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Exhibit 2.n

Maintenance and Source Control Manual



Maintenance and Source Control Manual CHAMPIONS CENTRE

DuPont, Washington

For

**Mustard Seed Legacy Dev. LLC
32706 Mountain Hwy E
Eatonville, WA 98328**

By

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Section 1 – Project Description

Project Name: Champions Centre

Permit Number(s): TBD

Project Site Address: XXX Barksdale Ave.
DuPont, WA 98237

Parcel Number(s): 0119362039, 0119362009, 0119362012, & 0119362043

Property Zoning: Commercial (COM)

Legal Description:

PARCEL A:

TAX PARCEL NUMBERS 0119362039, 0119362009 & 0119362012

THAT PORTION OF THE NORTHWEST QUARTER OF SECTION 36, TOWNSHIP 19 NORTH, RANGE 1 EAST, W.M., IN PIERCE COUNTY, WASHINGTON, LYING SOUTHEASTERLY OF WILMINGTON DRIVE (RE-ALIGNED DUPONT-STEILACOOM ROAD), DESCRIBED AS FOLLOWS:

COMMENCING AT THE BRONZE MONUMENT AT THE INTERSECTION OF THE CENTERLINE OF BARKSDALE AVENUE AND THE NORTHERLY LINE OF THE NORTHERN PACIFIC RAILROAD COMPANY'S RIGHT OF WAY, AS SHOWN ON THE PLAT OF REPLAT OF THE VILLAGE DUPONT, ACCORDING TO PLAT RECORDED IN VOLUME 15 OF PLATS, PAGE 65; THENCE NORTH 69°47'46" EAST 41.36 FEET ALONG SAID RAILROAD RIGHT OF WAY TO THE NORTHERLY LINE OF SAID BARKSDALE AVENUE; THENCE ALONG SAID NORTHERLY LINE OF BARKSDALE AVENUE, NORTH 63°41'54" WEST 679.50 FEET TO THE POINT OF BEGINNING; THENCE NORTH 54°19'24" WEST 6.81 FEET TO THE SOUTHEASTERLY CORNER OF BLOCK "L" IN SAID REPLAT OF THE VILLAGE OF DUPONT; THENCE NORTH 35°40'36" EAST 45.10 FEET TO THE SOUTHERLY LINE OF A 15 FOOT EASEMENT GRANTED TO THE PIERCE COUNTY SCHOOL DISTRICT 7 FOR PATH;

THENCE ON SAID SOUTHERLY LINE OF EASEMENT, EASTERLY 521.53 FEET TO THE WESTERLY LINE OF DUPONT-STEILACOOM HIGHWAY, AS ESTABLISHED IN DEED RECORDED DECEMBER 11, 1942 UNDER RECORDING NO. 1311721; THENCE SOUTHERLY ALONG SAID WESTERLY LINE 219 FEET, MORE OR LESS, TO THE NORTHERLY LINE OF BARKSDALE AVENUE; THENCE NORTH 63°41'54" WEST, ALONG SAID NORTHERLY LINE TO THE POINT OF BEGINNING;

EXCEPT THAT PORTION AS CONDEMNED IN DECREE OF APPROPRIATION ENTERED MARCH 11, 1988, IN PIERCE COUNTY SUPERIOR COURT CAUSE NO. 87-2-08765-1.

PARCEL B:

TAX PARCEL NUMBER 0119362043:

THAT PORTION OF THE SOUTHWEST QUARTER OF SECTION 25 AND OF THE NORTHWEST QUARTER OF SECTION 36, TOWNSHIP 19 NORTH, RANGE 1 EAST, W.M., CITY OF DUPONT, PIERCE COUNTY, WASHINGTON, BEING MORE PARTICULARLY DESCRIBED AS FOLLOWS:

COMMENCING AT FORT LEWIS MONUMENT NO. 262, BEING A 6"X6" CONCRETE MONUMENT WITH LEAD AND TACK, AS SHOWN ON THAT RECORD OF SURVEY BY ESM, INC. RECORDED UNDER PIERCE COUNTY RECORDING NO. 9303050249; THENCE SOUTH 87°57'04" EAST, 572.46 FEET TO THE WESTERLY RIGHT-OF-WAY MARGIN OF DUPONT - STEILACOOM ROAD; THENCE ALONG SAID WESTERLY MARGIN, SOUTH 01°42'01" WEST 1,488.92 FEET TO THE SOUTHEASTERLY CORNER OF THE PLAT OF "BELL HILL" AS ECORDED UNDER PIERCE COUNTY RECORDING NO. 9109060562 AND THE TRUE POINT OF BEGINNING; THENCE CONTINUING ALONG SAID WESTERLY MARGIN THE FOLLOWING COURSES: SOUTH 01°42'01" WEST, 74.27 FEET TO A POINT OF CURVATURE; SOUTHWESTERLY 589.42 FEET ALONG THE ARC OF A TANGENT CURVE TO THE RIGHT, HAVING A RADIUS OF 1846.32 FEET, THROUGH A CENTRAL ANGLE OF 19°49'02" TO A POINT OF TANGENCY; SOUTH 21°31'03" WEST, 234.08 FEET; SOUTH 31°28'47" WEST, 758.44 FEET TO THE SOUTHERLY LINE OF A 15 FOOT WIDE EASEMENT GRANTED TO PIERCE COUNTY SCHOOL DISTRICT NO. 7 FOR A PATH BY INSTRUMENT RECORDED UNDER PIERCE COUNTY RECORDING NO. 1604647; THENCE ALONG SAID SOUTHERLY LINE, THE FOLLOWING COURSES: N 73°58'12" W, 6.14 FEET; N 76°55'56" W, 137.26 FEET; N 80°45'26" W, 149.55 FEET; NORTH 83°19'26" WEST, 3.52 FEET TO THE SOUTHEASTERLY LINE OF BLOCK "L" AS SHOWN ON THE "REPLAT OF THE VILLAGE OF DUPONT" AS RECORDED IN VOLUME 15 OF PLATS, PAGE 66, RECORDS OF PIERCE COUNTY, WASHINGTON; THENCE ALONG THE SOUTHEASTERLY LINE OF SAID BLOCK "L" AND ALONG THE EASTERLY LINE OF THAT TRACT OF LAND CONVEYED BY DEED RECORDED UNDER RECORDING NO. 8609160527, NORTH 37°31'09" EAST, 421.17 FEET; THENCE ALONG THE EASTERLY AND NORTHEASTERLY LINES OF SAID TRACT, THE FOLLOWING COURSES: N 50°54'48" W, 39.71 FEET; N 20°15'28" E, 177.79 FEET; N 08°06'30" E, 148.69 FEET; N 18°28'36" E, 97.46 FEET; N 10°27'09" W, 109.27 FEET; N 10°49'00" E, 83.70 FEET; N 39°55'59" W, 402.16 FEET; N 49°44'03" W, 138.48 FEET; N 41°21'42" W, 83.79 FEET;

NORTH 47°49'04" WEST, 99.24 FEET TO THE SOUTHERLY LINE OF SAID PLAT OF "BELL HILL"; THENCE ALONG SAID SOUTHERLY LINE, THE FOLLOWING COURSES: N 86°09'51" E, 566.26 FEET; S 30°02'50" E, 66.31 FEET; N 81°03'07" E, 56.42 FEET; N 76°19'50" E, 49.78 FEET; S 80°24'24" E, 25.68 FEET; S 86°11'31" E, 41.36 FEET;

S 77°20'45" E, 37.53 FEET; N 82°37'33" E, 40.92 FEET; N 83°03'30" E, 29.71 FEET; S 71°21'32" E, 35.46 FEET; S 73°42'35" E, 28.67 FEET; S 61°30'59" E, 58.65 FEET; N 87°41'02" E, 42.60 FEET; S 37°31'32" E, 35.01 FEET; N 74°09'45" E, 57.08 FEET; S 88°17'59" E, 24.03 FEET TO THE TRUE POINT OF BEGINNING.

The Champions Centre project contains 4 existing parcels. The overall combined parcel area of the 4 parcels is 927,027 square feet (21.28 acres). This commercial project consists of a Boundary Line Adjustment to reduce the number of lots from 4 parcels into 3 parcels. Parcels A, B & C.

Parcel A will be 143,519 square feet (3.295 acre). This will be a commercial lot that will include the construction of approximately 25,892 square foot Religious Assembly that will have a maximum congregation occupancy of 350 people. The architectural footprint for this Religious Assembly is unique to allow for the existing grove of Landmark Oregon White Oak Trees that sit on an existing knoll to be protected and remain on-site. This property will also have a total of 135 parking stalls. The parking stalls will include 8 electric vehicle stalls, 4 standard ADA stalls, 1 van ADA stall and 122 standard stalls. This property will be served by Public Sewer & Water and will have on-site storm filter system(s) that will provide quality treatment of on-site stormwater runoff. After treatment onsite stormwater runoff will be conveyed to an on-site infiltration system which will provide quantity mitigation.

Parcel B will be 41,586 square feet (0.955 acres). This will be a commercial lot that will include the construction of approximately 3,000 square foot Eating and Drinking Establishment. The maximum occupancy is unknown at this time. This property will also have a total of 38 parking stalls. The parking stalls will include 10 electric vehicle stalls, 1 standard ADA stall, 1 van ADA stall and 26 standard stalls. This property will be served by Public Sewer & Water and will have an on-site cartridge-style storm filter system which will provide quality mitigation. Treated stormwater runoff will then be conveyed to and on-site stormwater infiltration system.

Parcel C will be 741,921 square feet (17.032 acres). This will include an existing wetland, wetland buffer, stream, stream buffer and Fema Flood Zone A per panel 53053C0526E effective date 3/7/2017. This parcel will be deeded to the City of DuPont upon the recording of the Boundary Line Adjustment.

Section 2 –Maintenance Importance and Intent

The importance of maintenance for the proper functioning of stormwater control facilities cannot be over-emphasized. A substantial portion of failures (clogging of filters, resuspension of sediments, loss of storage capacity, etc.) are due to inadequate maintenance. Stormwater BMP maintenance is essential to ensure that BMPs function as intended throughout their life cycle.

The fundamental goals of maintenance activities are to ensure the entire flow regime and treatment train designed for this site continue to fully function. For this site these include:

- Maintain designed infiltration capacity.

- Maintain ability to safely convey design stormwater flows.
- Maintain ability to treat stormwater runoff quality.
- Preserve soil and plant health, as well as stormwater flow contact with plant and soil systems.
- Clearly identify systems so they can be protected.
- Keep maintenance costs low.
- Prevent large-scale or extensive stormwater system failures.
- Prevent water quality violations or damage to downstream properties.

The intent of this section and manual is to pass on to the responsible party(s) all the information critical to understand the design of the system, risks and considerations for proper use, suggestions for maintenance frequencies, and cost so that realistic budgets can be established.

Section 3 – Responsible Parties

Onsite maintenance responsibilities for the conveyance system, cartridge filter system(s) and infiltration facilities will be the responsibility of the property owner. The City of DuPont will be responsible for maintaining the offsite storm drainage system, pervious walkway, and the associated conveyance piping/dispersion trench that flows through Parcel A. Refer to the approved plans for location of the dispersion trench and pervious pathway.

Section 4 – Facilities Requiring Maintenance

Stormwater Structures

Catch Basins and associated piping (onsite) – Private.

Catch Basins and associated piping (offsite) – Public.

Cartridge-style Stormwater Filter

PerkFilter for Parcel A-Lower – Private.

PerkFilter for Parcel A-Upper – Private.

PerkFilter for Parcel B. – Private.

Infiltration Systems

Infiltration Trench for Parcel A and Parcel B – Private

Pervious Pathway – Public

Dispersion Trench - Public

Section 5 – Maintenance Instructions

The parties responsible for maintenance must review and apply the maintenance requirements contained herein. These maintenance instructions outline conditions for determining if maintenance actions are required, as identified through inspection. However, they are not

*intended to be measures of the facility's required condition at all times between inspections. Exceedance of these conditions at any time between inspections or maintenance activity does not automatically constitute a violation of these standards. However, based upon inspection observations, the inspection and maintenance presented in the checklists shall be adjusted to minimize the length of time that a facility is in a condition that requires a maintenance action. For facilities **not owned** and maintained by the city, a log of maintenance activity that indicates what actions were taken must be kept on site and be available for inspection by the city.*

Responsibility of Property Owners

An infiltration trench with cartridge-style water quality filters system (PerkFilter) will be installed to capture, treat, and infiltrate runoff from the project for both Parcels A and B. In the case of Parcel A there will be two (2) PerkFilter systems installed (Lower and Upper).

Conveyance Systems: Maintenance should be performed when sediment and debris accumulate, or the system is damaged. Refer to maintenance checklist in the appendix of this document.

PerkFilter System(s): Maintenance should be performed in accordance with the Manufacturers' recommended methods and timing. Refer to maintenance checklists within the appendix of this document.

Catch Basins & Covers: Maintenance should be performed when trash or debris accumulates, (sedimentation occurs or the structure is damaged. Refer to maintenance checklists in the appendix.

Responsibility of the City of DuPont

Sidewalks located within the City Right-of-Way along Barksdale Avenue and DuPont-Steilacoom Road will be constructed of pervious concrete, allowing stormwater to infiltrate. Currently, existing structures located on DuPont-Steilacoom Road capture stormwater and convey it onto the existing parcel. This pipe will be extended through the project site and directed to a proposed dispersion trench located near the wetland.

Catch Basin & Cover: Maintenance should be performed when trash or debris accumulates, (sedimentation occurs or the structure is damaged. Refer to maintenance checklists in the appendix.

Conveyance Systems: Maintenance should be performed when sediment and debris accumulate, or the system is damaged. Refer to maintenance checklist in the appendix.

Pervious Pathway: Maintenance should be performed when trash or debris accumulates, sedimentation occurs, the structure is damaged, or performance does not meet design expectations. Refer to maintenance checklists in the appendix.

Dispersion Trench: Maintenance should be performed when trash or debris accumulates, sedimentation occurs, the structure is damaged, or performance does not meet design expectations.

Section 6 – Vegetation Maintenance

Plant Maintenance:

- All required landscaping shall be maintained for the life of the project.
- Plants shall be maintained in a vigorous and healthy condition, free from diseases, pests, and weeds.
- All landscape areas shall be kept free of trash.
- Plants lost due to lifecycle or disease shall be replaced within 180 days, during the spring or fall growing season. Replacement plants shall meet current plant size and irrigation standards.
- Plant maintenance standards apply for the life of the project and to all future property owners.

Tree Pruning:

- All plant materials shall be pruned and trimmed as necessary to maintain a healthy growing condition or to prevent primary limb failure.
- Pruning of trees shall be limited to thinning, windowing, or skirting, unless otherwise restricted by critical area regulations.
 - Thinning: Removal of foliage evenly through the tree crown maintaining tree form and health. Not more than one quarter of the total leaf area is removed.
 - Windowing: The practice of creating a “window” within the tree crown. The overall crown remains intact. When windowing one side of a tree, it may be necessary to prune the opposite side of the tree to maintain balance.
 - Skirting: The practice of opening up views by removing the lower limbs of a tree. As a rule, do not limb up more than one-third of the tree’s visible height.

Removal of Danger, Hazard, and Diseased Trees:

- Trees required to be retained pursuant to an approved conservation plan, landscape plan, or other similar plan or requirement shall not be removed unless it is demonstrated to the satisfaction of the city that a hazard exists to public safety, the safety of public or private property, or the health of surrounding trees (e.g. there is a significant chance of topping in high winds). The following requirements shall apply to the removal of a danger, hazard, or diseased tree in such areas:
 - The landowner shall submit a report and replanting plan prepared by a registered landscape architect, professional forester, or other expert approved by the Department to document the hazard, the specific actions that must occur to abate the threat, and the schedule for replanting.
 - Trees shall not be removed until after consultation and confirmation by the city that removal is necessary, unless hazard tree(s) are determined to pose an imminent threat or danger to public health or safety, or to public or private property, or serious environmental degradation.
 - Restoration plans shall consider retention of snags for wildlife habitat.
- Developer responsibility for maintenance of trees, including removal or replacement of diseased, dead, or dying trees, shall be as follows:

- Responsibility for maintaining trees shall remain in effect until such time as the property sale occurs. Upon the property sale, the new owner shall assume responsibility for maintenance.

Maintenance shall include care and pruning per ANSI 300 Standard Practices for trees, shrubs, and other woody plant maintenance. Ensure that a minimum of one (1) inch of water is supplied each week to restoration areas between May 1 and October 15 for at least the first two years following initial planting. The calculated amount of required water shall include both natural rainfall and temporary irrigation. Refer to landscape plans for additional information.

See Landscape Plan for further information.

Section 7 – Pollution Source Control Measures

Typical Commercial Pollution Source Control BMPs per Volume 4 have been provided and may be reviewed in Appendix C.

Section 8 – Annual Cost of Maintenance

The annual maintenance costs of the systems are estimated as follows:

City of DuPont's Responsibilities: \$2,000/year

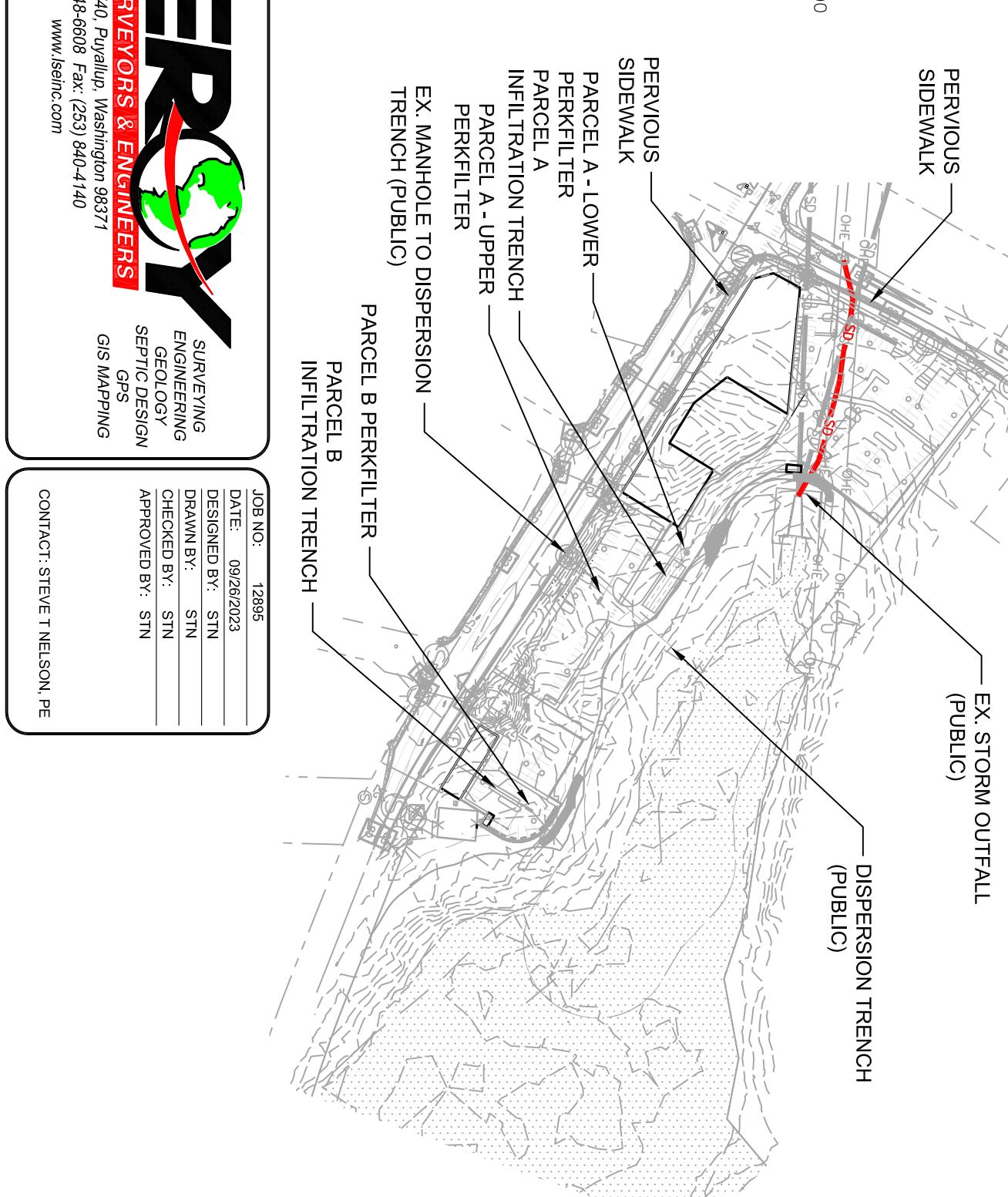
- Conveyance Piping and Dispersion Trench: \$1,000
- Pervious Pathway/Sidewalk: \$1,000

