere with any of it.

4 EA

If you have concerns regarding NOISE, please describe them below.

I lived in Edmond Village at one point, and the noise of the machines, drilling and such was very disturbing to my sleep and quiet enjoyment of my property. We don't need or want this noise.

5 EA

If you have concerns regarding LAND USE, please describe them below.

The proposed project would be too close to many households and trails, changing the nature of both.

6 EA

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.

I don't want the landscape of the town to change for the worse, negatively impacting property values.

7 EA

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

The wildlife, streams and fish are important to the culture of Native Americans living around here. This would be negatively impacted if the project is allowed to go forward.

8 EA

If you have concerns regarding TRANSPORTATION, please describe them below.

If you have OTHER concerns not listed above, please describe them below.

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

(SEPA2021-002 comment period 6/14/2024-7/15/2024)

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Date

7/21/2024

First Name *

James

Last Name *

Oliver

Are you a resident of the City of DuPont, WA? *

- (●) Yes
- ( ) No

Are you a business owner? *

- ( ) Yes
- (●) No

Are you part of an Agency or Organization? *

- ( ) Yes
- (●) No
- ( ) Not relevant to my input

If you have concerns regarding the EARTH, please describe them below.

If you have concerns regarding the AIR QUALITY, please describe them below.

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.

In recent memory, there was a shortage of water. This led the City of DuPont to decide to not water the trees in the median strip of Center Drive. This caused the loss of many trees. There were water restrictions in place. This occured before the average DuPont resident felt any effects of Climate Change. This past winter was decidedly different in the amount of rainfall and snowpack. As the effects of Climate Change continue we need to maintain all avenues to obtain water for the population of DuPont. Also the population of DuPont will be increasing due to the new housing regulation. I object to any business requesting to use more water at the expense of the residents of DuPont.

1
DS

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.

In recent memory, there was a shortage of water. This led the City of DuPont to decide to not water the trees in the median strip of Center Drive. This caused the loss of many trees. There were water restrictions in place. This occured before the average DuPont resident felt any effects of Climate Change. This past winter was decidedly different in the amount of rainfall and snowpack. As the effects of Climate Change continue we need to maintain all avenues to obtain water for the population of DuPont. Also the population of DuPont will be increasing due to the new housing regulation. I object to any business requesting to use more water at the expense of the residents of DuPont.

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.

If you have concerns regarding NOISE, please describe them below.

If you have concerns regarding LAND USE, please describe them below.

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

If you have concerns regarding TRANSPORTATION, please describe them below.

If you have OTHER concerns not listed above, please describe them below.

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

(SEPA2021-002 comment period 6/14/2024-7/15/2024)

Pioneer Aggregates South Parcel Draft Environmental Impact Statement (EIS)

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Date
6/26/2024

First Name *
Lizbeth

Last Name *
Orozco

Are you a resident of the City of DuPont, WA? *
- (●) Yes
- ( ) No

Are you a business owner? *
- (●) Yes
- ( ) No

Where do you do business?
Residence

Are you part of an Agency or Organization? *
- ( ) Yes
- ( ) No
- (●) Not relevant to my input

If you have concerns regarding the EARTH, please describe them below.
Preservation of habitats is important. I am against the mining and draining of our natural bodies water to meet a business goal of more financial gain. Cap the greed.

1
EA

If you have concerns regarding the AIR QUALITY, please describe them below.
See above

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.
See above

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.
See above

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.
See above

If you have concerns regarding NOISE, please describe them below.
See above

If you have concerns regarding LAND USE, please describe them below.
See above

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.
See above

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

See above

If you have concerns regarding TRANSPORTATION, please describe them below.

See above

If you have OTHER concerns not listed above, please describe them below.

See above

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

(SEPA2021-002 comment period 6/14/2024-7/15/2024)

Pioneer Aggregates South Parcel Draft Environmental Impact Statement (EIS)

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Date

7/13/2024

First Name *

Laura

Last Name *

Page

Are you a resident of the City of DuPont, WA? *

- (●) Yes
- ( ) No

Are you a business owner? *

- ( ) Yes
- (●) No

Are you part of an Agency or Organization? *

- ( ) Yes
- (●) No
- ( ) Not relevant to my input

If you have concerns regarding the EARTH, please describe them below.

If you have concerns regarding the AIR QUALITY, please describe them below.

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.

Please don't allow this. Our water is too precious to waste. Future potential need of the drinking water should be protected.

1 EA

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.

The stream will dry up for months during the hottest time of the year. Protect our wetlands and the water table that feeds them.

2 EA

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.

If you drain the aquifer the Sequalitchew Creek will dry up for months every year. The native flora watered by the seeps on the creek slopes will die and possibly never return.

3 DS EA

If you have concerns regarding NOISE, please describe them below.

If you have concerns regarding LAND USE, please describe them below.

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

If you have concerns regarding TRANSPORTATION, please describe them below.

If you have OTHER concerns not listed above, please describe them below.

Please do not allow the project. The S Creek trail is one that my family uses each time they come to visit me here in DuPont. It's where we take folks visiting from out of town so they can discover the beauty of the Pacific Northwest without having to drive far.

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

(SEPA2021-002 comment period 6/14/2024-7/15/2024)

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Date

7/21/2024

First Name *

Terri

Last Name *

Parks

Are you a resident of the City of DuPont, WA? *

- (●) Yes
- ( ) No

Are you a business owner? *

- ( ) Yes
- (●) No

Are you part of an Agency or Organization? *

- ( ) Yes
- ( ) No
- (●) Not relevant to my input

If you have concerns regarding the EARTH, please describe them below.

If you have concerns regarding the AIR QUALITY, please describe them below.

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.

Our very existence in DuPont is in danger due to the proposals to dig new wells. We need the aquifer to remain intact, not destroyed. . Our abundant natural resources will be depleted, impacting our citizens' quality of life as well as killing many animals living on our land.

1 EA

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.

We depend on the streams, surface water and wetlands to keep our forests alive. Our forests will be devastated if the plans to develop the land are allowed.

2 EA

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.

We cannot allow the many species of animals inhabiting the proposed development to be destroyed. They cannot survive the planned extensive invasion of their environment.

3 EA

If you have concerns regarding NOISE, please describe them below.

The natural area located in the proposed area is a buffer from noise for all of us living in DuPont. Please let's keep DuPont free from this destruction to our world.

4 EA

If you have concerns regarding LAND USE, please describe them below.

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

If you have concerns regarding TRANSPORTATION, please describe them below.

If you have OTHER concerns not listed above, please describe them below.

As a senior citizen and a 17 year resident of our beautiful little town, I am concerned about every aspect of this project negatively impacting our lives.My greatest fear is the loss of our abundant natural resources but I also worry my property value
will go down. As an 80 year old, I can ill afford a loss of value due to this invasive project.

5
EA

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

(SEPA2021-002 comment period 6/14/2024-7/15/2024)

Pioneer Aggregates South Parcel Draft Environmental Impact Statement (EIS)

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Date
6/25/2024

First Name *
Trena

Last Name *
Payton

Are you a resident of the City of DuPont, WA? *
- (●) Yes
- ( ) No

Are you a business owner? *
- (●) Yes
- ( ) No

Where do you do business?
DuPonr

Are you part of an Agency or Organization? *
- ( ) Yes
- ( ) No
- (●) Not relevant to my input

If you have concerns regarding the EARTH, please describe them below.
Please don't do this.

If you have concerns regarding the AIR QUALITY, please describe them below.
Please don't do this.

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.
Please don't do this.

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.
Please don't do this.

1
EA

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.
Please don't do this.

If you have concerns regarding NOISE, please describe them below.
Please don't do this.

If you have concerns regarding LAND USE, please describe them below.
Please don't do this.

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.
Please don't do this.

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

Please don't do this.

If you have concerns regarding TRANSPORTATION, please describe them below.

Please don't do this.

If you have OTHER concerns not listed above, please describe them below.

Please don't do this.

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

(SEPA2021-002 comment period 6/14/2024-7/15/2024)

1
cont

Pioneer Aggregates South Parcel Draft Environmental Impact Statement (EIS)

Comment Form

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Date
6/21/2024

First Name *
Suzanne

Last Name *
Pennock

Are you a resident of the City of DuPont, WA? *
- ○ Yes
- ◉ No

What city do you reside in?
Tacoma

Are you a business owner? *
- ○ Yes
- ◉ No

Are you part of an Agency or Organization? *
- ○ Yes
- ◉ No
- ○ Not relevant to my input

If you have concerns regarding the EARTH, please describe them below.
none

If you have concerns regarding the AIR QUALITY, please describe them below.
none

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.
none

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.
none

1
EA

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.
none

If you have concerns regarding NOISE, please describe them below.
none

If you have concerns regarding LAND USE, please describe them below.
none

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.
none

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

none

If you have concerns regarding TRANSPORTATION, please describe them below.

none

If you have OTHER concerns not listed above, please describe them below.

none

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

(SEPA2021-002 comment period 6/14/2024-7/15/2024)

1 cont

Pioneer Aggregates South Parcel Draft Environmental Impact Statement (EIS)

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Date
7/15/2024

First Name *
Jessica

Last Name *
Peppers

Are you a resident of the City of DuPont, WA? *
- ○ Yes
- ◉ No

What city do you reside in?
Steilacoom

Are you a business owner? *
- ○ Yes
- ◉ No

Are you part of an Agency or Organization? *
- ○ Yes
- ◉ No
- ○ Not relevant to my input

If you have concerns regarding the EARTH, please describe them below.

If you have concerns regarding the AIR QUALITY, please describe them below.

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.

We are retired military who frequent DuPont for its businesses and recreational areas. I use this trail regularly and its unique attributes include that it's watered. This riparian area thrives and stays cool during the summer when everything dries out. Keeping it watered is critical to the ecosystem and wetlands it feeds.

What's at Stake if the Vashon Aquifer is Dewatered?

· Sequalitchew Creek will go dry for approximately five months each year during the hottest part of the year.

· The slopes of our beloved Sequalitchew Creek Trail will go dry and vegetation will die as the seeps will be eliminated. The seeps maintain the lush riparian environment and make up the creek flow

· The water table of West Edmond Marsh will be lowered up to 9 feet. Other wetlands in DuPont will be lowered up to two feet

· The City of DuPont has used the Vashon Aquifer as potable drinking water in the past and still has a water right to the aquifer it wants to keep for future growth

Please do not allow the dewatering of this rare and valued gem in DuPont.

1
DS

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.

If you have concerns regarding NOISE, please describe them below.

If you have concerns regarding LAND USE, please describe them below.

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

If you have concerns regarding TRANSPORTATION, please describe them below.

If you have OTHER concerns not listed above, please describe them below.

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

(SEPA2021-002 comment period 6/14/2024-7/15/2024)

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Date
7/13/2024

First Name *
Samantha

Last Name *
Perfue

Are you a resident of the City of DuPont, WA? *
- (●) Yes
- ( ) No

Are you a business owner? *
- ( ) Yes
- (●) No

Are you part of an Agency or Organization? *
- ( ) Yes
- (●) No
- ( ) Not relevant to my input

If you have concerns regarding the EARTH, please describe them below.
Increased fire risk

1 EA

If you have concerns regarding the AIR QUALITY, please describe them below.

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.
Loss of potable water source, vegetation death,

2 EA

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.

If you have concerns regarding NOISE, please describe them below.

If you have concerns regarding LAND USE, please describe them below.

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

If you have concerns regarding TRANSPORTATION, please describe them below.

If you have OTHER concerns not listed above, please describe them below.

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

(SEPA2021-002 comment period 6/14/2024-7/15/2024)

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Date
7/15/2024

First Name *
Louis

Last Name *
Perkins

Are you a resident of the City of DuPont, WA? *
- ○ Yes
- ◉ No

What city do you reside in?
Steilacoom

Are you a business owner? *
- ○ Yes
- ◉ No

Are you part of an Agency or Organization? *
- ○ Yes
- ◉ No
- ○ Not relevant to my input

If you have concerns regarding the EARTH, please describe them below.

If you have concerns regarding the AIR QUALITY, please describe them below.

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.
This project would greatly affect the flow of the spring.

1 DS

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.
It would dry up wetlands

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.
It significantly reduces the habitats of multiple animals, completely disrupting the food chain.

2 EA

If you have concerns regarding NOISE, please describe them below.

If you have concerns regarding LAND USE, please describe them below.

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.
Steilacoom and DuPont are well known and loved for their nature. Please stop ruining what makes these towns great.

3 EA

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

If you have concerns regarding TRANSPORTATION, please describe them below.

If you have OTHER concerns not listed above, please describe them below.

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

(SEPA2021-002 comment period 6/14/2024-7/15/2024)

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Date
6/28/2024

First Name *
Kathryn

Last Name *
Pettibon

Are you a resident of the City of DuPont, WA? *
- (●) Yes
- ( ) No

Are you a business owner? *
- ( ) Yes
- (●) No

Are you part of an Agency or Organization? *
- ( ) Yes
- ( ) No
- (●) Not relevant to my input

If you have concerns regarding the EARTH, please describe them below.
The idea of taking such a lovely plant community and destroying the natural resources such as Brooks and streams and trails and trees and animal habitat for a gravel pit is a reason to abandon the city plan

1 EA

If you have concerns regarding the AIR QUALITY, please describe them below.

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.
We've come closer enough in Washington to losing our salmon and all Other water life from human consumption and destruction. We should not let that happen here.

2 EA

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.

If you have concerns regarding NOISE, please describe them below.

If you have concerns regarding LAND USE, please describe them below.

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

If you have concerns regarding TRANSPORTATION, please describe them below.

If you have OTHER concerns not listed above, please describe them below.

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

(SEPA2021-002 comment period 6/14/2024-7/15/2024)

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Date
7/21/2024

First Name *
Kathryn

Last Name *
Pettibon

Are you a resident of the City of DuPont, WA? *
- (●) Yes
- ( ) No

Are you a business owner? *
- ( ) Yes
- (●) No

Are you part of an Agency or Organization? *
- ( ) Yes
- ( ) No
- (●) Not relevant to my input

If you have concerns regarding the EARTH, please describe them below.
The natural one i. DuPont is limited and one of the reasons i chose to live here. Further expansion of digging and blasting will significantly reduce that natural land

1 EA

If you have concerns regarding the AIR QUALITY, please describe them below.
Reducing the number of trees affects air quality and habitat

2 EA

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.
The groundwater in Sequalitchew is vital to the vegetation and ecosystem. It will be severely impacted by the expansion

3 EA

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.
See above regarding groundwater, it applies as well to wetlands

4 EA

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.
See above regarding groundwater

5 EA

If you have concerns regarding NOISE, please describe them below.

If you have concerns regarding LAND USE, please describe them below.
Our land would be better served for to maintain barriers to places like CalPortland instead of making them your backyard view

6 EA

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

If you have concerns regarding TRANSPORTATION, please describe them below.

If you have OTHER concerns not listed above, please describe them below.

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

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Date

7/8/2024

First Name *

Mariya

Last Name *

Power

Are you a resident of the City of DuPont, WA? *

- (●) Yes
- ( ) No

Are you a business owner? *

- (●) Yes
- ( ) No

Where do you do business?

MVP Wellness and Yoga Therapy (DBA Dupont Yoga)

Are you part of an Agency or Organization? *

- ( ) Yes
- (●) No
- ( ) Not relevant to my input

If you have concerns regarding the EARTH, please describe them below.

I am concerned about sinkholes, and the destruction of beautiful DuPont trails related to mining.

1 Cal

If you have concerns regarding the AIR QUALITY, please describe them below.

Mining activities will affect the air quality in DuPont city due to machinery which creates polution.

2 EA

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.

I am not an expert in wanterways and aquifers, but there is a possibility of mining activities destroying the aquifer. This will directly affect me and my household since we have a well on the property. If the public water will become unavailable, we will not be able to utilize the well.

3 DS

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.

Mining activities will negatively affect Sequalitchew creek which feeds directly into the Puget Sounds. The wetlands are breeding grounds for many species of animals and birds. Mining will disturb the wetlands and cause birds to migrate to different areas.

4 DS EA

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.

The same comment as above: mining activities will disturb nature, animals and birds' habitats, and drain toxic waste to the Sound which in turn will affect fish population and their breeding patterns.

5 DS EA

If you have concerns regarding NOISE, please describe them below.

If you have concerns regarding LAND USE, please describe them below.

Instead of expanding the mine, this land could be used to build a nature park or a water park. There are so many different way to use this land other than destroying the environment by mining expansion.

6 EA

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.

The same as above. What's the beauty in mining? Why can't the state and city collaborate in building a park, a fishing pier, and more?

7 EA

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

If you have concerns regarding TRANSPORTATION, please describe them below.

Expansion of mining activities will lead to more trucks and other machinery coming through DuPont creating even more traffic. At this time, not only I5 is jammed back-to-back, but even the scenic route through Steailcoom is taking over 30 min to get through Steilacoom-Dupont road.

8 EA

If you have OTHER concerns not listed above, please describe them below.

I want to see how the mine is currently compliant with regulations.

9 EA City

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

(SEPA2021-002 comment period 6/14/2024-7/15/2024)

Pioneer Aggregates South Parcel Draft Environmental Impact Statement (EIS)

Comment Form

Input from the public regarding the Pioneer Aggregates South Parcel Project EIS is welcome. Please submit this form to share your comments. Note: Submitted comment forms are subject to the Public Records Act (RCW 42.56).

Date
7/10/2024

First Name *
Martin

Last Name *
Power

Are you a resident of the City of DuPont, WA? *
- (●) Yes
- ( ) No

Are you a business owner? *
- ( ) Yes
- (●) No

Are you part of an Agency or Organization? *
- ( ) Yes
- (●) No
- ( ) Not relevant to my input

If you have concerns regarding the EARTH, please describe them below.
I did not move across the USA to find a pleasant, clean community only to allow further destruction of the environment.

1
EA

If you have concerns regarding the AIR QUALITY, please describe them below.

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.

If you have concerns regarding NOISE, please describe them below.

If you have concerns regarding LAND USE, please describe them below.

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

If you have concerns regarding TRANSPORTATION, please describe them below.

If you have OTHER concerns not listed above, please describe them below.

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

(SEPA2021-002 comment period 6/14/2024-7/15/2024)

RECEIVED
JUL 2 2024
CITY OF DUPONT

To: City of Dupont

From: Kathy Preston

1907 Braget St.

DuPont, WA 98327

I am concerned about the request that is before the city from the local gravel mine company. From what I have read, the dewatering of the Vashon Aquifer in order to mine gravel would be devastating for our local environment. It would impact Sequalitchew Creek, the Sequalitchew Creet Trail's slopes, Edmond March and potentially compromise the source of potable drinking water. Our Comprehensive Plan and the CAO both have language that should deny a permit to expand the mining into the South Parcel. We could see vegetation stress, soil erosion, cracking and compacting of soil that protects plants and structures, and loss of habitat for animals and insects that rely on the wet environment. DuPont still has water rights issued in 1948 to the Vashon Aquifer. In the past the city has used that aquifer for drinking water and needs to keep that water available.

1
EA

2
EA
DS

Thank you,

Kathy Preston



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Date

7/14/2024

First Name *

Amy

Last Name *

Rakes

Are you a resident of the City of DuPont, WA? *

- (●) Yes
- ( ) No

Are you a business owner? *

- ( ) Yes
- (●) No

Are you part of an Agency or Organization? *

- ( ) Yes
- (●) No
- ( ) Not relevant to my input

If you have concerns regarding the EARTH, please describe them below.

If you have concerns regarding the AIR QUALITY, please describe them below.

I am concerned about air quality in DuPont as the mine expands, particularly near Creekside Apartments. 1 EA

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.

I am very concerned about any lowering of groundwater in and around Sequalitchew Creek and of any of DuPont's aquifers. Climate change means hotter, dryer weather for DuPont . Groundwater/aquifer recharge will be more difficult and expansion of the mine will lower the water available. 2 DS EA

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.

My understanding is that 4 months of the year Sequalitchew Creek will be dry if the mine is expanded. This would have significant impact on the riparian environment of the creek and its surrounding ecosystem. 3 DS

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.

As stated above, the entire ecosystem of Sequalitchew Creek would be impacted due to the de watering of the stream for gravel mining. The ecosystem is currently one of lush vegetation with heavy fern growth and shade. If you walk the trail, you hear birds and can see frequent garter snakes, frogs and squirrels.Their habitat will be greatly altered if not destroyed when de-watering occurs. 4 EA

If you have concerns regarding NOISE, please describe them below.

I am concerned about noise from the gravel mine operation as it comes closer to residential and recreational areas of DuPont, in particular Creekside Apartments, the Home Course and the DuPont Community Garden. 5 EA

If you have concerns regarding LAND USE, please describe them below.

Current mining land use should not be expanded in the direction of sensitive environmental areas like the Sequalitchew Creek. 6 EA

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.

The Sequalitchew Creek trail is an important environmental and visual asset for the City of DuPont. Residents (and non-residents) enjoy this recreational resource on a daily basis. It provides a natural respite from the built world and is irreplaceable.

7
EA

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

The Sequalitchew Trail borders sensitive Native American sites and therefore any environmental damage to the creek should take this into consideration.

8
EA

If you have concerns regarding TRANSPORTATION, please describe them below.

If you have OTHER concerns not listed above, please describe them below.

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

(SEPA2021-002 comment period 6/14/2024-7/15/2024)

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Date
7/14/2024

First Name *
Merrilee

Last Name *
Rambeau

Are you a resident of the City of DuPont, WA? *
- Yes
- No

What city do you reside in?

Are you a business owner? *
- Yes
- No

Are you part of an Agency or Organization? *
- Yes
- No
- Not relevant to my input

If you have concerns regarding the EARTH, please describe them below.

If you have concerns regarding the AIR QUALITY, please describe them below.

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.

I frequently walk the Sequalitchew Creek Trail as do hundreds if not thousands of others. I've been there at all times and days throughout the seasons and find plenty of other folks are too. Even in the hottest days of summer it is cool and damp. Water runs across the trail and down the stream when it hasn't rained for days and the creek is dry upstream. I understand this is because of the multiple seeps from the underlying aquifer. That is what makes this little canyon unique. Surely this is why this canyon was used for the winter home of the people for centuries. Here at the heart of the earliest industrialization in the area, this little canyon has been set aside, replanted with native plants, and historical sites identified. It is the jewel of DuPont's trail system. Destroying the aquifer cannot be undone. Why would the city council even consider this option? Surely there is no shortage of gravel in Western Wa. Whatever financial gains will be short lived but this unique canyon will be forever lost. This trail serves children and grandparents, students, soldiers and businessmen. It is a tiny remnant of the old world right in the heart of town. It is up to people like our councilmen to save a tiny scrap of the world for future generations, and besides, where else can a kid see salamanders around here anymore?

1
EA
DS

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.

If you have concerns regarding NOISE, please describe them below.

If you have concerns regarding LAND USE, please describe them below.

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

If you have concerns regarding TRANSPORTATION, please describe them below.

If you have OTHER concerns not listed above, please describe them below.

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

(SEPA2021-002 comment period 6/14/2024-7/15/2024)

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Date

7/22/2024

First Name *

Mary

Last Name *

Reeves

Are you a resident of the City of DuPont, WA? *

- (●) Yes
- ( ) No

Are you a business owner? *

- ( ) Yes
- (●) No

Are you part of an Agency or Organization? *

- ( ) Yes
- (●) No
- ( ) Not relevant to my input

If you have concerns regarding the EARTH, please describe them below.

If you have concerns regarding the AIR QUALITY, please describe them below.

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.

Projected permanent drop in groundwater in Edmunds Marsh, Pond Lake, Old Fort Lake, and other wetlands around DuPont is alarming, raises concerns about future availability for human use, especially given planned population increases and density requirements.

1 DS

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.

Lower water table and loss of wetlands affects streams and surface water, raising even greater concerns about increasing draught and fire danger due to even drier vegetation.

2 DS EA

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.

Of course loss of wetlands and groundwater adversely affects fish and wildlife.

3 EA

If you have concerns regarding NOISE, please describe them below.

If you have concerns regarding LAND USE, please describe them below.

Proposed plan appears to violate city ordinance. Given the DEIS study results I fail to see why this plan is still being considered. The fact that it is suggests the study and public comments are an irresponsible exercise in box checking, not serious due diligence.

4 EA

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

If you have concerns regarding TRANSPORTATION, please describe them below.

If you have OTHER concerns not listed above, please describe them below.

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

(SEPA2021-002 comment period 6/14/2024-7/15/2024)

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Date
7/22/2024

First Name *
Kurt

Last Name *
Reidinger

Are you a resident of the City of DuPont, WA? *
- ○ Yes
- ◉ No

What city do you reside in?
Unincorporated Pierce County

Are you a business owner? *
- ○ Yes
- ◉ No

Are you part of an Agency or Organization? *
- ○ Yes
- ◉ No
- ○ Not relevant to my input

If you have concerns regarding the EARTH, please describe them below.

If you have concerns regarding the AIR QUALITY, please describe them below.

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.
I have attached a comment letter with my concerns.

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.
I have attached a comment letter with my concerns.

1
EA

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.
I have attached a comment letter with my concerns.

If you have concerns regarding NOISE, please describe them below.

If you have concerns regarding LAND USE, please describe them below.

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

If you have concerns regarding TRANSPORTATION, please describe them below.

If you have OTHER concerns not listed above, please describe them below.

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

DEIS Comments Pioneer Aggregates South Parcel Project.pdf 168.73KB

(SEPA2021-002 comment period 6/14/2024-7/15/2024)

City of Dupont
1700 Civic Drive
DuPont, WA 98327
Attention: Barbara Kincaid

July 22, 2024

RE: Comments on Draft Environmental Impact Statement (DEIS) for Gravel Mining Proposal - Pioneer Aggregates South Parcel Project

To Whom It May Concern:

I have the following comments regarding the above. My comments not only cover the DEIS but touch on related, accessory documents provided during the scoping phase necessary to interpret elements of the DEIS where I found the latter was unclear or incomplete.

My comments generally cover hydrological impacts and related issues (e.g., wetland plants). Some of the two most concerning impacts from the mining expansion are effects to Sequalitchew Creek and the existing, unnamed kettle wetland. But there are some general concerns about the hydrological modeling underpinning the overall project and wider impacts outside the project area that should also be addressed.

1. Impacts to Sequalitchew Creek

The DEIS makes frequent reference to the Sequalitchew Creek Restoration Plan (SCRP). It describes this plan as a separate and somewhat related action. It implies that funding for this plan is dependent in whole or in part on the Applicant and notes that "… the 2011 Settlement Agreement indicates that any approval for mining under the Pioneer Aggregates South Parcel Project shall not be effective until permits and approvals needed for implementation of the Sequalitchew Creek Restoration Plan developed by CalPortland and the Environmental Caucus are in place." (p. 3.5-10).

For example, the relationship between the Applicant's DEIS and the SCRP is highlighted on p. 29 of Appendix B, South Parcel Monitoring Plan:

> "Mining of the South Parcel and the restoration of Sequalitchew Creek are separate, but interacting, projects. Each project has its own adaptive management process tailored to achieving the goals and objectives of that project. The interaction between the two adaptive management processes is three-fold: 1) project schedules that encourage restoration in advance of the potential impacts from mining; 2) development of performance thresholds for mining that support restoration based on prior technical studies, including the cumulative effects analysis prepared in 2016 (Aspect and Anchor, 2016); and 3) coordinated monitoring and open sharing of information."