Property Owner's Responsibilities: \$5,500/year Total

- Infiltration Trench – Parcel A: \$400
- Conveyance Piping – Parcel A: \$600
- PerkFilter – Parcel A-Lower: \$750
- PerkFilter – Parcel A-Upper: \$750
- Vegetation Maintenance: \$1,200
- Infiltration Trench – Parcel B: \$400
- Conveyance Piping – Parcel B: \$300
- PerkFilter – Parcel B: \$500
- Vegetation Maintenance: \$600

Appendix A

Project Site Map



Appendix B

Maintenance Checklists

Table V-A.5: Maintenance Standards - Catch Basins

Maintenance Component	Defect	Conditions When Maintenance is Needed	Results Expected When Maintenance is performed
General	Trash & Debris	Trash or debris which is located immediately in front of the catch basin opening or is blocking inletting capacity of the basin by more than 10%. Trash or debris (in the basin) that exceeds 60 percent of the sump depth as measured from the bottom of basin to invert of the lowest pipe into or out of the basin, but in no case less than a minimum of six inches clearance from the debris surface to the invert of the lowest pipe. Trash or debris in any inlet or outlet pipe blocking more than 1/3 of its height. Dead animals or vegetation that could generate odors that could cause complaints or dangerous gases (e.g., methane).	No Trash or debris located immediately in front of catch basin or on grate opening. No trash or debris in the catch basin. Inlet and outlet pipes free of trash or debris. No dead animals or vegetation present within the catch basin.
	Sediment	Sediment (in the basin) that exceeds 60 percent of the sump depth as measured from the bottom of basin to invert of the lowest pipe into or out of the basin, but in no case less than a minimum of 6 inches clearance from the sediment surface to the invert of the lowest pipe.	No sediment in the catch basin
	Structure Damage to Frame and/or Top Slab	Top slab has holes larger than 2 square inches or cracks wider than 1/4 inch. (Intent is to make sure no material is running into basin). Frame not sitting flush on top slab, i.e., separation of more than 3/4 inch of the frame from the top slab. Frame not securely attached	Top slab is free of holes and cracks. Frame is sitting flush on the riser rings or top slab and firmly attached.
	Fractures or Cracks in Basin Walls/ Bottom	Maintenance person judges that structure is unsound. Grout fillet has separated or cracked wider than 1/2 inch and longer than 1 foot at the joint of any inlet/outlet pipe or any evidence of soil particles entering catch basin through cracks.	Basin replaced or repaired to design standards. Pipe is regROUTed and secure at basin wall.
	Settlement/ Mis-alignment	If failure of basin has created a safety, function, or design problem.	Basin replaced or repaired to design standards.
	Vegetation	Vegetation growing across and blocking more than 10% of the basin opening. Vegetation growing in inlet/outlet pipe joints that is more than six inches tall and less than six inches apart.	No vegetation blocking opening to basin. No vegetation or root growth present.
	Contamination and Pollution	See Table V-A.1: Maintenance Standards - Detention Ponds	No pollution present.
Catch Basin Cover	Cover Not in Place	Cover is missing or only partially in place. Any open catch basin requires maintenance.	Cover/grate is in place, meets design standards, and is secured
	Locking Mechanism Not Working	Mechanism cannot be opened by one maintenance person with proper tools. Bolts into frame have less than 1/2 inch of thread.	Mechanism opens with proper tools.
	Cover Difficult to Remove	One maintenance person cannot remove lid after applying normal lifting pressure. (Intent is keep cover from sealing off access to maintenance.)	Cover can be removed by one maintenance person.
Ladder	Ladder Rungs Unsafe	Ladder is unsafe due to missing rungs, not securely attached to basin wall, misalignment, rust, cracks, or sharp edges.	Ladder meets design standards and allows maintenance person safe access.
Metal Grates (If Applicable)	Grate opening Unsafe	Grate with opening wider than 7/8 inch.	Grate opening meets design standards.
	Trash and Debris	Trash and debris that is blocking more than 20% of grate surface inletting capacity.	Grate free of trash and debris.
	Damaged or Missing.	Grate missing or broken member(s) of the grate.	Grate is in place, meets the design standards, and is installed and aligned with the flow path.

Table V-A.6: Maintenance Standards - Debris Barriers (e.g., Trash Racks)

Maintenance Components	Defect	Condition When Maintenance is Needed	Results Expected When Maintenance is Performed
General	Trash and Debris	Trash or debris that is plugging more than 20% of the openings in the barrier.	Barrier cleared to design flow capacity.
	Damaged/ Missing Bars.	Bars are bent out of shape more than 3 inches.	Bars in place with no bends more than 3/4 inch.
		Bars are missing or entire barrier missing.	Bars in place according to design.
Metal	Inlet/Outlet Pipe	Bars are loose and rust is causing 50% deterioration to any part of barrier.	Barriers replaced or repaired to design standards.
		Debris barrier missing or not attached to pipe	Barrier firmly attached to pipe

Table V-A.7: Maintenance Standards - Energy Dissipators

Maintenance Components	Defect	Conditions When Maintenance is Needed	Results Expected When Maintenance is Performed
External:			
Rock Pad	Missing or Moved Rock	Only one layer of rock exists above native soil in area five square feet or larger, or any exposure of native soil.	Rock pad replaced to design standards.
	Erosion	Soil erosion in or adjacent to rock pad.	Rock pad replaced to design standards.
Dispersion Trench	Pipe Plugged with Sediment	Accumulated sediment that exceeds 20% of the design depth.	Pipe cleaned/flushed so that it matches design.
	Not Discharging Water Properly	Visual evidence of water discharging at concentrated points along trench (normal condition is a "sheet flow" of water along trench). Intent is to prevent erosion damage.	Trench redesigned or rebuilt to standards.
	Perforations Plugged.	Over 1/2 of perforations in pipe are plugged with debris and sediment.	Perforated pipe cleaned or replaced.
	Water Flows Out Top of "Distributor" Catch Basin.	Maintenance person observes or receives credible report of water flowing out during any storm less than the design storm or its causing or appears likely to cause damage.	Facility rebuilt or redesigned to standards.
	Receiving Area Over-Saturated	Water in receiving area is causing or has potential of causing landslide problems.	No danger of landslides.
Internal:			
Manhole/Chamber	Worn or Damaged Post, Baffles, Side of Chamber	Structure dissipating flow deteriorates to 1/2 of original size or any concentrated worn spot exceeding one square foot which would make structure unsound.	Structure replaced to design standards.
	Other Defects	See Table V-A.5: Maintenance Standards - Catch Basins	See Table V-A.5: Maintenance Standards - Catch Basins

Table V-A.8: Maintenance Standards - Typical Biofiltration Swale

Maintenance Component	Defect or Problem	Condition When Maintenance is Needed	Recommended Maintenance to Correct Problem
General	Sediment Accumulation on Grass	Sediment depth exceeds 2 inches.	Remove sediment deposits on grass treatment area of the bio-swale. When finished, swale should be level from side to side and drain freely toward outlet. There should be no areas of standing water once inflow has ceased.
	Standing Water	When water stands in the swale between storms and does not drain freely.	Any of the following may apply: remove sediment or trash blockages, improve grade from head to foot of swale, remove clogged check dams, add underdrains or convert to a wet biofiltration swale.
	Flow spreader	Flow spreader uneven or clogged so that flows are not uniformly distributed through entire swale width.	Level the spreader and clean so that flows are spread evenly over entire swale width.

Table V-A.13: Maintenance Standards - Sand Filters (Above Ground/Open) (continued)

Maintenance Component	Defect	Condition When Maintenance is Needed	Results Expected When Maintenance is Performed
	Flow Spreader	Flow spreader uneven or clogged so that flows are not uniformly distributed across sand filter.	Spreader leveled and cleaned so that flows are spread evenly over sand filter.
	Damaged Pipes	Any part of the piping that is crushed or deformed more than 20% or any other failure to the piping.	Pipe repaired or replaced.

Table V-A.14: Maintenance Standards - Sand Filters (Below Ground/Enclosed)

Maintenance Component	Defect	Condition When Maintenance is Needed	Results Expected When Maintenance is Performed
Below Ground Vault.	Sediment Accumulation on Sand Media Section	Sediment depth exceeds 1/2-inch.	No sediment deposits on sand filter section that which would impede permeability of the filter section.
	Sediment Accumulation in Pre-Settling Portion of Vault	Sediment accumulation in vault bottom exceeds the depth of the sediment zone plus 6-inches.	No sediment deposits in first chamber of vault.
	Trash/Debris Accumulation	Trash and debris accumulated in vault, or pipe inlet/outlet, floatables and non-floatables.	Trash and debris removed from vault and inlet/outlet piping.
	Sediment in Drain Pipes/Cleanouts	When drain pipes, cleanouts become full with sediment and/or debris.	Sediment and debris removed.
	Short Circuiting	When seepage/flow occurs along the vault walls and corners. Sand eroding near inflow area.	Sand filter media section re-laid and compacted along perimeter of vault to form a semi-seal. Erosion protection added to dissipate force of incoming flow and curtail erosion.
	Damaged Pipes	Inlet or outlet piping damaged or broken and in need of repair.	Pipe repaired and/or replaced.
	Access Cover Damaged/Not Working	Cover cannot be opened, corrosion/deformation of cover. Maintenance person cannot remove cover using normal lifting pressure.	Cover repaired to proper working specifications or replaced.
	Ventilation	Ventilation area blocked or plugged	Blocking material removed or cleared from ventilation area. A specified % of the vault surface area must provide ventilation to the vault interior (see design specifications).
	Vault Structure Damaged; Includes Cracks in Walls, Bottom, Damage to Frame and/or Top Slab.	Cracks wider than 1/2-inch or evidence of soil particles entering the structure through the cracks, or maintenance/inspection personnel determine that the vault is not structurally sound. Cracks wider than 1/2-inch at the joint of any inlet/outlet pipe or evidence of soil particles entering through the cracks.	Vault replaced or repairs made so that vault meets design specifications and is structurally sound. Vault repaired so that no cracks exist wider than 1/4-inch at the joint of the inlet/outlet pipe.
	Baffles/Internal walls	Baffles or walls corroding, cracking, warping and/or showing signs of failure as determined by maintenance/inspection person.	Baffles repaired or replaced to specifications.
	Access Ladder Damaged	Ladder is corroded or deteriorated, not functioning properly, not securely attached to structure wall, missing rungs, cracks, and misaligned.	Ladder replaced or repaired to specifications, and is safe to use as determined by inspection personnel.

Table V-A.15: Maintenance Standards - Manufactured Media Filters

Maintenance Component	Defect	Condition When Maintenance is Needed	Results Expected When Maintenance is Performed
Below Ground	Sediment Accumulation on Media.	Sediment depth exceeds 0.25-inches.	No sediment deposits which would impede permeability of the

Table V-A.15: Maintenance Standards - Manufactured Media Filters (continued)

Maintenance Component	Defect	Condition When Maintenance is Needed	Results Expected When Maintenance is Performed
Vault	Sediment Accumulation in Vault	Sediment depth exceeds 6-inches in first chamber.	compost media.
	Trash/Debris Accumulation	Trash and debris accumulated on compost filter bed.	Trash and debris removed from the compost filter bed.
	Sediment in Drain Pipes/Clean-Outs	When drain pipes, clean-outs, become full with sediment and/or debris.	Sediment and debris removed.
	Damaged Pipes	Any part of the pipes that are crushed or damaged due to corrosion and/or settlement.	Pipe repaired and/or replaced.
	Access Cover Damaged/Not Working	Cover cannot be opened; one person cannot open the cover using normal lifting pressure, corrosion/deformation of cover.	Cover repaired to proper working specifications or replaced.
	Vault Structure Includes Cracks in Wall, Bottom, Damage to Frame and/or Top Slab	Cracks wider than 1/2-inch or evidence of soil particles entering the structure through the cracks, or maintenance/inspection personnel determine that the vault is not structurally sound. Cracks wider than 1/2-inch at the joint of any inlet/outlet pipe or evidence of soil particles entering through the cracks.	Vault replaced or repairs made so that vault meets design specifications and is structurally sound. Vault repaired so that no cracks exist wider than 1/4-inch at the joint of the inlet/outlet pipe.
	Baffles	Baffles corroding, cracking warping, and/or showing signs of failure as determined by maintenance/inspection person.	Baffles repaired or replaced to specifications.
	Access Ladder Damaged	Ladder is corroded or deteriorated, not functioning properly, not securely attached to structure wall, missing rungs, cracks, and misaligned.	Ladder replaced or repaired and meets specifications, and is safe to use as determined by inspection personnel.
	Media	Drawdown of water through the media takes longer than 1 hour, and/or overflow occurs frequently.	Media cartridges replaced.
Below Ground Cartridge Type	Short Circuiting	Flows do not properly enter filter cartridges.	Filter cartridges replaced.

Table V-A.21: Maintenance Standards - Bioretention Facilities (continued)

Maintenance Component	Recommended Frequency a		Condition when Maintenance is Needed (Standards)	Action Needed (Procedures)
	Inspection	Routine Maintenance		
	Vegetation management			protocols)

Note that the inspection and routine maintenance frequencies listed above are recommended by Ecology. They do not supersede or replace the municipal stormwater permit requirements for inspection frequency required of municipal stormwater permittees for "stormwater treatment and flow control BMPs/facilities".

a Frequency: A = Annually; B = Biannually (twice per year); M = Monthly; W = At least one visit should occur during the wet season (for debris/clog related maintenance, this inspection/maintenance visit should occur in the early fall, after deciduous trees have lost their leaves); S = Perform inspections after major storm events (24-hour storm event with a 10-year or greater recurrence interval).

IPM - Integrated Pest Management

ISA - International Society of Arboriculture

Table V-A.22: Maintenance Standards - Permeable Pavement

Component	Recommended Frequency a		Condition when Maintenance is Needed (Standards)	Action Needed (Procedures)
	Inspection	Routine Maintenance		
Surface/Wearing Course				
Permeable Pavements, all	A, S		Runoff from adjacent pervious areas deposits soil, mulch or sediment on paving	<ul style="list-style-type: none"> • Clean deposited soil or other materials from permeable pavement or other adjacent surfacing • Check if surface elevation of planted area is too high, or slopes towards pavement, and can be regraded (prior to regrading, protect permeable pavement by covering with temporary plastic and secure covering in place) • Mulch and/or plant all exposed soils that may erode to pavement surface
Porous asphalt or pervious concrete		A or B	None (routine maintenance)	<p>Clean surface debris from pavement surface using one or a combination of the following methods:</p> <ul style="list-style-type: none"> • Remove sediment, debris, trash, vegetation, and other debris deposited onto pavement (rakes and leaf blowers can be used for removing leaves) • Vacuum/sweep permeable paving installation using: <ul style="list-style-type: none"> ◦ Walk-behind vacuum (sidewalks) ◦ High efficiency regenerative air or vacuum sweeper (roadways, parking lots) ◦ ShopVac or brush brooms (small areas) • Hand held pressure washer or power washer with rotating brushes Follow equipment manufacturer guidelines for when equipment is most effective for cleaning permeable pavement. Dry weather is more effective for some equipment.
		A _b	Surface is clogged: Ponding on surface or water flows off the permeable pavement surface during a rain event (does not infiltrate)	<ul style="list-style-type: none"> • Review the overall performance of the facility (note that small clogged areas may not reduce overall performance of facility) • Test the surface infiltration rate using ASTM C1701 as a corrective maintenance indicator. Perform one test per installation, up to 2,500 square feet. Perform an additional test for each additional 2,500 square feet up to 15,000 square feet total. Above 15,000 square feet, add one test for every 10,000 square feet. • If the results indicate an infiltration rate of 10 inches per hour or less, then perform corrective maintenance to restore permeability. To clean clogged pavement surfaces, use one or combination of the following methods:

Table V-A.22: Maintenance Standards - Permeable Pavement (continued)

Component	Recommended Frequency a		Condition when Maintenance is Needed (Standards)	Action Needed (Procedures)
	Inspection	Routine Maintenance		
Permeable Pavement				<ul style="list-style-type: none"> ◦ Combined pressure wash and vacuum system calibrated to not dislodge wearing course aggregate. ◦ Hand held pressure washer or power washer with rotating brushes ◦ Pure vacuum sweepers <p>Note: If the annual/biannual routine maintenance standard to clean the pavement surface is conducted using equipment from the list above, corrective maintenance may not be needed.</p>
	A		Sediment present at the surface of the pavement	<ul style="list-style-type: none"> • Assess the overall performance of the pavement system during a rain event. If water runs off the pavement and/or there is ponding then see above. • Determine source of sediment loading and evaluate whether or not the source can be reduced/eliminated. If the source cannot be addressed, consider increasing frequency of routine cleaning (e.g., twice per year instead of once per year).
	Summer		Moss growth inhibits infiltration or poses slip safety hazard	<ul style="list-style-type: none"> • Sidewalks: Use a stiff broom to remove moss in the summer when it is dry • Parking lots and roadways: Pressure wash, vacuum sweep, or use a combination of the two for cleaning moss from pavement surface. May require stiff broom or power brush in areas of heavy moss.
	A		Major cracks or trip hazards and concrete spalling and raveling	<ul style="list-style-type: none"> • Fill potholes or small cracks with patching mixes • Large cracks and settlement may require cutting and replacing the pavement section. Replace in-kind where feasible. Replacing porous asphalt with conventional asphalt is acceptable if it is a small percentage of the total facility area and does not impact the overall facility function. • Take appropriate precautions during pavement repair and replacement efforts to prevent clogging of adjacent porous materials
Interlocking concrete paver blocks and aggregate pavers	A or B		None (routine maintenance)	<p>Clean pavement surface using one or a combination of the following methods:</p> <ul style="list-style-type: none"> • Remove sediment, debris, trash, vegetation, and other debris deposited onto pavement (rakes and leaf blowers can be used for removing leaves) • Vacuum/sweep permeable paving installation using: <ul style="list-style-type: none"> ◦ Walk-behind vacuum (sidewalks) ◦ High efficiency regenerative air or vacuum sweeper (roadways, parking lots) ◦ ShopVac or brush brooms (small areas) <p>Note: Vacuum settings may have to be adjusted to prevent excess uptake of aggregate from paver openings or joints. Vacuum surface openings in dry weather to remove dry, encrusted sediment.</p>
				<ul style="list-style-type: none"> • Review the overall performance of the facility (note that small clogged areas may not reduce overall performance of facility) • Test the surface infiltration rate using ASTM C1701 as a corrective maintenance indicator. Perform one test per installation, up to 2,500 square feet. Perform an additional test for each additional 2,500 square feet up to 15,000 square feet total. Above 15,000 square feet, add one test for every 10,000 square feet. • If the results indicate an infiltration rate of 10 inches per hour or less, then perform corrective maintenance to restore permeability.

Table V-A.22: Maintenance Standards - Permeable Pavement (continued)

Component	Recommended Frequency a		Condition when Maintenance is Needed (Standards)	Action Needed (Procedures)
	Inspection	Routine Maintenance		
Permeable Pavement				<ul style="list-style-type: none"> Clogging is usually an issue in the upper 2 to 3 centimeters of aggregate. Remove the upper layer of encrusted sediment, and fines, and/or vegetation from openings and joints between the pavers by mechanical means and/or suction equipment (e.g., pure vacuum sweeper). Replace aggregate in paver cells, joints, or openings per manufacturer's recommendations
	A		Sediment present at the surface of the pavement	<ul style="list-style-type: none"> Assess the overall performance of the pavement system during a rain event. If water runs off the pavement and/or there is ponding, then see above. Determine source of sediment loading and evaluate whether or not the source can be reduced/eliminated. If the source cannot be addressed, consider increasing frequency of routine cleaning (e.g., twice per year instead of once per year).
	Summer		Moss growth inhibits infiltration or poses slip safety hazard	<ul style="list-style-type: none"> Sidewalks: Use a stiff broom to remove moss in the summer when it is dry Parking lots and roadways: Vacuum sweep or stiff broom/power brush for cleaning moss from pavement surface
	A		Paver block missing or damaged	Remove individual damaged paver blocks by hand and replace or repair per manufacturer's recommendations
	A		Loss of aggregate material between paver blocks	Refill per manufacturer's recommendations for interlocking paver sections
	A		Settlement of surface	May require resetting
Open-celled paving grid with gravel		A or B	None (routine maintenance)	<ul style="list-style-type: none"> Remove sediment, debris, trash, vegetation, and other debris deposited onto pavement (rakes and leaf blowers can be used for removing leaves) Follow equipment manufacturer guidelines for cleaning surface.
	A _b		Aggregate is clogged: Ponding on surface or water flows off the permeable pavement surface during a rain event (does not infiltrate)	<ul style="list-style-type: none"> Use vacuum truck to remove and replace top course aggregate Replace aggregate in paving grid per manufacturer's recommendations
	A		Paving grid missing or damaged	<ul style="list-style-type: none"> Remove pins, pry up grid segments, and replace gravel Replace grid segments where three or more adjacent rings are broken or damaged Follow manufacturer guidelines for repairing surface.
	A		Settlement of surface	May require resetting
	A		Loss of aggregate material in paving grid	Replenish aggregate material by spreading gravel with a rake (gravel level should be maintained at the same level as the plastic rings or no more than 1/4 inch above the top of rings). See manufacturer's recommendations.
		A	Weeds present	<ul style="list-style-type: none"> Manually remove weeds Presence of weeds may indicate that too many fines are present (refer to Actions Needed under "Aggregate is clogged" to address this issue)
Open-celled paving grid with grass		A or B	None (routine maintenance)	<ul style="list-style-type: none"> Remove sediment, debris, trash, vegetation, and other debris deposited onto pavement (rakes and leaf blowers can be used for removing leaves) Follow equipment manufacturer guidelines for cleaning surface.