1 DS Cal

Because the SCRP figures so prominently in the DEIS, in addition to the fact that the Applicant's project is contingent on this plan, this plan or a good summary of it should have been included as an Appendix in the DEIS so that everyone understands what it is expected to accomplish and how.

This seems to be a critical omission. The fact that the SCRP wasn't included even partially calls into question the completeness of the DEIS.

The project intends to direct intercepted groundwater from the mining northward away from the upper portion of the creek's ravine and eventually to the so-called wetland mitigation area further downstream via a circuitous route[1]. Moreover, the project will ultimately leave the property adjacent to the north side of the creek with a deep and steep-sided cut devoid of groundwater bearing gravels. There are a number existing springs or seeps in the north side of the creek's deeply incised ravine channel that are likely to be threatened if groundwater in this area is diminished.

2 DS Cal

The Applicant declares at the outset that it has estimated up to 79% of the groundwater flows to Sequalitchew Creek would be lost under the proposal (p. 1-5). In addition, the Applicant acknowledges that "… during dry summers (when Sequalitchew Springs discharge to Sequalitchew Lake is fully consumed by JBLM), no surface water outflow from Sequalitchew Lake to East Edmond Marsh and Sequalitchew Creek would occur. Lower reaches of Sequalitchew Creek would be dry (pp. 1-6, 1-7). Moreover, the SCRP would have no effect on the ravine spring flows (p. 79, Appendix B, Earth and Water Resources Report).

So, understanding whether the SCRP is a viable mitigation measure for this project is key to evaluating the DEIS. Yet this component project appears to be missing from the DEIS.

3 DS Cal

This area, the ravine, has diverse conditions and thus harbors a diverse flora (with at least one relatively rare, state-sensitive species) and will clearly be impacted by the project. Sequalitchew Creek has already been drastically impacted by excessive groundwater withdrawals upstream in connection with JBLM's water system near Sequalitchew Springs and any summertime flow now is a function of available groundwater. This is a case where a project will have long-term impacts beyond its boundaries and these impacts need to be scrutinized carefully in the DEIS. I suggest the DEIS needs to focus on quantitative measures (estimates) of groundwater impacts to the springs and seeps contributing to creek flow in contrast to the predicted flows from the SCRP, including the reliability of such groundwater predictions in the face of climate change.

4 DS Cal

Unfortunately, I do not see a catalog of the plants and animals in the Sequalichew Creek ravine that will also be affected by water loss, hence the impacts to this area outside the project area boundaries are unknown or at least undocumented in the DEIS. For example, I noted that existence of one state-sensitive vascular plant species in this area (I have a somewhat recent photo of the plant). It is not my place to reveal the name and/or location of the plant and it's the Applicant's responsibility to contact the Department of Natural Resources Natural Heritage Program and find out the protocol for handling this issue for their project.[2] I have a list of other plant species in the ravine area that will likely be affected by the project, yet I don't see anything comparable in the DEIS.

5 Cal EA

The Applicant asserts (p. 3.6-19) that the SCRP

> "…has the potential to restore an annual average of 12.9 cfs to a 1,200-foot reach of Sequalitchew Creek that currently experiences little to no consistent flow. Seasonally, the flows in this reach following restoration are predicted to be between 2.5- cfs in August up to just over 26 cfs in March. Flows of this magnitude would reestablish a functioning stream in the now frequently dry channel,

6 DS

[1] Sheet C1 in "05-07-2021 South Parcel Project Plans_22x34_FLATTENED.pdf" from the Scoping Phase.
[2] DNR Natural Heritage Program at https://www.dnr.wa.gov/natural-heritage-program; the vascular plant in question is listed on the 2021 WA Vascular Plant Species of Conservation Concern List at https://www.dnr.wa.gov/NHPlists.

> providing new aquatic and riparian habitat and a connection between the Sequalitchew Creek ravine and the marshes." (underline added)

6 cont

But as noted previously (pp. 1-6, 1-7 in the DEIS), the creek still could be dry in some years despite the SCRP. The implication is that ravine habitat outside the project area is likely to change and become drier and less habitable for riparian vegetation.

As it stands now, and into the future, JBLM controls most of the water available that could replenish Sequalitchew Creek flows under any restoration, and this control is outside the State's regulatory framework; for example, on p. 34 of Appendix B, Earth and Water Resources Report the DEIS states:

> "... JBLM's legal access to water is embedded in the base's federal status as a military base, as such it is allowed to access water for the base's primary purposes which includes the drinking water system that serves its population. Sequalitchew Springs generally provides more flow that needed by JBLM for water supply." (underline added)

7 DS Cal

So, it's imperative that the Applicant explain precisely what objectives the SCRP is expected to achieve, what is the timeline for the SCRP, and how they will the objectives be attained given these jurisdictional discontinuities.

2. Impacts to the Kettle Wetland and other surface waters

The project intends to destroy the existing kettle wetland on the site and attempt replace it with a wetland mitigation site on already mined ground. The existing small wetland was likely formed around a glacial ice block that left fine materials of low permeability when it melted. The current area consists of black peat soils over a layer of lower permeability silty clay. It also apparently has some of the vegetation one might expect of a such a wetland[3]. The water table in its vicinity also exhibits smaller fluctuations in contrast to the much larger fluctuations on the rest of the site[4].

8 EA

In addition to the so-called Kettle Wetland, it is noted on p. 1-26 that:

> " … water levels in isolated lakes and kettle wetlands not directly connected by surface water to the Sequalitchew Creek system would be lowered due to lowered groundwater levels from the Proposed Action. The anticipated decrease in water levels would be approximately 3 ft for Wetland 1D; 2 ft for Pond Lake; 1 ft for Wetlands, #8, #9, #10, and #11; and 0.5 ft for Old Fort Lake. Implementation of the Restoration Plan would likely not mitigate these impacts. These isolated wetlands have significant seasonal variability in water levels and are often dry during the summer. For these reasons, changes that result from changes in groundwater level may be difficult to observe." (underline added)

9 Cal EA

These are adverse impacts outside the project boundaries that are unmitigated. The condition of these wetlands will likely be exacerbated by the effects of climate change and reduced rainfall. The DEIS need to acknowledge that the Applicant's project will compound these adverse conditions.

It appears that some results of vegetation sampling in and around the Kettle Wetland are included in the DEIS (Appendix B within Appendix J, Floodplain Habitat Assessment and Mitigation Report and pp.

10 Cal EA

[3] Page 5, Section 2.3 in March 2021 Wetland Mitigation Plan.
[4] Page 8, Section 4 in Groundwater Model Update-DuPont Mine South Parcel Expansion Area.

14-15 of the same report). This material is somewhat scattered and should be consolidated into a single table for just the Kettle Wetland for ultimate comparison with the results of the Applicant's proposed mitigation site plan. The Applicant has indicated their mitigation site will be re-vegetated in part using specimens from the Kettle Wetland, and partly from general sources in the Puget Sound region[5]. The scope of the original vegetation sampling is not clear, however, and it seems to be restricted to two (2) fairly small areas at the north and south ends of the wetland[6]. A key question the DEIS does not ask or answer is: how representative is this sampling and will it suffice in replicating the plant community of the original Kettle Wetland?

10 cont

The Applicant has indicated it will attempt to salvage the soils of the Kettle Wetland and re-use them in constructing a mitigation wetland site[7].

The Applicant's Wetland Mitigation Plan from 2021 hints that failure is a possibility, or at least such mitigation may not go according to plan, as it includes a section titled "Adaptive Management and Contingency Plan"[8]. The DEIS should mention and give a reference to these contingencies.

Perhaps more important is the timeline for how long the wetland mitigation is expected to take. The Credits and Debits document[9] cited in the mitigation plan notes that there are temporal losses due to delay of mitigation (see the section on Temporal Loss Factors in that document), and on p. 16 note that:

> "… if a mitigation project is delayed, and impacts are incurred before a mitigation project is installed, there is an increase in the temporal losses. Thus, the temporal loss factor is increased for projects that are delayed."

11 Cal EA

The DEIS should provide a summary of the mitigation timeline, i.e., the interval between wetland destruction and mitigation planting, not just the monitoring timeline noted in the Monitoring Plan section of the Applicant's Wetland Mitigation Plan.

Another practical question concerns how the Applicant will manage the process to keep the mitigation site from being overrun by deleterious invasive plants (Himalayan blackberry, yellow flag iris, Scotch broom, etc.) in the long term.

12 Cal EA

Finally, I note that after mining, the site landscape east and upgradient of the wetland mitigation site is zoned for residential, manufacturing, industrial, etc., and apparently, this intent is also contained in the reclamation correspondence with DNR[10]. So, a very large portion of the mining site will ultimately be covered with asphalt and similar hard or impervious surfaces (roads, residential roofs, warehouses, and commercial buildings) with all that implies for both water quality and water quantity. Such artificial surfaces are extremely deleterious to natural waters. I think the DEIS needs to spell out how the mitigation wetland will be maintained over the long term in the face of this development, not just during the gravel mining phase.

13 Cal City EA

[5] See 5.2.3 Mitigation Site Vegetation in March 2021 Wetland Mitigation Plan.
[6] See Figure 2 Kettle Wetland Map on PDF page 91 of March 2021 Wetland Mitigation Plan.
[7] See 5.2.2 Mitigation Site Soils in March 2021 Wetland Mitigation Plan.
[8] See p. 21 in March 2021 Wetland Mitigation Plan.
[9] Calculating Credits and Debits for Compensatory Mitigation in Western Washington - Final Report; available at https://apps.ecology.wa.gov/publications/SummaryPages/1006011.html
[10] For example, Figure 3 in Landmark Tree Inventory Report and Subsequent Use section on page 2 of the Reclamation Narrative Letter to DNR from the Scoping Phase.

3. Hydrological Modeling Predictions

The Applicant used groundwater modeling with the goal of predicting impacts from dewatering and gravel mining[11]:

> " … This report documents the updated analysis used to predict groundwater levels during and after the proposed dewatering and mining of the South Parcel at CalPortland's Pioneer Aggregate facility in DuPont, Washington." (underline added)

The Applicant used proprietary software[12] in conjunction with data collected locally to develop the model. While the Applicant considered some modeling uncertainties,[13] I didn't find mention of climate change effects that might overshadow these hydrological analyses. For example, the modelers note that[14]:

> "… For the purposes of this modeling effort, we assumed surface water levels in the wetlands will be similar to historical conditions".

14 DS Cal

This may be a flawed assumption and not taking into account climate change impacts on groundwater could make predicted outcomes unrealistic. For example, Johnson et. al. (2011)[15] in their numerical simulations of groundwater flow in the nearby Chambers-Clover watershed attempted to account for climate change affects by considering a 20% reduction in rainfall with its resultant effects on surface waters. The modelers for the proposed project could certainly carry out a similar exercise, or possibly even consider time varying changes (e.g., simultaneously reducing rainfall amounts while altering the distribution of rainfall within a year). This would allow decision makers to see a broader range of potential water-related outcomes.

Thank you for the opportunity to comment.

Sincerely,



Kurt Reidinger
P.O. Box 44105
Tacoma, WA 98448

[11] DEIS Appendix E Groundwater Model Update, p. 1.
[12] MODFLOW-SURFACT, p. 12 in DEIS Appendix E. The open-source USGS MODFLOW program is an example of a similar groundwater modeling framework: https://www.usgs.gov/mission-areas/water-resources/science/modflow-and-related-programs?qt-science_center_objects=0#qt-science_center_objects
[13] Section 3.2.1.6 Model Uncertainty in the DEIS.
[14] Page 30, Section 6 in Groundwater Model Update-DuPont Mine South Parcel Expansion Area.
[15] Johnson, K.H., Savoca, M.E., and Clothier, Burt. 2011. Numerical simulation of the groundwater-flow system in the Chambers-Clover Creek Watershed and Vicinity, Pierce County, Washington: U.S. Geological Survey Scientific Investigations Report 2011–5086, 108 p.

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Comment Form

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Date
7/21/2024

First Name *
Samantha

Last Name *
Rizzo

Are you a resident of the City of DuPont, WA? *
- (●) Yes
- ( ) No

Are you a business owner? *
- ( ) Yes
- (●) No

Are you part of an Agency or Organization? *
- ( ) Yes
- ( ) No
- (●) Not relevant to my input

If you have concerns regarding the EARTH, please describe them below.
Stop destroying our city and our world for money!!!

If you have concerns regarding the AIR QUALITY, please describe them below.
Stop destroying our city and ymour world for money!!!

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.
Stop destroying our city and our world for money!!!

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.
Stop destroying our city and our world for money!!!

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.
Stop destroying our city and our world for money!!!

If you have concerns regarding NOISE, please describe them below.
Stop shooting guns and bombs in THE MIDDLE OF THE NIGHT!!

If you have concerns regarding LAND USE, please describe them below.
Stop destroying our city and our world for money!!!

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.
Stop destroying our city and our world for money!!!

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

1 EA

2 EA

3 EA

4 EA

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If you have concerns regarding TRANSPORTATION, please describe them below.

A train station in Dupont would go a long way, especially during the upcoming worse parts of highway construction.

If you have OTHER concerns not listed above, please describe them below.

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If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

(SEPA2021-002 comment period 6/14/2024-7/15/2024)

4 cont

5 EA

6 EA

Pioneer Aggregates South Parcel Draft Environmental Impact Statement (EIS)

Comment Form

Input from the public regarding the Pioneer Aggregates South Parcel Project EIS is welcome. Please submit this form to share your comments. Note: Submitted comment forms are subject to the Public Records Act (RCW 42.56).

Date
7/15/2024

First Name *
James

Last Name *
Rodger

Are you a resident of the City of DuPont, WA? *

- (●) Yes
- ( ) No

Are you a business owner? *

- ( ) Yes
- (●) No

Are you part of an Agency or Organization? *

- ( ) Yes
- (●) No
- ( ) Not relevant to my input

If you have concerns regarding the EARTH, please describe them below.

I am writing this today to request you please consider to NOT allow the mining and ruining of Sequalitchew Trail. The wetlands in DuPont are known to have a positive effect on water quality downstream and in aquifers by removing pollutants through the processes of sediment trapping, nutrient removal, and chemical detoxification. Wetlands also regulate the flow, retention, and release of stormwater to surface and groundwater systems. CalPortland's request to dewater the Vashon Aquifer will destroy our wetlands, marshes, creek, and surrounding environment. In their proposal, it clearly states:

- West Edmonds Marsh groundwater level will decrease by 9 feet
- Pond Lake water level will be reduced by 2 feet
- Wetlands number 8, 9, and 10 water levels will be reduced by 1 foot
- Old Fort Lake will be reduced by 0.05 feet
- The Kettle Wetland will be eliminated
- The seeps and springs that feed Sequalitchew Creek will dry up

These groundwater levels will be reduced forever! The decrease in groundwater will lead to the loss of vegetation, loss of stream flow, loss of habitat, decreased ability to remove pollutants, and will add drought-like conditions to the Sequalitchew Creek Ravine.

ALL of this will be detrimental to the wellbeing of the wildlife and beauty know in DuPont. This will preclude future generations of enjoying the natural wildlife and habitats in DuPont.

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ALL DuPont residents will be affected with this decision so therefore I request you to consider a resounding NO to the mining which will ultimately result in a reduced quality of life for residents, and all living things— trees, plants, flowers, deers, sea lions, frogs, bunnies, and all creatures big and small.

1 DS

2 EA

3 EA

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If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.

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If you have concerns regarding NOISE, please describe them below.

I am writing this today to request you please consider to NOT allow the mining and ruining of Sequalitchew Trail.

The noise from the mining will not only disturb the residents but also the wildlife! The wildlife will be scared and injured due to this noise and disruption.

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The aesthetics and visual of Sequalitchew trail will be ruined with the mining due to the loss of water. It will lack the life and greenery well loved and enjoyed by all residents! This will depreciate the value and experience of the area. It will cause unnecessary death and drying bringing a sadness to the area especially to those who knew the trail before the damage.

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

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IMG_9618.jpeg 3.05MB

(SEPA2021-002 comment period 6/14/2024-7/15/2024)

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Date
7/13/2024

First Name *
Jessica

Last Name *
Rodger

Are you a resident of the City of DuPont, WA? *

- (●) Yes
- ( ) No

Are you a business owner? *

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If you have concerns regarding the EARTH, please describe them below.

I am concerned about the sequalitchew trail. My family including my kids, my husband, our dog, and I walk this trail all the time. We love the sequalitchew trail or as my daughter would call it the “walk to the water” and don’t want it to be affected by any man decided drilling/mining/corrupting/etc.,
We do not want to see the trail altered or damaged at all. Removing the water would ruin this trail and the experience of walking through nature to get to the water. The sound of the water on the walk, the green plants and trees, the wildlife all make the sequalitchew trail beautiful. Please do not lessen the quality of life that is the walk to the water. The peace with nature that is found on the walk to the water is not available anywhere else in DuPont. The families that utilize the trail, just like mine, are depending upon you to not do anything that would affect this beautiful piece of DuPont and one of our favorite DuPont traditions!
We enjoy the wildlife, the greenery, the life, the sounds, and the overall experience of the sequalitchew trail. Please do not ruin it.

1
EA

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We do not want to see the trail altered or damaged at all. Removing the water would ruin this trail and the experience of walking through nature to get to the water. The sound of the water on the walk, the green plants and trees, the wildlife all make the sequalitchew trail beautiful. Please do not lessen the quality of life that is the walk to the water. The peace with nature that is found on the walk to the water is not available anywhere else in DuPont. The families that utilize the trail, just like mine, are depending upon you to not do anything that would affect this beautiful piece of DuPont and one of our favorite DuPont traditions!
We enjoy the wildlife, the greenery, the life, the sounds, and the overall experience of the sequalitchew trail. Please do not ruin it.

2 cont

If you have concerns regarding LAND USE, please describe them below.

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2 cont

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If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

IMG_6269.jpeg 2.51MB

(SEPA2021-002 comment period 6/14/2024-7/15/2024)

Pioneer Aggregates South Parcel Draft Environmental Impact Statement (EIS)

Comment Form

Input from the public regarding the Pioneer Aggregates South Parcel Project EIS is welcome. Please submit this form to share your comments. Note: Submitted comment forms are subject to the Public Records Act (RCW 42.56).

Date
7/13/2024

First Name *
Matthew

Last Name *
Roelofsen

Are you a resident of the City of DuPont, WA? *
- (●) Yes
- ( ) No

Are you a business owner? *
- (●) Yes
- ( ) No

Where do you do business?
DuPont

Are you part of an Agency or Organization? *
- ( ) Yes
- ( ) No
- (●) Not relevant to my input

If you have concerns regarding the EARTH, please describe them below.
I grew up biking and running on sequalitchew and the marshes around DuPont. It would be extremely disappointing and painful to see the DuPont that raised me be slowly destroyed by this awful proposal.

1 EA

If you have concerns regarding the AIR QUALITY, please describe them below.

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.
Read first comment

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.
Read first comment

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.
Read first comment

2 EA

If you have concerns regarding NOISE, please describe them below.

If you have concerns regarding LAND USE, please describe them below.

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.
Read first comment

If you have concerns regarding CULTURAL RESOURCES, please describe them below.
Read first comment

If you have concerns regarding TRANSPORTATION, please describe them below.

If you have OTHER concerns not listed above, please describe them below.

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

(SEPA2021-002 comment period 6/14/2024-7/15/2024)

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Date

7/8/2024

First Name *

Kaitlyn

Last Name *

Rose

Are you a resident of the City of DuPont, WA? *

- (●) Yes
- ( ) No

Are you a business owner? *

- ( ) Yes
- (●) No

Are you part of an Agency or Organization? *

- ( ) Yes
- ( ) No
- (●) Not relevant to my input

If you have concerns regarding the EARTH, please describe them below.

What you are planning to do will ruin the environment for the animals that live there when there isn't much left already, it will also disturb the neighborhoods and bring in too much traffic. The beauty of the wetlands is that it's quiet and is a protected reserve. Please do not do this.

If you have concerns regarding the AIR QUALITY, please describe them below.

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If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.

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1 EA

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.

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If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.

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If you have OTHER concerns not listed above, please describe them below.

What you are planning to do will ruin the environment for the animals that live there when there isn't much left already, it will also disturb the neighborhoods and bring in too much traffic. The beauty of the wetlands is that it's quiet and is a protected reserve. Please do not do this.

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(SEPA2021-002 comment period 6/14/2024-7/15/2024)

1 cont

Pioneer Aggregates South Parcel Draft Environmental Impact Statement (EIS)

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Input from the public regarding the Pioneer Aggregates South Parcel Project EIS is welcome. Please submit this form to share your comments. Note: Submitted comment forms are subject to the Public Records Act (RCW 42.56).

Date

7/13/2024

First Name *

Maggie

Last Name *

Rouse

Are you a resident of the City of DuPont, WA? *

- (●) Yes
- ( ) No

Are you a business owner? *

- ( ) Yes
- (●) No

Are you part of an Agency or Organization? *

- ( ) Yes
- (●) No
- ( ) Not relevant to my input

If you have concerns regarding the EARTH, please describe them below.

It is important for the soil in this region to retain a healthy aquifer. Damage or depletion of the aquifer will negatively affect the health of the soil resulting in damage to the flora and fauna in the area.

1 EA

If you have concerns regarding the AIR QUALITY, please describe them below.

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.

Ground water and a healthy aquifer are important to the total health of an ecosystem. I am worried that the depletion of the auqifer will negatively impact the surrounding wildlife and flora.

2 EA

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.

Without a healthy auqifer, water sources are more likely to dry out. This negatively impacts all wildlife and flora. This also decreases the beauty of the area, negatively impacting outside experiences.

3 EA

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.

Fish, plants, and animals all rely heavily on an ecosystem that is supported by a healthy level of ground water. The depletion of this aquifer will negatively impact all the fish, plants, and animals living within this ecosystem.

4 EA

If you have concerns regarding NOISE, please describe them below.

If you have concerns regarding LAND USE, please describe them below.

This land should be used for recreational purposes. I do not believe this land should be used to increase production for a gravel mine. I believe the land is more valuable as a healthy example of family friendly outdoor recreation in Washington.

5 EA

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.

The depletion of this aquifer are will result in ecosystem death. That will negatively impact the aesthetics of the area. Plants and animals will disappear.

6 EA

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

If you have concerns regarding TRANSPORTATION, please describe them below.

If you have OTHER concerns not listed above, please describe them below.

As a citizen of Dupont and an avid user of this area, I am concerned with the lack of accessibility to such a wonderful recreation area. I am concerned for the health of the surrounding ecosystem if this project is to be completed. This area is an important source for the local community to spend time outside in the beautiful nature of Washington.

7 EA

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

(SEPA2021-002 comment period 6/14/2024-7/15/2024)

RECEIVED
JUL 15 2024
CITY OF DUPONT

July 15, 2024

The City of DuPont

1700 Civic Drive

DuPont, WA

98327

Attention: Barb Kinkaid

My comments regarding the City of DuPont's Pioneer Aggregates South Parcel Project - Draft EIS begin on the next page. Below are some prefacing remarks.

In 2011 CalPortland made it clear to the City of DuPont Mayor and Council members and to members of the Environmental Caucus (led by the Nisqually Delta Association) that **to avoid protracted litigation** a new conditional use permit would have to be issued to enable it to access Vashon aquifer saturated gravel located beneath the South Parcel under dry mining conditions.

What ensued was the 2011 Settlement Agreement whose provisions satisfied CalPortland in this regard. As mitigation for the adverse environmental impact of its proposed aquifer dewatering scheme CalPortland agreed to provide funding for development of a South Puget Sound Salmon Enhancement Group Sequalitchew Creek Restoration Plan.

The 2011 Settlement Agreement stipulated that such a Plan must incorporate **five essential elements**. In 2012, I pointed out that such a Plan would not be based upon a credible description of the hydrology of the area and, further, that if such a Plan was developed and implemented that it would not provide the mitigation described. 1 City DS Cal

I refer to the Sequalitchew Creek Restoration Plan's deficiencies in my following Pioneer Aggregates South Parcel Project - Draft EIS comments. I have also provided copies of my 2012 and 2020 advice to all parties' signatory to the 2011 Settlement Agreement for reference.

I have also provided a detailed Sequalitchew Creek Restoration Plan that I previously submitted to all parties' signatory to the 2011 Settlement Agreement. That Plan is based upon a proper understanding of the natural hydrology of the Sequalitchew Creek watershed. It eliminates the adverse effect that dewatering would have on the Sequalitchew Creek/Edmond Marsh watershed.

It is my view that since CalPortland has threatened **protracted litigation** if it is not issued a conditional use permit to mine Vashon aquifer saturate gravel in the South Parcel under dry mining conditions, it is unlikely that it will agree to support DuPont's No Action Scenario A or B options. 2 City DS Cal

A collaboratively developed CalPortland/City of DuPont Sequalitchew Creek Restoration Scenario Option may provide an off ramp necessary to avoid **protracted litigation** of this issue.

Thank you for the opportunity to comment,

Don Russell

(253) 534-5342 krdr1@juno.com

Dear Ms. Kinkaid,

My comments on the Pioneer Aggregates South Parcel Project – EIS are contained below.

As a witness

I have witnessed the adverse environmental impacts of the major hydromodification projects executed in the American Lake-Sequalitchew Lake-Sequalitchew Creek subwatershed of the Chambers-Clover Creek Watershed (WRIA 12) for the past 76 years. I am now 94 years old.

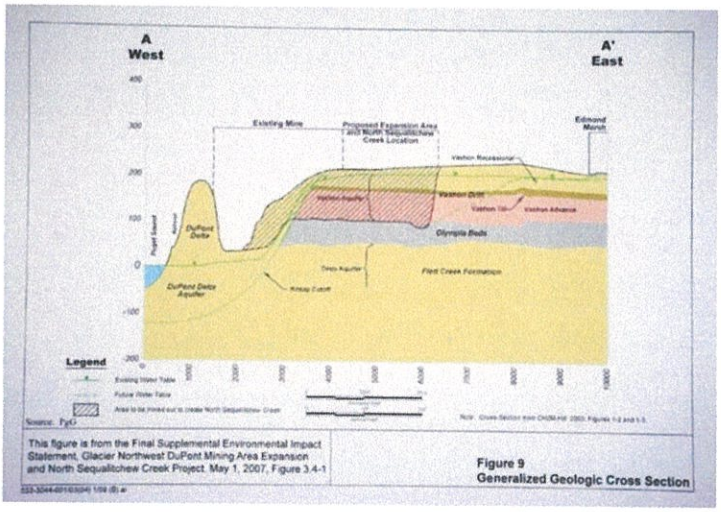
As a retired citizen volunteer and long-standing active member of the Chambers-Clover Watershed Council, I have conducted environmental impact surveys and water quality monitoring in this subwatershed for the past 25 years. For the past 15 years, I have been sending copies if my reports and commentary on CalPortland's quest, as defined in this DEIS, to secure a conditional use permit for expansion of its mining operations in the South Parcel to Ecology, DNR, DuPont City Council members, members of the Environmental Caucus, and CalPortland representative and their consultants.

3
EA

With this brief introduction I have the following comments about various aspects of the Pioneer Aggregates South Parcel Project Draft EIS. These aspects include; the adverse ecological impact of issuing a conditional use permit allowing CalPortland to dewater the Vashon aquifer to mine dry gravel contained in the South Parcel; the validity of the Sequalitchew Creek Restoration Plan; No Action Scenario A – Continuation of Existing Conditions; No Action Scenario B – Site Development Under Existing Zoning; and conclude by offering a proposed, collaboratively developed, CalPortland/City of DuPont Sequalitchew Creek Restoration Scenario that would involve upgradient groundwater discharge interception in a constructed and maintained upper flowing reach of Sequalitchew Creek and associated Edmond Marsh wetland.

4
EA

The adverse ecological impact of issuing a condition use permit allowing CalPortland to dewater the Vashon aquifer



The above illustration shows a cross section of the hydrogeology of the area. The green line with inverted pyramids shows the existing Vashon aquifer groundwater level. The green dotted line shows the Vashon aquifer groundwater level during and after CalPortland's dewatering of the area.

Note that the solid green line is shown as underlying and supporting groundwater that currently manifests itself as surface water in Edmond Marsh whereas after the dewatering pumps are turned off and removed that the Vashon aquifer groundwater level will be well below Edmond Marsh. Disconnect the groundwater that supports Edmond Marsh, and it will dry up.

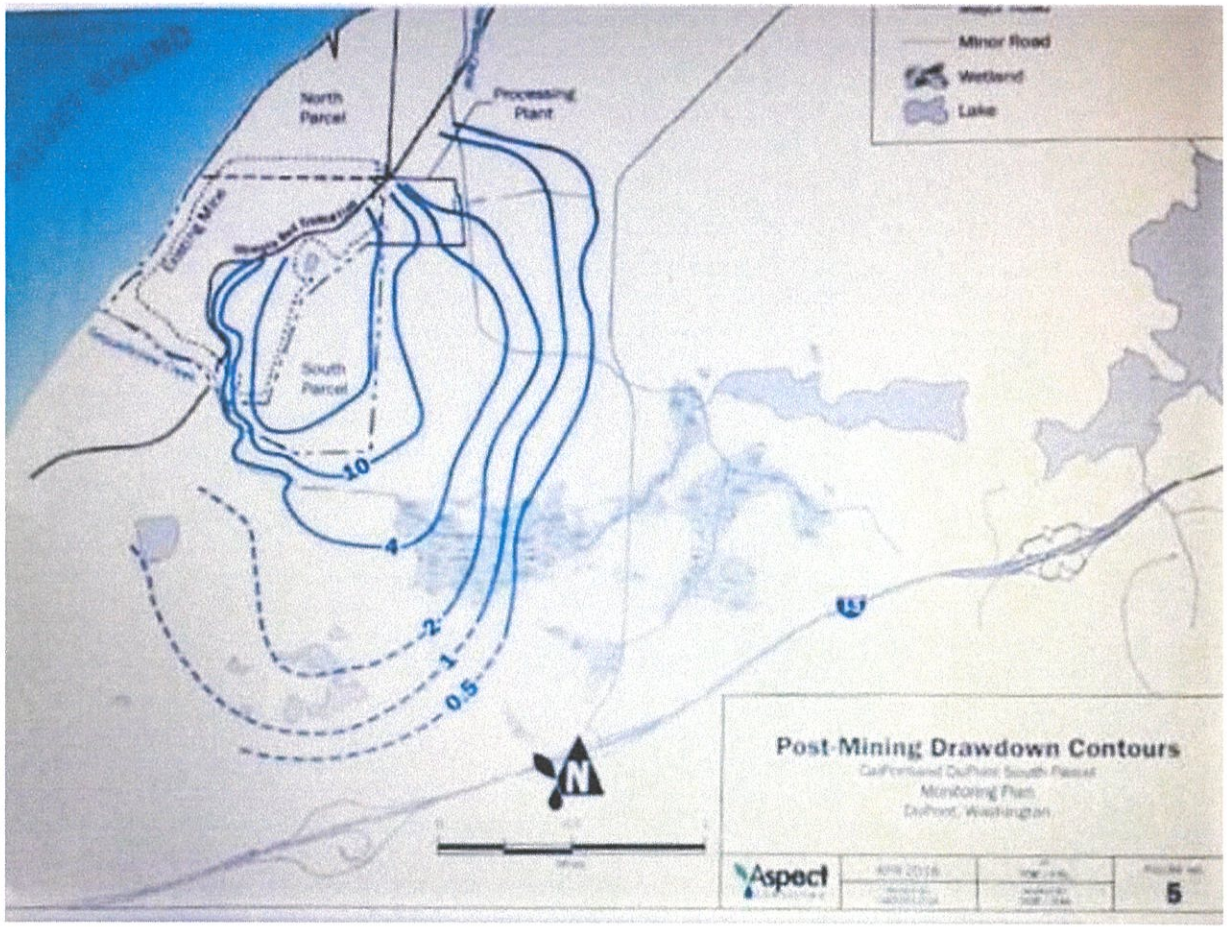
How CalPortland proposes to dewater the Vashon aquifer is shown in the below illustration.



Note the extensive array of dewatering pumps around the south and east perimeter of the mine pit. Also note that the combined discharge of these pumps is discharged into Edmond Marsh.

This technique will provide substantial pumped groundwater flow from the west end of Edmond marsh and down the ravine reach of Sequalitchew Creek. However, once the dewatering pumps are turned off and removed water in Edmond Marsh and flow in the ravine reach of Sequalitchew Creek will disappear. The effect of dewatering on groundwater level is illustrated below.

6
DS
Cal



Consequence of permitting dewatering of the Vashon aquifer

It will only become evident when the dewatering pumps are turned off 14 years hence that the disastrous ecological effect will become evident to the Department of Ecology, Environmental Caucus members, Nisqually Tribe, WDFW, DNR and the citizens of DuPont.

There will be no viable salmon habitat in the Sequalitchew Creek sub watershed, no functional Edmond Marsh wetland, and no groundwater discharge flow in Sequalitchew Creek. In other words, the Sequalitchew Creek watershed will become as groundwater discharge deprived and dysfunctional as much of the Clover Creek subbasin watershed.

7
DS
Cal

Such an outcome would render the 700-acre mined out groundwater flooded pit unfit for any subsequent development by the City of DuPont.

The validity of the Sequalitchew Creek Restoration Plan

The 2011 Settlement Agreement required that the Sequalitchew Creek Restoration Plan incorporate the below five elements (as defined by CalPortland's consultants Aspect and Anchor) for the Plan to be approved by CalPortland and the Environmental Caucus.

4.1.1. Improvement of gradients so [surface] *water discharges from Hamer and Bell Marshes flow into Edmond Marsh rather than into the diversion canal.*

4.1.2. Improvements to create significant [surface water] *flows from Sequalitchew Lake into the Edmond Marsh complex to support a functional creek ecosystem, and provide for the passage of migratory fish in the Sequalitchew Creek system. To achieve this goal, the Parties will consider, at minimum, modification of the diversion canal flood control structure and gradients.*

4.1.3. Rehabilitation of Edmond Marsh by removal of sufficient fill and other flow impediments to provide the hydraulic gradients and capacity necessary to achieve and maintain adequate [surface water] *flows through the Marsh.*

8
DS
Cal

4.1.4. Rehabilitation of Sequalitchew Creek below Edmond Marsh to reduce seepage, improve fish habitat, and help restore year-round [surface water] *flows.*

4.1.5. Active management of beaver activities to maintain the hydraulic gradients that provide [surface water] *flows through Hamer, Bell, and Edmond marshes. For purposes of this section, "active management of beaver activities" means management commencing with the least intrusive method and progressing to more intrusive methods only as necessary to maintain hydraulic gradients and flows, with lethal removal utilized only as a last resort.*

The above inserted bracketed words make it clear that CalPortland incorrectly assumed that Sequalitchew Creek is a surface water driven system. It is not. It is a groundwater discharge driven system that over the years has been adversely impacted by ever declining Vahon aquifer groundwater levels and ever increasing quantities of stormwater runoff being discharged into this once pristine salmon bearing groundwater fed upper Sequalitchew Creek and associated Edmond Marsh wetland complex.

Unfortunately, these CalPortland consultant prescribed elements were never vetted by others to determine whether they were grounded in a proper characterization of the 2011 condition of the Sequalitchew Creek watershed. In stream flows are dependent upon shallow aquifer groundwater levels. Ground water withdrawals (dewatering) are antithetical to surface water flow in the Edmond Marsh/Sequalitchew Creek ecosystem.

9
DS
Cal

What CalPortland's consultants monitored during the period from 2003 up until till 2011 and upon which the Sequalitchew Creek Restoration Plan was built no longer represents the condition of the Sequalitchew Creek watershed today. Therefore, the Sequalitchew Creek Restoration Plan proposed by CalPortland/Environmental Caucus and the South Puget Sound Salmon Enhancement Group is not relevant to addressing today's degraded condition of Edmond Marsh and what little is left of a naturally flowing and functioning Sequalitchew Creek.

10
DS
Cal

Action Scenario A – Continuation of Existing Conditions; No Action Scenario B – Site Development Under Existing Zoning

At the time that the South Parcel mine area was designated as being within DuPont's mineral overlay zone it was assumed that the Vashon aquifer groundwater level was sufficiently below the land surface to enable dry gravel mining operations in that area. Subsequent hydrological exploration by CalPortland determined that this was simply not the case. The appropriate action upon discovering this fact should have been the removal of the South Parcel as included with DuPont's mineral overlay zone and the land subject to development under provisions of the City of DuPont's zoning regulations. It is not too late to correct this mineral overlay zone designation error. Its dewatering to access Vashon aquifer saturated gravel under dry mining conditions should not be permitted for reasons previously cited and that these No Action scenarios be seriously considered and chosen over the Vashon aquifer dewatering scheme.

11 DS City Cal

A collaboratively developed, CalPortland/City of DuPont Sequalitchew Creek Restoration Action Plan Scenario Option

The CalPortland and Environmental Caucus Sequalitchew Creek Restoration Action Plan that was agreed to under provisions of the 2011 Settlement Agreement **is not adequate mitigation** for all direct and indirect adverse environmental impacts of dewatering and mining under dry conditions the South Parcel.

12 DS City Cal

A restoration plan for the Sequalitchew Creek watershed that is based upon an understanding of the *hydrology* of the area, *native salmonid habitat requirements* and the *conditions* that now adversely impact water quality and salmonid habitat in the Sequalitchew Creek watershed would embody the following essential action elements executed in the sequence proposed.

13 DS City Cal

Phase 1. Remove culvert by City Hall and walkway beneath Center Drive

Restoration action should start with simultaneous removal of the culvert beneath the berm located in the vicinity of City Hall and its replacement with either an open box culvert or a foot bridge and removal of the sidewalk beneath the Center Drive overpass. Both actions should be undertaken and completed before removing existing beaver dams. The culvert and sidewalk are physical obstructions to flow in a surface water drainage ditch (euphemistically referred to as a "dry reach of Sequalitchew Creek") that should be removed as an integral part of the City's obligation to properly design, construct, operate and maintain its surface water management system. DuPont city codes recognize such drainage ditch work as necessary and highly desirable. Furthermore, this work can be undertaken as soon as practical without an HPA permit since no in water work of a salmon bear stream is involved. Such an opportunity will be negated by releasing up gradient beaver dam impound water prior to this work being completed.

14 DS Cal City

Compare this fact-based Phase 1 approach with the fiction based Sequalitchew Creek Watershed Restoration Plan that advocates removal of Edmond Marsh's eastern most beaver dam that prevents water in Edmond Marsh flowing eastward and draining into the diversion canal and placing pond levelers in the balance of Edmond Marsh's beaver dams! Beaver dam ponds are the proximate cause of water flow and water quality problems in Edmond Marsh!! The

Restoration Plan's stated Vision, if it is to be realized, requires that all beaver dams, culverts, sidewalk below Center Drive and the railroad berm obstructions to east to west flow of discharging groundwater and salmon passage be removed.

Phase 2. Remove westernmost beaver dam, then those eastward, except eastern most

Once removal of the culvert and sidewalk impediments to surface water runoff flow is accomplished the western most West Edmond Marsh beaver dam should be removed (not provided with a pond leveled) so that the pond that it contains is lowered to its pre beaver dam impact level. Following its removal the next upstream Edmond Marsh beaver dam should be removed. This sequencing of beaver dam removals should proceed until all beaver dam impediments to east to west flow are removed from East and West Edmond Marsh. The eastern most beaver dam should remain in place unless it is established that surface water flow from Sequalitchew Lake is necessary to augment groundwater discharge flowing into Sequalitchew Creek Marsh/East Edmond Marsh/West Edmond Marsh is inadequate to achieve sufficient flow from groundwater discharge alone.

15 DS Cal City

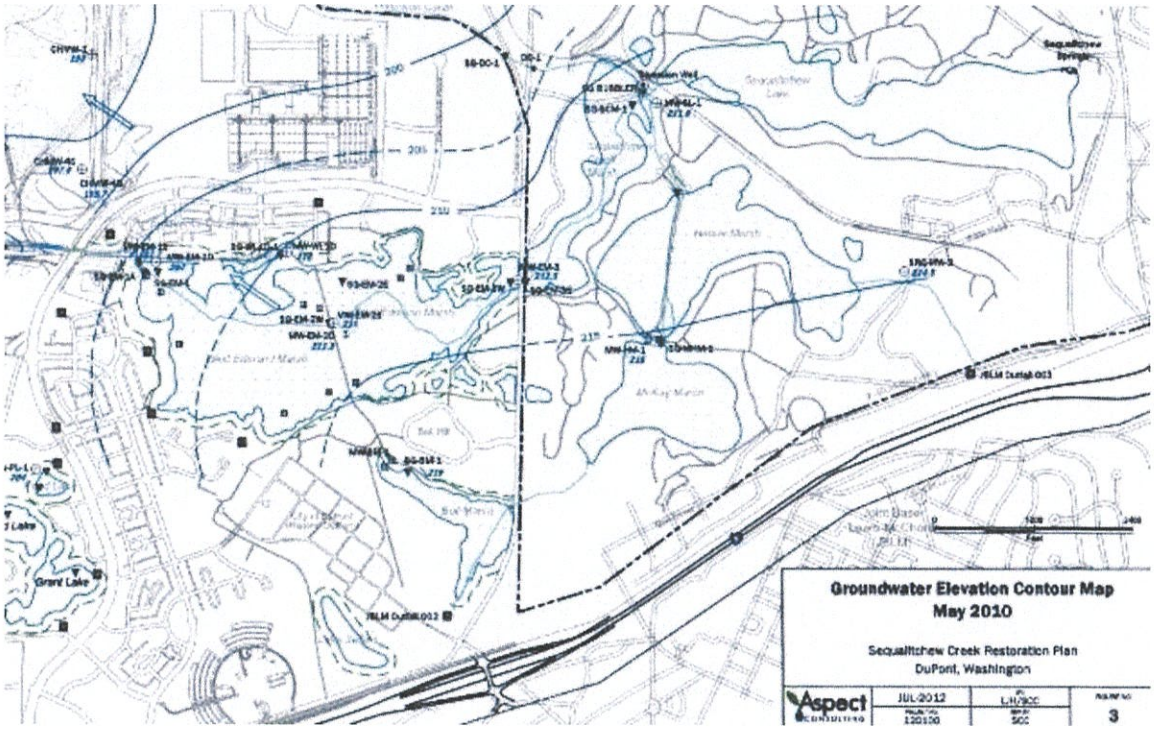
The result of beaver dam removal and clearing existing culverts will be a lower surface water level throughout Edmond Marsh (its historic condition) and restoration of a significant and unimpeded east to west flow of a seasonally fluctuating in quality, quantity and mix of surface and ground water flowing through the system. Beaver dam removal and the clearing of existing culverts will enhance water flow through Edmond Marsh to the extent that accumulated fine grained sediment contained in groundwater fed areas of Edmond Marsh will be flushed out of the Marsh and become the "seal" material to reduce surface water infiltration losses in the "dry reach of Sequalitchew Creek", thus assuring enhanced surface water flow through this "dry" drainage ditch reach of Sequalitchew Creek.

Phase 3. Remove south end of railroad trail, span with bridge

Once water levels are lowered in East and West Edmond Marsh as a result of beaver dam removal and existing culverts are cleaned out, the south end of the railroad berm trail should be removed, and the gap spanned by a pedestrian bridge. This is the one major capital project that will require design, HPA permitting and construction. When this final obstruction to east west flow in Edmond Marsh is completed, historic groundwater fed, gravel bed, meandering Sequalitchew Creek (as described in The 1997 Chambers-Clover Creek Watershed Management Committee Watershed Characterization report) can be created by constructing a groundwater discharge fed upper Sequalitchew Creek channel all along the southeast shoreline of Edmond Marsh to take advantage of the following facts.

16 DS Cal City

The below Aspect illustration clearly indicates that the source of water in Edmond Marsh is groundwater that is discharging from the southeast into Edmond Marsh. You will note that the groundwater level along the southeast shoreline of Edmond Marsh is at an elevation of 215 feet whereas the surface water level in central Edmond Marsh is at approximately 213 feet due to beaver dam impoundment. The water level in Sequalitchew Lake is controlled at approximately 211.5 feet. Surface water flowing from Sequalitchew Lake into Edmond Marsh is not and cannot be the source of water in Edmond Marsh, since water does not run uphill.



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Groundwater is entering Edmond Marsh all along its southeastern shoreline. Beaver dams, culverts and the railroad berm obstructions to east to west water flow through Edmond Marsh has resulted in inundation of former Sequalitchew Creek, its adjacent wetlands and caused extensive flooding of areas of former dry land. These same obstructions to east to west flow have created stagnant pools of water that have high dry season water temperatures, low dissolved oxygen, low pH, high concentrations of dissolved methane gas and in West Edmond Marsh high concentrations of dissolved and particulate iron and a recipient (i.e., detention and infiltration pond) of storm water runoff from Palisades Village.

I have included two papers in this comment submittal package that provide the rationale for CalPortland and the City of DuPont considering my proposed third CalPortland/City of DuPont Sequalitchew Creek Restoration Action Plan Scenario Option.

The first paper titled Sequalitchew Creek Dug Channel Proposal was submitted to the parties to the 2011 Settlement Agreement on 10/1/2012.

17 DS Cal City

The second paper titled Restoration of the Sequalitchew Creek Watershed was submitted to CalPortland, Environmental Caucus members and the South Sound Salmon Enhancement Group on 7/23/2020.

If this CalPortland/City of DuPont Sequalitchew Creek Restoration Action Plan Scenario Option is adopted and implemented native salmonid will once again inhabit the low gradient glacial flood plain upland portion of a restored Sequalitchew Creek watershed and the relative merits of reconciling the first two opposing Scenario options presented in the Pioneer Aggregates South Parcel Project – EIS will thereby become readily apparent to CalPortland and the citizens of the City of DuPont.

Concluding comment

Before any gravel mining activity is permitted in the South Parcel a fact-based CalPortland/City of DuPont Sequalitchew Creek Restoration Action Plan should be executed by CalPortland followed by a hydrological study of the extent to which Vashon aquifer groundwater lowering has been achieved by execution of the Plan. Then a determination of how deep gravel mining operations could be conducted pursuant to the original mining permit's restriction of "10 feet above Vashon aquifer groundwater level".

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Don Russell
July 15, 2024

Attachments:

2012 paper titled: An Examination and Evaluation of Alternative 2.1.6 Infiltrate Stormwater and Groundwater Discharges to Recharge Puget Sound Springs

10/1/2012 paper titled: Sequalitchew Creek Dug Channel Proposal

Illustration of the Dug Channel route shown in red in relationship to referenced Aspect Key Beaver Dams

7/23/2020 paper titled: Restoration of the Sequalitchew Creek Watershed

AN EXAMINATION AND EVALUATION OF ALTERNATIVE 2.1.6

Preface

This paper examines and fatal flaw evaluates Alternative 2.1.6 Infiltrate Stormwater and Groundwater Discharges to Recharge Puget Sound Springs. It does so by reciting passages from the March 25, 2010 Draft Feasibility Study (in italics), providing evaluation commentary (in this print format) and offers a conclusion regarding its fatal flaw status.

Relevant Passages and Commentary

"The purpose of the Feasibility Study is to identify and evaluate alternatives for improving or restoring ecosystem functions in the Sequalitchew Creek watershed."

"... surface water features within the Sequalitchew Creek basin are hydraulically connected and interact with the groundwater system."

"It is these mingled Vashon Aquifer and sea level aquifer waters that form the Puget Sound shoreline springs, referred to as the Large and Small Springs north of the mouth of Sequalitchew Creek."

"Groundwater discharges as springs and seeps in the lower Sequalitchew Creek... and provides the majority of creek baseflow which varies between approximately 0.5 cubic feet per second (cfs)(summer) and 1.5 cfs (winter). Dewatering the Vashon aquifer and excavating gravel in the South Expansion Area at or below the elevation of the adjacent Sequalitchew Creek bed will cause diminishment or cessation of base flow in Sequalitchew Creek. This is clearly a violation of the no impact provision of the 1994 Agreement.

"The post-mining groundwater discharge is predicted to average about 7 cfs and range seasonally from 6 to 9 cfs."

"A 1.78-acre kettle wetland is located in a large, closed depression that lies near the center of the existing mine site. The kettle wetland vegetation communities are relatively susceptible to changes in groundwater hydrology, which directly control water levels in the wetland." Alternative 2.1.6 would eliminate this Class 2 wetland. Such an act would be in violation of a provision (25 foot buffer) of CalPortland's current mining permit and the City of DuPont's municipal code DMC 25.105.070.1(f).

"West Edmond Marsh is an approximate 135-acre wetland with a hydraulic regime dominated by surface water inputs to the south and east." Alternative 2.1.6 would impact this Class 1 wetland by lowering the groundwater level 1.5 feet beneath West Edmond Marsh. The City of DuPont's municipal code DMC 25.105.070.1(f) states that alteration of Class 1 wetlands is prohibited.

"A 0.13-acre seep wetland complex of two long, very narrow, and non-contiguous wetlands is located just above the trail along Sequalitchew Creek at about RM 0.75 to 0.85." Alternative 2.1.6 would disconnect this wetland complex from the groundwater source that sustains it. The elimination of this seep wetland complex would be in violation of DMC 25.105.070.1(f). Since the water that flows from this wetland discharges into Sequalitchew Creek such an act would be in violation of the 1994 Agreement.

"The underlying zoning of the mine site is a mix of residential (North Expansion Area) and manufacturing and industrial (South Expansion Area) designations, and the mine is included within a mineral resources overlay. Mining activities are considered a temporary use and are consistent with the underlying zoning. Future land use is an important consideration in any alternative proposed for this study." RCW 78.44.031(11) states that "Although both the need for and practicability of reclamation will control the type and degree of reclamation in any specific surface mine, the basic objective shall be to reestablish on a perpetual basis the vegetative cover, soil stability, and water conditions appropriate to the approved subsequent use of the surface mine and to prevent or mitigate future environmental degradation." 6 to 9 cubic feet per second of discharging groundwater emanating from the east sloping face of the South Expansion Area and flowing out onto exposed impervious Olympia Bed soil and its commingling with stormwater runoff poses an in perpetuity problem that neither industrial tenants or the City of DuPont should have to face. Such a scenario seems in clear violation of the basic objective of mine reclamation as cited in RCW 78.44.031(11). Furthermore, to convey this quantity of groundwater and commingled stormwater runoff to the central mine area and North Expansion Area for treatment and infiltration seems incongruous with the intended residential use of these areas of the spent mine as well.

"Mining is permitted only above the aquifer and a 25-foot separation (10-foot separation for slopes) is required between mining activities and the seasonal high groundwater level. Stormwater is managed onsite through infiltration." [Page 25, lines 19 – 22] This is a current restriction in CalPortland's aggregate mining permit. This restriction makes good environmental sense in that: *"...surface water features within the Sequalitchew Creek basin are hydraulically connected and interact with the groundwater system."* Alternative 2.1.6 would adversely impact the surface water features of Kettle, Seep and Edmond Marsh wetlands and Sequalitchew Creek since they are all hydraulically connected and interact with the groundwater system that CalPortland proposes to dramatically alter by dewatering the Vashon aquifer that sustains these critical and sensitive surface water bodies.

"The goal of the alternatives in this section is to avoid, minimize, and/or mitigate any change to the aquifer levels in the project area. These alternatives would also avoid and minimize any change to the flow of Sequalitchew Creek from current levels." [Page 28, lines 25 – 27] Note the subtle shift in the above language from that stated as the purpose of the Feasibility Study, which states: *"The purpose of the Feasibility Study is to identify and evaluate alternatives for improving or restoring ecosystem functions in the Sequalitchew Creek watershed."* The words *minimize* and *mitigate* are incongruous with

the words *improving* and *restoring* as they related to change to aquifer levels or stream flow in the Sequalitchew Creek watershed. Alternative 2.1.6 further degrades the natural functioning of Kettle, seep and Edmond Marsh wetlands, diminishes flow in Sequalitchew Creek and infiltrates commingled physically and chemically altered groundwater and polluted stormwater runoff into the groundwater that feeds pristine Puget Sound Springs, the latter of which flows onto a shoreline of state wide significance.

Alternative 2.1.5 Infiltrate Dewatering Water within the Mine is no longer being consider because: *"This alternative was determined to be infeasible by consensus of the parties to the memorandum of understanding."* [Page 76, lines 16 -17] How then can infiltrating stormwater runoff from 177 acres of manufacturing and industrial facilities built on impervious Olympia Bed soils and 8.3 cubic feet per second of discharging groundwater within the mine be judged as feasible when Alternative 2.1.5 which was judged by the parties to the memorandum of understanding as *infeasible*?

Alternative 2.1.6 would involve: *"...design, permitting, and construction of 1,000 feet of tightline pipe 1,250 feet of ditch, and a 0.5-acre to 5.4-acre infiltration pond..." "Water quality pre-treatment may be necessary depending on whether the groundwater system also intercepts stormwater."* It is highly unlikely that stormwater and groundwater can be kept separate. 8.3 cubic feet per second of discharging groundwater, containing fine grained particulate matter, would emanate from the exposed east sloped wall of the excavated South Expansion Area. This wall face will be exposed to the same precipitation falling on the impervious Olympia Bed soil at the bottom of the pit. Discharging groundwater, sediment from stormwater exposed and eroding sloped mine walls and runoff from impervious surfaces collected in drainage ditches would make segregation of groundwater discharge and stormwater runoff highly unlikely, if not impossible. Therefore, the entire combined flow of 8.3 cfs of groundwater and stormwater runoff from 177 acres would have to be treated to remove sediment and pollutants before being conveyed to infiltration ponds lest the buildup of fine-grained particulate matter negate the ability of the ponds to infiltrate the water. As far as using this water to recharge Puget Sound Springs is concerned there is no cost-effective treatment available to remove soluble pollutants (e.g., nutrients, heavy metals, organic compounds) from infiltrating surface water runoff. They will pass unaltered to contaminate the diminished groundwater supply of the Puget Sound Springs.