Table V-A.22: Maintenance Standards - Permeable Pavement (continued)

Component	Recommended Frequency ^a		Condition when Maintenance is Needed (Standards)	Action Needed (Procedures)
	Inspection	Routine Maintenance		
	A _b		Aggregate is clogged: Ponding on surface or water flows off the permeable pavement surface during a rain event (does not infiltrate)	Rehabilitate per manufacturer's recommendations.
	A		Paving grid missing or damaged	<ul style="list-style-type: none"> Remove pins, pry up grid segments, and replace grass Replace grid segments where three or more adjacent rings are broken or damaged Follow manufacturer guidelines for repairing surface.
	A		Settlement of surface	May require resetting
	A		Poor grass coverage in paving grid	<ul style="list-style-type: none"> Restore growing medium, reseed or plant, aerate, and/or amend vegetated area as needed Traffic loading may be inhibiting grass growth; reconsider traffic loading if feasible
		As needed	None (routine maintenance)	Use a mulch mower to mow grass
		A	None (routine maintenance)	<ul style="list-style-type: none"> Sprinkle a thin layer of compost on top of grass surface (1/2" top dressing) and sweep it in Do not use fertilizer
		A	Weeds present	<ul style="list-style-type: none"> Manually remove weeds Mow, torch, or inoculate and replace with preferred vegetation
Inlets/Outlets/Pipes				
Inlet/outlet pipe	A		Pipe is damaged	Repair/replace
	A		Pipe is clogged	Remove roots or debris
Underdrain pipe	Clean pipe as needed	Clean orifice at least biannually (may need more frequent cleaning during wet season)	Plant roots, sediment or debris reducing capacity of underdrain (may cause prolonged draw-down period)	<ul style="list-style-type: none"> Jet clean or rotary cut debris/roots from underdrain(s) If underdrains are equipped with a flow restrictor (e.g., orifice) to attenuate flows, the orifice must be cleaned regularly
Raised subsurface overflow pipe	Clean pipe as needed	Clean orifice at least biannually (may need more frequent cleaning during wet season)	Plant roots, sediment or debris reducing capacity of underdrain	<ul style="list-style-type: none"> Jet clean or rotary cut debris/roots from under-drain(s) If underdrains are equipped with a flow restrictor (e.g., orifice) to attenuate flows, the orifice must be cleaned regularly
Outlet structure	A, S		Sediment, vegetation, or debris reducing capacity of outlet structure	<ul style="list-style-type: none"> Clear the blockage Identify the source of the blockage and take actions to prevent future blockages
Overflow	B		Native soil is exposed or other signs of erosion damage are present at discharge point	Repair erosion and stabilize surface
Aggregate Storage Reservoir				
Observation port	A, S		Water remains in the storage aggregate longer than anticipated by design after the end of a storm	If immediate cause of extended ponding is not identified, schedule investigation of subsurface materials or other potential causes of system failure.

Table V-A.22: Maintenance Standards - Permeable Pavement (continued)

Component	Recommended Frequency a		Condition when Maintenance is Needed (Standards)	Action Needed (Procedures)
	Inspection	Routine Maintenance		
Vegetation				
Adjacent large shrubs or trees		As needed	Vegetation related fallout clogs or will potentially clog voids	<ul style="list-style-type: none"> Sweep leaf litter and sediment to prevent surface clogging and ponding Prevent large root systems from damaging subsurface structural components
		Once in May and Once in September	Vegetation growing beyond facility edge onto sidewalks, paths, and street edge	Edging and trimming of planted areas to control groundcovers and shrubs from overreaching the sidewalks, paths and street edge improves appearance and reduces clogging of permeable pavements by leaf litter, mulch and soil.
Leaves, needles, and organic debris		In fall (October to December) after leaf drop (1-3 times, depending on canopy cover)	Accumulation of organic debris and leaf litter	Use leaf blower or vacuum to blow or remove leaves, evergreen needles, and debris (i.e., flowers, blossoms) off of and away from permeable pavement
Note that the inspection and routine maintenance frequencies listed above are recommended by Ecology. They do not supersede or replace the municipal stormwater permit requirements for inspection frequency required of municipal stormwater permittees for "stormwater treatment and flow control BMPs/facilities".				
a Frequency: A= Annually; B= Biannually (twice per year); S = Perform inspections after major storm events (24-hour storm event with a 10-year or greater recurrence interval).				
b Inspection should occur during storm event.				

Table V-A.23: Maintenance Standards - Vegetated Roofs

Activity	Objective	Schedule	Notes
Structural and Drainage Components			
Clear inlet pipes: Remove soil substrate, vegetation or other debris.	Maintain free drainage of inlet pipes.	Twice annually.	
Inspect drain pipe: Check for cracks settling and proper alignment, and correct and re-compact soils or fill material surrounding pipe, if necessary.	Maintain free drainage of inlet pipes.	Twice annually.	
Inspect fire ventilation points for proper operation	Fire and safety.	Twice annually.	
Maintain egress and ingress: Clear routes of obstructions and maintained to design standards.	Fire and safety.	Twice annually.	
Insects: (see note)			Roof garden design should provide drainage rates that do not allow pooling of water for periods that promote insect larvae development. If standing water is present for extended periods correct drainage problem. Chemical sprays should not be used.
Prevent release of contaminants: Identify activities (mechanical systems maintenance, pet access, etc.) that can potentially release pollutants to the roof garden and establish agreements to prevent release.	Water quality protection.	During construction of roof and then as determined by inspection.	Any cause of pollutant release should be corrected as soon as identified and the pollutant removed.
Vegetation and Growth Medium			
Invasive or nuisance plants: Remove manually and without herbicide applications.	Promote selected plant growth and survival, maintain aesthetics.	Twice annually.	At a minimum, schedule weeding with inspections to coincide with important horticultural cycles (e.g., prior to major weed varieties dispersing seeds).



PERKFILTER™

Inspection and Maintenance Guide



PerkFilter™ Media Filtration System

Description

The PerkFilter is a stormwater treatment device used to remove pollutants from urban runoff. Impervious surfaces and other urban and suburban landscapes generate a variety of contaminants that can enter stormwater and pollute downstream receiving waters. The PerkFilter is a media-filled cartridge filtration device designed to capture and retain sediment, gross solids, metals, nutrients, hydrocarbons, and trash and debris. As with any stormwater treatment system, the PerkFilter requires periodic maintenance to sustain optimum system performance.

Function

The PerkFilter is a water quality treatment system consisting of three chambers: an inlet chamber, a filter cartridge treatment chamber, and an outlet chamber (Figure 1). Stormwater runoff enters the inlet chamber through an inlet pipe, curb opening, or grated inlet. Gross solids are settled out, and floating trash and debris are trapped in the inlet chamber. Pretreated flow is then directed to the treatment chamber through an opening in the baffle wall between the inlet chamber and treatment chamber. The treatment chamber contains media-filled filter cartridges (Figure 2) that use physical and chemical processes to remove pollutants. During a storm event, runoff pools in the treatment chamber before passing radially through the cylindrical cartridges from the outside surface, through the media for treatment, and into the center of the cartridge. At the center of the cartridge is a center tube assembly designed to distribute the hydraulic load evenly across the surface of the filter cartridge and control the treatment flow rate. The center tube assembly discharges treated flow through the false floor and into the outlet chamber. A draindown feature built into each cartridge allows the treatment chamber to dewater between storm events.

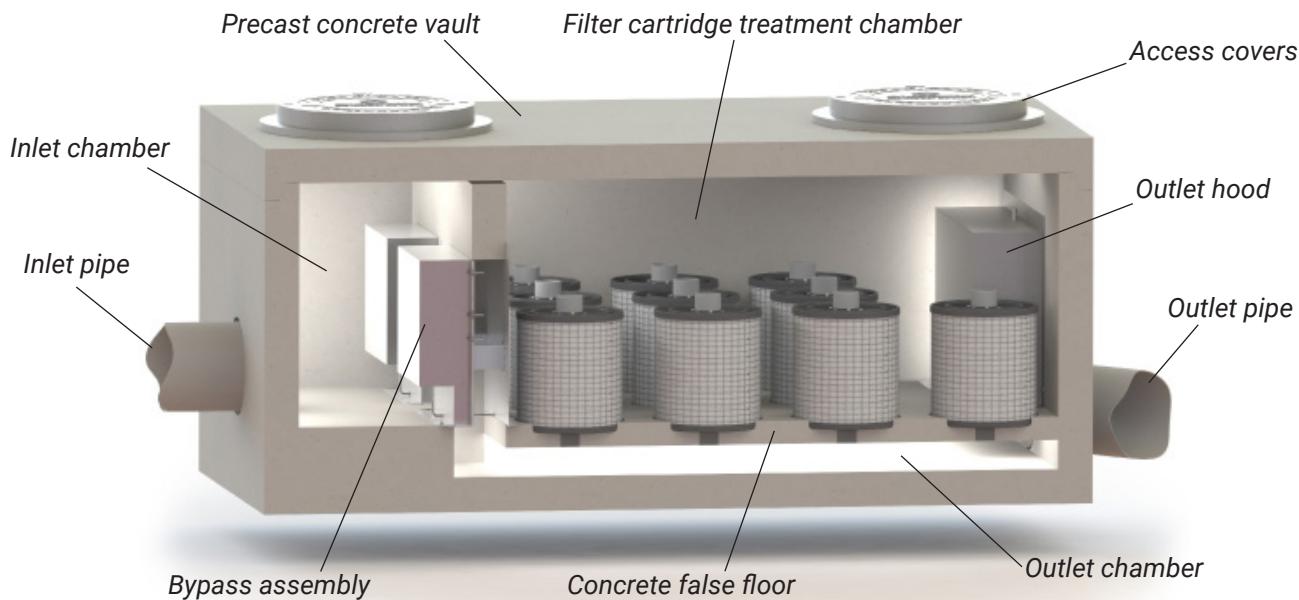


Figure 1. Schematic of the PerkFilter system.

All PerkFilter systems include a high-flow bypass assembly to divert flow exceeding the treatment capacity of the filter cartridges around the treatment chamber. The bypass assembly routes peak flow from the inlet chamber directly to the outlet chamber, bypassing the treatment chamber to prevent sediment and other captured pollutants from being scoured and re-entrained by high flow. Treated flow and bypass flow merge in the outlet chamber for discharge by a single outlet pipe.

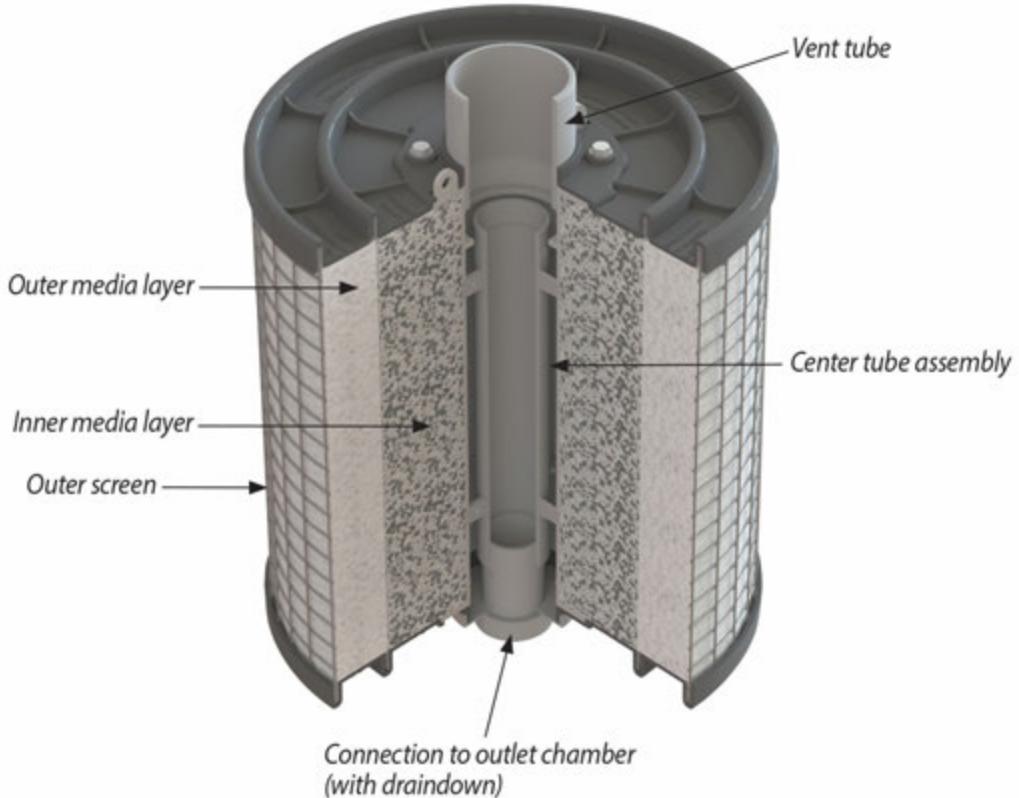


Figure 2. Schematic of PerkFilter cartridge.

Configuration

The PerkFilter structure may consist of a vault, manhole, or catch basin configuration. Catch basin units may be fabricated from concrete or steel. Internal components including the PerkFilter cartridges are manufactured from durable plastic and stainless steel components and hardware. All cartridges are 18 inches in diameter and are available in two heights: 12-inch and 18-inch. Cartridges may be used alone or may be stacked (Figure 3) to provide 24-inch and 30-inch combinations. The capacity of each cartridge or cartridge combination is dictated by the allowable operating rate of the media and the outer surface area of the cartridge. Thus, taller cartridges have greater treatment capacity than shorter cartridges, but they also require more hydraulic drop across the system. Cartridges may be filled with various media depending on the target pollutants and desired treatment rate, among other factors.

Access to an installed PerkFilter system is typically provided by ductile iron castings or hatch covers. The location and number of access appurtenances is dependent on the size and configuration of the system.

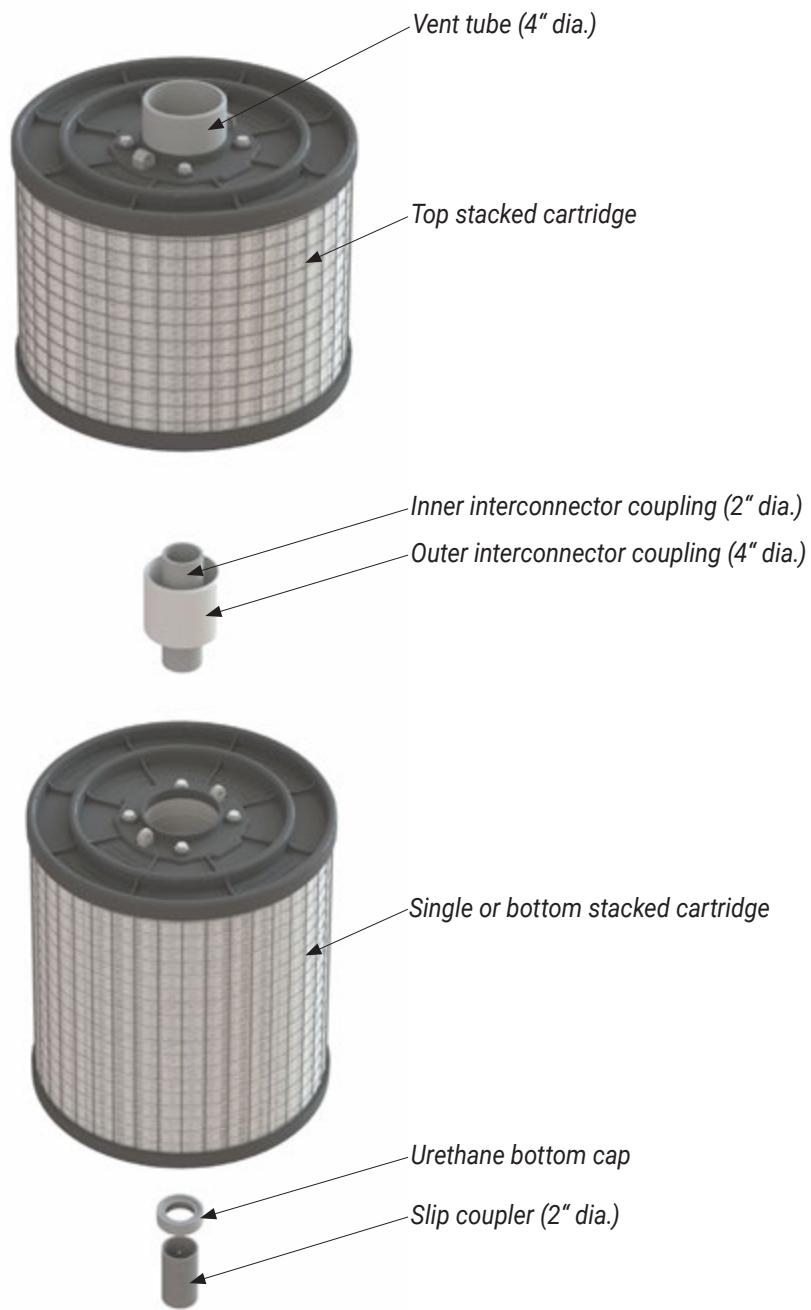


Figure 3. Schematic of stacked cartridges and connector components.

Maintenance Overview

State and local regulations require all stormwater management systems to be inspected on a periodic basis and maintained as necessary to ensure performance and protect downstream receiving waters. Maintenance prevents excessive pollutant buildup that can limit system performance by reducing the operating capacity and increasing the potential for scouring of pollutants during periods of high flow.

Inspection and Maintenance Frequency

The PerkFilter should be inspected on a periodic basis, typically twice per year, and maintained as required. Initially, inspections of a new system should be conducted more frequently to help establish an appropriate site-specific inspection frequency. The maintenance frequency will be driven by the amount of runoff and pollutant loading encountered by a given system. In most cases, the optimum maintenance interval will be one to three years. Inspection and maintenance activities should be performed only during dry weather periods.

Inspection Equipment

The following equipment is helpful when conducting PerkFilter inspections:

- Recording device (pen and paper form, voice recorder, iPad, etc.)
- Suitable clothing (appropriate footwear, gloves, hardhat, safety glasses, etc.)
- Traffic control equipment (cones, barricades, signage, flagging, etc.)
- Socket and wrench for bolt-down access covers
- Manhole hook or pry bar
- Flashlight
- Tape measure
- Measuring stick or sludge sampler
- Long-handled net (optional)

Inspection Procedures

PerkFilter inspections are visual and may be conducted from the ground surface without entering the unit. To complete an inspection, safety measures including traffic control should be deployed before the access covers are removed. Once the covers have been removed, the following items should be checked and recorded (see form provided at the end of this document) to determine whether maintenance is required:

- Inspect the internal components and note whether there are any broken or missing parts. In the unlikely event that internal parts are broken or missing, contact Oldcastle Infrastructure at (800) 579-8819 to determine appropriate corrective action.
- Note whether the inlet pipe is blocked or obstructed. The outlet pipe is covered by a removable outlet hood and cannot be observed without entering the unit.
- Observe, quantify and record the accumulation of floating trash and debris in the inlet chamber. The significance of accumulated floating trash and debris is a matter of judgment. A long-handled net may be used to retrieve the bulk of trash and debris at the time of inspection if full maintenance due to accumulation of floating oils or settled sediment is not yet warranted.