"Planning, design, permitting, and construction of this alternative is anticipated to cost... between $900,000 and $1,200,000 if all mine stormwater, dewatering, and post-mining groundwater discharge is infiltrated. The higher costs also include construction of 5.5 acres of wetland mitigation." Missing from this cost analysis is the costs to the City of DuPont (and its manufacturing, industrial, and residential property owners in the form of surface water management fees) of on-going (in perpetuity) operation, maintenance and eventual replacement of these surface water management facilities. Construction of 5.5 acres of wetland mitigation is incongruous with the stated purpose of the Feasibility Study, i.e., *"... to identify and evaluate alternatives for improving or restoring ecosystem functions in the Sequalitchew Creek watershed."* Constructed wetland seldom provides the natural function and value of the destroyed wetlands that

they are supposed to mitigate. Constructed wetlands are seldom self-sustaining and require on-going maintenance (in this case by the City of DuPont) if they are to provide essential wetland function and value. The assumption that 5.5 acres of constructed wetlands in the midst of a manufacturing and industrial complex, or for that matter in the midst of a residential area, will adequately mitigate the elimination of Kettle and Seep wetlands, further degradation of 135 acre Edmond Marsh and a reduction in the base flow of lower Sequalitchew Creek borders on the ludicrous.

"Some ongoing monitoring and maintenance would be required to ensure continued function of the conveyance and infiltration [and the 5.5-acre constructed wetland] *system. Maintenance would include periodic inspection of the tightline and weir, removal of any accumulated debris, and removal of accumulated sediment from the infiltration pond* [and a 5.5 acre constructed wetland since it would not be self-sustaining]. What funding source is proposed to cover the costs to the City of DuPont for ongoing operation, maintenance and replacement of these facilities? CalPortland will be long gone from the scene.

"Groundwater would be segregated from stormwater and would be infiltrated back into the ground. No detectable change in overall water quality is anticipated." It is naive to believe that no detectable change in overall water quality will occur as a result of implementing what is proposed in 2.1.6. As mentioned above it is highly unlikely, if not impossible, to segregate 8.3 cfs of groundwater flowing out of the east wall of the mine onto the floor of the mine from precipitation falling on this same wall and on 177 acres of impervious Olympia Bed soil. The infiltration of this combined water through a 5 (as CalPortland has suggested) or 25 feet (as the current mining permit dictates) of underlying pervious course grained gravel (assuming that this water is conveyed away from the area underlain by Olympia Bed soil) is going to impact the quality and quantity of groundwater discharging into Puget Sound via the Puget Sound Springs.

"If all the mine stormwater, and temporary and post-mining groundwater discharges are infiltrated, this alternative would have similar effects as construction of North Sequalitchew Creek would have... on the flow regime in the upper reach of the Sequalitchew Creek Ravine, marshes, and aquifer levels. The adverse *effects* referred to above were grounds for the Environmental Coalition to conclude that the North Sequalitchew Creek alternative was fatally flawed. I believe that the Environmental Coalition should, for the same reasons, conclude that Alternative 2.1.6 is fatally flawed.

In regard to sustainability: *"This* [2.1.6] *alternative would require a modest level of ongoing maintenance to keep the passive dewatering system functioning smoothly. The key to sustainability is providing adequate water quality treatment to avoid impacting the long-term function of the infiltration pond. The type of water quality pre-treatment necessary would depend on whether the collection system also intercepts stormwater."* I would disagree with the word *modest.* As mentioned previously a surface water management system that complies with NPDES requirements for the discharge of surface water runoff (discharging groundwater now on the surface being a component thereof) by infiltration into an underlying aquifer and thence to Puget Sound and the operation,

maintenance and requirement for the periodic replace of the requisite facilities to handle the quantity of water described herein will overwhelm the very limited financial capacity and staff of the City of DuPont.

Is Alternative 2.1.6 Fatally Flawed?

I believe so.

Alternative 2.1.6 has an in perpetuity adverse environmental impact on the groundwater hydrology of the Sequalitchew Creek watershed and its groundwater dependent springs (including Puget Sound Springs), wetlands and Sequalitchew Creek and an in perpetuity adverse on-going financial impact on the City of DuPont and its citizens.

Unfortunately, the Memorandum of Understanding/Feasibility Study process proposed and managed by CalPortland has focused on mitigating the adverse environmental impacts that dewater the Vashon aquifer will have on the function and value of an already degraded Edmond Marsh and Sequalitchew Creek. Its motivation is to increase its take of gravel from the South Expansion Area where the gravel is now saturated by the Vashon aquifer. CalPortland has offered fish population enhancement via a proposed North Sequalitchew Creek to gain support for this alternative by the Nisqually Tribe and the Washington Department of Fish and Wildlife. If fish population enhancement is the goal of the Nisqually Tribe and the Washington Department of Fish and Wildlife then I submit that they need to support alternatives that enhanced discharge of Vashon aquifer groundwater discharge into and through Edmond Marsh and down Sequalitchew Creek Canyon and oppose Alternative 2.1.6 which will infiltrate a ground/storm water blend of polluted water that will degrade the quality and quantity the water of Puget Sound Springs which discharge onto critical and sensitive near shore habitat that is vital to salmon recovery.

The interests of the citizens of the City of DuPont have been poorly represented during the entire MOU/FS process. Citizens have been relegated the role of spectators with their opportunity to participate limited to 15 minutes at the conclusion of FS meetings. Yet it is the citizens of DuPont whose property values, quality of life and surface water management fees are going to be most impacted by the decisions that are made by CalPortland, Environmental Coalition and governmental agency representatives. Unfortunately the City Manager, City Attorney and members of City staff have not acted in the best interests of the citizens of DuPont otherwise they would have applied and enforced the City's critical and sensitive area ordinances at the time that CalPortland applied for a Conditional Use Permit that allowed dewatering of the Vashon aquifer.

In the final analysis all the Alternatives that have been proposed and considered by the participants in the MOU/FS process that allow dewatering of the Vashon aquifer are fatally flawed if the purpose of the process is: *... to identify and evaluate alternatives for improving or restoring ecosystem functions in the Sequalitchew Creek watershed."*

Don Russell

SEQUALITCHEW CREEK DUG CHANNEL PROPOSAL

Preface

I have proposed that a Sequalitchew Creek channel be dug (excavated) along the toe of the highlands located along the southern shoreline of Edmond Marsh to (1) capture the groundwater discharge that emanates at this location, (2) provide a cold water refugia for coho salmon during the dry season, (3) provide an accessible and easily maintained open water path for water flowing into and through Edmond Marsh, and (4) restore a flowing Sequalitchew Creek from DuPont-Steilacoom Road to the head of and down Sequalitchew Creek Canyon. There are numerous past and proposed examples of using dug channels to accomplish a variety of functions (e.g., farming, flood control, fish passage and habitat) in Edmond Marsh and throughout the Sequalitchew Creek watershed. This paper presents an argument for excavating a fish friendly channel in the location previously described.

A History of Dug Channels

The first channels dug during the mid to late 1800s in the Edmond Marsh-Sequalitchew Creek watershed had as their purpose the lowering of the surface water levels in Edmond, Hamer, Mckay and Bell Marshes to expose and access the fertile soils of the Marsh for farming.

A major channel (the diversion canal) was dug in 1954 to protect Fort Lewis' Sequalitchew Springs domestic drinking water source from the adverse impacts of area wide groundwater flooding events. In subsequent years this channel and related water level control weirs has functioned as a surface and groundwater drainage system as the water levels in Sequalitchew Creek and East Edmond Marshes have increased as a result of beaver dam construction.

During the 1970s the WDFW used Sequalitchew Lake for salmon rearing activities. So that these reared fish could access Puget Sound the WDFW constructed and maintained an unobstructed and open water channel through East and West Edmond Marshes to Sequalitchew Creek.

During the period of Weyerhaeuser's residential development of the DuPont area Sequalitchew Creek was rerouted via a dug channel (over groundwater unsaturated gravel soil) to its present location beneath Center Drive.

In 2009 CalPortland proposed construction of a dug channel (North Sequalitchew Creek) at the toe of the east bank of the South Parcel gravel pit excavation to intercept discharging groundwater and convey this groundwater discharge through a cut in the north wall of the Squalitchew Creek Canyon and into the lower Canyon reach of Sequalitchew Creek.

As the above attests constructing dug channels in the Sequalitchew Creek watershed to accomplish various objectives is certainly nothing new or novel.

The Rationale for a Dug Channel Paralleling the Southern Highlands

The stated objective of the Restoration Plan planning process is to develop a Plan that upon its implementation will result in the creation of *"..a functional creek ecosystem and provide* [suitable habitat] *for... migratory fish in the Sequalitchew Creek system... "*

In order to achieve this objective there needs to be restoration of both perennial surface and ground water flow into and through Edmond Marsh and down the Canyon reach of Sequalitchew Creek.

The source of surface water has been identified as coming from Sequalitchew Lake (a groundwater fed lake). It is important to restore this unimpeded component of flow into and through Sequalitchew Creek Marsh and Edmond Marsh and down the Canyon reach of Sequalitchew Creek. It is also important to recognize that this surface water flow will vary seasonally and epochally and thus require active management to assure adequate dry season flow on the one hand and prevent excessive wet season (and occasional groundwater flood event) flows into Edmond Marsh and down Sequalitchew Creek on the other hand.

What has not been addressed is how to restore groundwater discharge into Edmond Marsh. To restore this vital component of flow will require interception of groundwater discharge from areas that currently have groundwater table levels that are higher than the surface water level of Edmond Marsh. These areas of higher groundwater table level lie to the south and southeast of Edmond Marsh. A dug channel (aka Sequalitchew Creek) should be excavated close and parallel (resulting in sinuosity) to the toe of the highlands (and higher groundwater table areas) that border the southern shoreline of Edmond Marsh.

There is already ample precedence for dug channels in the Sequalitchew Creek watershed as the history of human development in this watershed attests. Why not create a dug channel that accomplishes the objective of the Restoration Plan?

Advantages of a southern shoreline dug channel

These advantages include:

An active, unobstructed, accessible and relatively easy to maintain surface and ground water flow channel from Sequalitchew Lake through Edmond Marsh and down the Canyon reach of Sequalitchew Creek.

A lowering of the surface water level of Edmond Marsh will increase the horizontal gradient of the system and hydraulic head vis-a-vis Sequalitchew Lake and Bell, McKay

and Hamer Marshes thus enhancing both surface and ground water flow into and through Edmond Marsh.

Provide a cold water, ample dissolved oxygen refugia for coho salmon during the dry season and during low (or no) and warm surface water flow from Sequalitchew Lake.

The relatively narrow width of a dug channel located at the south end of the railroad berm trail where the sewer line is at its highest elevation above the surface of Edmond Marsh would enable lower cost construction of an elevated bridge, suspended sewer line and viewing platform over Edmond Marsh and the Sequalitchew Creek dug channel.

Lowering the surface water elevation of Edmond Marsh will remove the water in the Marsh that now overlies the beaver dam inundated northern boundary of Edmond Marsh. Since this area is characterized by pervious gravel soils and is disconnected from sustaining groundwater it constitutes a major source of water loss from the Marsh as a result of infiltration and evapotranspiration.

Should CalPortland be permitted to mine the South Parcel the adverse environmental impact of dewatering in this area would be reduced as Edmond Marsh and Sequalitchew Creek are moved further away from the dewatering impacted area. Also the diminishment of groundwater discharge into the Canyon reach of Squalitchew Creek as a result of dewatering the South Parcel would be mitigated by a significantly enhanced flow of water through Edmond Marsh and down the Canyon reach of Sequalitchew Creek.

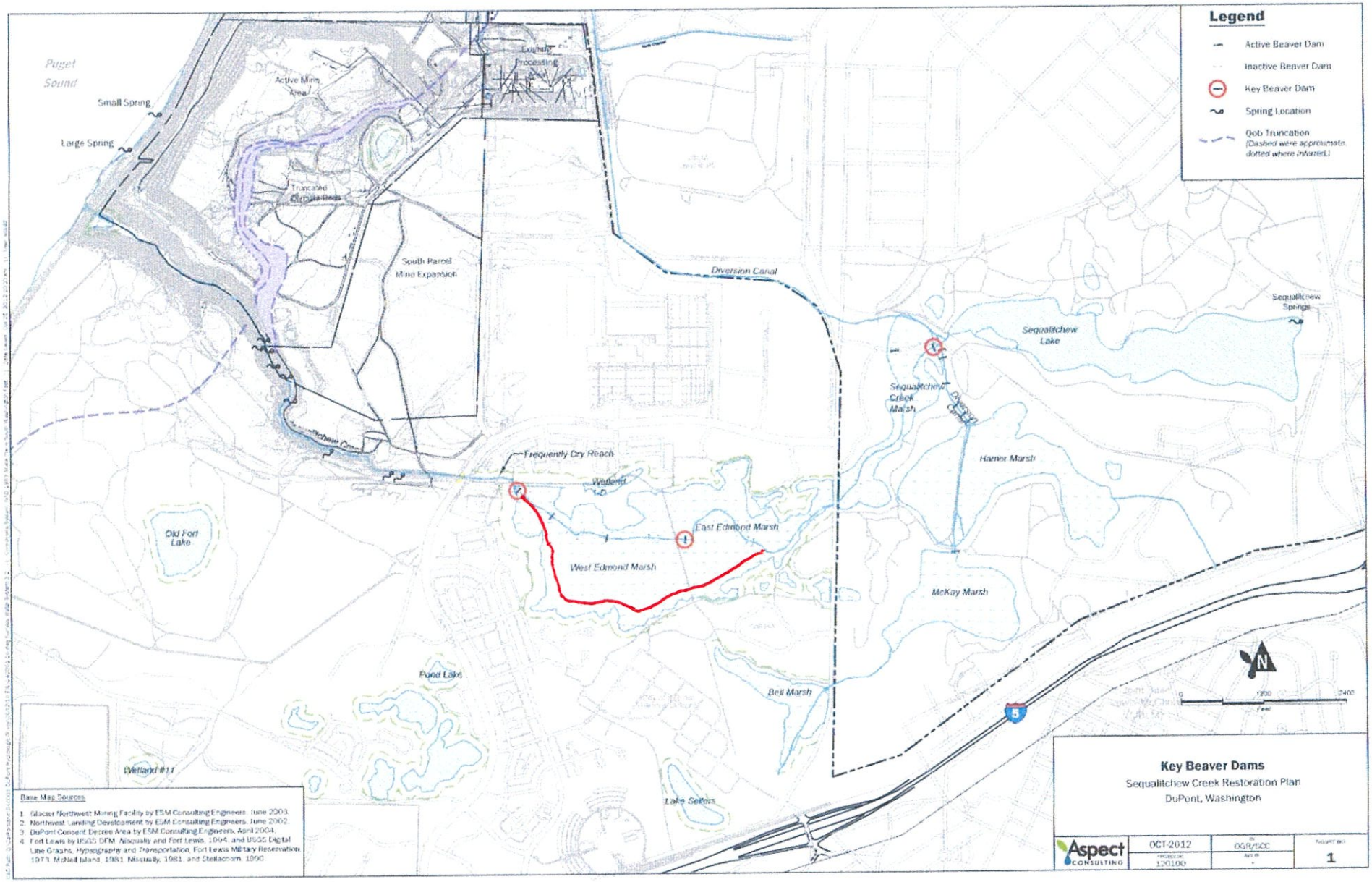
A dug channel as proposed would enhance the ecological function of Edmond Marsh, assure restoration of suitable migratory fish habitat, facilitate the requisite human maintenance of flow through conditions (i.e., beaver management), provide the citizens of DuPont and visitors visual access to Edmond Marsh and Squalitchew Creek and likely be consider adequate mitigation (provide that CalPortland funded the construction of the dug channel and related amenities) for the adverse environmental impact of CalPortland being permitting to mine the South Parcel.

Regulatory and financial impediments to constructing such a channel

Currently DuPont sensitive area ordinances prohibit any alteration of Edmond Marsh. The City Council has the authority to change DuPont's sensitive area ordinances and should do so to allow the creation of a flow through dug channel (aka Sequalitchew Creek flowing within the boundary of Edmond Marsh).

Other environmental regulatory agencies generally allow alteration of sensitive areas provided there is either no net loss or enhancement of ecological function. A dug channel as proposed would constitute a significant net gain in the ecological function of Edmond Marsh and Squalitchew Creek.

Don Russell


Legend
Active Beaver Dam
Inactive Beaver Dam
Key Beaver Dam
Spring Location
Qob Truncation
(Dashed were approximate, dotted where inferred.)
Puget Sound
Small Spring
Large Spring
Active Mine Area
Truncated Cornuta Beds
South Parcel Mine Expansion
Diversion Canal
Sequalitchew Lake
Sequalitchew Springs
Sequalitchew Creek Marsh
Harner Marsh
Frequently Dry Reach
Wetland 1-D
East Edmond Marsh
West Edmond Marsh
Old Fort Lake
McKay Marsh
Pond Lake
Bell Marsh
Wetland #11
Lake Sellers
5
N
0
1200
2400
Feet
Base Map Sources
1. Glacier Northwest Mining Facility by ESM Consulting Engineers, June 2003.
2. Northwest Landing Development by ESM Consulting Engineers, June 2002.
3. DuPont Consent Decree Area by ESM Consulting Engineers, April 2004.
4. Fort Lewis by USGS DFM, Nisqually and Fort Lewis, 1994, and USGS Digital Line Graphs, Hypsography and Transportation, Fort Lewis Military Reservation, 1973, McNeil Island, 1981, Nisqually, 1981, and Steilacoom, 1990.
Key Beaver Dams
Sequalitchew Creek Restoration Plan
DuPont, Washington
Aspect CONSULTING
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RESTORATION OF THE SEQUALITCHEW CREEK WATERSHED

Preface

This paper presents an alternative approach *"... for improving ecosystem functions in the Sequalitchew Creek's watershed."* to that now being offered by CalPortland as part of the Memorandum of Understanding process. The presumption here is that *"... improving ecosystem functions in the Sequalitchew Creek watershed* requires restoration of this watershed, not mitigation for the permanent environmental damage that will occur as a result of dewatering the Vashon aquifer.

The Meaning of Restoration

The Washington State Department of Ecology recognizes that "restoration" does not mean restoration of degraded groundwater, seeps, wetlands, streams, lakes and Puget Sound to pre European settlement conditions. This is a common misconception. Rather it means restoring, in so much as feasible, the natural ecological function and value of impaired groundwater, seeps, wetlands, streams, lakes and Puget Sound. It is instructive to consider the natural ecological functioning of the ecological units that comprise the American Lake-Sequalitchew Creek watershed when considering restoration options. Once this understanding is achieved the various alternatives that have been proposed during the MOU process can be evaluated on their ecological merits.

The Natural Condition of the American Lake/Sequalitchew Creek Watershed

Sequalitchew Creek is located within the Chambers-Clover Washington State Water Resources Area 12 (WRIA 12). WRIA 12 is comprised of a number of sub-basin watersheds. The best known of these is the Chambers-Clover Creek Basin which is comprised of several sub-basins. Not as well known is the American Lake sub-basin. Just as Chambers Creek is the surface water drainage stream to Puget Sound for Clover Creek, Sequalitchew Creek is the surface water drainage stream to Puget Sound for the American Lake sub-basin. [See the Chambers-Clover Technical Assessment Final Report, April 10, 2003, Figure 1.1 Base Map]

Contrary to Glacier Northwest's assertion that the headwaters of Sequalitchew Creek is Edmonds Marsh, the headwaters of Sequalitchew Creek is Murray Creek (formerly called Upper Sequalitchew Creek) which flows into American Lake, the largest natural lake in Pierce County. American Lake has a surface water level significantly higher (by 20 feet) than that of Sequalitchew Lake. Because of this difference in lake levels, their close proximity and intervening porous gravel soil there is considerable subsurface (groundwater) flow from American Lake to Sequalitchew Springs and Sequalitchew Lake. Occasionally, as a result of high groundwater levels, there is surface water flow from American Lake to Sequalitchew Lake. Surface water outflow from Sequalitchew Lake, supplemented by localized groundwater discharge from the Vashon aquifer, provided the water that sustained an extensive complex of Class I wetlands and Sequalitchew Creek.

The source of water that sustained and nourished the American Lake-Sequalitchew Creek watershed (ecosystem) was (and is) precipitation in the form of rainfall. The shallow gradient of this watershed and its permeable soils allowed precipitation to infiltrate into the ground where it fell rather than run off into its streams, wetlands and lakes. Several natural water conditioning processes were important to the proper functioning of this watershed. Precipitation falling on vegetated soil was cleansed of airborne pollutants (oxides of nitrogen, phosphorus and sulfur) as a result of their being assimilated by plants and adsorbed to fine grained topsoil particles. These airborne pollutants were primarily from volcanic eruptions, naturally occurring forest fires and the burning of grasslands by native Americans. Infiltrating rainwater percolating through topsoil beneath the vegetative cover picked up respired carbon dioxide from soil bacteria. This functioned to impart a degree of acidity to infiltrating rain water. Mildly acidic water percolating through underlying soil dissolved calcium from gravel deposits to form water soluble calcium bicarbonate. Calcium ions in water moderate fish gill function and must be present in appropriate concentration to assure proper functioning of gill tissue. Bicarbonate ions functioned as important buffers. Buffers prevent water from becoming either too acidic or too alkaline to support salmon. Chemically conditioned infiltrating water became the substance that comprised the Vashon aquifer. The gravel deposits of the Vashon aquifer functioned as a sponge that both stored groundwater and slowly released (discharged) it to springs, streams, wetlands and lakes. Vashon aquifer groundwater discharge was the natural and historic source of water for the springs, streams, wetlands and lakes in the American Lake-Sequalitchew Creek watershed.

Groundwater is insulated from the effects of fluctuations in surface temperature. Its temperature stabilizes and remains at approximately 50 degrees F throughout the entire season. Groundwater, under the influence of gravity, flows slowly through gravel soils from areas of higher elevation to areas of lower elevation. It ultimately surfaces (discharges) with its physical (low temperature) and chemical (calcium and bicarbonate) properties intact to become the water that flows from a spring or becomes the water in a salmon friendly stream, wetland, or lake, or discharges subsurface into Puget Sound. Salmon evolved, and thrived, in clean, cool, well oxygenated, calcium rich and buffered fresh water habitats. Eventually salmon commenced migrating to saltwater where food was more plentiful than in their freshwater habitat. Making a transition from a fresh water environment to salt water environment and the reverse requires major physiological changes in the functioning of fish gills. This transition takes time and is facilitated by salmon spending time in the fresh-salt (brackish) water estuaries which were located at the mouth of all salmon bearing streams.

There are natural seasonal and long term fluctuations in the amount of precipitation falling on the American Lake/Sequalitchew Creek watershed. These fluctuations affect groundwater levels. During the wet season, or prolonged periods of precipitation, groundwater levels are high (as a result of recharge) as is groundwater discharge to springs, stream, wetlands and lakes. During the dry season, or periods of drought, groundwater levels are low which diminishes the volume of groundwater discharged to springs, streams, wetlands and lakes. Under extremely dry conditions (or as a result of

humans limiting the amount of infiltration of precipitation to groundwater or withdrawal of groundwater for consumption) streams, wetlands and lakes can loose their connectivity with groundwater. When this occurs water from surface water bodies will infiltration (leak) into adjacent and underlying unsaturated soils with the result that spring and stream flows diminish or disappear all together and wetland and lake levels drop, or result in their drying up completely, with adverse effects on native species of vegetation, fish, and wildlife. It is this condition, whether naturally occurring or brought about by human impact, that favors the displacement of native vegetation and establishment of invasive species.

Under natural (historic) conditions wet season increase in groundwater discharge to streams, wetlands and lakes had several desirable effects. It increased stream flows sufficiently to provide salmon access to suitable spawning habitat. Increased groundwater discharge into streams back flushed (dislodged) the fine grained sediments that had accumulated in the stream bed during dry season low flow periods. Re-suspended sediment particles were flushed out of the system by stream flows enhanced by contributions from groundwater flooded upstream wetlands and lakes. Stream beds cleansed of silt by this natural process provided salmon optimum stream bed conditions for spawning. During the dry season cool, dissolved oxygen and calcium enriched, and buffered groundwater discharging into streams, wetlands and lakes provided optimal environmental conditions for salmon egg survival and the rearing of young salmon.

Prior to 1850 the natural conditions and watershed functions described above prevailed throughout the American Lake/Sequalitchew Creek watershed. Sequalitchew Creek was a perennial stream with a discharge of from 10 to 20 cfs that flowed into a fresh-salt water estuary. As a result the American Lake/Sequalitchew Creek watershed provided habitat for coho, sockeye and chum salmon, sea run cutthroat trout and steelhead (rainbow trout) and supported a viable Indian fishery. All this began to changed when white European settlers arrived in this area and began to "develop" the American Lake/Sequalitchew Creek watershed

Degradation of the American Lake/Sequalitchew Creek Watershed

In the middle 1800s and early 1900s the American Lake-Sequalitchew Creek watershed was adversely affected by timber harvesting in the Sequalitchew Canyon. This led to instability of its canyon walls and increased silting of the lower reach of Sequalitchew Creek. This condition was exacerbated when the fresh-salt water estuary at the mouth of Sequalitchew Creek was transected by a railroad bed. A five by five foot culvert was constructed to allow water exchange between Sequalitchew Creek and Puget Sound. The constriction in water flow caused by the undersized culvert allowed silt to accumulate and eventually fill in the upper portion of the fresh-salt water estuary thus destroying its function as a salt-to-fresh/fresh-to-salt water transition zone for salmon.

In 1916 when Fort Lewis was being developed American Lake's level was 239 feet above msl. [TNT article 10/8/51] American Lake is a major source of recharge to the Vashon aquifer during the dry season. It also provides a prolific subsurface flow to down

gradient Sequalitchew Springs. As part of the development of Fort Lewis the Army Corps of Engineers tapped Sequalitchew Springs as the domestic water source for personnel serving on the Army base. After domestic use most of the water withdrawn from Sequalitchew Springs was returned (as recharge) to the Vashon aquifer by way of infiltration from septic systems. Thus there was little adverse effect on groundwater levels and impact on the watershed as a result of the Army's consumptive use of Sequalitchew Springs water. Later, however, water withdrawn from Sequalitchew Springs would, after its use, enter sewer lines and be conveyed to the Army's Solo Point sewage treatment plant for discharge into Puget Sound. Thus Vashon aquifer recharge in the Sequalitchew Creek basin was diminished as was groundwater table level.

American Lake's shoreline, not owned by Fort Lewis, Camp Murray and the Veterans Hospital, was extensively developed during the period from 1920 through the 1940's. This development took place during a period of below average precipitation in the American Lake watershed when the lake level had dropped and remained below 235 feet above msl. Whereas old time residents who were familiar with the natural seasonal and decadal rise and fall of American Lake level built their homes upland from the lake, newcomers to American Lake built their homes close to the lake shore.

In 1951, as a result of several years of increasing precipitation, American Lake level rose to 237 feet above msl. The result was extensive groundwater flooding of shoreline homes and septic systems around the lake that had been built during the period of low water. Lakeshore residents complained and asked the U.S. Army Corps of Engineers to construct a groundwater flood control structure at their end of the lake that would prevent groundwater flooding damage to lake side homes and septic systems. The Army's position at that time was that it had no responsibility to mitigate the impact of high lake water level. Their argument was that the lake level in 1951was two feet below the 239 foot above msl level that existed when the Army first began developing Fort Lewis in 1916 and that the lake level rise to 237 feet above msl was a natural condition.

Extensive groundwater flooding in the American Lake-Sequalitchew Creek watershed occurred again in 1956. [TNT article 1/10/56] This time the groundwater flooding adversely affected properties owned by the Army, notably their Sequalitchew Springs domestic water works and some of the Army facilities that had been constructed near wetlands during the 1920 to 1950 period of low groundwater levels. 1956's groundwater flooding of wetlands located near these facilities was exacerbated by the Army's practice of conveying surface water runoff from impervious surfaces to these wetlands. The impact of draining surface water runoff to wetlands and superimposing it on ground water flooded wetlands was a sobering new experience for the people at Fort Lewis.