- Observe, quantify and record the accumulation of oils in the inlet chamber. The significance of accumulated floating oils is a matter of judgment. However, if there is evidence of an oil or fuel spill, immediate maintenance by appropriate certified personnel is warranted.
- Observe, quantify and record the average accumulation of sediment in the inlet chamber and treatment chamber. A calibrated dipstick, tape measure, or sludge sampler may be used to determine the amount of accumulated sediment in each chamber. The depth of sediment may be determined by calculating the difference between the measurement from the rim of the PerkFilter to the top of the accumulated sediment, and the measurement from the rim of the PerkFilter to the bottom of the PerkFilter structure. Finding the top of the accumulated sediment below standing water takes some practice and a light touch, but increased resistance as the measuring device is lowered toward the bottom of the unit indicates the top of the accumulated sediment.
- Finally, observe, quantify and record the amount of standing water in the treatment chamber around the cartridges. If standing water is present, do not include the depth of sediment that may have settled out below the standing water in the measurement.

Maintenance Triggers

Maintenance should be scheduled if any of the following conditions are identified during the inspection:

- Internal components are broken or missing.
- Inlet piping is obstructed.
- The accumulation of floating trash and debris that cannot be retrieved with a net and/or oil in the inlet chamber is significant.
- There is more than 6" of accumulated sediment in the inlet chamber.
- There is more than 4" of accumulated sediment in the treatment chamber.
- There is more than 4" of standing water in the treatment chamber more than 24 hours after end of rain event.
- A hazardous material release (e.g. automotive fluids) is observed or reported.
- The system has not been maintained for 3 years (wet climates) to 5 years (dry climates).

Maintenance Equipment

The following equipment is helpful when conducting PerkFilter maintenance:

- Suitable clothing (appropriate footwear, gloves, hardhat, safety glasses, etc.)
- Traffic control equipment (cones, barricades, signage, flagging, etc.)
- Socket and wrench for bolt-down access covers
- Manhole hook or pry bar
- Confined space entry equipment, if needed
- Flashlight
- Tape measure
- 9/16" socket and wrench to remove hold-down struts and filter cartridge tops
- Replacement filter cartridges
- Vacuum truck with water supply and water jet

Contact Oldcastle Infrastructure at (800) 579-8819 for replacement filter cartridges. A lead time of four weeks is recommended.

Maintenance Procedures

Maintenance should be conducted during dry weather when no flow is entering the system. Confined space entry is necessary to maintain vault and manhole PerkFilter configurations. Only personnel that are OSHA Confined Space Entry trained and certified may enter underground structures. Confined space entry is not required for catch basin PerkFilter configurations. Once safety measures such as traffic control are deployed, the access covers may be removed and the following activities may be conducted to complete maintenance:

- Remove floating trash, debris and oils from the water surface in the inlet chamber using the extension nozzle on the end of the boom hose of the vacuum truck. Continue using the vacuum truck to completely dewater the inlet chamber and evacuate all accumulated sediment from the inlet chamber. Some jetting may be required to fully remove sediment. The inlet chamber does not need to be refilled with water after maintenance is complete. The system will fill with water when the next storm event occurs.
- Remove the hold-down strut from each row of filter cartridges and then remove the top of each cartridge (the top is held on by four 9/16" bolts) and use the vacuum truck to evacuate the spent media. When empty, the spent cartridges may be easily lifted off their slip couplers and removed from the vault. The couplers may be left inserted into couplings cast into the false floor to prevent sediment and debris from being washed into the outlet chamber during washdown.
- Once all the spent cartridges have been removed from the structure, the vacuum truck may be used to evacuate all accumulated sediment from the treatment chamber. Some jetting may be required to fully remove sediment. Take care not to wash sediment and debris through the openings in the false floor and into the outlet chamber. All material removed from the PerkFilter during maintenance including the spent media must be disposed of in accordance with local, state, and/or federal regulations. In most cases, the material may be handled in the same manner as disposal of material removed from sumped catch basins or manholes.
- Place a fresh cartridge in each cartridge position using the existing slip couplers and urethane bottom caps. If the vault is equipped with stacked cartridges, the existing outer and inner interconnector couplers must be used between the stacked cartridges to provide hydraulic connection. Transfer the existing vent tubes from the spent cartridges to the fresh cartridges. Finally, refit the struts to hold the fresh cartridges in place.
- Securely replace access covers, as appropriate.
- Make arrangements to return the empty spent cartridges to Oldcastle Infrastructure.

PerkFilter

Inspection and Maintenance Log

Location _____	
Structure Configuration and Size: _____	
<input type="checkbox"/> Vault _____ feet x _____ feet <input type="checkbox"/> Manhole _____ feet diameter <input type="checkbox"/> Catch Basin _____ feet x _____ feet	
Number and Height of Cartridge Stacks: _____	
Media Type: _____	
Count _____ each <input type="checkbox"/> 12" <input type="checkbox"/> 18" <input type="checkbox"/> 24" <input type="checkbox"/> 30"	
<input type="checkbox"/> ZPC <input type="checkbox"/> Perlite <input type="checkbox"/> Other _____	
Condition of Internal Components	
<input type="checkbox"/> Good <input type="checkbox"/> Damaged <input type="checkbox"/> Missing	
Inlet or Outlet Blockage or Obstruction	
<input type="checkbox"/> Yes <input type="checkbox"/> No	
Floating Trash and Debris	
<input type="checkbox"/> Significant <input type="checkbox"/> Not Significant	
Floating Oils	
<input type="checkbox"/> Significant <input type="checkbox"/> Not Significant <input type="checkbox"/> Spill	
Sediment Depth in Inlet Chamber	
<input type="checkbox"/> Inches of Sediment: _____	
Sediment Depth in Treatment Chamber	
<input type="checkbox"/> Inches of Sediment: _____	
Standing Water in Treatment Chamber	
<input type="checkbox"/> Inches of Standing Water: _____	
Maintenance Required	
<input type="checkbox"/> Yes - Schedule Maintenance <input type="checkbox"/> No - Inspect Again in _____ Months	

PERKFILTER™

OUR MARKETS



BUILDING
STRUCTURES



COMMUNICATIONS



WATER



ENERGY



TRANSPORTATION



June 2016

GENERAL USE LEVEL DESIGNATION FOR BASIC AND PHOSPHORUS TREATMENT

for

Oldcastle Precast, Inc., PerkFilter™ (using ZPC Filter Media)

Ecology's Decision:

Based on Oldcastle's application submissions, including the Draft Technical Evaluation Report, dated April 2010, Ecology hereby issues the following use level designations:

1. General Use Level Designation (GULD) for the PerkFilter™ for basic treatment:
 - Using a zeolite-perlite-carbon (ZPC) filter media as specified by Oldcastle.
 - Sized at hydraulic loading rate of no more than 1.5 gpm/ft² of media surface area, per Table 1.

Table 1. Design Flow Rate Per Cartridge

Effective Cartridge Height (inches)	12	18
Cartridge Flow Rate (gpm/cartridge)	6.8	10.2

2. General Use Level Designation (GULD) for the PerkFilter™ for phosphorus treatment:
 - Using a zeolite-perlite-carbon (ZPC) filter media as specified by Oldcastle.
 - Sized at hydraulic loading rate of no more than 1.5 gpm/ft² of media surface area, per Table 1.
3. Ecology approves PerkFilter™ units for treatment at the hydraulic loading rates shown in Table 1, and sized based on the water quality design flow rate for an off-line system. The internal weir in the inlet chamber functions as a bypass to route flow in excess of the water quality design flow rate around the treatment chamber. Calculate the water quality design flow rate using the following procedures:
 - Western Washington: For treatment installed upstream of detention or retention, the water quality design flow rate is the peak 15-minute flow rate as calculated using the latest version of the Western Washington Hydrology Model or other Ecology-approved continuous runoff model.

- **Eastern Washington:** For treatment installed upstream of detention or retention, the water quality design flow rate is the peak 15-minute flow rate as calculated using one of the three methods described in Chapter 2.2.5 of the Stormwater Management Manual for Eastern Washington (SWMMEW) or local manual.
- **Entire State:** For treatment installed downstream of detention, the water quality design flow rate is the full 2-year release rate of the detention facility.

4. These General Use Level Designations have no expiration date but may be revoked or amended by Ecology, and are subject to the conditions specified below.

Ecology's Conditions of Use:

PerkFilter™ units shall comply with the following conditions:

1. **Design, assemble, install, operate, and maintain PerkFilter™ units in accordance with Oldcastle's applicable manuals and documents and the Ecology Decision.**
2. **Each site plan must undergo Oldcastle review and approval before site installation.** This ensures that site grading and slope are appropriate for use of a PerkFilter™ unit.
3. **PerkFilter™ media shall conform to the specifications submitted to, and approved by, Ecology.**
4. **Maintenance:** The required maintenance interval for stormwater treatment devices is often dependent upon the degree of pollutant loading from a particular drainage basin. Therefore, Ecology does not endorse or recommend a “one size fits all” maintenance cycle for a particular model/size of manufactured filter treatment device.
 - Typically, Oldcastle designs PerkFilter systems for a target filter media replacement interval of 12 months. Maintenance includes removing accumulated sediment from the vault, and replacing spent cartridges with recharged cartridges.
 - Indications of the need for maintenance include effluent flow decreasing to below the design flow rate, as indicated by the scumline above the shoulder of the cartridge.
 - Owners/operators must inspect PerkFilter for a minimum of twelve months from the start of post-construction operation to determine site-specific maintenance schedules and requirements. You must conduct inspections monthly during the wet season, and every other month during the dry season. (According to the SWMMWW, the wet season in western Washington is October 1 to April 30. According to SWMMEW, the wet season in eastern Washington is October 1 to June 30). After the first year of operation, owners/operators must conduct inspections based on the findings during the first year of inspections.

- **Conduct inspections by qualified personnel, follow manufacturer's guidelines, and use methods capable of determining either a decrease in treated effluent flowrate and/or a decrease in pollutant removal ability.**
- **When inspections are performed, the following findings typically serve as maintenance triggers:**
 - **Accumulated vault sediment depths exceed an average of 2 inches, or**
 - **Accumulated sediment depths on the tops of the cartridges exceed an average of 0.5 inches, or**
 - **Standing water remains in the vault between rain events, or**
 - **Bypass occurs during storms smaller than the design storm.**
- **Note: If excessive floatables (trash and debris) are present, perform a minor maintenance consisting of gross solids removal, not cartridge replacement.**

5. Discharges from the PerkFilter™ units shall not cause or contribute to water quality standards violations in receiving waters.

Applicant: Oldcastle Precast, Inc.

Applicant's Address: 5885 Pruitt Avenue
Windsor, California 95492

Application Documents:

- PerkFilter™ Final Report, prepared by: Office of Water Programs, California State University, Sacramento (September 2007).
- Verification Phase of PerkFilter™ Tests with Zeolite-Perlite-Carbon Media and Zeolite-Carbon Media (August 2007).
- Quality Assurance Project Plan PerkFilter™ Stormwater Treatment Performance Monitoring Project, October 2008 Draft.
- Technical Evaluation Report Volume 1: PerkFilter™ Stormwater Treatment System Performance Monitoring, April 2010.
- Technical Evaluation Report Volume 2 - Appendices: PerkFilter™ Stormwater Treatment System Performance Monitoring, April 2010.

Applicant's Use Level Request:

- General Use Level Designation as a Basic and Phosphorus treatment device in accordance with Ecology's *Guidance for Evaluating Emerging Stormwater Treatment Technologies Technology Assessment Protocol – Ecology (TAPE) January 2011 Revision.*

Applicant's Performance Claims:

- Capability to remove 80% of total suspended solids from stormwater runoff from sites with influent concentrations between 100 mg/L and 200 mg/L and provide effluent concentrations of 20 mg/L or less with influent concentrations less than 100 mg/L given a typical particle size distribution.
- Capability to remove 50% of Total Phosphorus from stormwater runoff from sites with influent concentrations between 0.1 mg/l and 0.5 mg/l.

Findings of Fact:

- Based on laboratory testing at a flow rate of 12 GPM per filter, the PerkFilter™ containing ZPC media had an average total suspended solids removal efficiency of 82% using Sil-Co-Sil 106 with an average influent concentration of 102 mg/L and zero initial sediment loading.
- Based on field-testing at a flow rate of 0.57 GPM/inch of cartridge height (17.25 inch diameter cartridge) (1.5 gpm per sq ft filter surface area), the PerkFilter™ containing ZPC media had an average total suspended solids removal efficiency of 82.4% for an influent concentration between 20 mg/L and 200 mg/l. The PerkFilter™ containing ZPC media had an average removal efficiency of 85.2% for an influent concentration between 100 mg/l and 200 mg/l. Removal rates fell over time and dropped below 80% after approximately 10 months.
- Based on field testing at a flow rate of 0.57 GPM/inch of cartridge height (17.25 inch diameter cartridge) (1.5 gpm per sq ft filter surface area), the PerkFilter™ containing ZPC media had an average total Phosphorus removal efficiency of 62.4% for an influent concentration between 0.1 mg/L and 0.5 mg/l. Removal rates tended to remain relatively constant during the 10 months of monitoring.
- Field Testing indicates that sediment accumulation in the Sediment Gallery during the 10 months of sampling was within the available volume for sediment. Thus, maintenance at a 6-month frequency (vacuuming of sediment from Inlet Gallery) as suggested by the manufacturer is sufficient.
- Filter flows during bypass events utilize the full 30-inch height of the filter. Without bypass, an unknown amount of filter is used. Comparing the flow through the filter during bypass events with the design flow rate shows that the Oldcastle system falls below the design flow rate after approximately 10 months of operation.
- Percent removal of TSS falls below 80% after approximately 10 months. There are earlier data points below 80% but these are from low influent concentration storms

Other PerkFilter™ Related Issues to be Addressed by the Company:

1. Oldcastle may perform additional monitoring to better determine the maintenance frequency for the filters with respect to design flow rate and Total Suspended Solids removal. Presentation of additional data may result in a modification to the requirements in this General Use Level Designation document.

Technology Description: Download at:
www.oldcastlestormwater.com

Contact Information:

Applicant: Jay Holtz, P.E.
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Oldcastle Precast, Inc.
5885 Pruitt Avenue
Windsor, CA 95492
(800) 579-8819
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Applicant website: www.oldcastlestormwater.com

Ecology web link: <http://www.ecy.wa.gov/programs/wq/stormwater/newtech/index.html>

Ecology: Douglas C. Howie, P.E.
Department of Ecology
Water Quality Program
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Revision History

Date	Revision
March 2008	Original draft general-use-level-designation document
June 2010	Revise Use Level to General
January 2013	Modified Design Storm Description, added Revision Table, formatted document to match Ecology standard
May 2014	Revised company name and contact information
June 2016	Designated device for off-line sizing

Appendix C

Attachment B – Best Management Practices

IV-1 Source Control BMPs Applicable to All Sites

S410 BMPs for Correcting Illicit Discharges to Storm Drains

Description of Pollutant Sources: Illicit discharges are unpermitted sanitary or process wastewater discharges to a storm sewer or to surface water, rather than to a sanitary sewer, industrial process wastewater, or other appropriate treatment. They can also include swimming pool water, filter backwash, cleaning solutions/washwaters, cooling water, etc. Experience has shown that illicit discharges are common, particularly in older buildings.

Pollutant Control Approach: Identify and eliminate unpermitted discharges or obtain an NPDES permit, where necessary, particularly at industrial and commercial facilities.

Applicable Operational BMPs:

- For all real properties, responsible parties must examine their plumbing systems to identify any potential illicit discharges. Review site plans, engineering drawings, or other sources of information for the plumbing systems on the property.
- If an illicit discharge is suspected, trace the source using an appropriate method such as visual reconnaissance, smoke test, flow test, dye test with a nontoxic dye, or closed circuit television (CCTV) inspection. These tests are to be performed by qualified personnel such as a plumbing contractor. Note: Contact Ecology prior to performing a dye test which may result in a discharge to a receiving water.
- If illicit connections are found, permanently plug or disconnect the connections.
- Eliminate prohibited discharges to storm sewer, ground water, or surface water.
- Convey unpermitted discharges to a sanitary sewer if allowed by the local sewer authority, or to other approved treatment.
- Obtain all necessary permits for altering or repairing side sewers and plumbing fixtures. Restrictions on certain types of discharges, particularly industrial process waters, may require pretreatment of discharges before they enter the sanitary sewer. It is the responsibility of the property owner or business operator to obtain the necessary permits and to replace the connection.
- Obtain appropriate state and local permits for these discharges.

Recommended Additional Operational BMPs:

At commercial and industrial facilities, conduct a survey of wastewater discharge connections to storm drains and to surface water as follows:

- Conduct a field survey of buildings, particularly older buildings, and other industrial areas to locate storm drains from buildings and paved surfaces. Note where these discharge.
- During non-stormwater conditions, inspect each storm drain for non-stormwater discharges. Record the locations of all non-stormwater discharges. Include all permitted discharges.
- If useful, prepare a map of each area. Show on the map the known location of storm sewers, sanitary sewers, and permitted and unpermitted discharges. Aerial photos may be useful. Check records such as piping schematics to identify known side sewer connections and show these on the map. Consider using smoke, dye, or chemical analysis tests to detect connections between two conveyance systems (e.g., process water and stormwater). If desirable, conduct TV inspections of the storm drains and record the footage on videotape.
- Compare the observed locations of connections with the information on the map and revise the map accordingly. Note suspect connections that are inconsistent with the field survey.
- Identify all connections to storm sewers or to surface water and take the actions specified above as applicable BMPs.

S453 BMPs for Formation of a Pollution Prevention Team

The pollution prevention team should be responsible for implementing and maintaining all BMPs and treatment for the site. This team should be able to address any corrective actions needed on site to mitigate potential stormwater contamination. The team members should:

- Consist of those people who are familiar with the facility and its operations.
- Possess the knowledge and skills to assess conditions and activities that could impact stormwater quality at your facility, and who can evaluate the effectiveness of control measures.
- Assign pollution prevention team staff to be on duty on a daily basis to cover applicable permittee facilities when those facilities are in operation.
- Have the primary responsibility for developing and overseeing facility activities necessary to comply with stormwater requirements.
- Have access to all applicable permit, monitoring, SWPPP, and other records.
- Be trained in the operation, maintenance and inspections of all BMPs and reporting procedures.
- Establish responsibilities for inspections, operation, maintenance, and emergencies.
- Regularly meet to review overall facility operations and BMP effectiveness.

S454 BMPs for Preventive Maintenance / Good Housekeeping

Preventative maintenance and good housekeeping practices reduce the potential for stormwater to come into contact with pollutants and can reduce maintenance intervals for the drainage system and sewer system.

Applicable BMPs:

- Prevent the discharge of unpermitted liquid or solid wastes, process wastewater, and sewage to ground or surface water, or to storm drains that discharge to surface water, or to the ground. Conduct all oily parts cleaning, steam cleaning, or pressure washing of equipment or containers inside a building, or on an impervious contained area, such as a concrete pad. Direct contaminated stormwater from such an area to a sanitary sewer where allowed by local sewer authority, or to other approved treatment.
- Promptly contain and clean up solid and liquid pollutant leaks and spills including oils, solvents, fuels, and dust from manufacturing operations on an exposed soil, vegetation, or paved area.
- If a contaminated surface must be pressure washed, collect the resulting washwater for proper disposal (usually involves plugging storm drains, or otherwise preventing discharge and pumping or vactoring up washwater, for discharge to sanitary sewer or for vactor truck transport to a waste water treatment plant for disposal).
- Do not hose down pollutants from any area to the ground, storm drains, conveyance ditches, or receiving water. Convey pollutants before discharge to a treatment system approved by the local jurisdiction.
- Sweep all appropriate surfaces with vacuum sweepers quarterly, or more frequently as needed, for the collection and disposal of dust and debris that could contaminate stormwater. Use mechanical sweepers, and manual sweeping as necessary to access areas that a vacuum sweeper can't reach to ensure that all surface contaminants are routinely removed.
- Do not pave over contaminated soil unless it has been determined that ground water has not been and will not be contaminated by the soil. Call Ecology for assistance.
- Construct impervious areas that are compatible with the materials handled. Portland cement concrete, asphalt, or equivalent material may be considered.
- Use drip pans to collect leaks and spills from industrial/commercial equipment such as cranes at ship/boat building and repair facilities, log stackers, industrial parts, trucks and other vehicles stored outside.
- At industrial and commercial facilities, drain oil and fuel filters before disposal. Discard empty oil and fuel filters, oily rags, and other oily solid waste into appropriately closed and properly labeled containers, and in compliance with the Uniform Fire Code or International Building Code.
- For the storage of liquids use containers, such as steel and plastic drums, that are rigid and

durable, corrosion resistant to the weather and fluid content, non-absorbent, water tight, rodent-proof, and equipped with a close fitting cover.