In 1951 the U.S Army began construction of a means to control Sequalitchew Lake's level so that it could no longer rise to levels that would endanger its Sequalitchew Springs domestic water supply. Provisions were also made to control the water level in wetlands located in close proximity of Army facilities constructed during the period of low groundwater levels. The flood control structure that was built to deal with these two issues was comprised of a weir complex at the south end of Sequalitchew Lake and a

flood water diversion canal. In response to 1956's ground and surface water flooding event the U.S. Army constructed a groundwater flood control weir at the south end of American Lake. It was designed to prevent American Lake level from exceeding 233 feet above msl.

The purpose of these two structures was to convey flood water affecting Sequalitchew Lake and related marshes to Puget Sound, yet still provide headwater flow for Sequalitchew Creek. Under natural conditions the surface flood water routed to Puget Sound via the diversion canal would have infiltrated into permeable soils to recharge the Vashon aquifer and thus sustain the groundwater level (water table) necessary to maintain the proper functioning of Edmond Marsh and Sequalitchew Creek. Unfortunately the diversion canal as now operated has functioned to "dewater" (by lowering the water table) the upper reach of Sequalitchew Creek, reduced natural east to west flow throughout Edmond Marsh, and during periods of low groundwater table level or beaver dam building activity causes the water in East Edmond Marsh to flow backward toward and into the diversion canal.

Lowering American Lake's water level from 239 to 233 feet above msl, withdrawing groundwater from Sequalitchew Springs to meet the U. S. Army's need for a domestic water supply, diverted Sequalitchew Springs water, after use, to the Solo Point sewage treatment plant for discharge to Puget Sound, increasing impervious surfaces thus reducing groundwater recharge, diverting most of Sequalitchew Lake's and related wetlands' groundwater contribution and surface water runoff down the diversion canal to Puget Sound all conspired to lower mean groundwater levels throughout the American Lake/Sequalitchew Creek watershed by approximately six feet over a span of 100 years. The cumulative effect of these actions reduced historic Sequalitchew Creek perennial flow to Puget Sound from 10 to 20 cfs to 1 to 2 cfs.

[The recent (2004 et al) groundwater studies done and the application of the groundwater model used to determine the effects of dewatering the Vashon aquifer in the South Expansion Area are based upon a groundwater table that has been lowered and stream flows altered by human activity over the past one hundred years. Reliance on this recently gathered data and model results and the heterogeneous nature of the Vashon Drift are of questionable value in assessing the likely impact of dewatering the Vashon aquifer, or for that matter, the effectiveness of any proposed mitigation]

The practice of using natural and historic wetlands as surface water runoff treatment, detention and infiltration ponds has contributed significantly to the degradation of the American Lake-Sequalitchew Creek watershed. When surface water runoff is introduced into groundwater fed streams, wetlands and lakes it changes the flow regime and physical and chemical properties of their water and alters their biological response in ways that degrade their natural functioning and suitability as fish and wildlife habitat. What occurs is a dramatic increase in the range of water levels fluctuations (e.g., streams and wetlands experience alternating periods of flooding and drying), anoxic and toxic bottom sediments build up as a result of accumulations of particulate matter conveyed by surface water runoff, water stagnates leading to dry season high water temperatures and low

dissolved oxygen, fish and amphibian kills occur, native plants, fish and wildlife are displaced by invasive species, toxic algae blooms occur in ponds and lakes and estuaries are lost due to sediment build up and pollution. These water quality problems are now prevalent throughout much of the Chambers-Clover Creek watershed and are of particular concern when considering the likely fate of the American Lake-Sequalitchew Creek ecosystem should Glacier Northwest be permitted to dewater the Vashon aquifer.

Restoration of Historic Sequalitchew Creek

One of the six announced goals of the Puget Sound Partnership is: *"An ecosystem that is supported by ground water levels as well as river and stream flow levels sufficient to sustain people, fish, wildlife, and the natural functions of the environment."*

In spite of the extent and magnitude of degradation that has occurred in the American Lake-Sequalitchew watershed during the past 150 years much of this degradation can be mitigated, i.e., its ecosystem can largely be restored. American Lake level can be raised from 233 feet to 235 feet above msl by simply raising the height of the south end weir by two feet. The diversionary canal at the south west end of Sequalitchew should be used only to mitigate the occasional adverse impact of area wide surface and groundwater flooding. Discharge from Sequalitchew Lake and related wetlands should be allowed to either flow down Sequalitchew Creek or infiltrate to recharge groundwater rather than be lost to the watershed by its conveyance via the diversion canal to Puget Sound. Sequalitchew Spring domestic water supply can be returned to groundwater after use and treatment by allowing it to infiltrating and recharge the Vashon groundwater aquifer up gradient of I-5 rather than piping it to the Solo Point sewage treatment facility and subsequently discharging it into Puget Sound. This mitigation would provide the additional benefit of stopping the discharge of millions of gallons per year of nutrient rich effluent into already degraded South Puget Sound. The practice of using natural wetlands as surface water runoff detention, treatment, and infiltration ponds should be discontinued. These functions should be separated with detention and treatment being carried out in constructed and maintained detention and treatment ponds that function to remove sediments, nutrients and pollutants from surface water runoff. The cleansed surface water runoff could then be released to existing natural wetlands to maintain their natural hydrologic functioning. The former, but now sediment filled, brackish marsh at the mouth of Sequalitchew Creek could be restored as a salt-to-fresh and fresh-to-salt water transition zone for salmon by the removing the accumulated sediments that now render it ineffective for this purpose.

By restoring and maintaining near historic groundwater levels increases in steam flows and wetland and lake levels would follow. By protecting, maintaining and restoring native vegetation and top soil their water cleansing and conditioning functions would be restored. By preventing aquifer dewatering and gravel removal from sensitive areas their storage capacity and slow time release of cool clear, clean water into streams, wetlands and lakes would be sustained. If these things were done PSP's goal to *"... sustain people, fish, wildlife, and the natural functions of the environment."* would be realized in the American Lake-Sequalitchew Creek watershed.

The Benefits of Restoring the Historic Sequalitchew Creek Corridor

Restoration of the historic Sequalitchew Lake to Puget Sound salmon and wildlife corridor would provide the following benefits.

- Salmon access to their historic and natural spawning grounds and over-the-dry season salmon young (smolts) rearing habitats (i.e., groundwater fed marshes).

- In addition to restoration of chum and coho salmon runs there exists the possibility of restoration of sockeye salmon populations once access to groundwater fed Sequalitchew Lake is re-established.

- A restored and functioning salmon bearing stream running through the heart of the City of DuPont would enhance the City's attractiveness for residents and a major draw for tourists.

- The natural hydrology of the American Lake sub-watershed would be restored which would assure healthy and natural functioning of the many springs, streams, wetlands and lakes that comprise this watershed.

- Groundwater quantity and quality would improve as a result of restoration of the natural functioning of the extensive wetlands and the ponds and lakes than are features of this sub-watershed. Wetlands function to remove pollutants from surface water prior to its infiltrating to recharge underlying aquifers. They provide over-the-dry season refuge for young salmon. And they store and release surface water to recharge the aquifers (as do the ponds and lakes) upon which domestic water supplies depend during the dry season.

- There is far greater certainty that salmon would return in sustainable numbers, and much sooner, to a restored historic Sequalitchew Creek than they would to a degraded lower Sequalitchew Creek and brackish marsh and a constructed, and highly questionable, North Fork Sequalitchew Creek that can only be accessed by salmon passing through a 500 foot long pipe.

None of these benefits can be realized if Glacier Northwest is allowed to dewater the Vashon aquifer in order to increase its take from their DuPont gravel mine. There is simply no effective mitigation for the extensive removal of natural vegetation, top soil, and water bearing gravel soil and loss of hundreds of acres of upland Class 1 wetlands that Glacier Northwest's mine expansion and dewatering of the Vashon aquifer will cause.

An Unintended (?) Consequence

Should CalPortland be permitted to remove gravel down to the Olympia Beds the effect will be to eliminate 177 acres of previous forested land and replace it with a flat,

featureless and impervious surface that will accumulate standing (flood) water and sheet flow runoff in an area designated for industrial development. Located adjacent to this industrial area will be, under CalPortland's preferred alternative, a constructed surface water mine drainage ditch (North Sequalitchew Creek). There will be a strong temptation to dispose of surface water runoff by routing it to and down this constructed mine drainage ditch. It difficult to image that a mine drainage ditch located at the back of an industrial park will be perceived as *"... improving ecosystem functions in the Sequalitchew Creek's watershed."* or improving the quality of life and aesthetic pleasure of the citizens of DuPont.

Conclusion

The natural condition of the American Lake-Sequalitchew Creek watershed is best describe as its being a precipitation, infiltration, water conditioning, groundwater storage and discharge to surface water bodies hydrologic system. Surface water bodies reflected discharging groundwater physical and chemical attributes. Water in streams and lakes was cold, clear, devoid of excessive nutrients, toxic materials and sediments. Fluctuations in seasonal stream flows and wetland and lake levels were dampened (muted) as a result of the storage capacity and delayed response of groundwater discharge to variations in precipitation. Native plants, salmon and trout, amphibians, birds and wildlife evolved, were attuned to, thrived and their populations sustain in this environment.

In the past 150 years human activities have altered this natural condition. Groundwater recharge has been diminished as a result of impervious surfaces and the practice of draining surface, waste stream and flood water to Puget Sound. Groundwater has been polluted as a result of infiltrating untreated waste water (septic effluent) and runoff water into gravel soils. Groundwater withdrawals have increased to provide water for domestic and industrial consumption. As a result the natural functioning of the American Lake-Sequalitchew Creek has been degraded, but restorable. Dewatering the Vashon aquifer in the South Expansion Area will further and permanently degrade this watershed. Dewatering the Vashon aquifer should not be permitted.

Steven Schenk

1473 Kittson Street, Dupont

253-307-7208

14 Jul 24

RECEIVED
JUL 15 2024
CITY OF DUPONT

City of DuPont:

I recommend disapproval of this project for three reasons. No viable reclamation of the land mine plan has been put forward to date; the dewatering of Sequalitchew Creek and existing marshland surrounding it; and failure to fully account for current and future noise levels and the effects on residents.

Water:

The draft EIS statement below tells the story. It is criminal to allow for the dewatering of an existing aquifer without 100% knowledge of the impact of surrounding water supplies in the long term. The draft EIS makes assumptions that are unacceptable given climate change, our current park and trail system and water supplies. Water supplies not just for DuPont *but the surrounding area.*

"Vashon Aquifer water levels would decrease due to dewatering activities needed for mining. Ultimately, the gravel deposits of which the Vashon Aquifer is comprised would be removed from the Re-Mine Area and part of the South Parcel. Drawdown of the Vashon Aquifer is anticipated to affect groundwater within a one to two-mile radius from the proposed mine sit"

1 DS

"Marsh System - Water levels in the off-site marshes are expected to be lowered, due to the proposed groundwater lowering"

"Up to 79% of the groundwater flows to Sequalitchew Creek would be lost."

Noise:

The application is too simple and incorrect regarding noise. It waves away potential noise as a hazard to residents especially at Creek Side apartments. The below quotes from draft EIS basically say as the bulldozers move around the mine the noise level will vary. Well,

2 EA

YES. No city official will be monitoring where and when bulldozers at the mine operate. A potentially mitigating action the city can do now is update its noise ordinance.

From page 3-7 Draft EIS. *"The sound levels when a bulldozer is working very near the Expansion Area portion of the site boundaries in Phase 2C are substantially higher than the baseline sound levels at the upper floors of the Creekside Apartments (R1a), resulting in potential increases of 8 to 16 dBA. If these sound levels were experienced throughout the life of the project, they would represent a substantial increase. However, the modeled levels at the Creekside Apartments are dominated by noise from a bulldozer working on the slope of 2C very near the southern site boundary. This worst-case condition would only occur during Phase 2C excavation. Even during Phase 2C excavation, the bulldozer would split its time between excavation in Phase 2C and excavation in the existing mining areas farther north and west, and sound levels much of the time would be substantially lower than the worst-case levels identified. The variation in sound levels over the life of the mine and the variation in day-to-day bulldozer activities would reduce the reported potential noise impacts at the Creekside Apartments due to increases over baseline levels"*

2 cont

"CUMULATIVE IMPACTS The annual amount of mining activity, and associated noise conditions, with the Proposed Action in combination with mining at the Existing Mine would not exceed current levels, and cumulative mining noise impacts are not anticipated. In addition, noise impacts associated with mining would be temporary in nature and would occur some distance from potential future development that could occur in the vicinity, and no significant cumulative noise impacts are anticipated."

Reclamation of site after mining.

No viable reclamation plan has been developed to date. This mine will permanently scar the landscape and dewater marshland and the city's creek. One only needs to look at historical photos and research the millions spent by government to reclaim Chambers Bay. When this mining company was in its earlier form, they denuded the hill slope at what is now Chambers Bay golf course. This was a source of pollution and eroded into Puget Sound for decades.

3 Cal

To the point, there is no viable plan to hold the company accountable to reclaim and put back to nature what they have already mined. The idea that DNR will not review a reclamation plan until after city issues permits for mining either is a joke or the law needs changed if indeed the law. I believe the reclamation plan needs to be briefed to the city and its citizens before any permits issued.

-OF NOTE- ALL IMPACTS of MINE EXPANSION are ON public LAND. very little ON LAND (besides where the dig is) CALPORTLAND OWNS. THEY don't OWN creek, aquifer, OR MARSH.

4 EA

7/12/24 Letter 189

RECEIVED
JUL 15 2024
CITY OF DUPONT

DEAR DIRECTOR KINCAID,

I am extremely concerned about the proposed CalPortland South Parcel mine expansion and its impact on the groundwater due to dewatering the Vashon Aquifer. This could significantly affect surrounding vegetation and increase fire danger for our residents, homes, and businesses. It would dry up the seeps along the Sequalitchew trail, causing the hillside slopes to dry up. If the South Parcel mine expansion receives a permit the creek water alongside the trail would go dry for almost half a year. Currently the underground water from the Vashon Aquifer feels the lush hillside as well as the creek and our wetlands. Please DO NOT approve a mining permit that will destroy our stream, our hillside, and our wetlands in PERPETUITY. No mitigations exist. Nor is any mitigation proposed, that would protect our environment. 1 DS

The projected drop in groundwater level up to 9 feet in Edmonds Marsh is of specific concern. This drop in groundwater level will likely put Dupont residents at an even greater risk of fire danger. 2 DS

Climate conditions have worsened since the 2011 Settlement Agreement was prepared. The City of Dupont is surrounded by forests and climate change is already the risk of fire to our residents. 3 DS

Restoring Sequalitchew Creek does not have to depend on dewatering the Vashon Aquifer. It should be restored without dewatering the Vashon Aquifer. In face, CalPortland could be a great community partner by funding the restoration WITHOUT dewatering the acquirer. 4 EA

Thank you,

Harold Schmidt and Linda Smith
2084 McDonald Ave
Dupont, Wa 98327

Pioneer Aggregates South Parcel Draft Environmental Impact Statement (EIS)

Comment Form

Input from the public regarding the Pioneer Aggregates South Parcel Project EIS is welcome. Please submit this form to share your comments. Note: Submitted comment forms are subject to the Public Records Act (RCW 42.56).

Date
7/10/2024

First Name *
Kelly

Last Name *
Schneider

Are you a resident of the City of DuPont, WA? *
- (●) Yes
- ( ) No

Are you a business owner? *
- ( ) Yes
- (●) No

Are you part of an Agency or Organization? *
- ( ) Yes
- (●) No
- ( ) Not relevant to my input

If you have concerns regarding the EARTH, please describe them below.
Do you own property within DuPont's shoreline?

Yes. Our home backs on Edmond's Marsh.

How do you use the shoreline in DuPont? (passive viewing, fishing, walking, biking, boating, etc.)

We take hikes/walks, bike ride in the area, beach comb with the kids, bird watch, and are novice wildlife photograpers.

How often do you use the shoreline for each of these activities? Please be specific.

We walk the area around the marsh nearly daily. We hike or run along the creek about once/wk, more often during the summer months.

What do you value most about DuPont's shoreline? (views, public access opportunities, water quality, wildlife, etc.)
Access to the water, and the presence of wildlife living tucked into an area that is so populated....including a Western Pond Turtle that we found injured from Edmond's Marsh behind us, and took to a wildlife rehab. expert for the Woodland Park Zoo. We have also seen birds that are rarely seen in Washington State in the area (Edmond's Marsh) behind our home. There are also many deer, raccoons, squirrels, birds, coyote's and various birds who call the Marsh area "home". I took some wonderful pictures of a Great Horned Owl at the edge of the marsh, yesterday. I also think it is AMAZING that we have a salmon stream in our community!

1
EA

What is your vision for DuPont's shoreline? (public access, habitat restoration, water-enjoyment uses, other)
First, I would like to see environmental experts consulted with, who can provide accurate, unbiased scientific data on this. This is a far cry from what has happened up to this point. Historical knowledge of the water table is extremely important to this. I would like to see our city officials act on this information in the interest of protecting, and restoring, our waterways. I would absolutely like to see habitat restoration, with restoration of the water flow to the Creek, and the surrounding waterways. I think it would be wonderful to have a public "swimming hole", as the town of Dupont historically did. What a treasure this would be for all of us, and a big draw from outside the community, with the trails and access to the sound. I wish to see active protection of our watershed, and water basin. I am willing, without a doubt, to pay increased taxes in order to see this happen.

2
EA
City

What is your greatest concern, if any, about DuPont's shorelines and its future?

The mining poses a huge risk. This certainly needs to be limited and controlled carefully. We need to actively protect, and restore, all of our waterways, including Edmond's Marsh, and the Sequalitchew Creek. My son is a fifth grade student who participates in the Washington Virtual Academy, through our school district. He has been studying watersheds, basins, and collection areas, along with the crucial need for water conservation and preservation. We need to tread lightly, as drilling or mining into our aquifer could lead to lowering our water table, eventually leading to drought issues. For very basic information on how this can occur, I would recommend this site: http://imnh.isu.edu/digitalatlas/hydr/concepts/gwater/aquifer.htm
I absolutely believe that our future quality of life as Dupont residents, rests heavily on decisions that are being made by our Counsel Members at this current juncture.

3 EA

If you have concerns regarding the AIR QUALITY, please describe them below.

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.

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If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.

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5 EA

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5 cont

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.

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Access to the water, and the presence of wildlife living tucked into an area that is so populated....including a Western Pond Turtle that we found injured from Edmond's Marsh behind us, and took to a wildlife rehab. expert for the Woodland Park Zoo. We have also seen birds that are rarely seen in Washington State in the area (Edmond's Marsh) behind our home. There are also many deer, raccoons, squirrels, birds, coyote's and various birds who call the Marsh area "home". I took some wonderful pictures of a Great Horned Owl at the edge of the marsh, yesterday. I also think it is AMAZING that we have a salmon stream in our community!

What is your vision for DuPont's shoreline? (public access, habitat restoration, water-enjoyment uses, other)
First, I would like to see environmental experts consulted with, who can provide accurate, unbiased scientific data on this. This is a far cry from what has happened up to this point. Historical knowledge of the water table is extremely important to this. I would like to see our city officials act on this information in the interest of protecting, and restoring, our waterways. I would absolutely like to see habitat restoration, with restoration of the water flow to the Creek, and the surrounding waterways. I think it would be wonderful to have a public "swimming hole", as the town of Dupont historically did. What a treasure this would be for all of us, and a big draw from outside the community, with the trails and access to the sound. I wish to see active protection of our watershed, and water basin. I am willing, without a doubt, to pay increased taxes in order to see this happen.

What is your greatest concern, if any, about DuPont's shorelines and its future?
The mining poses a huge risk. This certainly needs to be limited and controlled carefully. We need to actively protect, and restore, all of our waterways, including Edmond's Marsh, and the Sequalitchew Creek. My son is a fifth grade student who participates in the Washington Virtual Academy, through our school district. He has been studying watersheds, basins, and collection areas, along with the crucial need for water conservation and preservation. We need to tread lightly, as drilling or mining into our aquifer could lead to lowering our water table, eventually leading to drought issues. For very basic information on how this can occur, I would recommend this site: http://imnh.isu.edu/digitalatlas/hydr/concepts/gwater/aquifer.htm
I absolutely believe that our future quality of life as Dupont residents, rests heavily on decisions that are being made by our Counsel Members at this current juncture.

6 EA

If you have concerns regarding NOISE, please describe them below.

If you have concerns regarding LAND USE, please describe them below.

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

If you have concerns regarding TRANSPORTATION, please describe them below.

If you have OTHER concerns not listed above, please describe them below.

In 2010 we were asked to answer a series of questions about land use, the shoreline, and information pertinent to the mining operations. I wanted to share my answers to that Q and A, as I felt it was pertinent to the decisions that are currently being made. I wish to place it on record, as a DuPont citizen and homeowner of 22 years, I am emphatically opposing the dewatering of our aquifer, and think it's terribly foolish to even consider it, as we know protecting our water sources is of VITAL importance, as it's one of our most valuable resources.

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

(SEPA2021-002 comment period 6/14/2024-7/15/2024)

7
EA

RECEIVED
JUL 15 2024
CITY OF DUPONT

July 14, 2024

To: City of DuPont
1700 Civic Dr.
DuPont, WA. 98327

From: David and Christine Schnell
607 Louviers Avenue
DuPont, WA. 98327

Re: Comments pertaining to the proposed work by Pioneer Aggregates South Parcel Project
City File No. SEPA2021-002

Attn. Barb Kincaid

We understand that the proposed project involves the mining of gravel deposits located adjacent to Sequalitchew Creek and the natural riparian area associated with it. The work would necessitate the dewatering of the aquifer that supplies water to the creek and associated wetlands (including Edmond Marsh).

The dewatering of soils in the South Parcel area of the gravel mine would have a devastating impact to the current condition and volume of water passing through the aquifer soils that hydrate the marsh and creek. Any change to hydrology of this remarkable, natural environment would have devastating impacts to the forest, which provides shade, clean water and temperature moderation for the creek as well as habitat for the existing wildlife, and noise/visual buffering for all who currently live nearby, and enjoy park-like City trail system. 1 DS

The history of DuPont **IS** the resource of Sequalitchew Creek and Edmond Marsh. Native Americans, and later the Hudson Bay Company/Fort Nisqually relied upon these waters for their sustenance and livelihood. This water is the **REASON** that attracted the human settlement of our area (the <u>first</u> European settlement on Puget Sound!) It is inconceivable to us that the company or the City would consider any dewatering and mining of property adjacent to the creek and the subsequent destruction of that element of our historical legacy. 2 EA

Too often we have heard "Oh, our project won't harm the natural environment ... and if does, we will fix it back as good as it was before". We know the reality of strip mines and superfund sites that take their profits and then run out of money to fix their damage. Besides, how could anyone restore (recreate) such a well balanced and beautiful area as is the Sequalitchew Creek! 3 EA

No, this area is best left alone. This proposed project **WILL** have an adverse environmental impact to Sequalitchew Creek, Edmond Marsh and the City and environs of DuPont.

Sincerely,

David and Christine Schnell

David W Schnell CS

Pioneer Aggregates South Parcel Draft Environmental Impact Statement (EIS)

Comment Form

Input from the public regarding the Pioneer Aggregates South Parcel Project EIS is welcome. Please submit this form to share your comments. Note: Submitted comment forms are subject to the Public Records Act (RCW 42.56).

Date
7/14/2024

First Name *
Amy

Last Name *
Senftleben

Are you a resident of the City of DuPont, WA? *
- (●) Yes
- ( ) No

Are you a business owner? *
- (●) Yes
- ( ) No

Where do you do business?
Home

Are you part of an Agency or Organization? *
- ( ) Yes
- (●) No
- ( ) Not relevant to my input

If you have concerns regarding the EARTH, please describe them below.

If you have concerns regarding the AIR QUALITY, please describe them below.

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.

If you have concerns regarding NOISE, please describe them below.

If you have concerns regarding LAND USE, please describe them below.

The Sequalitchew Creek and trail is a feature of the city, and enjoyed by likely hundreds of people every week, connecting us to the water, and creating tourism for a city that otherwise struggles to attract visitors. Please, please do not permanently destroy the beauty of this area for short term gains for one business. As a homeowner, I was not to see this city thrive, and this permitting would be a move away from long-term success.

1
EA

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

If you have concerns regarding TRANSPORTATION, please describe them below.

If you have OTHER concerns not listed above, please describe them below.

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

(SEPA2021-002 comment period 6/14/2024-7/15/2024)

Pioneer Aggregates South Parcel Draft Environmental Impact Statement (EIS)

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Date
7/11/2024

First Name *
Elizabeth

Last Name *
Shaver

Are you a resident of the City of DuPont, WA? *
- (●) Yes
- ( ) No

Are you a business owner? *
- ( ) Yes
- (●) No

Are you part of an Agency or Organization? *
- ( ) Yes
- (●) No
- ( ) Not relevant to my input

If you have concerns regarding the EARTH, please describe them below.
We know that water is becoming a valuable asset and this company would disrupt and possibly ruin our water supply for the future. This company does not pay enough to the city to make it worth it. But the bottom line is we are destroying what bit of nature we have. It would be a shame to see the land raped of its resources. The constant growth in this area is getting out of control and is making even a bigger mess of our roads and infrastructure. 1 EA

If you have concerns regarding the AIR QUALITY, please describe them below.
I'm always concerned of air quality due to fires. 2 EA

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.
I don't think we should left them get near our water source. It is shared by many areas and it would destroy the creek runny through there and could seriously ruin our water source. 3 DS EA

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.
We should always protect these areas. Water will decrease in these areas, so I have heard. 4 DS EA

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.
We need to protect the wildlife that is here before it is to late. 5 EA

If you have concerns regarding NOISE, please describe them below.
Always hate the noise. 6 EA

If you have concerns regarding LAND USE, please describe them below.
We don't need to keep putting down concrete everywhere possible. 7 EA

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.

It will look like any other dug up space. I prefer trees and forest area.

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

If you have concerns regarding TRANSPORTATION, please describe them below.

More traffic in an area that cannot handle what it has now. Most days everyone sits in traffic, it can become real annoying because there are not other roads to go on and you can gets stuck for long periods of time.

8
EA

If you have OTHER concerns not listed above, please describe them below.

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

(SEPA2021-002 comment period 6/14/2024-7/15/2024)

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Date
7/8/2024

First Name *
David

Last Name *
Shaw

Are you a resident of the City of DuPont, WA? *
- (●) Yes
- ( ) No

Are you a business owner? *
- ( ) Yes
- (●) No

Are you part of an Agency or Organization? *
- ( ) Yes
- (●) No
- ( ) Not relevant to my input

If you have concerns regarding the EARTH, please describe them below.

If you have concerns regarding the AIR QUALITY, please describe them below.

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.

CalPortland should be denied the opportunity to dewater (dry out) the Vashon Aquifer. The water table(s) in our area need to be protected and kept from being lowered by even the smallest amount. Reducing water levels will have a negative effect upon plant life which supports wildlife in so many ways, i.e. food and protection. This area has suffered enough from development already as evidenced by the reduction of wildlife which this area used to enjoy.

1
DS
EA

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.