- For the temporary storage of solid wastes contaminated with liquids or other potential polluted materials use dumpsters, garbage cans, drums, and comparable containers, which are durable, corrosion resistant, non-absorbent, non-leaking, and equipped with either a solid cover or screen cover to prevent littering. If covered with a screen, the container must be stored under a roof or other form of adequate cover.
- Where exposed to stormwater, use containers, piping, tubing, pumps, fittings, and valves that are appropriate for their intended use and for the contained liquid.
- Clean oils, debris, sludge, etc. from all stormwater facilities regularly, including catch basins, settling/detention basins, oil/water separators, boomed areas, and conveyance systems to prevent the contamination of stormwater. Refer to [Ecology Requirements for Generators of Dangerous Wastes](#) in [I-2.15 Other Requirements](#) for references to assist in handling potentially dangerous waste.
- Promptly repair or replace all substantially cracked or otherwise damaged paved secondary containment, high-intensity parking, and any other drainage areas, subjected to pollutant material leaks or spills. Promptly repair or replace all leaking connections, pipes, hoses, valves, etc., which can contaminate stormwater.
- Do not connect floor drains in potential pollutant source areas to storm drains, surface water, or to the ground.

Recommended BMPs:

- Where feasible, store potential stormwater pollutant materials inside a building or under a cover and/or containment.
- Minimize use of toxic cleaning solvents, such as chlorinated solvents, and other toxic chemicals.
- Use environmentally safe raw materials, products, additives, etc. such as substitutes for zinc used in rubber production.
- Recycle waste materials such as solvents, coolants, oils, degreasers, and batteries to the maximum extent feasible. Contact Ecology's *Hazardous Waste & Toxics Reduction Program* at <https://ecology.wa.gov/About-us/Get-to-know-us/Our-Programs/Hazardous-Waste-Toxics-Reduction> for recommendations on recycling or disposal of vehicle waste liquids and other waste materials.
- Empty drip pans immediately after a spill or leak is collected in an uncovered area.
- Stencil warning signs at stormwater catch basins and drains, e.g., "Dump no waste – Drains to waterbody".
- Use solid absorbents, e.g., clay and peat absorbents and rags for cleanup of liquid spills/leaks, where practicable.
- Promptly repair/replace/reseal damaged paved areas at industrial facilities.

- Recycle materials, such as oils, solvents, and wood waste, to the maximum extent practicable.

Note: Evidence of stormwater contamination by oils and grease can include the presence of visible sheen, color, or turbidity in the runoff, or present or historical operational problems at the facility. Operators can use simple pH tests, for example with litmus or pH paper. These tests can screen for high or low pH levels (anything outside a 6.5-8.5 range) due to contamination in stormwater.

S455 BMPs for Spill Prevention and Cleanup

Description of Pollutant Sources: Spills and leaks can damage public infrastructure, interfere with sewage treatment, and cause a threat to human health or the environment. Spills are often preventable if appropriate chemical and waste handling techniques are practiced effectively and the spill response plan is immediately implemented. Additional spill control requirements may be required based on the specific activity occurring on site.

Applicable BMPs:

Spill Prevention

- Clearly label or mark all containers that contain potential pollutants.
- Store and transport liquid materials in appropriate containers with tight-fitting lids.
- Place drip pans underneath all containers, fittings, valves, and where materials are likely to spill or leak.
- Use tarpaulins, ground cloths, or drip pans in areas where materials are mixed, carried, and applied to capture any spilled materials.
- Train employees on the safe techniques for handling materials used on the site and to check for leaks and spills.

Spill Plan

- Develop and implement a spill plan and update it annually or whenever there is a change in activities or staff responsible for spill cleanup. Post a written summary of the plan at areas with a high potential for spills, such as loading docks, product storage areas, waste storage areas, and near a phone. The spill plan may need to be posted at multiple locations. Describe the facility, including the owner's name, address, and telephone number; the nature of the facility activity; and the general types of chemicals used at the facility.
- Designate spill response employees to be on-site during business activities. Provide a current list of the names and telephone numbers (home and office) of designated spill response employees who are responsible for implementing the spill plan.
- Provide a site plan showing the locations of storage areas for chemicals, inlets/catch basins, spill kits and other relevant infrastructure or materials information.
- Describe the emergency cleanup and disposal procedures. Note the location of all spill kits in

the spill plan.

- List the names and telephone numbers of public agencies to contact in the event of a spill.

Spill Cleanup Kits

- Store all cleanup kits near areas with a high potential for spills so that they are easily accessible in the event of a spill. The contents of the spill kit must be appropriate to the types and quantities of materials stored or otherwise used at the facility, and refilled when the materials are used. Spill kits must be located within 25 feet of all fueling/fuel transfer areas, including on-board mobile fuel trucks.

Note: Ecology recommends that the kit(s) include salvage drums or containers, such as high density polyethylene, polypropylene or polyethylene sheet-lined steel; polyethylene or equivalent disposal bags; an emergency response guidebook; safety gloves/clothes/equipment; shovels or other soil removal equipment; and oil containment booms and absorbent pads; all stored in an impervious container.

Spill Cleanup and Proper Disposal of Waste

- Stop, contain, and clean up all spills immediately upon discovery.
- Implement the spill plan immediately.
- Contact the designated spill response employees.
- Block off and seal nearby inlets/catch basins to prevent materials from entering the drainage system or combined sewer.
- Use the appropriate material to clean up the spill.
- Do not use emulsifiers or dispersants such as liquid detergents or degreasers unless disposed of properly. Emulsifiers and dispersants are not allowed to be used on surface water, or in a place where they may enter storm drains, surface waters, treatments systems, or sanitary sewers.
- Immediately notify Ecology and the local jurisdiction if a spill has reached or may reach a sanitary or storm sewer, ground water, or surface water. Notification must comply with state and federal spill reporting requirements.
- Do not wash absorbent material into interior floor drains or inlets/catch basins.
- Place used spill control materials in appropriate containers and dispose of according to regulations.

S456 BMPs for Employee Training

Train all employees that work in pollutant source areas about the following topics:

- Identifying Pollution Prevention Team Members.
- Identifying pollutant sources.

- Understanding pollutant control measures.
- Spill prevention and response.
- Emergency response procedures.
- Handling practices that are environmentally acceptable. Particularly those related to vehicle/equipment liquids such as fuels, and vehicle/equipment cleaning.

Additional specialized training may be needed for staff who will be responsible for handling hazardous materials.

S457 BMPs for Inspections

Qualified personnel shall conduct inspections monthly. Make and maintain a record of each inspection on-site. The following requirements apply to inspections:

- Be conducted by someone familiar with the facility's site, operations, and BMPs.
- Verify the accuracy of the pollutant source descriptions in the SWPPP.
- Assess all BMPs that have been implemented for effectiveness and needed maintenance and locate areas where additional BMPs are needed.
- Reflect current conditions on the site.
- Include written observations of the presence of floating materials, suspended solids, oil and grease, discoloration, turbidity and odor in the stormwater discharges; in outside vehicle maintenance/repair; and liquid handling, and storage areas. In areas where acid or alkaline materials are handled or stored use a simple litmus or pH paper to identify those types of stormwater contaminants where needed.
- Eliminate or obtain a permit for unpermitted non-stormwater discharges to storm drains or receiving waters, such as process wastewater and vehicle/equipment washwater.
- Identify actions to address inspection deficiencies.

S458 BMPs for Record Keeping

See the applicable permit for specific record-keeping requirements and retention schedules for the following reports. At a minimum, retain the following reports for five years:

- Inspection reports which should include:
 - Time and date of the inspection
 - Locations inspected
 - Statement on status of compliance with the permit
 - Summary report of any remediation activities required
 - Name, title, and signature of person conducting the inspection

- Reports on spills of oil or hazardous substances in greater than Reportable Quantities (Code of Federal Regulations Title 40 Parts 302.4 and 117). Report spills of the following: antifreeze, oil, gasoline, or diesel fuel, that cause:
 - A violation of the State of Washington's Water Quality Standards.
 - A film or sheen upon or discoloration of the waters of the State or adjoining shorelines.
 - A sludge or emulsion to be deposited beneath the surface of the water or upon adjoining shorelines.

To report a spill or to determine if a spill is a substance of a Reportable Quantity, call the Ecology regional office and ask for an oil spill operations or a dangerous waste specialist:

- Northwest Region (425)649-7000
- Southwest Region (360)407-6300
- Eastern Region (509)329-3400
- Central Region (509) 575-2490

In addition, call the Washington Emergency Management Division at 1-800-258-5990 or 1-800-OILS-911 AND the National Response Center at 1-800-424-8802.

Also, refer to *Focus on Emergency Spill Response* ([Ecology, 2009](#)).

The following is additional recommended record keeping:

Maintain records of all related pollutant control and pollutant generating activities such as training, materials purchased, material use and disposal, maintenance performed, etc.

IV-2 Cleaning or Washing Source Control BMPs

S431 BMPs for Washing and Steam Cleaning Vehicles / Equipment / Building Structures

Description of Pollutant Sources: Pollutant sources include the commercial cleaning of vehicles, aircraft, vessels, and other transportation, restaurant kitchens, carpets, and industrial equipment, and large buildings with low- or high-pressure water or steam. This includes “charity” car washes at gas stations and commercial parking lots. The cleaning can include hand washing, scrubbing, sanding, etc. Washwater from cleaning activities can contain oil and grease, suspended solids, heavy metals, soluble organics, soaps, and detergents that can contaminate stormwater.

Permitting Requirements: Obtain all necessary permits for installing, altering, or repairing onsite drainage and side sewers. Restrictions on certain types of discharges may require pretreatment before they enter the sanitary sewer.

Pollutant Control Approach: The preferred approach is to cover and/or contain the cleaning activity, or conduct the activity inside a building, to separate the uncontaminated stormwater from the washwater sources. Convey washwater to a sanitary sewer after approval by the local sewer authority. Provide temporary storage before proper disposal, or recycling. Under this preferred approach, no discharge to the ground, to a storm drain, or to surface water should occur.

The Industrial Stormwater General Permit prohibits the discharge of process wastewater (e.g., vehicle washing wastewater) to ground water or surface water. Stormwater that commingles with process wastewater is considered process wastewater.

Facilities not covered under the Industrial Stormwater General Permit that are unable to follow one of the preferred approaches listed above may discharge washwater to the ground only after proper treatment in accordance with *Vehicle and Equipment Washwater Discharges Best Management Practices Manual* ([Ecology, 2012](#)).

The quality of any discharge to the ground after proper treatment must comply with Ecology's Ground Water Quality Standards, [Chapter 173-200 WAC](#).

Facilities not covered under the Industrial Stormwater General Permit that are unable to comply with one of the preferred approaches and want to discharge to storm sewer, must meet their local stormwater requirements. Local authorities may require treatment prior to discharge.

Contact the local Ecology Regional Office to discuss permitting options for discharge of washwater to surface water or to a storm drain after on-site treatment.

Applicable Structural Source Control BMPs:

Conduct vehicle/equipment washing in one of the following locations:

- At a commercial washing facility in which the washing occurs in an enclosure and drains to the sanitary sewer, or

- In a building constructed specifically for washing of vehicles and equipment, which drains to a sanitary sewer.

Conduct outside washing operations in a designated wash area with the following features:

- In a paved area, construct a spill containment pad to prevent the run-on of stormwater from adjacent areas. Slope the spill containment area to collect washwater in a containment pad drain system with perimeter drains, trench drains or catchment drains. Size the containment pad to extend out a minimum of four feet on all sides of the washed vehicles and/or equipment.
- Convey the washwater to a sump (like a grit separator) and then to a sanitary sewer (if allowed by the local Sewer Authority), or other appropriate wastewater treatment or recycle system. The containment sump must have a positive control outlet valve for spill control with live containment volume, and oil/water separation. Size the minimum live storage volume to contain the maximum expected daily washwater flow plus the sludge storage volume below the outlet pipe. Shut the outlet valve during the washing cycle to collect the washwater in the sump. The valve should remain shut for at least two hours following the washing operation to allow the oil and solids to separate before discharge to a sanitary sewer.
- Use a two way valve for discharges from the containment pad. This valve should be normally switched to direct water to treatment, but may be switched to the drainage system after that pad is clean to handle stormwater runoff. The stormwater can then drain into the conveyance/discharge system outside of the wash pad (essentially bypassing the sanitary sewer or recycle system). Post signs to inform people of the operation and purpose of the valve. Clean the concrete pad thoroughly until there is no foam or visible sheen in the washwater prior to closing the inlet valve and allowing uncontaminated stormwater to overflow and drain off the pad.

Note that the purpose of the valve is to convey only washwater and contaminated stormwater to a treatment system.

- Collect the washwater from building structures and convey it to appropriate treatment such as a sanitary sewer system if it contains oils, soaps, or detergents. If the washwater does not contain oils, soaps, or detergents (in this case only a low pressure, clean, cold water rinse is allowed) then it could drain to soils that have sufficient natural attenuation capacity for dust and sediment.
- Sweep surfaces prior to cleaning/washing to remove excess sediment and other pollutants.
- If roof equipment or hood vents are cleaned, ensure that no washwater or process water is discharged to the roof drains or drainage systems.
- Label all mobile cleaning equipment as follows: "Properly dispose of all wastewater. Do not discharge to an inlet/catch basin, ditch, stream, or on the ground."

Recommended Additional BMPs:

- Mark the wash area at gas stations, multifamily residences and any other business where non-employees wash vehicles.

- Operators may use a manually operated positive control valve for uncovered wash pads, but a pneumatic or electric valve system is preferable. The valve may be on a timer circuit and opened upon completion of a wash cycle. After draining the sump or separator, the timer would then close the valve.
- Minimize the use of water and detergents in washing operations when practicable.
- Use phosphate-free biodegradable detergents when practicable.
- Use the least hazardous cleaning products available.
- Consider recycling the washwater.

Operators may use soluble/emulsifiable detergents in the wash medium and should use it with care and the appropriate treatment. Carefully consider the selection of soaps and detergents and treatment BMPs. Oil/water separators are ineffective in removing emulsified or water soluble detergents. Another treatment appropriate for emulsified and water soluble detergents may be required.

Exceptions:

- At gas stations (for charity car washes) or commercial parking lots, where it is not possible to discharge the washwater to a sanitary sewer, a temporary plug or a temporary sump pump can be used at the storm drain to collect the washwater for off-site disposal such as to a nearby sanitary sewer.
- New and used car dealerships may wash vehicles in the parking stalls as long as employees use a temporary plug system to collect the washwater for disposal as stated above, or an approved treatment system for the washwater is in place.

At industrial sites, contact Ecology for NPDES Permit requirements even when not using soaps, detergents, and/or other chemical cleaners in washing trucks.

S434 BMPs for Dock Washing

Description of Pollutant Sources: Washing docks (or wharves, piers, floats, and boat ramps) can result in the discharge dirt, bird feces, soaps, and detergents that can be toxic to aquatic life, especially after they take on contaminants while cleaning. The BMPs in this section do not address dry docks, graving docks, or marine railway cleaning operations.

Pollutant Control Approach: Use dry methods and equipment (scraping, sweeping, vacuuming) to remove debris and contaminants prior to cleaning with water to prevent these substances from entering surface water.

Applicable Operational BMPs:

Surface Preparation and Spot Cleaning

- Scoop and collect debris and bird feces.
- Sweep, capture, and dispose of debris from the dock as solid waste. Sweep or vacuum docks to minimize the need for chemical cleaners.

- During cleaning activities, if debris, substances, or wash water could enter surface waters through drains, temporarily block the drains and collect the water for proper disposal.
- Hose down the area if necessary and collect water as feasible.
- Try spot cleaning with water and a coarse cloth before using soaps or detergents.
- If a cleaner is needed for spot cleaning:
 - Mix it in a bucket and use it to scrub down only the areas that need extra attention.
 - Start with vinegar and baking soda and move to other options as needed. Spot clean using a rag if harsher cleaning products are needed.
 - Avoid or minimize the use of petroleum distillates, chlorinated solvents, and ammonia-niated cleaning agents.
 - Use degreasers or absorbent material to remove residual grease by hand and do not allow this material to enter surface water.
 - Keep cleaners in sealed containers. Keep cleaner containers closed securely when transporting between the shore and docks.
 - Properly dispose of the dirty bucket water.
- Minimize the scour impact of wash water to any exposed soil at the landward end(s) of the dock or below the dock. Place a tarp over exposed soil, plant vegetation, or put berms to contain eroded soil.

Dock Washing and Disposal

- To the extent practicable, collect any wash water generated from hosing down, pressure washing, or cleaning dock areas, and dispose of it properly.
- The following video, provided courtesy of the Port of Seattle, highlights the methods they have developed to collect wash water generated during dock washing.

Video: Dock Scrubbing at Port of Seattle (YouTube Link): [https://www.youtTube.com/watch?v=7RBFdjC3K1Q](https://www.youtube.com/watch?v=7RBFdjC3K1Q)

- Try pressure washing using light pressure. This uses less water and decreases the need for soap and scrubbing when washing the dock. Avoid using excessive pressure, which may damage the dock or send flakes of paint and other material into the water.
- Do not place any debris and substances resulting from cleaning activities in shoreline areas, riparian areas, or on adjacent land where these substances may erode into waters of the state.
- Where treated wood associated with the structure being washed are present, use non-abrasive methods and tools that, to the maximum extent practicable, minimize removal of the creosote or treated wood fibers when it removes marine growth from creosote or any other treated wood.
- Do not discharge removed marine growth to waters of the state where such marine growth

would accumulate on the sea bed.

- Do not discharge emulsifiers, dispersants, solvents, or other toxic deleterious materials to waters of the state.

S441 BMPs for Potable Water Line Flushing, Water Tank Maintenance, and Hydrant Testing

Description of Pollutant Sources: Flushing is a common maintenance activity used to improve pipe hydraulics and to remove pollutants in systems. Flushing done improperly can result in the discharge of solids to receiving waters. Hydrant testing may result in the discharge of rust particles.

Chemicals used in line flushing and tank maintenance are highly toxic to aquatic organisms and can degrade receiving waters.

Pollutant Control Approach: Dechlorinate and pH adjust water used for flushing, tank maintenance, or hydrant testing. Dispose of the water to the sanitary sewer if possible.

Applicable Operational BMPs:

- Remove solids from associated curbs and gutters before flushing water. Use erosion and sediment control BMPs such as [BMP C235: Wattles](#), [BMP C220: Inlet Protection](#), etc. to collect any solids resulting from flushing activities.
- If using super chlorination or chemical treatment as part of flushing, discharge water to the sanitary sewer. If sanitary sewer is not available, the water may be infiltrated to the ground as long as all of the following are met:
 - The water is dechlorinated to a total residual chlorine of 0.1 ppm or less.
 - Water quality standards are met.
 - A diffuser is used to prevent erosion.
 - The water does not cross property lines.
- Discharging water to a drainage system requires approval from the local jurisdiction. Check with the local jurisdiction to determine their requirements for approval. Most jurisdictions will require the water to be dechlorinated to a total residual chlorine concentration of 0.1 ppm or less and pH adjusted if necessary. Water must be volumetrically and velocity controlled to prevent resuspension of sediments or pollutants in the Municipal Separate Storm Sewer System (MS4).
- Do not over apply dechlorination agents. This can deplete the dissolved oxygen concentration and reduce the pH in discharge / receiving waters.

Optional Operational BMPs:

- If possible, design flushing to convey accumulated material to strategic locations, such as to the sanitary sewer or to a treatment facility; thus, preventing re-suspension and overflow of a

portion of the solids during storm events.

- If possible, conduct flushing and tank maintenance activities on non-rainy days and during the time of year that poses the least risk to aquatic biota.

Optional Treatment BMPs:

- Treatment for dechlorinating can include an application of a stoichiometric quantity of:
 - Ascorbic Acid, Sodium Ascorbate (Vitamin C)
 - Calcium Thiosulfate
 - Sodium Sulfite tablets
 - Sodium Thiosulfate
 - Sodium Bisulfite
 - Alternate Dechlorination Solutions

IV-3 Roads, Ditches, and Parking Lot Source Control BMPs

S405 BMPs for Deicing and Anti-Icing Operations for Airports

Refer to 40 CFR Part 449 for EPA effluent limitations guidelines and new source performance standards to control discharges of pollutants from airport deicing operations.

Description of Pollutant Sources: Operators use deicing and/or apply anti-icing compounds on airport runways, taxiways, and on aircraft to control ice and snow. Typically, ethylene glycol and propylene glycol are deicers used on aircraft. Deicers commonly used on runways, taxiways, and other hard surfaces include calcium magnesium acetate (CMA), calcium chloride, magnesium chloride, sodium chloride, urea, and potassium acetate. The deicing and anti-icing compounds become pollutants when conveyed to storm drains or to surface water after application. Leaks and spills of these chemicals can also occur during their handling and storage.

Pollutant Control Approach for Aircraft: Spent glycol discharges in aircraft application areas are regulated process wastewaters under Ecology's Industrial Stormwater General Permit. BMPs for aircraft de/anti-icers must be consistent with aviation safety and the operational needs of the aircraft operator.

Applicable BMPs for Aircraft:

- Conduct aircraft deicing or anti-icing applications in impervious containment areas. Collect aircraft deicer or anti-icer spent chemicals, such as glycol, draining from aircraft in deicing or anti-icing application areas and convey to a sanitary sewer, treatment, or other approved disposal or recovery method. Divert deicing runoff from paved gate areas to appropriate collection areas or conveyances for proper treatment or disposal.
- Do not discharge spent deicer or anti-icer chemicals or stormwater contaminated with aircraft deicer or anti-icer chemicals from application areas, including gate areas into storm drains. No discharge to surface water, or ground water, directly or indirectly should occur.
- Transfer deicing and anti-icing chemicals on an impervious containment pad, or equivalent spill/leak containment area, and store in secondary containment areas. (See [S428 BMPs for Storage of Liquids in Permanent Aboveground Tanks](#)).

Note this applicable containment BMP of aircraft de/anti-icing applications, and applicable treatment BMPs for de/anti-icer spent chemicals such as glycols.

Recommended Additional BMPs for Aircraft:

- Establish a centralized aircraft de/anti-icing facility, if practicable, or in designated areas of the tarmac equipped with separate collection drains for the spent deicer liquids.

- Consider installing an aircraft de/anti-icing chemical recovery system, or contract with a chemical recycler.

Applicable BMPs for Airport Runways/Taxiways:

- Avoid excessive application of all de/anti-icing chemicals, which could contaminate stormwater.
- Store and transfer de/anti-icing materials on an impervious containment pad or an equivalent containment area and/or under cover in accordance with [S429 BMPs for Storage or Transfer \(Outside\) of Solid Raw Materials, Byproducts, or Finished Products](#). Consider other material storage and transfer approaches only if the de/anti-icer material will not contaminate stormwater.

Recommended Additional BMPs for Airport Runways/Taxiways:

- Include limits on toxic materials and phosphorous in the specifications for de/anti-icers, where applicable.
- Consider using anti-icing materials rather than deicers if it will result in less adverse environmental impact.
- Select cost-effective de/anti-icers that cause the least adverse environmental impact.

S406 BMPs for Streets and Highways

Description of Pollutant Sources: These BMPs apply to the maintenance and deicing/anti-icing of streets and highways. Deicing products can be conveyed during storm events to inlets/catch basins or to receiving waters after application. Leaks and spills of these products can also occur during their handling and storage. Equipment and processes using during maintenance can contribute pollutants such as oil and grease, suspended solids, turbidity, high pH, and metals.

Pollutant Control Approach: Apply good housekeeping practices, preventative maintenance, properly train employees, and use materials that cause less adverse effects on the environment.

Applicable BMPs:

Deicing and Anti-Icing Operations

- Adhere to manufacturer's guidelines and industry standards of use and application.
- Store and transfer de and anti-icing materials on impervious containment pads, or an equivalent spill/leak containment area in accordance with [S429 BMPs for Storage or Transfer \(Outside\) of Solid Raw Materials, Byproducts, or Finished Products](#).
- Sweep/clean up accumulated de and anti-icing materials and grit from roads as soon as possible after the road surface clears.
- Minimize use in areas where runoff or spray from the roadway immediately enters sensitive areas such as fish-bearing streams.

Maintenance Operations

- Use drip pans or absorbents wherever concrete, asphalt, asphalt emulsion, paint product, and drips are likely to spill, such as beneath discharge points from equipment.
- Cover and contain nearby storm drains to keep runoff from entering the drainage system.
- Collect and contain all solids, slurry, and rinse water. Do not allow these to enter gutters, storm drains, or drainage ditches or onto the paved surface of a roadway or driveway.
- Designate an area onsite for washing hand tools and collect that water for disposal.
- Conduct all fueling of equipment in accordance with [S419 BMPs for Mobile Fueling of Vehicles and Heavy Equipment](#).
- Do not use diesel fuel for cleaning or prepping asphalt tools and equipment.
- Sweep areas as frequently as needed. Collect all loose aggregate and dust for disposal. Do not hose down areas into storm drains.
- Store all fuel, paint, and other products on secondary containment.
- Conduct paint striping operations during dry weather.

Recommended Additional BMPs:

- Where feasible and practicable, use roadway deicing chemicals that cause the least adverse environmental impact. Apply only as needed using minimum quantities. Consider the Pacific Northwest Snowfighters Qualified Products List when selecting roadway de-icers and anti-icers.
- Intensify roadway and drainage structure cleaning in early spring to help remove particulates from road surfaces.
- Include limits on toxic metals in the specifications for de/anti-icers.
- Install catch basin inserts to collect excess sediment and debris as necessary. Inspect and maintain catch basin inserts to ensure they are working correctly.
- Research admixtures (e.g. corrosion inhibitors, surfactants) to determine what additional pollutants may be an issue. Verify with the local jurisdiction if there are any restrictions on admixtures.

S415 BMPs for Maintenance of Public and Private Utility Corridors and Facilities

Description of Pollutant Sources: Corridors and facilities at petroleum product pipelines, natural gas pipelines, water pipelines, electrical power transmission corridors, and rights-of-way can be sources of pollutants such as herbicides used for vegetation management, and eroded soil particles from unpaved access roads. At pump stations, waste materials generated during maintenance activities may be temporarily stored outside. Additional potential pollutant sources include the leaching of

preservatives from wood utility poles, PCBs in older transformers, water removed from underground transformer vaults, and leaks/spills from petroleum pipelines. The following are potential pollutants: oil and grease, TSS, BOD, organics, PCBs, pesticides, and heavy metals.

Pollutant Control Approach: Implementation of spill control plans as well as control of fertilizer and pesticide applications, soil erosion, and site debris that can contaminate stormwater.

Applicable Operational BMPs:

- Minimize the amount of herbicides and other pesticides used to maintain access roads and facilities.
- Implement [S411 BMPs for Landscaping and Lawn / Vegetation Management](#).
- Comply with [WSDA Pesticide Regulations](#) (see [I-2.15 Other Requirements](#)).
- When removing water or sediments from electric transformer vaults, determine the presence of contaminants before disposing of the water and sediments.
 - This includes inspecting for the presence of oil or sheen, and determining from records or testing if the transformers contain PCBs.
 - If records or tests indicate that the sediments or water are contaminated above applicable levels, manage these media in accordance with applicable federal and state regulations, including the federal PCB rules (40 CFR 761) and the state MTCA cleanup regulations ([Chapter 173-340 WAC](#)).
 - Water removed from the vaults can be discharged in accordance with the federal 40 CFR 761.79, and state regulations ([Chapter 173-201A WAC](#) and [Chapter 173-200 WAC](#)), or via the sanitary sewer if the requirements, including applicable permits, for such a discharge are met. (See also [Requirements for Stormwater Discharges to Public Sanitary Sewers, Septic Systems, Dead-End Sumps, and Industrial Waste Treatment Systems](#) and [Ecology Requirements for Generators of Dangerous Wastes](#) in [I-2.15 Other Requirements](#)).
- Stabilize access roads or areas of bare ground with gravel, crushed rock, or another method to prevent erosion. Use and manage vegetation to minimize bare ground/soils that may be susceptible to erosion.
- Provide maintenance practices to prevent stormwater from accumulating and draining across and/or onto roadways. Convey stormwater through roadside ditches and culverts. The road should be crowned, outsloped, water barred, or otherwise left in a condition not conducive to erosion. Appropriately maintaining grassy roadside ditches discharging to surface waters is an effective way of removing some pollutants associated with sediments carried by stormwater.
- Maintain ditches and culverts at an appropriate frequency to ensure that plugging and flooding across the roadbed, with resulting overflow erosion, does not occur.
- Apply the appropriate BMPs in this Volume for the storage of waste materials that can contaminate stormwater.

Recommended Operational BMPs:

- When selecting utility poles for a specific location, consider the potential environmental effects of the pole or poles during storage, handling, and end-use, as well as its cost, safety, efficacy, and expected life. Use wood products treated with chemical preservatives made in accordance with generally accepted industry standards such as the American Wood Preservers Association Standards (see <http://www.awpa.com/standards/>). Consider alternative materials or technologies if placing poles in or near an environmentally sensitive area, such as a wetland or a drinking water well. Alternative technologies include poles constructed with material(s) other than wood such as fiberglass composites, metal, or concrete. Consider other technologies and materials, such as sleeves or caissons for wood poles, when they are determined to be practicable and available.
- As soon as practicable remove all litter from wire cutting/replacing operations.
- Implement temporary erosion and sediment control in areas cleared of trees and vegetation and during the construction of new roads.

S416 BMPs for Maintenance of Roadside Ditches

Description of Pollutant Sources: Common road debris including eroded soil, oils, vegetative particles, and heavy metals can be sources of stormwater pollutants.

Pollutant Control Approach: Maintain roadside ditches to preserve the condition and capacity for which they were originally constructed, and to minimize bare or thinly vegetated ground surfaces. Maintenance practices should provide for erosion and sediment control (see [S411 BMPs for Landscaping and Lawn / Vegetation Management](#)).

Additional Regulations: Note that work in wet areas may be regulated by local, state, or federal regulations that impose additional obligations on the responsible party. Check with the appropriate authorities prior to beginning work in those areas.

Applicable Operational BMPs:

- Inspect roadside ditches regularly to identify sediment accumulations and localized erosion.
- Clean ditches on a regular basis, as needed. Keep ditches free of rubbish and debris.
- Vegetation in ditches often prevents erosion and cleanses runoff waters. Remove vegetation only when flow is blocked or excess sediments have accumulated. Conduct ditch maintenance (seeding, fertilizer application, harvesting) in late spring and/or early fall, where possible. This allows re-establishment of vegetative cover by the next wet season thereby minimizing erosion of the ditch as well as making the ditch effective as a biofilter.
- Do not apply fertilizer unless needed to maintain vegetative growth.
- In the area between the edge of the pavement and the bottom of the ditch, commonly known as the “bare earth zone,” use grass vegetation, wherever possible. Establish vegetation from the edge of the pavement, if possible, or at least from the top of the slope of the ditch.
- Maintain diversion ditches on top of cut slopes constructed to prevent slope erosion by

intercepting surface drainage to retain their diversion shape and capability.

- Use temporary erosion and sediment control measures or re-vegetate as necessary to prevent erosion during ditch reshaping.
- Do not leave ditch cleanings on the roadway surfaces. Sweep, collect, and dispose of dirt and debris remaining on the pavement at the completion of ditch cleaning operations as described below:
 - Consider screening roadside ditch cleanings, not contaminated by spills or other releases and not associated with a stormwater treatment system such as a bioswale, to remove litter. Separate screenings into soil and vegetative matter (leaves, grass, needles, branches, etc.) categories. Compost or dispose of the vegetative matter in a municipal waste landfill. Consult with the jurisdictional health department to discuss use or disposal options for the soil portion. For more information, see [Appendix IV-B: Management of Street Waste Solids and Liquids](#).
 - Roadside ditch cleanings contaminated by spills or other releases known or suspected to contain dangerous waste must be handled following the Dangerous Waste Regulations ([Chapter 173 303 WAC](#)). If testing determines materials are not dangerous waste but contaminants are present, consult with the jurisdictional health department for disposal options.
- Examine culverts on a regular basis for scour or sedimentation at the inlet and outlet, and repair as necessary. Give priority to those culverts conveying perennial and/or salmon-bearing streams and culverts near streams in areas of high sediment load, such as those near subdivisions during construction. Maintain trash racks to avoid damage, blockage, or erosion of culverts.

Recommended Treatment BMPs:

Install biofiltration swales and filter strips (see [V-7 Biofiltration BMPs](#)) to treat roadside runoff wherever practicable and use engineered topsoils wherever necessary to maintain adequate vegetation. These systems can improve infiltration and stormwater pollutant control upstream of roadside ditches.

S417 BMPs for Maintenance of Stormwater Drainage and Treatment Systems

Description of Pollutant Sources: Facilities include roadside catch basins on arterials and within residential areas, conveyance systems, detention facilities such as ponds and vaults, oil/water separators, biofilters, settling basins, infiltration systems, and all other types of stormwater treatment systems presented in [Volume V](#). Oil and grease, hydrocarbons, debris, heavy metals, sediments and contaminated water are found in catch basins, oil and water separators, settling basins, etc.

Pollutant Control Approach: Provide maintenance and cleaning of debris, sediments, and other pollutants from stormwater collection, conveyance, and treatment systems to maintain proper operation.

Applicable Operational BMPs:

Maintain stormwater treatment facilities per the operations and maintenance (O&M) procedures presented in [Appendix V-A: BMP Maintenance Tables](#) in addition to the following BMPs:

- Inspect and clean treatment BMPs, conveyance systems, and catch basins as needed, and determine necessary O&M improvements.
- Promptly repair any deterioration threatening the structural integrity of stormwater facilities. These include replacement of clean-out gates, catch basin lids, and rock in emergency spillways.
- Ensure adequacy of storm sewer capacities and prevent heavy sediment discharges to the sewer system.
- Regularly remove debris and sludge from BMPs used for peak-rate control, treatment, etc. and discharge to a sanitary sewer if approved by the sewer authority, or truck to an appropriate local or state government approved disposal site.
- Clean catch basins when the depth of deposits reaches 60 percent of the sump depth as measured from the bottom of basin to the invert of the lowest pipe into or out of the basin. However, in no case should there be less than six inches clearance from the debris surface to the invert of the lowest pipe. Some catch basins (for example, WSDOT's *Catch Basin Type 1L* ([WSDOT, 2011](#))) may have as little as 12 inches sediment storage below the invert. These catch basins need frequent inspection and cleaning to prevent scouring. Where these catch basins are part of a stormwater collection and treatment system, the system owner/operator may choose to concentrate maintenance efforts on downstream control devices as part of a systems approach.
- Properly dispose of all solids, polluted material, and stagnant water collected through system cleaning. Do not decant water back into the drainage system from eductor trucks or vacuum equipment since there may be residual contaminants in the cleaning equipment. Do not jet material downstream into the public drainage system.
- Clean woody debris in a catch basin as frequently as needed to ensure proper operation of the catch basin.
- Post warning signs; "Dump No Waste - Drains to Ground Water," "Streams," "Lakes," or emboss on or adjacent to all storm drain inlets where possible.
- Disposal of sediments and liquids from the catch basins must comply with [Appendix IV-B: Management of Street Waste Solids and Liquids](#).

S421 BMPs for Parking and Storage of Vehicles and Equipment

Description of Pollutant Sources: Public and commercial parking lots such as retail store, fleet vehicle (including rent-a-car lots and car dealerships), equipment sale and rental parking lots, and

parking lot driveways, can be sources of toxic hydrocarbons and other organic compounds, including oils and greases, metals, and suspended solids.

Pollutant Control Approach: If the parking lot meets the site use thresholds to determine if the site is expected to generate high concentrations of oil, as defined in [Step 2: Determine if an Oil Control BMP is Required](#) in [III-1.2 Choosing Your Runoff Treatment BMPs](#), provide oil removal equipment for the contaminated stormwater runoff.

Applicable Operational BMPs:

- If a parking lot must be washed, discharge the washwater to a sanitary sewer, if allowed by the local sewer authority, or other approved wastewater treatment system, or collect washwater for off-site disposal.
- Do not hose down the area to a storm sewer or receiving water. Vacuum sweep parking lots, storage areas, and driveways regularly to collect dirt, waste, and debris. Mechanical or hand sweeping may be necessary for areas where a vacuum sweeper cannot reach.
- Clean up vehicle and equipment fluid drips and spills immediately.
- Place drip pans below leaking vehicles (including inoperative vehicles and equipment) in a manner that catches leaks or spills, including employee vehicles. Drip pans must be managed to prevent overfilling and the contents disposed of properly.

Recommended Operational BMPs:

- Encourage employees to repair leaking personal vehicles.
- Encourage employees to carpool or use public transit through incentives.
- Encourage customers to use public transit by rewarding valid transit pass holders with discounts.
- Install catch basin inserts to collect excess sediment and oil if necessary. Inspect and maintain catch basin inserts to ensure they are working correctly.

Applicable Treatment BMPs:

Establishments subject to high-use intensity are significant sources of oil contamination of stormwater. Examples of potential high use areas include customer parking lots at fast food stores, grocery stores, taverns, restaurants, large shopping malls, discount warehouse stores, quick-lube shops, and banks.

Refer to [Step 2: Determine if an Oil Control BMP is Required](#) in [III-1.2 Choosing Your Runoff Treatment BMPs](#) for the site use thresholds that determine if an oil control BMP is required, and for a list of oil control BMPs.

S430 BMPs for Urban Streets

Description of Pollutant Sources: Urban streets can be the source of vegetative debris, paper, fine dust, vehicle liquids, tire and brake wear residues, heavy metals (lead and zinc), soil particles,

ice control salts, domestic wastes, lawn chemicals, and vehicle combustion products. Street surface contaminants contain significant concentrations of particle sizes less than 250 microns ([Sartor and Boyd, 1972](#)).

Pollutant Control Approach: Conduct efficient street sweeping where and when appropriate to minimize the contamination of stormwater. Do not wash street debris into storm drains.

Facilities not covered under the Industrial Stormwater General Permit may consider a minimum amount of water washing of streets. All facilities must comply with their local stormwater requirements for discharging to storm sewers. Municipal NPDES permittees are required to limit street wash water discharges and may have special conditions or treatment requirements.

Recommended BMPs:

- For maximum stormwater pollutant reductions on curbed streets and high volume parking lots, use efficient vacuum sweepers.

Note: High-efficiency street sweepers utilize strong vacuums and the mechanical action of main and gutter brooms combined with an air filtration system that only returns clean air to the atmosphere (i.e., filters very fine particulates). They sweep dry and use no water since they do not emit any dust.

High-efficiency vacuum sweepers have the capability of removing 80 percent or more of the accumulated street dirt particles whose diameters are less than 250 microns ([Sutherland et al., 1998](#)). This assumes pavements under good condition and reasonably expected accumulation conditions.

- For moderate stormwater pollutant reductions on curbed streets use regenerative air sweepers or tandem sweeping operations.

Note: A tandem sweeping operation involves a single pass of a mechanical sweeper followed immediately by a single pass of a vacuum sweeper or regenerative air sweeper.

- *A regenerative air sweeper blows air down on the pavement to entrain particles and uses a return vacuum to transport the material to the hopper.*
- *These operations usually use water to control dust. This reduces their ability to pick up fine particulates.*

These types of sweepers have the capability of removing approximately 25 to 50 percent of the accumulated street dirt particles whose diameters are less than 250 microns. ([Sutherland et al., 1998](#)). This assumes pavements under good conditions and typical accumulation conditions.

- For minimal stormwater pollutant reductions on curbed streets use mechanical sweepers.
 - *Note: The industry refers to mechanical sweepers as broom sweepers and uses the mechanical action of main and gutter brooms to throw material on a conveyor belt that transports it to the hopper.*
 - *These sweepers usually use water to control dust. This reduces their ability to pick up fine particulates.*

Mechanical sweepers have the capability of removing only 10 to 20 percent of the accumulated street dirt particles whose diameters are less than 250 microns (Sutherland et al., 1998). This assumes pavements under good condition and the most favorable accumulation conditions.

- Conduct vacuum sweeping at optimal frequencies. Optimal frequencies are those scheduled sweeping intervals that produce the most cost-effective annual reduction of pollutants normally found in stormwater and can vary depending on land use, traffic volume, receiving water, and rainfall patterns.
- Train operators in those factors that result in optimal pollutant removal. These factors include sweeper speed, brush adjustment and rotation rate, sweeping pattern, maneuvering around parked vehicles, and interim storage and disposal methods.
- Consider the use of periodic parking restrictions in low to medium density single-family residential areas to ensure the sweeper's ability to sweep along the curb.
- Establish programs for prompt vacuum sweeping, removal, and disposal of debris from special events that will generate higher than normal loadings.
- Disposal of street sweeping solids must comply with [Appendix IV-B: Management of Street Waste Solids and Liquids](#).
- Consider developing ordinances that prohibit citizens from putting yard debris in the street gutters, or doing vehicle maintenance on the street.
- Provide incentives to property owners for installing permeable pavement parking areas and driveways.
- Consider installing catch basin inserts in high use areas to remove trash and yard debris before it enters the system.
- Implement a storm drain stenciling program to label and educate the public not to dump materials into storm drains or onto sidewalks, streets, parking lots, and gutters.
- Provide household hazardous waste collection and used oil recycling for citizens to avoid illegal dumping.