If you have concerns regarding NOISE, please describe them below.

If you have concerns regarding LAND USE, please describe them below.

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

If you have concerns regarding TRANSPORTATION, please describe them below.

If you have OTHER concerns not listed above, please describe them below.

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

(SEPA2021-002 comment period 6/14/2024-7/15/2024)

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Date
7/21/2024

First Name *
Kaiya

Last Name *
Shenkel

Are you a resident of the City of DuPont, WA? *
- (●) Yes
- ( ) No

Are you a business owner? *
- ( ) Yes
- (●) No

Are you part of an Agency or Organization? *
- ( ) Yes
- (●) No
- ( ) Not relevant to my input

If you have concerns regarding the EARTH, please describe them below.
Draining the aquifer can not be good for the earth!!

1 EA

If you have concerns regarding the AIR QUALITY, please describe them below.
More noise pollution, and dust . No thank you .

2 EA

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.
Wildlife will be forced to relocate .. we're already seeing the bears in our backyard, when we haven't seen them before .

3 EA

If you have concerns regarding NOISE, please describe them below.

If you have concerns regarding LAND USE, please describe them below.

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

If you have concerns regarding TRANSPORTATION, please describe them below.

If you have OTHER concerns not listed above, please describe them below.

The draining of the aquifer does not benefit the town of DuPont , and its residents. We need to stop this .

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

(SEPA2021-002 comment period 6/14/2024-7/15/2024)

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Date

6/26/2024

First Name *

Christine

Last Name *

Shoup

Are you a resident of the City of DuPont, WA? *

- (●) Yes
- ( ) No

Are you a business owner? *

- ( ) Yes
- (●) No

Are you part of an Agency or Organization? *

- ( ) Yes
- (●) No
- ( ) Not relevant to my input

If you have concerns regarding the EARTH, please describe them below.

Unless the city of DuPont plans to build an amphitheater that will plan and host outdoor concerts and events then what's the plan for the gaping hole in the ground? Will the taxpayers have to find the money to buy the landfill to fill it up? What's the plan?

1 EA City

If you have concerns regarding the AIR QUALITY, please describe them below.

Obviously the air quality would suffer.

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.

They plan to de-water a potable drinking water aquifer. That should be illegal. Clean potable water is vital for our survival. Allowing billionaires to destroy our natural resources is the highest form of stupidity. If they de-water the aquifer and we have no potable water because they destroyed FOREVER due to salt water intrusion then all of our homes will be worthless. They have not done the proper study to see if saltwater intrusion would occur. If the city allows them to do this then the city should prepare for lawsuits. Hauling water is not an option.

2 DS EA

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.

Cal Portland said they'd restore Sequalitchew Creek over a decade ago and I have seen zero work towards that effort. Why would anyone believe they care about any of this is beyond me. They want money from the resources that are not theirs to take. We the People of DuPont will never benefit in any way from their destruction of property. They're not paying off my home, are they paying off yours? They're not building a community center and pool. They're not contributing any money to anything but to their own pockets.

3 DS EA City

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.

Absolutely. There's been enough destruction of habitat after all of these gross warehouses and semi truck traffic. We don't need more.

4 EA

If you have concerns regarding NOISE, please describe them below.

Clearly. It's already noisy enough here with the interstate that has no sound barrier and the current semi truck traffic.

5 EA

If you have concerns regarding LAND USE, please describe them below.

Yes. They depleted their land. They can't have ours too. If they want it so badly they can buy the land they want to use for however much it would costs to pay off everyone's mortgage loans. At least the people of DuPont would get something out of the deal that way. If they can go for a ridiculously big ask then so can we.

6 EA

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.

Yes. Enough. It's gross.

7 EA

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

The Nisqually Indians can speak for themselves here.

8 EA

If you have concerns regarding TRANSPORTATION, please describe them below.

Too many semi trucks and construction trucks already. It's not safe.

9 EA

If you have OTHER concerns not listed above, please describe them below.

The fact that the same few people constantly have to fight to stop the same insane crap from happening in this city over and over and over. I should be asleep but instead I'm writing. It's ridiculous this crap is allowed to keep happening. Enough is enough.

10 EA

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

(SEPA2021-002 comment period 6/14/2024-7/15/2024)

Pioneer Aggregates South Parcel Draft Environmental Impact Statement (EIS)

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Date
6/25/2024

First Name *
Norma

Last Name *
Shupe

Are you a resident of the City of DuPont, WA? *
- (●) Yes
- ( ) No

Are you a business owner? *
- ( ) Yes
- (●) No

Are you part of an Agency or Organization? *
- ( ) Yes
- (●) No
- ( ) Not relevant to my input

If you have concerns regarding the EARTH, please describe them below.
DuPont is a beautiful oasis. Cutting off the water to our will destroy the beautiful green forest. Do not allow it to happen.

1 EA

If you have concerns regarding the AIR QUALITY, please describe them below.
The trees and natural habitats help to keep our air quality.

2 EA

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.
The streams and wetlands keep everything free and lusciously beautiful. It will all go away if there is no water.

3 EA

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.

If you have concerns regarding NOISE, please describe them below.

If you have concerns regarding LAND USE, please describe them below.

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

If you have concerns regarding TRANSPORTATION, please describe them below.

If you have OTHER concerns not listed above, please describe them below.

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

(SEPA2021-002 comment period 6/14/2024-7/15/2024)

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Date

7/21/2024

First Name *

Mike

Last Name *

Slattery

Are you a resident of the City of DuPont, WA? *

- (●) Yes
- ( ) No

Are you a business owner? *

- ( ) Yes
- (●) No

Are you part of an Agency or Organization? *

- ( ) Yes
- (●) No
- ( ) Not relevant to my input

If you have concerns regarding the EARTH, please describe them below.

Humans are destroying our Earth and we as citizens need to step up in advocate for it. The gravel company will just keep digging away until there's nothing left and their profits are made and then they'll move on. When is enough enough? 1 EA

If you have concerns regarding the AIR QUALITY, please describe them below.

Additional exhaust from continued equipment digging and moving and digging and moving and digging and moving. Additional dust from more years of digging and crunching the rock. 2 EA

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.

Our aquifer is not set up to have continuous assault placed on it. The more earth that is removed only stands to reason that the water that finally hits our aquifer is going to be affected so therefore the aquifer has no chance. You cannot expect it to remain the same when we keep pulling more water out of it. 3 DS

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.

Sequailichew Creek will be forever doomed and our aquifer greatly impacted by this expansion. 4 DS EA

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.

Squirrels, raccoons, frogs, fish, dear, bear, etc etc etc etc all call our sequality and Dupont area home. With further expansion of this gravel company and housing we are just pushing them out of their natural habitat and before long they will be forever gone. Shame on us. 5 EA

If you have concerns regarding NOISE, please describe them below.

With the expansion of the gravel company right into our backyards it only makes sense to know that the sound of the equipment will impact the noise level tremendously! More equipment, more trucks, more vehicles of all sorts etc etc etc 6 EA

If you have concerns regarding LAND USE, please describe them below.

The more that is given up to companies like the gravel company the less there will be for the community use. Our land is being devastated by the gravel company and once it's gone it's gone.

7 EA

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.

It's ommon sense that once the trees and bushes and fauna are gone as the gravel company completed their expansion that it will impact the visual beauty of this area. Look at what their current digging and dredging has done too this equality area. They have removed tons and tons of Earth. It will never be the same.

8 EA

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

If you have concerns regarding TRANSPORTATION, please describe them below.

Stands to reason that anytime anything grows it also incorporates more vehicles hence more transportation. DuPont does not need any further transportation issues as it cannot handle what it currently has.

9 EA

If you have OTHER concerns not listed above, please describe them below.

Tired of companies making billions of dollars at the expense of the community. I vote know to any expansion. Save our Sequalitchew habitat to include the air quality, land use, animals that live and reside, groundwater and aquifer. You can do a gazillion test and manipulate them to say that it will have no impact but that is utter ridiculousness. Of course it will and in a very adverse manner.

10 EA

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

(SEPA2021-002 comment period 6/14/2024-7/15/2024)

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Date

7/6/2024

First Name *

Nicole

Last Name *

Slattery

Are you a resident of the City of DuPont, WA? *

- (●) Yes
- ( ) No

Are you a business owner? *

- ( ) Yes
- (●) No

Are you part of an Agency or Organization? *

- ( ) Yes
- (●) No
- ( ) Not relevant to my input

If you have concerns regarding the EARTH, please describe them below.

I find it appalling that more of our precious earth and soil needs to be profit for this gravel company to expand. Once the ground soil is Disturbed it doesn't matter what you do it will never be the same as created by God. 1 EA

If you have concerns regarding the AIR QUALITY, please describe them below.

Imagine more dust and truck fumes in our environment and our neighborhood due to the expanded vehicle use that will be required for this expansion. Pollution, including air pollution is a massive concern that we all should be aware of. This expansion will only increase our air pollution with exhaust and more dust. 2 EA

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.

Company does not care about the aquifer All they want to do is make money. I do not believe a single report that comes out saying that the sequela chew aquifer will not be disturbed as there's no possible way that it cannot be if this project is to continue. So quality Trail is already a mere trickle of what it used to be and this will only further decrease it. 3 EA

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.

Once any of our water is diverted or land removed that moves the water underneath it The streams and the ground surface will be effective in a negative way. Our wetlands and sequality Trail are priceless treasures that this company could care less about as long as they make a profit. 4 EA

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.

Plants will be forever gone, homes for the animals will be forever gone and our precious so quality area will be changed dramatically forever. Haven't they made enough money already at the expense of the area and the land? 5 EA

If you have concerns regarding NOISE, please describe them below.

Trucks, trucks, trucks, trucks!! How many more vehicles will be coming in and out of the Sequoia chew area as this expansion occurs? Fumes dust and massive gas use. None of the trucks are silent and the noise pollution will escalate. We have a beautiful place that just needs to be left alone. Go take your trucks and your expansion elsewhere as you've already desecrated the land that you currently have. 6 EA

If you have concerns regarding LAND USE, please describe them below.

I would dare anybody to produce a photograph of the current land use owned by the gravel mine and compare it with what it looks like now. What once was a beautiful area now is decimated.

7 EA

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.

You rape the land you can never get it back. You can tell me you'll plant trees or foliage but it will never be the way it was when it was created by God.

8 EA

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

Everything for money and the bottom profits for a company. Nobody cares about cultural resources or if they do it's only lip service. Our area is rich with history from the native Americans that once resided here to the fort that later followed them and push them out. This land is a very spiritual area and needs to be left alone

9 EA

If you have concerns regarding TRANSPORTATION, please describe them below.

The more we take from this area the less there is of nature that's left. More people more cars more trucks more transportation more gravel trucks more more more more more

10 EA

If you have OTHER concerns not listed above, please describe them below.

Absolutely 1,000% opposed to this expansion and the harm it will forever create in our community.

11 EA

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

(SEPA2021-002 comment period 6/14/2024-7/15/2024)

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Date

7/21/2024

First Name *

David

Last Name *

Snyder

Are you a resident of the City of DuPont, WA? *

- (●) Yes
- ( ) No

Are you a business owner? *

- ( ) Yes
- (●) No

Are you part of an Agency or Organization? *

- ( ) Yes
- ( ) No
- (●) Not relevant to my input

If you have concerns regarding the EARTH, please describe them below.

If you have concerns regarding the AIR QUALITY, please describe them below.

I have concerns about the amount of dust and other contaminants that would come from the mining operations, including vehicles. Thousands of people, their pets , and other wildlife utilize the Sequalitchew Creek Trail and the surrounding areas every year. The apartments and the DuPont Community Garden will have their air quality adversely affected, as well as those who live in the Edmonds Village neighborhood.

1 EA

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.

Reducing the water level in the aquifer can cause sinkholes and have negative effects on local water levels. This could cause the water bills for residents to increase dramatically if we need to find another water source for the city's water.

2 DS

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.

Biodiversity is tremendous in this area. The mining project will have a devastating impact on that biodiversity.

3 EA

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.

If you have concerns regarding NOISE, please describe them below.

I live in Edmonds Village. I moved to DuPont because it was overall a very quiet community. I didn't move here to hear loud machinery day in and day out.

4 EA

If you have concerns regarding LAND USE, please describe them below.

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

If you have concerns regarding TRANSPORTATION, please describe them below.

The amount of heavy trucks already improperly using Center Drive is more than enough. I can't imagine what will happen when truck's GPS tells them Powerline Rd is a viable route.

5
EA

If you have OTHER concerns not listed above, please describe them below.

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

(SEPA2021-002 comment period 6/14/2024-7/15/2024)

Pioneer Aggregates South Parcel Draft Environmental Impact Statement (EIS)

Comment Form

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Date
7/17/2024

First Name *
Steven

Last Name *
Sortais

Are you a resident of the City of DuPont, WA? *
- Yes
- No

What city do you reside in?

Are you a business owner? *
- Yes
- No

Are you part of an Agency or Organization? *
- Yes
- No
- Not relevant to my input

If you have concerns regarding the EARTH, please describe them below.

If you have concerns regarding the AIR QUALITY, please describe them below.

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.

We have enjoyed seeing the responsible growth of DuPont and love the Sequalitchchew Trail as a shaded/native growth/natural animal habitat walk with our dog. The idea that this area could be destroyed by the expansion of a local gravel mine is SO disheartening! With all need for water/clean water access with the growth of population to this region of the South Sound, it seems like a backwards move to approve an expansion that endangers such an important Aquifer. The idea that for months of the year, after the Aquifer is 'dewatered' there would be 'dry' creeks, wetlands, vegetation, seems like an automatic no to that expansion would be the choice. The increased Fire risk due to 'dry' areas and then a lack of access to water to fight the fires seems like another issue to consider. Please consider a no vote for this expansion.

1
DS
EA

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.

If you have concerns regarding NOISE, please describe them below.

If you have concerns regarding LAND USE, please describe them below.

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

If you have concerns regarding TRANSPORTATION, please describe them below.

If you have OTHER concerns not listed above, please describe them below.

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

(SEPA2021-002 comment period 6/14/2024-7/15/2024)

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Date

7/21/2024

First Name *

Tracie

Last Name *

Sprague

Are you a resident of the City of DuPont, WA? *

- (●) Yes
- ( ) No

Are you a business owner? *

- ( ) Yes
- (●) No

Are you part of an Agency or Organization? *

- ( ) Yes
- (●) No
- ( ) Not relevant to my input

If you have concerns regarding the EARTH, please describe them below.

If you have concerns regarding the AIR QUALITY, please describe them below.

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.

I'm concerned that this will dry up the area of the trail and this will cause the stream back there to dry up. The green land will become brown and dead and it's a beautiful place of nature that should be preserved

1
DS

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.

If the stream dries up and the ground dries the birds will leave because their natural habitat will be changed forever.

If you have concerns regarding NOISE, please describe them below.

If you have concerns regarding LAND USE, please describe them below.

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

If you have concerns regarding TRANSPORTATION, please describe them below.

If you have OTHER concerns not listed above, please describe them below.

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

(SEPA2021-002 comment period 6/14/2024-7/15/2024)

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Date

7/3/2024

First Name *

Thomas

Last Name *

Steinhart

Are you a resident of the City of DuPont, WA? *

- (●) Yes
- ( ) No

Are you a business owner? *

- ( ) Yes
- (●) No

Are you part of an Agency or Organization? *

- ( ) Yes
- ( ) No
- (●) Not relevant to my input

If you have concerns regarding the EARTH, please describe them below.

If you have concerns regarding the AIR QUALITY, please describe them below.

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.

Mining near the creek may disturb the aquifer, reducing the plants along the Trail. With reduced vegetation, it will become harder for the animals in the area to find food.

1 EA

If you have concerns regarding NOISE, please describe them below.

I live near the expansion area. I don't want to hear mining next door.

2 EA

If you have concerns regarding LAND USE, please describe them below.

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.

I am concerned that expanding the mining area will disturb the aquifer, reducing the water to the existing vegetation and causing it to dry up/die off. If this happens, the hillside along the creek will become barren and ugly.

3 EA

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

If you have concerns regarding TRANSPORTATION, please describe them below.

If you have OTHER concerns not listed above, please describe them below.

If the mining results in a die off or reduction in the vegetation above the creek and trail, then every time it rains there will be mud sliding onto the trail and into the creek. The trail is a desirable method of exercising and enjoying nature, I would rather it stay that way.

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

(SEPA2021-002 comment period 6/14/2024-7/15/2024)

RECEIVED
JUL 15 2024
CITY OF DUPONT

Public Records Comments Opposing Permitting the Mining Expansion of the South Parcel

I strongly oppose the mine expansion of the South Parcel. I think it would negatively affect Sequalitchew Creek, Edmond Marsh, our wetlands, and the Sequalitchew Creek Trail slopes. It would also drain the Vashon Aquifer, which is a potential source of drinking water for DuPont. DuPont still has water rights to the aquifer, issued in 1948. 1 DS

One of the great things about DuPont is the protected natural areas and trails. We need to maintain these areas for all residents to use and enjoy. The Sequalitchew Trail is used by DuPont residents, as well as visitors from other areas. It is an important natural feature in the Pacific Northwest. 2 EA

I strongly urge the city to deny the permit to expand the South Parcel mining. Please keep the wonderful nature areas of DuPont healthy and viable for use by residents, now, and in the future. 3 EA

Christy Stephenson
2193 McDonald Ave.
DuPont, WA 98327

Christy Stephenson

RECEIVED
JUL 15 2024
CITY OF DUPONT

To: The City of DuPont (City Council)

From: Norm Stephenson, 2193 McDonald Avenue, DuPont, WA 98327

Subject:: Concerns About Approval of Mining Expansion Negatively Affecting Dewatering of the Vashion Aquifer and the Environment

Mining gravel could impact water levels in the Vashion Aquifer, resulting in negative impacts on vegetation, soil, habitat, trails, fire risks, wetlands, potable drinking water, and the general earth environment.

1
DS

According to my recent research, there is no real mitigation plan that would prevent irreversible dewatering in the aquifer.

I urge the city to deny the permit to expand the CalPortland South Parcel mining.

Norman D. Stephenson

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Date
7/20/2024

First Name *
Mark

Last Name *
Switzer

Are you a resident of the City of DuPont, WA? *
- ○ Yes
- ◉ No

What city do you reside in?
Tacoma, Washington

Are you a business owner? *
- ○ Yes
- ◉ No

Are you part of an Agency or Organization? *
- ○ Yes
- ◉ No
- ○ Not relevant to my input

If you have concerns regarding the EARTH, please describe them below.
I am highly concerned that this project prioritizes corporate profitability over the long term environmental sustainability of the area and its surroundings. The optics of this move indicate that a renege of previous commitments of the mine, and I do not believe any mitigations I've observed will satisfy these concerns. Please consider having a third party environmental conservatory agency review this plan as selected by the EPA and provide a thorough impact statement from their results and how you can align to it. If no alignment can be reached, early exit the mine in a graceful way.

1 EA

If you have concerns regarding the AIR QUALITY, please describe them below.

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.
I am extremely concerned about impact to water quality and the habitats that will be disrupted.

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.
I am extremely concerned about impact to water quality and the habitats that will be disrupted.

2 DS EA

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.
I am extremely concerned about impact to water quality and the habitats that will be disrupted.

If you have concerns regarding NOISE, please describe them below.

If you have concerns regarding LAND USE, please describe them below.
I am concerned this land is not being used in a way that aligns with the core environmental values of the Pacific Northwest residents.

3 EA

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

If you have concerns regarding TRANSPORTATION, please describe them below.

If you have OTHER concerns not listed above, please describe them below.

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

(SEPA2021-002 comment period 6/14/2024-7/15/2024)

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Date
7/5/2024

First Name *
Nancy

Last Name *
Taylor

Are you a resident of the City of DuPont, WA? *
- ○ Yes
- ◉ No

What city do you reside in?
Steilacoom

Are you a business owner? *
- ○ Yes
- ◉ No

Are you part of an Agency or Organization? *
- ○ Yes
- ◉ No
- ○ Not relevant to my input

If you have concerns regarding the EARTH, please describe them below.
Sequalitchew Trail is such a gift to us, please take care of it. 1 EA

If you have concerns regarding the AIR QUALITY, please describe them below.
WE need all the trees for healthy air. 2 EA

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.
I am concerned how this changes everything around the Sequalitchew Trail all vegetation green and beautiful and ALIVE and what about all the creatures and birds 3 EA

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.
I have concerns for all wildlife living here 4 EA

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.
I am concerned for all the creatures and birds and plants that l;ive here on the Trail 5 EA

If you have concerns regarding NOISE, please describe them below.
I don't want to hear any noise except to hear the sounds of the creek creek 6 EA

If you have concerns regarding LAND USE, please describe them below.

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

If you have concerns regarding TRANSPORTATION, please describe them below.

If you have OTHER concerns not listed above, please describe them below.

we have so few areas for people to DE-STRESS and getting out in NATURE is the best healer. It's such a beautiful area, I would just hate for that to vanish or change in any way. Please do the BEST and MOST complete EIS that you can do.
Please leave this area alone. PROTECT THE SEQUALITCHEW TRAIL.

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

(SEPA2021-002 comment period 6/14/2024-7/15/2024)

7
EA

Pioneer Aggregates South Parcel Draft Environmental Impact Statement (EIS)

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Date

7/8/2024

First Name *

Sherrie

Last Name *

Teague

Are you a resident of the City of DuPont, WA? *

- ○ Yes
- ◉ No

What city do you reside in?

unincorporated Pierce County

Are you a business owner? *

- ○ Yes
- ◉ No

Are you part of an Agency or Organization? *

- ○ Yes
- ◉ No
- ○ Not relevant to my input

If you have concerns regarding the EARTH, please describe them below.

Everyone should have concerns for the earth. If the gravel pit is allowed to expand, the current tree canopy will not survive. Reducing summer peak temperatures and air pollution, enhancing property values, providing wildlife habitat, providing aesthetic benefits, and improving social ties among neighbors are just some of the benefits of improving a city's urban tree canopy.

1 EA

If you have concerns regarding the AIR QUALITY, please describe them below.

Environmental exposure to dust from quarrying activities poses health dangers to the population living nearby. Dust generated through site preparation, various processing activities (drilling, blasting, crushing, screening and sorting and moving material should not be expanded and take place any closer to the trail that leads to Puget Sound.

2 EA

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.

If the creek is stopped/ allowed to dry up even for one month it will harm all that grows on the creek's banks and it will drive wild life that drinks there to leave the area and show up in neighbor's yards.

3 DS EA

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.

When will man learn that his actions do greater harm than good when it comes to construction of natural wetlands, streams and surface waters?

4 EA

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.

Obviously stopping the flow of water will kill any fish that may inhabit the creek and everyone knows water sustains all living plants and animals. Electric power companies in neighboring communities have had to tear out dams so our fish can survive and remain part of the natural food chain. Destroying the creek will cost money and the long term effects will be devastating for all. And down the road it will cost more money to correct the destruction in an attempt to return it to its natural state. What will become of the Nurse Tree?

5 EA

If you have concerns regarding NOISE, please describe them below.

If you have concerns regarding LAND USE, please describe them below.

There are 10 points of interest on the trail. What will be come of them?

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.

The Sequalitchew Trail is one of the prettiest trails in the area. It is a gently sloping, shaded, trail that goes all the way to Puget Sound.

6
EA

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

What does the Dupont Historical Museum think of these plans to enlarge the gravel pit? Don't they own the DuPont Wharf which is marked as historical on maps? Will the Historical Marker of the First 4th of July celebration west of the Mississippi also be destroyed? The “Buffalo Soldiers” encamped near Sequalitchew Creek. What do they say of these plans? They have a museum in Tacoma.

7
EA
Cal

If you have concerns regarding TRANSPORTATION, please describe them below.

If you have OTHER concerns not listed above, please describe them below.

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

(SEPA2021-002 comment period 6/14/2024-7/15/2024)

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Date
7/16/2024

First Name *
Melissa

Last Name *
Tennille

Are you a resident of the City of DuPont, WA? *
- ○ Yes
- ◉ No

What city do you reside in?
Steilacoom

Are you a business owner? *
- ◉ Yes
- ○ No

Where do you do business?
Tacoma, Gig Harbor

Are you part of an Agency or Organization? *
- ◉ Yes
- ○ No
- ○ Not relevant to my input

What is the name of the Agency or Organization?
South Sound Mushroom Club

If you have concerns regarding the EARTH, please describe them below.
There are several species of mushrooms that grow in the area you are looking at. I have seen some species there that I have never seen before. There are currently no state or federal protections for fungi. My grandchildren and I have been foraging edibles and making observations there for several years now. It is difficult to find such a large and wild parcel of land so close to human habitation. We are lucky to have it!

1 EA

If you have concerns regarding the AIR QUALITY, please describe them below.
It's not just the air quality for DuPont that is at stake here this Is so close to the shore that it will affect several nearby places in the South Sound.

2 EA

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.
We all enjoy untainted water.

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.
Yes, these are fragile and disappearing habitats that deserve to be protected.

3 EA

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.
The lack of lane, negative impacts on water and air quality, and increased traffic will be bad for land, air, and water ecologies.

If you have concerns regarding NOISE, please describe them below.

If you have concerns regarding LAND USE, please describe them below.
Not a lot of cities have such a large, beautiful and wild park as DuPont does. There are a lot of track homes recently built there and the town is growing fast. Please be sure to leave plenty of recreation and wild areas in your town for the residents. It will make it a more desirable place to live.

4 EA

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

If you have concerns regarding TRANSPORTATION, please describe them below.

If you have OTHER concerns not listed above, please describe them below.

You have each concern listed here. Looking at them all, how can you consider using the land this way?

5
EA

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

IMG_8327.jpeg 3.12MB

(SEPA2021-002 comment period 6/14/2024-7/15/2024)

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Date
6/16/2024

First Name *
Samuel

Last Name *
Thayer

Are you a resident of the City of DuPont, WA? *
- (●) Yes
- ( ) No

Are you a business owner? *
- ( ) Yes
- (●) No

Are you part of an Agency or Organization? *
- ( ) Yes
- (●) No
- ( ) Not relevant to my input

If you have concerns regarding the EARTH, please describe them below.
I vote NO. Once that land and environment is destroyed, it cannot be recovered. Dupont needs a balance between business, residential and natural space. I don't want to own a house between warehouses and a gravel pit.

1 EA City

If you have concerns regarding the AIR QUALITY, please describe them below.

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.
What is the impact on the aquifer? That cannot be repaired or replaced.

2 DS EA

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.
Where do the animals go?

3 EA

If you have concerns regarding NOISE, please describe them below.

If you have concerns regarding LAND USE, please describe them below.

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

If you have concerns regarding TRANSPORTATION, please describe them below.

If you have OTHER concerns not listed above, please describe them below.

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

(SEPA2021-002 comment period 6/14/2024-7/15/2024)

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Date

6/14/2024

First Name *

Samuel

Last Name *

Thayer

Are you a resident of the City of DuPont, WA? *

- (●) Yes
- ( ) No

Are you a business owner? *

- ( ) Yes
- (●) No

Are you part of an Agency or Organization? *

- ( ) Yes
- (●) No
- ( ) Not relevant to my input

If you have concerns regarding the EARTH, please describe them below.

If you have concerns regarding the AIR QUALITY, please describe them below.

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.

If you have concerns regarding NOISE, please describe them below.

If you have concerns regarding LAND USE, please describe them below.