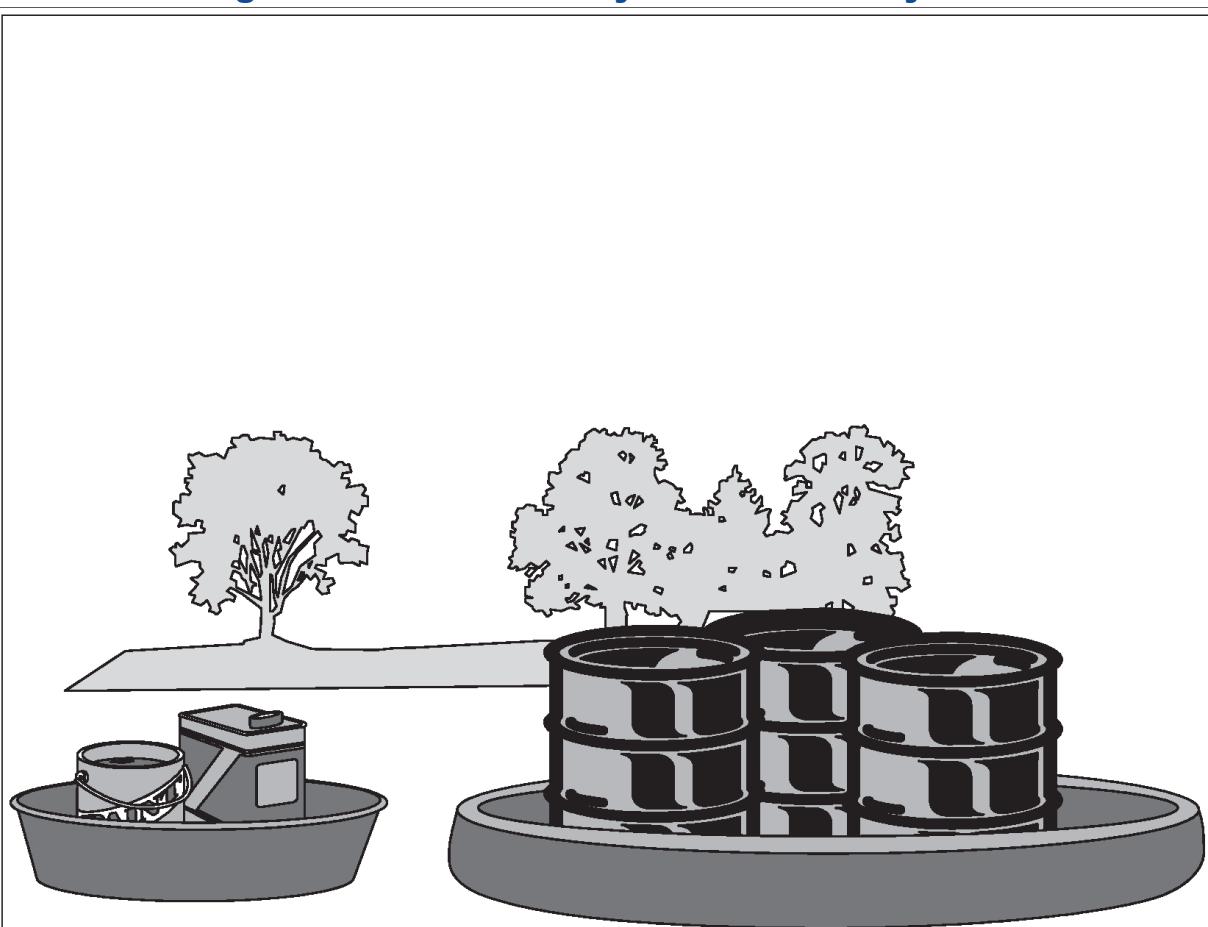
IV-5 Storage and Stockpiling Source Control BMPs

S427 BMPs for Storage of Liquid, Food Waste, or Dangerous Waste Containers

Description of Pollutant Sources: Steel and plastic drums with volumetric capacities of 55 gallons or less are typically used at industrial facilities for container storage of liquids and powders. The BMPs specified below apply to container(s) located outside a building. Use these BMPs when temporarily storing potential pollution generating materials or wastes. These BMPs do not apply when Ecology has permitted the business to store the wastes (see [Standards for Solid Waste Containers](#) in [I-2.15 Other Requirements](#)). Leaks and spills of pollutant materials during handling and storage are the primary sources of pollutants. Oil and grease, acid/alkali pH, BOD, COD are potential pollutant constituents.

Pollutant Control Approach: Store containers in impervious containment under a roof, or other appropriate cover, or in a building. For storage areas on-site for less than 30 days, consider using a portable temporary secondary system like that shown in [Figure IV-5.1: Secondary Containment System](#) in lieu of a permanent system as described above.

Figure IV-5.1: Secondary Containment System



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Secondary Containment System

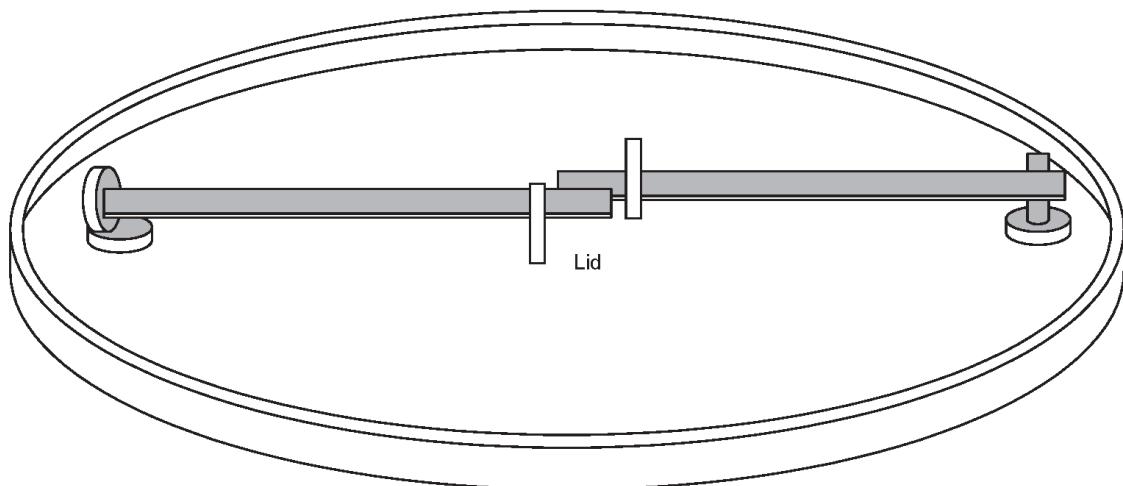
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Applicable Operational BMPs:

- Place tight-fitting lids on all containers.
- Label all containers appropriately. Store containers so that the labels are clearly visible..
- Place drip pans beneath all mounted container taps and at all potential drip and spill locations during filling and unloading of containers.
- Inspect container storage areas regularly for corrosion, structural failure, spills, leaks, overfills, and failure of piping systems. Check containers daily for leaks/spills. Replace containers, and replace and tighten bungs in drums as needed.
- Empty drums containing residues should be stored to prevent stormwater from entering drum closures. Cover or tilt drums to prevent stormwater from accumulating on the top of empty drums and around drum closures.
- Store containers that do not contain free liquids in a designated sloped area with the containers elevated or otherwise protected from stormwater run-on. Comply with local fire code.
- Secure drums when stored in an area where unauthorized persons may gain access in a manner that prevents accidental spillage, pilferage, or any unauthorized use (see [Figure IV-5.2: Locking System for Drum Lid](#)).

Figure IV-5.2: Locking System for Drum Lid



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Locking System for Drum Lid

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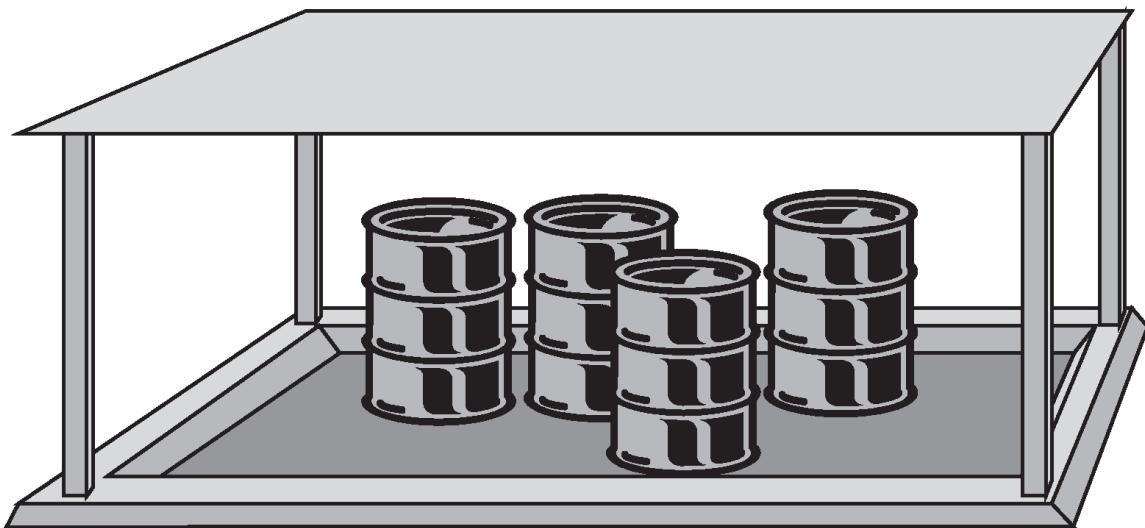
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- If the material is a Dangerous Waste, the business owner must comply with any additional Ecology requirements as specified in [Ecology Requirements for Generators of Dangerous Wastes](#) within [I-2.15 Other Requirements](#).
- Storage of flammable, ignitable, and reactive chemicals and materials must comply with the stricter of local zoning codes, local fire codes, the Uniform Fire Code (UFC), UFC standards, or the National Electric Code
- Have spill kits or cleanup materials near container storage areas.
- Clean up all spills immediately.
- Cover dumpsters, or keep them under cover such as a lean-to, to prevent the entry of stormwater. Keep dumpster lids closed.
- Replace or repair leaking garbage dumpsters, or install waterproof liners.
- Drain dumpsters and/or dumpster pads to sanitary sewer where approved by the sewer authority.
- When collection trucks directly pick up roll-containers, ensure a filet is on both sides of the curb to facilitate moving the dumpster.

Applicable Structural Source Control BMPs:

- Keep containers with Dangerous Waste, food waste, or other potential pollutant liquids inside a building unless this is not feasible due to site constraints or Uniform/International Fire Code requirements.
- Store containers in a designated area, which is covered, bermed or diked, paved and impermeable in order to contain leaks and spills (see [Figure IV-5.3: Covered and Bermed Containment Area](#)). Slope the secondary containment to drain into a dead-end sump for the collection of leaks and small spills.
- For liquid materials, surround the containers with a dike as illustrated in [Figure IV-5.3: Covered and Bermed Containment Area](#). The dike must be of sufficient height to provide a volume of either 10 percent of the total enclosed container volume or 110 percent of the volume contained in the largest container, whichever is greater.

Figure IV-5.3: Covered and Bermed Containment Area



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Covered and Bermed Containment Area

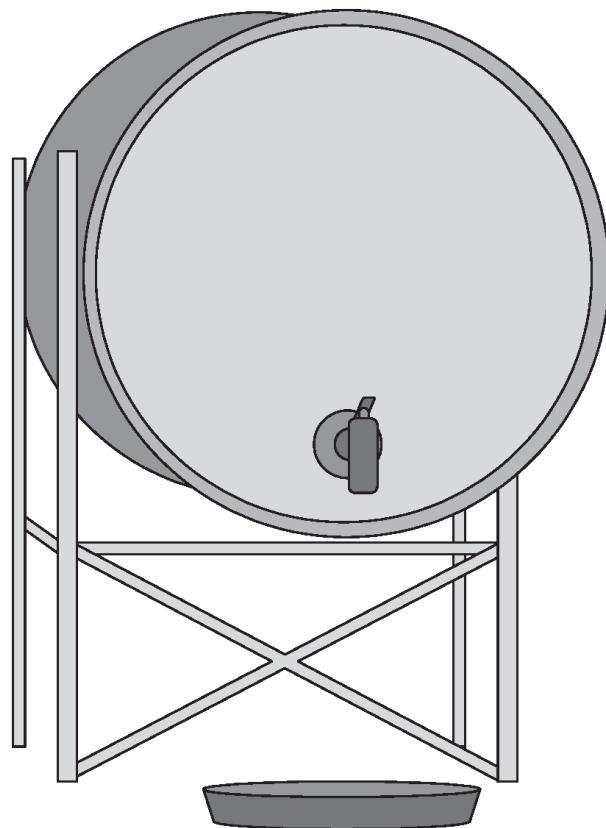
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- Where material is temporarily stored in drums, use a containment system as illustrated, in lieu of the above system (see [Figure IV-5.1: Secondary Containment System](#)).
- Place containers mounted for direct removal of a liquid chemical for use by employees inside a containment area as described above. Use a drip pan during liquid transfer (see [Figure IV-5.4: Mounted Container - With Drip Pan](#)).

Figure IV-5.4: Mounted Container - With Drip Pan



*Note that the secondary containment is not shown in this figure

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Mounted Container - with Drip Pan

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Applicable Treatment BMP:

Note this treatment BMP is for contaminated stormwater from drum storage areas.

- To discharge contaminated stormwater, pump it from a dead-end sump or catchment and dispose of appropriately.

S428 BMPs for Storage of Liquids in Permanent Aboveground Tanks

Description of Pollutant Sources: Aboveground tanks containing liquids (excluding uncontaminated water) may be equipped with a valved drain, vent, pump, and bottom hose connection. Aboveground tanks may be heated with steam heat exchangers equipped with steam traps, if required. Leaks and spills can occur at connections and during liquid transfer. Oil and grease, organics, acids, alkalis, and heavy metals in tank water and condensate drainage can also cause stormwater contamination at storage tanks.

Pollutant Control Approach: Install secondary containment or a double-walled tank. Slope the containment area to a drain with a sump. Operators may need to discharge stormwater collected in the containment area to a Runoff Treatment BMP such as [BMP T11.10: API \(Baffle type\) Separator](#) or [BMP T11.11: Coalescing Plate \(CP\) Separator](#), or an equivalent BMP. Add safeguards against accidental releases including protective guards around tanks to protect against vehicle or forklift damage, and tagging valves to reduce human error. *Tank water and condensate discharges are process wastewater that may need an NPDES Permit.*

Applicable Operational BMPs:

- Inspect the tank containment areas regularly for leaks/spills, cracks, corrosion, etc. to identify problem components such as fittings, pipe connections, and valves.
- Place adequately sized drip pans beneath all mounted taps and drip/spill locations during filling/unloading of tanks. Operators may need valved drain tubing in mounted drip pans.
- Vacuum sweep and clean the tank storage area regularly, if paved.
- Replace or repair tanks that are leaking, corroded, or otherwise deteriorating.
- Storage of flammable, ignitable, and reactive chemicals and materials must comply with the stricter of local zoning codes, local fire codes, the Uniform Fire Code (UFC), UFC standards, or the National Electric Code.

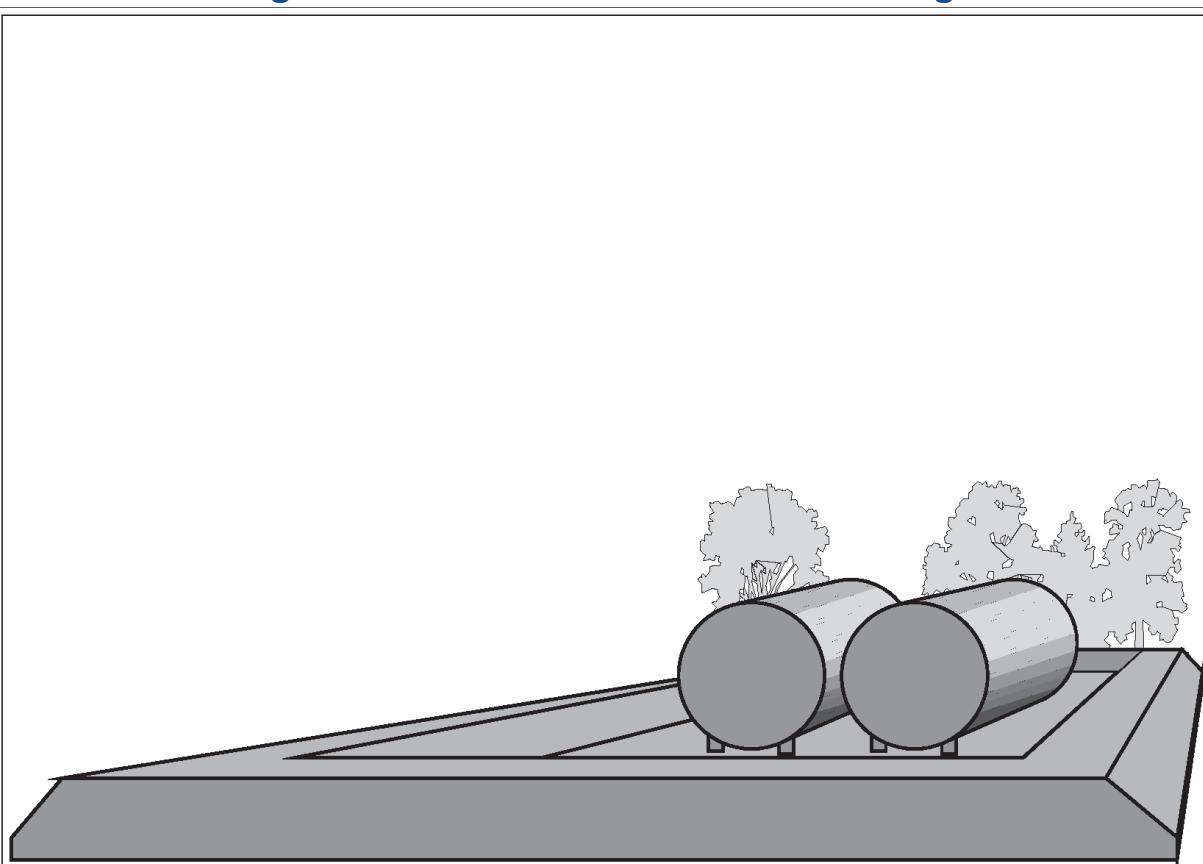
Applicable Structural BMPs:

- Locate permanent tanks in impervious (Portland cement concrete or equivalent) secondary containment surrounded by dikes as illustrated in [Figure IV-5.5: Above-Ground Tank Storage](#), or use UL Approved double-walled tanks. The dike must be of sufficient height to provide a containment volume of either 10 percent of the total enclosed tank volume or 110 percent of the volume contained in the largest tank, whichever is greater.
- Slope the secondary containment to drain to a normally closed valve, for the collection of small

spills.

- Include a tank overfill protection system to minimize the risk of spillage during loading.

Figure IV-5.5: Above-Ground Tank Storage



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Above-Ground Tank Storage

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Applicable Treatment BMPs:

- Depending on the kind of liquid being stored, the potential and type of stormwater contamination will vary and may require specialized treatment.
- For an uncovered tank containment area, equip the outlet from the spill-containment sump with a normally closed shutoff valve. Operators may open this valve manually or automatically, only to convey contaminated stormwater to approved treatment or disposal, or to convey uncontaminated stormwater to a storm sewer. Evidence of contamination can include the presence of visible sheen, color, or turbidity in the runoff, or existing or historical operational problems at the facility. Use simple pH tests with litmus or pH paper for areas subject to acid or alkaline contamination.
- At petroleum tank farms, convey stormwater contaminated with floating oil or debris in the contained area to a sanitary sewer with the sewer authority's approval or through [BMP T11.10: API \(Baffle type\) Separator](#) or [BMP T11.11: Coalescing Plate \(CP\) Separator](#), or other approved treatment prior to discharge to the storm drain or surface water.

S429 BMPs for Storage or Transfer (Outside) of Solid Raw Materials, Byproducts, or Finished Products

Description of Pollutant Sources: Some pollutant sources stored outside in large piles, stacks, etc. at commercial or industrial establishments include:

- Solid raw materials
- Byproducts
- Gravel
- Sand
- Salts
- Topsoil
- Compost
- Logs
- Sawdust
- Wood chips
- Lumber
- Concrete
- Metal products

Contact between outside bulk materials and stormwater can cause leachate, and erosion of the stored materials. Contaminants may include TSS, BOD, organics, and dissolved salts (sodium, calcium, and magnesium chloride, etc.).

Pollutant Control Approach: Provide impervious containment with berms, dikes, etc. and/or cover to prevent run-on and discharge of leachate pollutant(s) and TSS.