How many times do we have to say no? Dupont balances, natural area residential and industrial and cannot afford to lose any more natural area. The mining proposed would be irreversible and destructive to the environment.

1
EA

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

If you have concerns regarding TRANSPORTATION, please describe them below.

If you have OTHER concerns not listed above, please describe them below.

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

(SEPA2021-002 comment period 6/14/2024-7/15/2024)

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Date
6/26/2024

First Name *
Samuel

Last Name *
Thayer

Are you a resident of the City of DuPont, WA? *
- (●) Yes
- ( ) No

Are you a business owner? *
- ( ) Yes
- (●) No

Are you part of an Agency or Organization? *
- ( ) Yes
- (●) No
- ( ) Not relevant to my input

If you have concerns regarding the EARTH, please describe them below.
When they run out of Steilacoom gravel, where will they go. Ext? The damage cannot be repaired. Rape the land then move on . . . ?

1 EA Cal

If you have concerns regarding the AIR QUALITY, please describe them below.

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.
An aquifer is the root to all life above it. The plants and animals depend on it. Once destroyed, it can NEVER be repaired. The trees and ground vegetation can NEVER be replaced. The wildlife can NEVER be replaced.

2 DS EA

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.
Where do the animals go? Where do the birds nest?

3 EA

If you have concerns regarding NOISE, please describe them below.

If you have concerns regarding LAND USE, please describe them below.
Rape the land and there is no going back..

4 EA

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.
Dupont has a tenuous balance of industrial, residential and natural. I don't want a home between warehouses and a gravel pit. STOP DEVELOPMENT

5 EA

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

If you have concerns regarding TRANSPORTATION, please describe them below.

If you have OTHER concerns not listed above, please describe them below.

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

(SEPA2021-002 comment period 6/14/2024-7/15/2024)

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Date
7/19/2024

First Name *
Samuel

Last Name *
Thayer

Are you a resident of the City of DuPont, WA? *
- (●) Yes
- ( ) No

Are you a business owner? *
- ( ) Yes
- (●) No

Are you part of an Agency or Organization? *
- ( ) Yes
- (●) No
- ( ) Not relevant to my input

If you have concerns regarding the EARTH, please describe them below.

If you have concerns regarding the AIR QUALITY, please describe them below.

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.
So long as it does not effect the aquifer in any way, I have no objections.

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.
So long as it does not effect the surface water / streams / wetlands in any way, I have no objections.

1
EA

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.
So long as it does not effect the wildlife in any way, I have no objections.

If you have concerns regarding NOISE, please describe them below.

If you have concerns regarding LAND USE, please describe them below.

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

If you have concerns regarding TRANSPORTATION, please describe them below.

If you have OTHER concerns not listed above, please describe them below.

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

(SEPA2021-002 comment period 6/14/2024-7/15/2024)

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Date
7/21/2024

First Name *
Alissa

Last Name *
Thomas

Are you a resident of the City of DuPont, WA? *
- (●) Yes
- ( ) No

Are you a business owner? *
- ( ) Yes
- (●) No

Are you part of an Agency or Organization? *
- ( ) Yes
- (●) No
- ( ) Not relevant to my input

If you have concerns regarding the EARTH, please describe them below.

If you have concerns regarding the AIR QUALITY, please describe them below.

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.

If you have concerns regarding NOISE, please describe them below.
We reside in a neighborhood close to the proposed expansion and do not want to be exposed to the noise from the mining. It would have a negative impact on the quality of life we've come to know and love in DuPont.

1
EA

If you have concerns regarding LAND USE, please describe them below.

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

If you have concerns regarding TRANSPORTATION, please describe them below.

If you have OTHER concerns not listed above, please describe them below.

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

(SEPA2021-002 comment period 6/14/2024-7/15/2024)

Pioneer Aggregates South Parcel Draft Environmental Impact Statement (EIS)

Comment Form

Input from the public regarding the Pioneer Aggregates South Parcel Project EIS is welcome. Please submit this form to share your comments. Note: Submitted comment forms are subject to the Public Records Act (RCW 42.56).

Date

6/26/2024

First Name *

Hannah

Last Name *

Thornton

Are you a resident of the City of DuPont, WA? *

- (●) Yes
- ( ) No

Are you a business owner? *

- ( ) Yes
- (●) No

Are you part of an Agency or Organization? *

- ( ) Yes
- (●) No
- ( ) Not relevant to my input

If you have concerns regarding the EARTH, please describe them below.

If you have concerns regarding the AIR QUALITY, please describe them below.

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.

Our glaciers are rapidly shrinking and we will not be able to depend on glacial run off for fresh water in the future. We need to preserve and protect ground water resources in Western Washington

1 EA

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.

Our glaciers are rapidly shrinking and we will not be able to depend on glacial run off for fresh water in the future. We need to preserve and protect ground water resources in Western Washington.

2 EA

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.

There are so few natural spaces left, and it is these natural spaces that are the front line protectors against climate change. We need to continue to preserve and expand these precious places.

3 EA

If you have concerns regarding NOISE, please describe them below.

Noise pollution has actually been shown to decrease IQ points in developing children, and has a serious impact on psychological well being.

4 EA

If you have concerns regarding LAND USE, please describe them below.

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

Sequalichew Creek was the home for indigenous people for thousands of years. This is a cultural site that absolutely must be protected and preserved for future people to learn about not only what existed but what was taken from the indigenous people that are still here. We should not continue a legacy of disrespecting indigenous land.

5 EA Cal

If you have concerns regarding TRANSPORTATION, please describe them below.

If you have OTHER concerns not listed above, please describe them below.

Sequalichew Creek is one of the most magical aspects of DuPont. It is a sacred natural space in a place that has largely been stripped of its natural beauty. It is a peaceful haven for many of us and provides psychological support. For me, this is like my Church. Sitting next to that creek is where I go when I am lost and hurting, and it's where I go when I am joyful and celebrating. I think of the people who found similar peace here for thousands of years. I think of the old churches and architecture that are so protected and know that this land deserves that same respect and more. Nature lost can't be brought back, and for the animals that depend on this space it needs to be preserved. Natural spaces are also essential for protecting our planet and physical health. Please do not allow greed that will only continue to consume and strip before moving on when it has taken everything it can to destroy this place.

6 EA DS

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

(SEPA2021-002 comment period 6/14/2024-7/15/2024)

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Date

7/21/2024

First Name *

Rebecca

Last Name *

Toppenberg

Are you a resident of the City of DuPont, WA? *

- (●) Yes
- ( ) No

Are you a business owner? *

- (●) Yes
- ( ) No

Where do you do business?

Tacoma

Are you part of an Agency or Organization? *

- ( ) Yes
- ( ) No
- (●) Not relevant to my input

If you have concerns regarding the EARTH, please describe them below.

Lower lake levels or—in extreme cases—intermittent or totally dry perennial streams. These effects can harm aquatic and riparian plants and animals that depend on regular surface flows. Land subsidence and sinkhole formation in areas of heavy withdrawal. 1 EA

With the Future plans to expand the area aolng the nisqually sound there if going to ned to be use of other water sources, these sorces will be at risk of further contaminattion if the watertable is lowered and the mine expands.
Nitrate and orther ground chemicals can contaminate the soil more densely, It is a concern because if we lessen the amount of groundwater in the aquafer increased contamination of drinking water due to decreased ground water and compacted soil can affect our water, For example increased nitrates found in soil can reduce the ability of red blood cells to carry oxygen. This can cause serious health problems, especially for infants. 2 DS EA

If you have concerns regarding the AIR QUALITY, please describe them below.

According to a 2017 study by Hyndman and Wood, groundwater depletion in the United States could release 1.7 million metric tons of carbon dioxide into the atmosphere each year, which is more than the amount produced by the electricity used to power 250,000 households. 3 EA

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.

Groundwater depletion can also lead to water quality deterioration. Increased pumping costs: As groundwater levels decline, it can become more expensive to pump water. 4 DS

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.

Lower lake levels or—in extreme cases—intermittent or totally dry perennial streams. These effects can harm aquatic and riparian plants and animals that depend on regular surface flows. Land subsidence and sinkhole formation in areas of heavy withdrawal. 5 DS EA

Exposure to flooding: When an aquifer becomes compacted, it can lose its ability to absorb water, which can lead to surface flooding during heavy rains 6 DS

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.

trickle effect Depleted water leas to less water sources for Animal and plants, dry out the aquafier and increased fire risks putting the ecosystem in place at danger. Wildlife will come into community areas more with noise and industrial and less food sources and water. 7 EA

If you have concerns regarding NOISE, please describe them below.

I am already upset with the future building plans for the Housing development there is already so much noise and light pollution with the industrial zones and the Military this will have an increase on the ecosystem and our community.

8 EA

If you have concerns regarding LAND USE, please describe them below.

I want this land to stay as natural as it can and not be demolished and depleted Like the Giving tree till there is no more! This is a treasure tht so many families enjoy it provides a respite area and solitude area for natural land and for the inhabitants both human and wildlife. Everyone that visits us we take on this hike or bike the lush forest to the sound.

9 EA

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.

I want this land to stay as natural as it can and not be demolished and depleted Like the Giving tree till there is no more! This is a treasure that so many families enjoy it provides a respite area and solitude area for natural land and for the inhabitants both human and wildlife. Everyone that visits us we take on this hike or bike the lush forest to the sound. Depleting it and allowing the mine to be closer will affect it, maybe not right away but eventually and puts the land at rsik for sink holes and fires as well.

10 EA

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

If you have concerns regarding TRANSPORTATION, please describe them below.

If you have OTHER concerns not listed above, please describe them below.

The City of DuPont (Water System ID 20500) currently uses groundwater from five (5) wells for its public water supply. The City's water supply wells are located at Bell Hill (3) and Hoffman Hill (2), as shown on the map to the right. Bell Hill Wells 1 and 3 draw water from the Red Salmon Springs Aquifer; Bell Hill Well 2 draws water from the deeper undifferentiated Outwash/Lakewood Glacier Aquifer. Hoffman Hill Wells 1 and 2 draw water from the Red Salmon Springs Aquifer. Additional booster pumps were placed into service in 2003 to provide adequate pressure to customers on Hoffman Hill. All City wells access deep aquifers, making them less susceptible to contaminants. Brian Johnson, LG
Groundwater Quality Specialist
brian.johnson@ecy.wa.gov
360-800-7207

11 EA

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

(SEPA2021-002 comment period 6/14/2024-7/15/2024)

Pioneer Aggregates South Parcel Draft Environmental Impact Statement (EIS)

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Date

7/13/2024

First Name *

Yaleidy

Last Name *

Torres

Are you a resident of the City of DuPont, WA? *

- (●) Yes
- ( ) No

Are you a business owner? *

- ( ) Yes
- (●) No

Are you part of an Agency or Organization? *

- ( ) Yes
- (●) No
- ( ) Not relevant to my input

If you have concerns regarding the EARTH, please describe them below.

Surface mines create a huge amount of waste materials. Mines release harmful substances into the air and water, and can cause serious health issues if inhaled or consumed. Mines also release acidic water, which can kill marine life and make freshwater unsuitable for drinking. Underground mining produces fewer waste materials than surface mines, but they are risky for mine workers.

1 EA

If you have concerns regarding the AIR QUALITY, please describe them below.

Gravel mining can emit airborne particulates, including PM-10 particles, which can be hazardous to respiratory health.

2 EA

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.

Blasting and quarry operations can change the turbidity levels in groundwater.

3 DS EA

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.

Pits and quarries disrupt the existing movement of surface water and groundwater; they interrupt natural water recharge and can lead to reduced quantity and quality of drinking water for residents and wildlife near or downstream from a quarry site.

4 DS EA

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.

Creating gravel pits or quarries requires removing vegetation, topsoil, and subsoil, which can lead to loss of habitat and biodiversity.

5 EA

If you have concerns regarding NOISE, please describe them below.

The hours of work at the gravel pit extend up to 12 hours a day, 6 days a week. On top of this, extended hours, could mean disturbed sleep for the community.

6 EA

If you have concerns regarding LAND USE, please describe them below.

Mining is an inherently invasive process that can cause damage to a landscape in an area much larger than the mining site itself. The effects of this damage can continue years after a mine has shut down, including the addition to greenhouse gasses, death of flora and fauna, and erosion of land and habitat.

7 EA

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.

Gravel pits can disrupt natural landscapes by changing runoff patterns and surface water flow, which can cause problems for entire watersheds.

8 EA

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

If you have concerns regarding TRANSPORTATION, please describe them below.

It will Increase road traffic on an already very limited network of roads

9 EA

If you have OTHER concerns not listed above, please describe them below.

Other potential environmental impacts of gravel mining include: noise, dust, blasting effects, erosion, and sedimentatio

10 EA

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

(SEPA2021-002 comment period 6/14/2024-7/15/2024)

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Date

6/26/2024

First Name *

Nathaniel

Last Name *

Torres-Figueroa

Are you a resident of the City of DuPont, WA? *

- (●) Yes
- ( ) No

Are you a business owner? *

- ( ) Yes
- (●) No

Are you part of an Agency or Organization? *

- ( ) Yes
- (●) No
- ( ) Not relevant to my input

If you have concerns regarding the EARTH, please describe them below.

If you have concerns regarding the AIR QUALITY, please describe them below.

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.

The dewatering of the Vashon Aquifer can heavily reduce groundwater for the natural area surrounding the city of DuPont

1 DS

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.

The Sequalitchew Creek will go dry for five months of the year if dewatering occurs. The Edmond Marsh in DuPont, a critical habitat, will also be heavily affected through the loss of water.

2 DS EA

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.

The dewatering of the Vashon Aquifer will reduce water flow to the Sequalitchew creek, significantly harming the riparian environment that surrounds it by halting water seeps. Specifically, it will hurt the growth of plants along the stream and destroy habitats for fish such as the rainbow trout, western brook lamprey, cutthroat trout, and sculpin. What's more, the loss of riparian functions can potentially cause wider harm to the local ecology by disrupting seasonal flow regimes of nutrients and matter from terrestrial environments to the Puget Sound.

3 DS EA

If you have concerns regarding NOISE, please describe them below.

If you have concerns regarding LAND USE, please describe them below.

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.

If the dewatering of the Vashon Aquifer occurs, the Sequalitchew creek will be emptied for a significant portion of time, killing the flora along the Sequalitchew creek trail.

4 DS EA

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

If you have concerns regarding TRANSPORTATION, please describe them below.

If you have OTHER concerns not listed above, please describe them below.

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

(SEPA2021-002 comment period 6/14/2024-7/15/2024)

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Date

6/15/2024

First Name *

Joel

Last Name *

Trauba

Are you a resident of the City of DuPont, WA? *

- (●) Yes
- ( ) No

Are you a business owner? *

- ( ) Yes
- (●) No

Are you part of an Agency or Organization? *

- ( ) Yes
- (●) No
- ( ) Not relevant to my input

If you have concerns regarding the EARTH, please describe them below.

I love Dupont I don't want a company to destroy the land and nice trails we have to adventure around in. I don't want this company to come to DuPont and mess it all up.

1 EA

If you have concerns regarding the AIR QUALITY, please describe them below.

I like fresh air. I don't want pollution that makes it bad to breath in the summer. I like how Dupont is green and has so much to do outdoors. Lots of nice trails and peaceful walks. I don't want a company to come in and ruin it here.

2 EA

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.

I wish they would fix the water coming over the trails at Sequalitchew Trail. Even a boardwalk on some of the trails going down to the Puget sound. I don't want the Ground water / Aquifer be ruined if a company comes to DuPont. I want the water to be fresh and clean for the residents. I don't want to worry about our drinking water in DuPont.

3 EA

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.

I like the flow of the creeks. I want the national beauty let the salmons and fish go back up stream. Love the wetlands and we got take care of the beauty of it.

4 EA

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.

Take care of our land and animals and fish and plants. It's so nice to see and explore the land. See all the wild animals and plants.

5 EA

If you have concerns regarding NOISE, please describe them below.

I love having a quite community. Never wanted Dupont to become loud and busy like the main towns. Keep Dupont quite and small. Love it here!

6 EA

If you have concerns regarding LAND USE, please describe them below.

I like to keep the land as it. Leave it be. I don't want a company to destroy what we have here.

7 EA

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.

I don't like having ugly stuff that ruins everything. I like to just have the woods peaceful.

8 EA

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

I just want everything to have clean fresh water leave everything as is.

9 EA

If you have concerns regarding TRANSPORTATION, please describe them below.

I don't want heavy trucks roaming through the town ruining the roads loud noises. I don't want any of that.

10 EA

If you have OTHER concerns not listed above, please describe them below.

I do not want a company to mine and DuPont. I want to keep everything as is. I like the quietness and the fresh air we have in DuPont. I just want companies to leave Dupont alone. We already have enough commercial trucks in DuPont.

11 EA

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

inbound4629510894662867699.jpg 2.07MB

(SEPA2021-002 comment period 6/14/2024-7/15/2024)

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Date
6/25/2024

First Name *
Timothy

Last Name *
Tucci

Are you a resident of the City of DuPont, WA? *
- ○ Yes
- ◉ No

What city do you reside in?
Lakewood Wa

Are you a business owner? *
- ◉ Yes
- ○ No

Where do you do business?
Pierce county

Are you part of an Agency or Organization? *
- ◉ Yes
- ○ No
- ○ Not relevant to my input

What is the name of the Agency or Organization?
Tucci and Sons Inc

If you have concerns regarding the EARTH, please describe them below.
With regard to the questions below. I believe that the applicant has addressed all this issues to my satisfaction. They have proven to be a responsible company.

1
EA

If you have concerns regarding the AIR QUALITY, please describe them below.

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.

If you have concerns regarding NOISE, please describe them below.

If you have concerns regarding LAND USE, please describe them below.

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

If you have concerns regarding TRANSPORTATION, please describe them below.

If you have OTHER concerns not listed above, please describe them below.

See my attached letter

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

20240625_085815.pdf 213.89KB

(SEPA2021-002 comment period 6/14/2024-7/15/2024)

June 25, 2024

Timothy F. Tucci
Tucci & Sons, Inc.
4224 Waller Rd
Tacoma, WA 98443

Barb Kincaid, AICP
Director of Public Services
City of DuPont
1700 Civic Drive
DuPont, WA 98327

RE: Pioneer Aggregates South Parcel Project – SEPA 2021-002

Dear Ms. Kincaid:

I am writing on behalf of Tucci & Sons Inc. in support of the Pioneer Aggregates South Parcel Project (SEPA 2021-002) and to comment on the recently released Draft Environmental Impact Statement (DEIS).

Tucci & Sons Inc is a civil construction company. We act as both a general contractor as well as a subcontractor performing earthwork, underground utilities, and asphalt paving. We work for private clients as well as all public agencies. We employ over 200 people and have 3 locations in Pierce County. Two of these locations are asphalt plants. At one of our asphalt plants, we deliver the aggregate material necessary for the production of our finished product via barge from Dupont. We receive 5-7 loads of material a month. Dupont Aggregates supply both of our asphalt plants with crushed products utilizing over 250,000 tons of crushed material annually. We also purchase washed materials, crushed products, and concrete for the various jobs we do. It is a vital source of material for our company and our region. It is critical to keeping cost down along with supplying high-quality materials.

1 EA

It is important that regulatory reviewers do not overlook the important economic contribution the Pioneer Aggregates facility makes to the regional economy and the businesses and livelihoods that depend on this resource.

Thank you for taking the time to review and consider these comments.

Sincerely,
Tucci & Sons, Inc.

Timothy F. Tucci

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Date
7/18/2024

First Name *
Taylor

Last Name *
Underwood

Are you a resident of the City of DuPont, WA? *
- ○ Yes
- ◉ No

What city do you reside in?
Lakewood

Are you a business owner? *
- ○ Yes
- ◉ No

Are you part of an Agency or Organization? *
- ○ Yes
- ◉ No
- ○ Not relevant to my input

If you have concerns regarding the EARTH, please describe them below.
Please see the attached letter.

If you have concerns regarding the AIR QUALITY, please describe them below.
Please see the attached letter.

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.
Please see the attached letter.

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.
Please see the attached letter.

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.
Please see the attached letter.

If you have concerns regarding NOISE, please describe them below.
Please see the attached letter.

If you have concerns regarding LAND USE, please describe them below.
Please see the attached letter.

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.
Please see the attached letter.

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

1
EA

If you have concerns regarding TRANSPORTATION, please describe them below.

If you have OTHER concerns not listed above, please describe them below.

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

Pioneer Aggregates South Parcel Project Comments.docx 21.4KB

(SEPA2021-002 comment period 6/14/2024-7/15/2024)

Taylor Underwood
EPA Certified Watershed Manager
12111 Clover Creek Dr Sw
Lakewood, WA 98499
TaylorUnderwood2.99@gmail.com

July 18, 2024

Barb Kincaid
City of DuPont
1700 Civic Dr.
DuPont, WA 98327

Re: Pioneer Aggregates South Parcel Project City File No. SEPA2021-002

Dear DuPont City Council Members:

I am writing to address my concerns regarding CalPortland's proposed dewatering of the Vashon aquifer for gravel mining purposes. As an EPA-certified watershed manager dedicated to the preservation of our natural resources, I urge the City of DuPont to take decisive action against this environmentally detrimental project.

The Vashon aquifer is an essential ecological and hydrological asset for our region. It plays a role in sustaining critical habitats and contributes to the community's and the military's primary source of drinking water. Dewatering this aquifer could result in far-reaching and irreversible damage to the local environment and community. 1 DS

The potential impacts of dewatering include, but are not limited to:

1. **Groundwater Depletion:** A significant reduction in the nearby aquifers' water levels, affecting upstream and downstream ecosystems, including the Edmond Marsh as well as Sequalitchew Creek riparian areas. Additionally, a reduction in water availability for residents and businesses at a time when environmental pressures indicate future water scarcity. 2 DS
2. **Land Subsidence:** Structural damage to buildings, roads, and infrastructure due to geological instability caused by the loss of aquifer support will cost the city and residents millions in damages. 3 EA Cal
3. **Saltwater Intrusion:** An increased risk of saltwater contamination in the aquifer due to significant decreases in the surrounding water table, rendering it unsuitable for human consumption or agricultural use. This is also true for surrounding aquifers, which the city depends on. 4 DS

4. **Air and Noise Pollution:** The use of heavy machinery and other mining techniques will generate substantial noise pollution and release particulate matter into the air, impacting both wildlife and the surrounding communities.
5. **Contaminant Pollution:** There is an increased risk of advection events caused by the creation of hydraulic gradients which have resulted from significant groundwater depletion. Advection events within this watershed are highly probable considering the activities of JBLM and the DuPont chemical company, potentially leading to the contamination of surrounding aquifers.
6. **Habitat Destruction:** Disruption of delicate wetlands and aquatic ecosystems, leading to the loss of biodiversity seen within the diverse ecosystems within DuPont's city limits.

The long-term consequences of these impacts would be devastating for the City of DuPont, JBLM, and the communities within. The economic, environmental, and public health implications are substantial and must not be overlooked.
I urge the City of DuPont to prioritize the protection of the Vashon aquifer by:

1. Denying CalPortland's dewatering permit application.
2. Implementing comprehensive groundwater management plans to safeguard the aquifer for future generations.
3. Exploring alternative, sustainable mining methods that do not rely on aquifer depletion.

By taking a leadership role in protecting this invaluable resource, the City of DuPont can demonstrate its commitment to environmental stewardship and the well-being of its community. Thank you for your attention to this critical matter. I am available to discuss this issue further and provide any additional support as needed.

Sincerely,

Taylor Underwood
EPA Certified Watershed Manager

5 EA

6 DS

7 EA

8 DS City EA

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Date

6/29/2024

First Name *

Kelly

Last Name *

Unekis

Are you a resident of the City of DuPont, WA? *

- (●) Yes
- ( ) No

Are you a business owner? *

- ( ) Yes
- (●) No

Are you part of an Agency or Organization? *

- ( ) Yes
- (●) No
- ( ) Not relevant to my input

If you have concerns regarding the EARTH, please describe them below.

I am concerned about the impact that stirring up dirt related to the smelter plume will have unintended impact on thoss living close to the area as well as local wildlife. 1 EA

If you have concerns regarding the AIR QUALITY, please describe them below.

I don't like the idea of stirring up dust in the area of the smelter plume cloud. 2 EA

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.

I am concerned about the drawdown of the aquifer and the resulting damage to sequalichew creek. This area is habitat to native wildlife as well as native plants. In addition, in our current changing climate, water resources are more important than ever. The sequalichew trail also brings in people from outside dupont. Damaging the area, even through indirect action would make this a less desireable hiking location. 3 DS EA

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.

The wetlands provide habitat for other species of plants and animals and reduce fire risk by holding water in the environment rather than letting it run off and dry out. 4 EA

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.

The destruction of habitat in general and landmark trees, particularly endangered trees like the Pacific Yew should not be considered lightly. 5 EA

If you have concerns regarding NOISE, please describe them below.

This area is encroaching on housing areas and the increase in noise will not be welcome. 6 EA

If you have concerns regarding LAND USE, please describe them below.

Currently, this area is a nice wooded place to hike and maintains a buffer to the sequalichew creek trail. Even with an easement, an open hole devoid of trees is not a pleasant place to be. 7 EA

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.

The green wooded space is far more appealing than an open hole.

8 EA

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

If you have concerns regarding TRANSPORTATION, please describe them below.

If you have OTHER concerns not listed above, please describe them below.

This entire endeavor sounds terrible from the start. The impacts on local wildlife, habitat, and ecosystems laid out in the attached statements are fairly damning already. I can't believe this catastrophicly destructive proposal made it this far. Part of why I live here is the natural beauty that is easily accessible by the trails. I'm not sure why the city of Dupont would be so keen to destroy one of their best assets for a temporary influx of funds.

9 EA

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

(SEPA2021-002 comment period 6/14/2024-7/15/2024)

Pioneer Aggregates South Parcel Draft Environmental Impact Statement (EIS)

Comment Form

Input from the public regarding the Pioneer Aggregates South Parcel Project EIS is welcome. Please submit this form to share your comments. Note: Submitted comment forms are subject to the Public Records Act (RCW 42.56).

Date

7/2/2024

First Name *

Ben

Last Name *

VanBeurden

Are you a resident of the City of DuPont, WA? *

- (●) Yes
- ( ) No

Are you a business owner? *

- ( ) Yes
- (●) No

Are you part of an Agency or Organization? *

- ( ) Yes
- ( ) No
- (●) Not relevant to my input

If you have concerns regarding the EARTH, please describe them below.

If you have concerns regarding the AIR QUALITY, please describe them below.

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.

If you have concerns regarding NOISE, please describe them below.

If you have concerns regarding LAND USE, please describe them below.

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

If you have concerns regarding TRANSPORTATION, please describe them below.

If you have OTHER concerns not listed above, please describe them below.

For every complaint we the people make, people draft a response. The game goes on while the damage lasts forever. Every problem leads to a temporary solution which leads to new problems. I want to promote the idea that leaving nature alone will promote improved life for everyone.

1
EA

Damaging the ecosystem will certainly lead to know and unknown damage to life. I ask decision makers to approach decisions from a position of 100 or 1000 years instead of a 10 or 20 year plan. Protect DuPont for our kids and their kids.

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

(SEPA2021-002 comment period 6/14/2024-7/15/2024)

1 cont

Pioneer Aggregates South Parcel Draft Environmental Impact Statement (EIS)

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Date

6/26/2024

First Name *

Marcella

Last Name *

Velazquez

Are you a resident of the City of DuPont, WA? *

- (●) Yes
- ( ) No

Are you a business owner? *

- ( ) Yes
- (●) No

Are you part of an Agency or Organization? *

- ( ) Yes
- (●) No
- ( ) Not relevant to my input

If you have concerns regarding the EARTH, please describe them below.

The land will dry out due to lack of water during the hottest time of the year. With the threat of fires increasing every year having draining our source of water is disastrous, not to mention the environmental impact that will have on our already sensitive ecosystem.

1 EA

If you have concerns regarding the AIR QUALITY, please describe them below.

Without the greenery to filter out the heat and purify the air (due to lack of water during the hottest times of the year) what will we have as a barrier?

2 EA

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.

The whole ecosystem will collapse. The forest area will die back, all the animals will be displaced.

3 EA

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.

What will happen to all the wildlife that will be displaced for this project? Part of the beauty of living in DuPont is being surrounded by the beautiful green forest and living so close to wildlife. All that will be gone because the "new ecosystem" that will be created won't be able to sustain their needs.

4 EA Cal

If you have concerns regarding NOISE, please describe them below.

If you have concerns regarding LAND USE, please describe them below.

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

If you have concerns regarding TRANSPORTATION, please describe them below.

If you have OTHER concerns not listed above, please describe them below.

I would like to know how destroying an already sensitive ecosystem, for profit, is helping with climate change?

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

(SEPA2021-002 comment period 6/14/2024-7/15/2024)

5
EA

Pioneer Aggregates South Parcel Draft Environmental Impact Statement (EIS)

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Input from the public regarding the Pioneer Aggregates South Parcel Project EIS is welcome. Please submit this form to share your comments. Note: Submitted comment forms are subject to the Public Records Act (RCW 42.56).

Date
7/21/2024

First Name *
Wesley

Last Name *
Wagner

Are you a resident of the City of DuPont, WA? *
- (●) Yes
- ( ) No

Are you a business owner? *
- ( ) Yes
- (●) No

Are you part of an Agency or Organization? *
- ( ) Yes
- ( ) No
- (●) Not relevant to my input

If you have concerns regarding the EARTH, please describe them below.

If you have concerns regarding the AIR QUALITY, please describe them below.

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.

If you have concerns regarding NOISE, please describe them below.

If you have concerns regarding LAND USE, please describe them below.

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

If you have concerns regarding TRANSPORTATION, please describe them below.

If you have OTHER concerns not listed above, please describe them below.
The aquifer's limited water allowance will increase the risk of fire and floods. This will negatively affect wildlife and the ecosystem.

1
EA

Animals will also be impacted as their water source and vegetation will dry up.

The noise of construction and mining operations will cause increased noise in the area, especially when North Fort Lake will be developed.

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

(SEPA2021-002 comment period 6/14/2024-7/15/2024)

2
EA

Pioneer Aggregates South Parcel Draft Environmental Impact Statement (EIS)

Comment Form

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Date
6/21/2024

First Name *
Tom

Last Name *
Walrath

Are you a resident of the City of DuPont, WA? *
- ○ Yes
- ◉ No

What city do you reside in?

Are you a business owner? *
- ◉ Yes
- ○ No

Where do you do business?
Puget Sound Region

Are you part of an Agency or Organization? *
- ◉ Yes
- ○ No
- ○ Not relevant to my input

What is the name of the Agency or Organization?
T E Walrath Trucking, Inc.

If you have concerns regarding the EARTH, please describe them below.

If you have concerns regarding the AIR QUALITY, please describe them below.

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.

If you have concerns regarding NOISE, please describe them below.

If you have concerns regarding LAND USE, please describe them below.

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

If you have concerns regarding TRANSPORTATION, please describe them below.

If you have OTHER concerns not listed above, please describe them below.
Concerned that we need resources available to build our cities, counties and state.

1
EA

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

Cal Portland Support Letter 1 2024.pdf 210.19KB

(SEPA2021-002 comment period 6/14/2024-7/15/2024)

WALRATH LANDSCAPE SUPPLY

T.E. WALRATH TRUCKING, INC.

Enhancing Lives by Serving Others

WALRATH SAND PRODUCTS

June 21, 2024

Barb Kincaid, AICP
Director of Public Services
City of DuPont
1700 Civic Drive
DuPont, WA 98327

RE: Pioneer Aggregates South Parcel Project – SEPA 2021-002

Dear Ms. Kincaid:

I am writing on behalf of T. E. Walrath Trucking, Inc. in support of the Pioneer Aggregates South Parcel Project (SEPA 2021-002) and to comment on the recently released Draft Environmental Impact Statement (DEIS).

- We are a family operated trucking co. and landscape supplier with 125 employees
- We have landscape supply yards in Gig Harbor, Olympia and 2 in Tacoma
- We also have a marine division that specializes in offloading barges for local projects
- Our trucks are in the Dupont pit multiple times every day.

1 EA

We utilize many of the aggregates produced at the Dupont pit. They end up in projects and private homes all over our region. The cost of transportation is so high, having material sources close to the end users is vital. The economic burden is already pressing in on folks.

It is important that regulatory reviewers do not overlook the important economic contribution the Pioneer Aggregates facility makes to the regional economy and the businesses and livelihoods that depend on this resource.

Thank you for taking the time to review and consider these comments.

Sincerely,

Tom Walrath, Jr.
T. E. Walrath Trucking, Inc.

11405 - 24th Ave. E. • Tacoma, Washington 98445 • Bus: (253) 531-7499 • Fax: (253) 537-4531

Barbara Kincaid

From: Kate Walsh <3mcwals@gmail.com>
Sent: Tuesday, July 9, 2024 11:08 AM
To: Barbara Kincaid
Subject: Re: Expansion of CalPortland Mining and Destruction of Creek, Marsh, and Wet lands

PS Please include this additional cite for heat changes: Axios Seattle, Our heat waves are getting longer in Seattle and across Western Washington, Christine Clarridge, July 09, 2024.
Thanks

On Mon, Jul 8, 2024 at 5:56 PM Kate Walsh <3mcwals@gmail.com> wrote:

Dear Barbara,

Here is my comment opposing CalPortland's request to expand the mining operation in its South Parcel:

I oppose permitting CalPortland to expand mining operations in its South Parcel because of the destructive environmental impact that its proposed expansion will have on Sequalitchew Creek, the Sequalitchew Creek Trail, and the Trail slopes; the Edmond Marsh; four other wetlands in DuPont.

The **2015 DuPont Comprehensive Plan** (**DMC**) and the Critical Area Ordinance Chapter 25.105 both contain language that supports denying a permit expanding mining into the South Parcel. *See* **DMC 25.105.010** (stating the primary purposes of the chapter are to protect public helath safety and welfare by preventing adverse environmental impacts of development, endorsing a policy of no net loss of wetland and stream function, value, or area within DuPont, barring to the extent practicable adverse cumulative impacts to water quality, wetlands, stream corridors, and fish and wildlife habitats, using the best available science). And **DMC 25.105.010** expressly protects the public from injury, loss of life, property damage, or financial loss due to flooding, erosion, landslides, seismic events, soil subsidence or steep slope failures. 1 EA City

The **DMC** recognizes the value of mineral resource extraction, but it also requires that mining entities protect the natural enviroment's integrity and employ best management practices that protect the long-term integrity of the natural environment, water resources, adjacent land uses, and the long-term productivity of the resource lands. **Resource Land Goal LU-10, LU 10.3.** And **Natural Environment Goal NE-1** supports protecting DuPont's natural environment by meeting citizen's current needs without compromising the needs of future generations. The NE Goals serve to preserve environmentally sensitive areas and areas that constitute valuable natural and aesthetic resources. **NE 1.1, 1.2.** These goals support development and construction practices that minimize impacts on the environment, not that ignore or override developmental impacts on the environment.

CalPortland's DEIS violates the protective purposes of the DMC and the NE Goals in seeking to dewater the Vashon Aquifer and expand its gravel mining operation. CalPortland clearly acknowledges that in dewatering the aquifer, it will dry up the Sequalitchew Creek Ravine for extended months of the

year, thereby drying out the creek ravine's seeps and springs. That in turn will destroy the riparian vegetation and unique environment and recreational use of the Sequalitchew Creek trail, which DuPont residents and local visitors treasure and that positively influence the valuation and desireability of DuPont residential properties. 1 cont

CalPortland acknowledges but discounts the fact that dewatering the aquifer, drying out the creek, and reducing the seeps will increase the level of landslide hazard susceptibility within the Sequalitchew creek ravine. Ground water dynamics relating to dewatering a slope in a riparian corridor show that such dewatering definitely can lead to instability and landslides. CalPortland ignores or downplays the risk its proposed expansion will cause: riparian vegetative stress, soil erosion, soil compaction, increased ground water temperature, loss of animal and insect presence and diversity, loss of trees that provide shade, habitat for wildlife, and air purification. And of course, increased landslide hazard will drive out humans who live here or visit DuPont and seek the pleasure of walking the creek. It offers no meaningful mitigation plan to addrss the consequnces of its proposal. 2 EA Cal

Also as Washington faces hotter than usual summers, with lower precipitation, *see* University of Washington Climate Impacts Group, https://climate.washington.edu/climate-data/trendanalysisapp/, dewatering the Sequlitchew Creek ravine will create fire hazard in DuPont's growing community. And increased fire hazard will means increased fire-protection costs and tax burden on citizens. CalPortland does not address or offer to mitigate the potential fire hazards and costs of its dewatering proposal. 3 DS EA

Relatedly, CalPortland's plan to increase mining in its South parcel will significantly, adversely affect the wetlands, marshes and creeks, including that:
The West Edmonds marsh groundwater level will decrease by 9 feet, the Pond Lake water level will drop 2 feet, Wetlands numbers 8, 9, and 10 will be reduced by a foot, Old Fort Lake will drop .05 feet, The Kettle Wetland will evaporate, and the Sequalitchw Creek seeps and springs will dry up. And these groundwater reductions will be permanant, thus permanently causing loss of vegetation, stream flow, habitat, and ability to remove air pollutants. 4 DS EA

Other persons doubtless may respond to other issues, like the adverse effect of CalPortland's mining on the City of DuPont's water rights to the Vashon Aquifer. In closing, I'll only ask the City to reject CalPortland's mining plan that will destroy not just Sequalitchew Creek, but also multiple, essential elements of the quality of life upon which DuPont has prided itself: the green space, the family-friendly "your home town" atmosphere, the safe streets and focus on outdoor walking opportunities. CalPortland's plan will ride rough-shod over and destroy the very values that have promoted DuPont's growth and desirabilty in the last decades and will damage the value of residential owner's properties, by destroying a unique, close-to-home outdoor, recreational amenity. 5 EA

I oppose the permitting of the mining expansion of CalPortland's South Parcel and favor a "No Action" recommendation on its proposal.Thank you for this opportunity to comment.

Sincerely
Kate Walsh
2180 Palisade Boulevard
DuPont WA 98327

RECEIVED
JUL 17 2024
CITY OF DUPONT

Letter 231

Dear Ms. Kincaid,

Thank you for expanding the comment period. This comment specifically addresses how expanding gravel mining will destroy the value of homes in DuPont, destroying our community and most residents' primary investments. I submit it because the question was raised about whether there was evidence that expanding gravel mining operations as CalPortland wants affects residential property value.

Studies repeatedly have found that mining, including operating gravel mines and gravel pits, adjacent to homes significantly damage housing values. Professor Dianne Hite, professor of Economics at Auburn University, authored the much referred to study **The Impact of Operational Gravel Pits on House Values, Prof. Dianne Hite, Auburn University (2006); The effect of a sand/aggregate mine on property value, Valaria Simpson, Plumas News, July 15, (2024)** that affirmatively answers that question. Hite found a definite statistical correlation between property sale prices and the proximity of homes to gravel pits and open pit gravel minds. She found that homes adjacent to a gravel pit/mine lost about 30% of their market value, homes a mile from a pit or mine site lost 14.5% of their value, homes two miles from a pit or mine lost 8.9% of its market value, and homes that were three miles or more from a gravel pit or mine lost 4.9% of their value. This is understandable: operators of gravel pits, quarries, and mines remove vegetation, topsoil, and subsoil, damaging preexisting stream flows, in order to access the gravel resource they seek. ***Home Values Plummet from Quarries, Kill the Albion Quarry, citing Pemrial Institute (2005).***

The mining/open pit operations destroy home values by imposing : (1) Aquifer depletion and loss of wells or potable water source; (2) Contamination of drinking water, (3) Noise pollution from increased traffic, blasting, and other mining operations that adversely affect residents' health, (4) Degradation of air quality that damages citizen health, especially young and the elderly; (5) Light pollution that destroys residential atmosphere, (6) Vibrating heavy equipment and trucks and blasting, that aggravates earthquake fault lines, causes cracks in buildings, and promotes excess erosion, (7) Increased fire risk from causes including the storage of diesel fuel, petroleum hydraulic liquids, and other transmission fluids at open pits or mines, and (8) Destruction of community safety. ***Id.***; **US Study on the impact of pits and quarries on home prices, GravelWatch. org.wp-contract.**

1
EA
City

Even where, as here, a mining company may promise restoration of mining a decade down the road, after the extraction concludes and profits are collected by the company, municipalities must beware of the dangers of past mining history on residential values in its communities. **Beware the Dangers of Past Mining, Tom Backhouse, Mortgage Finance Gazette (August 2018)**. Past mining activity creates a risk of collapse of later-built housing developments, due to the historical mining. The hazard of collapse of a later built development, due to historical mining, is especially present when the mining activity was on or under a house or development and historical mining can reduce the value of property by 30%. **Id.**

From a residential real estate position, location is the paramount factor valuing residential property. Living close to certain businesses or facilities, including mining, can negatively affect overall property value. Value decreases near a dump, landfill, power plant or mine, or similar operation because of a business's increased traffic, industrial noise, and the light, air or water pollution. **Things that can hurt your property value, Jennifer Schmidt and Richard Haddaad, Homelight, February 25, 2023).** The effects of mining particularly include increased industrial traffic, noise, traffic pollution. But mining also brings explosive blasting, dust, serious threats to water courses and ecosystems, and air blasts, which are felt and heard by residents adjoining the mines or pits, and farther away. The vibrations from blasting and the mining process also cause cracks and structural and cosmetic damage to homes. ***Effects***

***of mine blasting on residential structures, Research Gate,* E. Fgad, J.L.Wilson (August 1, 2005); Home values plummet from Quarries**. Hite concluded that because loss of property value is greater the closer a home is to a gravel mine, gravel mines should be located far from existing residences, to minimize the negative financial cost and adverse health and safety consequences to homeowners of gravel mining activity. 1 cont

That continues to be true and for all the reasons discussed above the city should reject Cal Portland's plan to expand its mining operation at the cost of homeowners and the safety and health of DuPont citizens. CalPortland's plan will benefit CalPortland but will devalue DuPont homes and damage DuPont citizens' investments in their homes and community. CalPortland's legal obligation is to derive the greatest profit at the least cost from its mining operations for the financial benefit of its shareholders. It states that it is headquartered in Glendora California. Consistent with its capitalist and corporate duty it cares not about the destruction to DuPont's water and ecosystems that effectuating its proposal will cause to resources like Sequalitchew Creek or the foliage and streams surrounding it, or the future risk that historical mining will impose. Any proposal it puts forward or promises it makes about restoration and the effect of historical mining should be reviewed by an independent expert, so that a decision about the CalPortland plan is based on actual effects of the plan on Sesqualitchew Creek, the water tables and ecosystems here, and the value of homes in DuPont. 2 EA

For this reason too, I oppose the plan CalPortland puts forth. Thanks for extending the deadline and offering a further comment.

Sincerely,

Kate Walsh
2180 Palisade Boulevard
DuPont WA 98327

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Date
6/26/2024

First Name *
Rebecca

Last Name *
White

Are you a resident of the City of DuPont, WA? *
- (●) Yes
- ( ) No

Are you a business owner? *
- ( ) Yes
- (●) No

Are you part of an Agency or Organization? *
- ( ) Yes
- (●) No
- ( ) Not relevant to my input

If you have concerns regarding the EARTH, please describe them below.

If you have concerns regarding the AIR QUALITY, please describe them below.
I have asthma, the dust particles from this project and the fumes from machinery will make it hard to breathe for people with breathing issues. 1 EA

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.
The drinking water is already subpar, this will make it unusable. 2 DS

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.
Why would you want to displace our wildlife? Didn't that happen with the industrial park? Now that things have finally settled down from that, why make it worse? 3 EA

If you have concerns regarding NOISE, please describe them below.
This has the potential to be very noisy,given we live less than .25 miles from the proposed area. 4 EA

If you have concerns regarding LAND USE, please describe them below.

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.
We opted to retire in Dupont for the beauty of this community. We love having trails. Stop trying to take that away. 5 EA

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

If you have concerns regarding TRANSPORTATION, please describe them below.

We have enough issues with large trucks barreling through, this will only make things worse.

6
EA

If you have OTHER concerns not listed above, please describe them below.

We arein near drought conditions. This has a potential to cause wildfires, which will certainly add to air quality issues. Not to mention the potential to displace people from their homes. I also see people moving away, this will take the serenity out of this town.

7
EA

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

(SEPA2021-002 comment period 6/14/2024-7/15/2024)

Pioneer Aggregates South Parcel Draft Environmental Impact Statement (EIS)

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Date
7/13/2024

First Name *
Lacie

Last Name *
Whitted

Are you a resident of the City of DuPont, WA? *
- ○ Yes
- ◉ No

What city do you reside in?
Lacey

Are you a business owner? *
- ○ Yes
- ◉ No

Are you part of an Agency or Organization? *
- ○ Yes
- ○ No
- ◉ Not relevant to my input

If you have concerns regarding the EARTH, please describe them below.

If you have concerns regarding the AIR QUALITY, please describe them below.

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.

Do not allow the local gravel quarry to expand and dewater the aquifer. This will have a negative impact on the community and the local vegetation and wildlife.

1
EA

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.

If you have concerns regarding NOISE, please describe them below.

If you have concerns regarding LAND USE, please describe them below.

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

If you have concerns regarding TRANSPORTATION, please describe them below.

If you have OTHER concerns not listed above, please describe them below.

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

(SEPA2021-002 comment period 6/14/2024-7/15/2024)

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Date
7/20/2024

First Name *
Corrine

Last Name *
Wilkinson

Are you a resident of the City of DuPont, WA? *
- (●) Yes
- ( ) No

Are you a business owner? *
- ( ) Yes
- (●) No

Are you part of an Agency or Organization? *
- ( ) Yes
- (●) No
- ( ) Not relevant to my input

If you have concerns regarding the EARTH, please describe them below.

If you have concerns regarding the AIR QUALITY, please describe them below.

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.

If you have concerns regarding NOISE, please describe them below.

If you have concerns regarding LAND USE, please describe them below.

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

If you have concerns regarding TRANSPORTATION, please describe them below.

If you have OTHER concerns not listed above, please describe them below.

Concerned about all of these areas. We are so careful about everything else that is proposed for our community, but not about the noise, mess, traffic, environmental change and disruption this will create?

1
EA

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

(SEPA2021-002 comment period 6/14/2024-7/15/2024)

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Date

6/29/2024

First Name *

Portland

Last Name *

Williams

Are you a resident of the City of DuPont, WA? *

- (●) Yes
- ( ) No

Are you a business owner? *

- ( ) Yes
- (●) No

Are you part of an Agency or Organization? *

- ( ) Yes
- (●) No
- ( ) Not relevant to my input

If you have concerns regarding the EARTH, please describe them below.

Protecting our earths aquifers is so very important. When we know ahead of authorizing mining that an aquifer will be dewatered, we must, as responsible citizens consider the impact and thoroughly understand where this will impact the surrounding land and the the far reaching implications for this communities future.

1 DS EA

If you have concerns regarding the AIR QUALITY, please describe them below.

When trees, plants and grass die from no longer having the water supply, science tells us this affects our air. Please ensure a contingency plan is in place before dewatering the aquifer for gravel mining.

2 EA

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.

The proposal, on pg. 3.1-14, clearly states this effect will dewater the Vashon Aquifer and I feel the only responsible thing is to require a plan for how to avoid taking such an important natural resource away from this earth that will never come back before allowing any gravel mining.

3 DS EA

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.

Surface water feeds the aquifer, our streams and wetlands depend on the aquifer. What is the plan to ensure these resources stay healthy and are not affected?

4 DS EA

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.

We must consider the organisms we cannot see as well as the animals we can see when deciding to dewater an aquifer. As a rain forest type climate in our community where is the study that will show the damage and long range impact of eliminating a water source for organisms living in our environment?

5 EA

If you have concerns regarding NOISE, please describe them below.

Noise should be considered for the quality of life of the residents who live near where the mining will be implemented. There should be no noise increase for any resident of our community.

6 EA

If you have concerns regarding LAND USE, please describe them below.

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

It is important to maintain and even contribute to the over arching aesthetic of our community. One of trails and natural beauty where families and individuals can have a healthy area to thrive when outside right within steps of their residences.

7 EA

If you have concerns regarding TRANSPORTATION, please describe them below.

No more large trucks going in and out of this community! Hear the residents when we say, we want alternatives to trucking in our community!

8 EA

If you have OTHER concerns not listed above, please describe them below.

Our community needs resources like medical and emergency services. High end homes that contribute tax dollars are preferred to selling off the land for mining in my opinion.
Overall we must educate ourselves about aquifer=gets in our earth and how they support the unique environment we are living in before we destroy them!

9 EA

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

(SEPA2021-002 comment period 6/14/2024-7/15/2024)

RECEIVED
JUL 2 2024
CITY OF DUPONT

The City of DuPont
Care of Barb Kincaid
1700 Civic Dr.
DuPont, WA 98327

July 2, 2024

RE: CalPortland South Parcel DEIS Comments

I am extremely concerned about the proposed CalPortland South Parcel mine expansion, it's impact on the ground water level due to cutting through the Vashon Aquifer, the impact this would have on the surrounding vegetation, and the resulting potential increase of fire danger for our residents, our homes and our businesses. Therefore, I do not recommend approving the expansion of the mine unless there are mitigations that ensure that the groundwater level will not be lowered. One such mitigation would be to limit the mine expansion to areas above the aquifer.

1
EA
DS

Of specific concern is the projected drop in the groundwater level of up to nine feet in Edmonds Marsh. Other areas of concern include the drop in ground water level in Pond Lake; wetlands 8, 9, and 10; and Old Fork Lake. In addition, another concern is the elimination of the Kettle Wetland and that the seeps and springs feeding Sequalitchew Creek will likely dry up. This drop in groundwater level will likely dry out the vegetation surrounding the City of DuPont.

2
DS

It is important to note climate conditions have worsened since the 2011 Settlement Agreement was prepared. The City of DuPont is surrounded by forest and climate change is already increasing the risk of fire to our residents. The resulting decrease in the ground water level from the mine expansion will likely put the residents of DuPont at even a greater risk of fire danger.

3
DS
Cal
City

While restoring Sequalitchew Creek is a goal we should all be working toward, I do not believe it should be dependent upon dewatering the Vashon Aquifer. As outlined above, the decrease in the groundwater level throughout the area will likely have a huge negative environmental impact on the vegetation and the wildlife in the area. We would simply be changing one environmental problem for another. This new environmental problem likely increases the risk of fire for the residents of DuPont.

4
EA

Thank you for your consideration and work on this very important matter.

Sincerely,

Michael Winkler

Michael Winkler
1448 Montgomery Street
DuPont, WA 98327
253-459-4756

Letter 237

RECEIVED
JUL 2 2024
CITY OF DUPONT

The City of DuPont
Care of Barb Kincaid
1700 Civic Dr.
DuPont, WA 98327

July 2, 2024

RE: CalPortland South Parcel DEIS Comments

I wish to take a moment to share concerns about the proposed CalPortland South Parcel mine expansion and the need for mitigations that ensure that the expansion doesn't increase the fire danger to the vegetation and to our residences. Unless the mitigations can ensure that the surrounding groundwater table isn't reduced, I recommend that mining be limited to the area above the Vashon Aquifer.

1 DS Cal EA

Climate change has become an increasing problem for all of us, with a special note of the increased fires on the west coast, to include western Washington. The City of DuPont is surrounded by forest and the projected decrease in the ground water level from the mine expansion will likely make these forests more susceptible to fire. This, in turn, would put the residents of DuPont at a higher risk of fire danger.

2 DS Cal City

A review of the documents shows that the projected drop in the groundwater level in Edmonds Marsh is up to nine feet. There is also a projected drop in ground water levels in Pond Lake; wetlands 8, 9, and 10; and Old Fork Lake. Also, the Kettle Wetland would be eliminated and Sequalitchew Creek will likely dry up. Again, the impact on vegetation and the potential increase in fire danger is very concerning.

3 DS EA

Thank you for reviewing my concerns and for ensuring the safety of our residences and the protection of our surrounding environment.

Sincerely,

Nanette Winkler

Nanette Winkler
1448 Montgomery Street
DuPont, WA 98327
253-441-1282

Pioneer Aggregates South Parcel Draft Environmental Impact Statement (EIS)

Comment Form

Input from the public regarding the Pioneer Aggregates South Parcel Project EIS is welcome. Please submit this form to share your comments. Note: Submitted comment forms are subject to the Public Records Act (RCW 42.56).

Date
7/6/2024

First Name *
Zhara

Last Name *
Zwerling

Are you a resident of the City of DuPont, WA? *
- (●) Yes
- ( ) No

Are you a business owner? *
- ( ) Yes
- (●) No

Are you part of an Agency or Organization? *
- ( ) Yes
- (●) No
- ( ) Not relevant to my input

If you have concerns regarding the EARTH, please describe them below.
As a 21 year resident.. I am very upset with this news.

With all the work that has been down over the years to correct the damage that DuPont Chemical did, I cannot understand how this could even be a considered. 1 EA

If you have concerns regarding the AIR QUALITY, please describe them below.
Lots concerns about the air quality. 2 EA

If you have concerns regarding the GROUNDWATER / AQUIFER, please describe them below.
Very concerned, we also ready have water issue of contamination. 3 EA

If you have concerns regarding SURFACE WATER / STREAMS / WETLANDS, please describe them below.
I have huge concerns about our surface water, streams and wetlands. 4 EA

If you have concerns regarding FISH / PLANTS / ANIMALS, please describe them below.
This is not good for fish, plants or animals. Please don't let this happen to our little town! 5 EA

If you have concerns regarding NOISE, please describe them below.
We have to deal with noise from JBLM but this would be a daily noise and it will be awful! No one will want to live here! 6 EA

If you have concerns regarding LAND USE, please describe them below.
They will lie and it will be a terrible choice for our town! 7 EA

If you have concerns regarding AESTHETICS / VISUAL, please describe them below.

They will ruin our beautiful trails!

8 EA

If you have concerns regarding CULTURAL RESOURCES, please describe them below.

If you have concerns regarding TRANSPORTATION, please describe them below.

We have so many issues already with all the trucks in town who don't follow the rules and drive through our little town and many times running of plants and grass to turn around.

9 EA

If you have OTHER concerns not listed above, please describe them below.

It's seems that all many city official's care about it money for the corporation in town who don't live here. They don't care about our town!

10 EA

If you have documents or images that support your comments and / or concerns, please combine them and upload the combined document below. Only one document may be uploaded.

(SEPA2021-002 comment period 6/14/2024-7/15/2024)