Applicable Operational BMPs:

- Do not hose down the contained stockpile area to a storm drain or a conveyance to a storm drain, or to a receiving water.
- Maintain drainage areas in and around storage of solid materials with a minimum slope of 1.5 percent to prevent pooling and minimize leachate formation. Areas should be sloped to drain stormwater to the perimeter for collection or to internal drainage “alleyways” where no stockpiled material exists.
- Sweep paved storage areas regularly for collection and disposal of loose solid materials.
- If and when feasible, collect and recycle water-soluble materials (leachates).
- Stock cleanup materials, such as brooms, dustpans, and vacuum sweepers near the storage area.

Applicable Structural BMPs:

For stockpiles less than 5 cubic yards, place temporary plastic sheeting (polyethylene, polypropylene, hypalon, or equivalent) over the material as shown in [Figure IV-5.7: Material Covered with Plastic Sheeting](#).

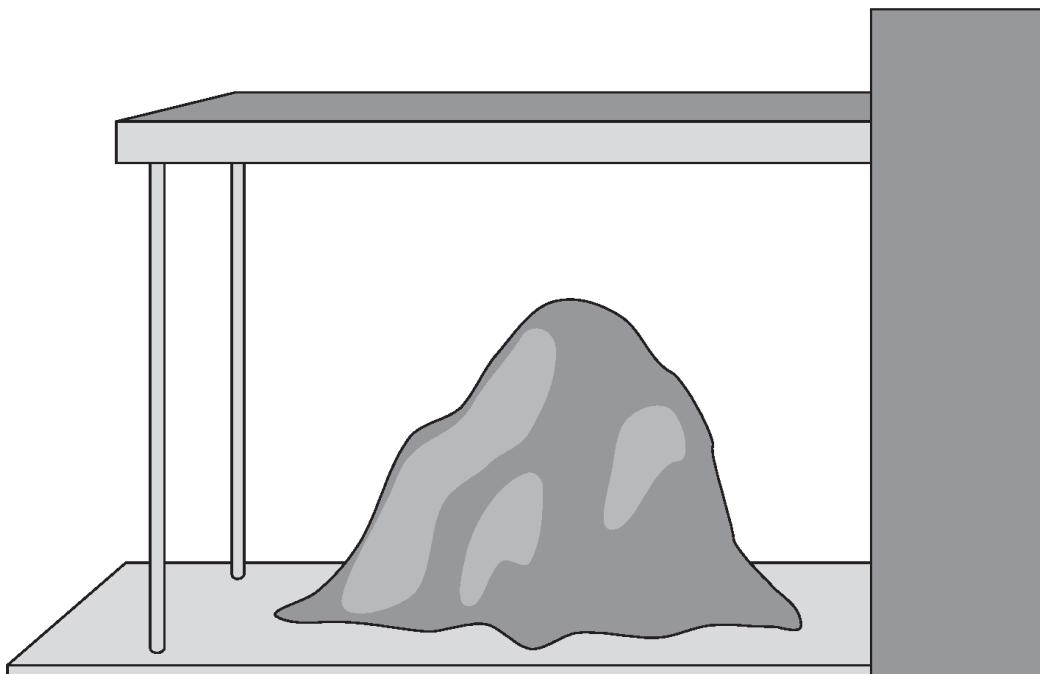
The source control BMP options listed below are applicable to:

- Stockpiles greater than 5 cubic yards of erodible or water soluble materials such as:
 - Soil
 - Road deicing salts
 - Compost
 - Unwashed sand and gravel
 - Sawdust
- Outside storage areas for solid materials such as:
 - Logs
 - Bark
 - Lumber
 - Metal products

Choose one or more of the following Source Control BMPs:

- Store in a building or paved and bermed covered area as shown in [Figure IV-5.6: Covered Storage Area for Bulk Solids.](#)
- Place temporary plastic sheeting (polyethylene, polypropylene, hypalon, or equivalent) over the material as shown in [Figure IV-5.7: Material Covered with Plastic Sheeting.](#)
- Pave the area and install a drainage system. Place curbs or berms along the perimeter of the area to prevent the run-on of uncontaminated stormwater and to collect and convey runoff to treatment. Slope the paved area in a manner that minimizes the contact between stormwater (e.g., pooling) and leachable materials in compost, logs, bark, wood chips, etc.
- For large uncovered stockpiles, implement containment practices at the perimeter of the site and at any catch basins as needed to prevent erosion and discharge of the stockpiled material off-site or to a storm drain. Ensure that no direct discharge of contaminated stormwater to catch basins exists without conveying runoff through an appropriate treatment BMP.

Figure IV-5.6: Covered Storage Area for Bulk Solids



* Include a berm if needed.

NOT TO SCALE



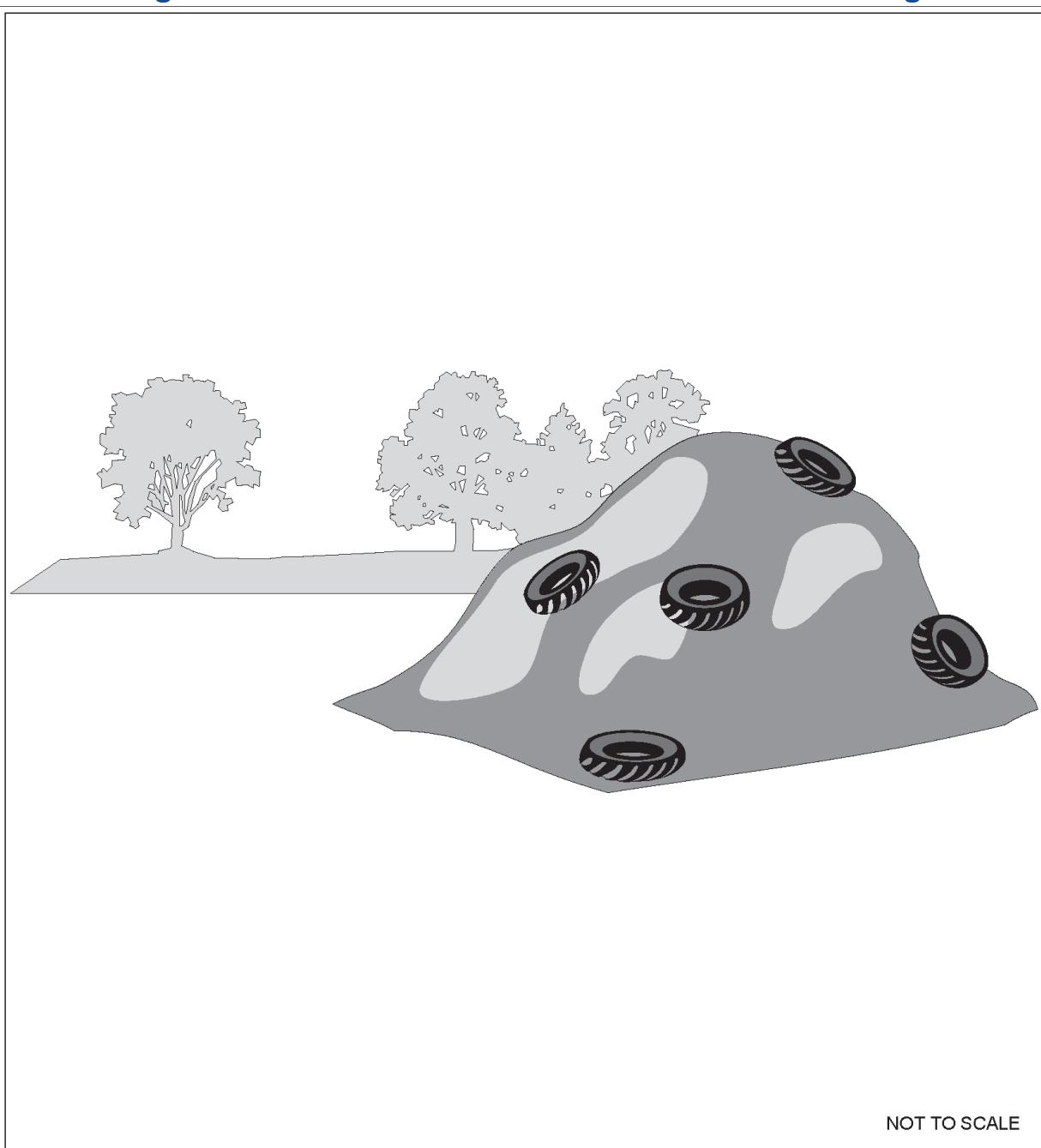
Covered Storage Area for Bulk Solids

Revised June 2017

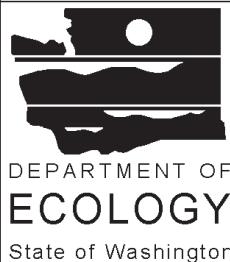
DEPARTMENT OF
ECOLOGY
State of Washington

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Figure IV-5.7: Material Covered with Plastic Sheeting



NOT TO SCALE



Material Covered with Plastic Sheeting

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Applicable Treatment BMPs:

Convey contaminated stormwater from the stockpile area to:

- [BMP T10.10: Wetponds - Basic and Large](#),
- [BMP T10.20: Wetvaults](#),
- [BMP T6.10: Presettling Basin](#),
- Manufactured Treatment Device (see [V-10 Manufactured Treatment Devices as BMPs](#), or
- other appropriate treatment system depending on the contamination.

S445 BMPs for Temporary Fruit Storage

Description of Pollutant Sources: This activity applies to businesses that temporarily store fruits and vegetables outdoors prior to or after packing, processing, or sale, or that crush, cut, or shred fruits or vegetables for wines, frozen juices, and other food and beverage products.

Activities involving the storage or processing of fruits, vegetables, and grains can potentially result in the delivery of pollutants to stormwater. Potential pollutants of concern from all fruit and vegetable storage and processing activities include nutrients, suspended solids, substances that increase biological oxygen demand (BOD), and color. These pollutants must not be discharged to the drainage system or directly into receiving waters.

Pollutant Control Approach: Store and process fruits and vegetables indoors or under cover whenever possible. Educate employees about proper procedures. Cover and contain operations and apply good housekeeping and preventive maintenance practices to prevent the contamination of stormwater.

Applicable Operational BMPs:

- Educate employees on the benefits of keeping a clean storage area.
- Keep fruits, vegetables, and grains stored outside for longer than a day in plastic bins or in bins lined with plastic. The edge of the plastic liner should be higher than the amount of fruit stored or should drape over the side of the bin.
- Dispose of rotten fruit, vegetables, and grains in a timely manner (typically, within a week).
- Make sure all outside materials that have the potential to leach or spill to the drainage system are covered, contained, or moved to an indoor location. For fruits, vegetables, and grains stored outside for a week or more, cover with a tarp or other waterproof material. Make sure coverings are secured from wind.
- Minimize the use of water when cleaning produce to avoid excess runoff.
- Sweep or shovel storage and processing areas daily to collect dirt and fruit and vegetable fragments for proper disposal. Keep hosing to a minimum.
- Keep cleanup materials, such as brooms and dustpans, near the storage area.

- If a holding tank is used for the storage of wastewater, pump out the contents before the tank is full and dispose of wastewater to a sanitary sewer or approved wastewater treatment system.

Applicable Structural BMPs:

- Enclose the processing area in a building or shed, or cover the area with provisions for stormwater run-on prevention. Alternatively, pave and slope the area to drain to the sanitary sewer, holding tank, or process treatment system collection drain.

Optional Structural BMPs:

- Cover outdoor storage areas for fruits and vegetables.
- Use a containment curb, dike, or berm to prevent off-site runoff from storage or processing areas and to prevent stormwater run-on.

Appendix IV-B: Management of Street Waste Solids and Liquids

Introduction

This appendix addresses street waste as defined in [chapter 173-350 WAC](#), Solid waste handling standards. [WAC 173-350](#) is the governing rule for management of typical street waste solids. Ecology adopted revisions to this rule that became effective September 1, 2018, in part to provide clarity on managing soils impacted by release of contaminants, such as street waste. Ecology has solid waste guidance to help ensure handlers of street waste manage it in accordance with [WAC 173-350](#). End users and other authorities may have their own requirements for street waste reuse and handling.

- Per [WAC 173-350](#):
 - **"Street waste"** means solids or dewatered materials collected from stormwater catch basins and similar stormwater treatment and conveyance structures, and materials collected during street and parking lot sweeping.

"Street waste," as defined here, does not include solids and liquids from street washing using detergents, cleaning of electrical vaults, vehicle wash sediment traps, restaurant grease traps, industrial process waste, sanitary sewage, mixed process, or combined sewage/stormwater wastes. Wastes from oil/water separators at sites that load fuel are not included as street waste. Street waste also does not include flood debris, landslide debris, and chip seal gravel.

Regulations for Street Waste Management

Street waste is solid waste. While street waste from routine road maintenance is likely not dangerous waste, it is presumed to be solid waste under [WAC 173-350](#). This Rule classifies Street Waste as a likely "contaminated soil," which is included in the definition of "solid waste." Since stormwater conveyance structures are places where contaminants from streets can accumulate at concentrations that could be harmful for indiscriminate placement, material from such structures is presumed to be "contaminated soil."

- Per [WAC 173-350](#):
 - **"Contaminated soil"** means soil containing one or more contaminants from a release and when moved from one location to another for placement on or into the ground:
 - Contains contaminants at concentrations that exceed a cleanup level under [chapter 173-340 WAC](#), Model Toxics Control Act—Cleanup, that would be established for existing land use at the location where soil is placed; or
 - Contains contaminants that affect pH, and pH of the soil is below 4.5 or above 9.5 or is not within natural background pH limits that exist at the location where soil is placed.

Unless excluded in [WAC 173-350-020](#), contaminated soil is solid waste and must be managed at a solid waste handling facility in conformance with this chapter or [chapter 173-351 WAC](#), Criteria for municipal solid waste landfills. Characterization of material may be required based on solid waste facility acceptance standards. Examples of potentially contaminated soil may include, but are not limited to, street waste, petroleum contaminated soil, engineered soil, and soil likely to have contaminants from a release associated with industrial or historical activities.

Based on test results, street waste to contain contaminants at concentrations that would require either disposal at a permitted solid waste disposal facility, or treatment at a permitted solid waste handling facility for use.

Owners/operators storing or treating street waste prior to disposal or use are typically subject to permitting under the section in [WAC 173-350](#) dealing with “piles used for storage and treatment,” since most storage and treatment takes place in outdoor piles. Indoor or other storage or treatment is subject to permitting under the section dealing with “transfer stations and drop boxes.” To obtain a permit, an owner/operator will need to meet design standards, operating requirements, including characterization procedures and concentration limits if propose to use materials, and record keeping and reporting.

Note: Decant facilities are not subject to solid waste permitting if they will not have intermediate storage or treatment of decanted solids between the decant part of a facility operating in conformance with water quality rules and placement into transfer vehicles going to permitted solid waste facilities.

Street waste solids may contain contaminants at levels too high to allow unrestricted use. Street waste will need to meet the definition in [WAC 173-350](#) for “clean soil” in order for its management or use outside of permitted solid waste handling facilities. “Clean soil” is tied to meeting contaminant concentrations so as not to create a cleanup site where placement of materials would occur.

- Per [WAC 173-350](#):
 - **“Clean soil”** means soil that does not contain contaminants from a release. It also includes soil that contains one or more contaminants from a release and when moved from one location to another for placement on or into the ground:
 - a. Does not contain contaminants at concentrations that exceed a cleanup level under [chapter 173-340 WAC](#), Model Toxics Control Act—Cleanup, that would be established for existing land use at the location where soil is placed; or
 - b. Contains contaminants that affect pH, but pH of the soil is between 4.5 and 9.5 or within natural background pH limits that exist at the location where soil is placed.

Examples of potentially clean soil may include, but are not limited to, soil from undeveloped lands unlikely to have impacts from release of contaminants associated with area-wide or local industrial or historical activities. This includes similar soils over which development may have occurred but land use is unlikely to have led to a release, such as use for residential housing, or over which development provided protection from impacts from a release, such as coverage by pavement. Soil with substances from natural background conditions, as natural background is defined in [WAC 173-350-100](#), is clean soil under this section.

Street waste that will go directly to a permitted landfill or transfer station is not subject to the standards of [WAC 173-350](#), though operators will need to adhere to receiving facility acceptance criteria. For street waste that will not go directly to a permitted landfill or transfer station, an operator needs to consult with their jurisdictional health department to see what solid waste regulations apply to street waste management. In Washington, [chapter 70.95 RCW](#), Solid waste management – Reduction and recycling, gives jurisdictional health departments primary authority over solid waste handling and permitting.

As stated earlier, guidance will be available soon with more specificity on how to manage “contaminated soil” under the recently revised [WAC 173-350](#).

Contaminants in Street Waste Solids

Street waste does not typically classify as dangerous waste. The owner of the stormwater facility and/or collector of street waste is considered the waste generator and responsible for deciding whether the waste designates as dangerous waste. However, sampling has historically shown that material from routine maintenance of roads and stormwater facilities does not classify as dangerous waste.

It is possible that street waste from spill sites has high enough concentration of contaminants to classify it as dangerous waste. Street waste suspected to be dangerous waste should not be collected with other street waste to avoid creating a larger volume of dangerous waste. Street waste with obvious contamination (unusual color, staining, corrosion, unusual odors, fumes, and oily sheen) should be left in place or segregated until tested. Base testing activities on probable contaminants. If collecting potentially dangerous waste because of emergency conditions, or if the waste becomes suspect after it is collected, an owner/operator should handle and store it separately until a determination as to proper disposal is made. Dangerous waste must be handled following [chapter 173-303 WAC](#), Dangerous waste regulations.

Test results from sampling street waste show that it contains contaminants including total petroleum hydrocarbons (TPH), carcinogenic polycyclic aromatic hydrocarbons (c-PAHs), and several metals. These contaminants can be at concentrations high enough to be harmful to human health and the environment unless managed appropriately. The following tables provide a summary of some past test results.

Table IV-B.1: Typical TPH Levels in Street Sweeping and Catch Basin Solids

Reference	Street Sweeping (mg/kg)	Catch Basin Solid (mg/kg)
Snohomish County (1) (Landau, 1995)	390 - 4300	
King County (1) (Herrera, 1995)		123 - 11049 (Median 1036)
Snohomish County & Selected Cities (1) (W&H Pacific, 1994)	163 - 1500 (Median 760)	163 - 1562 (Median 760)

Table IV-B.1: Typical TPH Levels in Street Sweeping and Catch Basin Solids (continued)

Reference	Street Sweeping (mg/kg)	Catch Basin Solid (mg/kg)
City of Portland (2) (Bretsch, 2000)		MDL - 1830 (Median 208)
City of Seattle - Diesel Range (2) (Seattle Public Utilities and Herrera, 2009)	330 - 520	780 - 1700
City of Seattle - Motor Oil (2) (Seattle Public Utilities and Herrera, 2009)	2000 - 2800	3500 - 7000
Oregon (1) (Collins, 1998)	1600 - 2380	
Oregon (3) (Collins, 1998)	98 - 125	
(1) Method WTPH 418.1; does not incorporate new methods to reduce background interference due to vegetative material (2) Method NWTPH-Dx (3) Method WTPH - HCID		

Table IV-B.2: Typical c-PAH Values in Street Waste Solids and Related Materials

Sample Source	City of Everett						WSDOT	
	Analyte	Street Sweepings	Soil	3-Way Topsoil	Vector Solids	Leaf & Sand	Sweepings - Fresh	Sweepings - Weathered
Benzo(a)anthracene	0.1U	0.076U	0.074U	0.21	0.45	0.56	0.40	
Chrysene	0.14	0.09	0.074U	0.32	0.53	0.35	0.35	
Benzo(b)fluoranthene	0.11	0.076U	0.074U	0.27	0.52	0.43	0.51	
Benzo(k)fluoranthene	0.13	0.076U	0.074U	0.25	0.38	0.39	0.40	
Benzo(a)pyrene	0.13	0.076U	0.074U	0.26	0.5	0.41	0.33U	
Indeno(1,2,3-cd)pyrene	0.1U	0.076U	0.074U	0.19	0.39	NR	NR	

Table IV-B.2: Typical c-PAH Values in Street Waste Solids and Related Materials (continued)

Sample Source	City of Everett					WSDOT	
Analyte	Street Sweepings	Soil	3-Way Topsoil	Vactor Solids	Leaf & Sand	Sweepings - Fresh	Sweepings - Weathered
Dibenzo(a,h)-anthracene	0.1U	0.076U	0.074U	0.081	0.12	0.39	0.33U
Revised MTCA Benzo (a)pyrene [ND=PQL]	0.215	0.134	0.134	0.388	0.727	0.708	0.597
Benzo (a)pyrene [ND = 1/2 PQL]	0.185	0.069	0.067	0.388	0.727	0.708	0.366
Benzo (a)pyrene [See * below]	0.185	0.069	0	0.388	0.727	0.708	0.366
Benzo (a)pyrene [ND = 0]	0.155	0.001	0	0.388	0.727	0.708	0.135

* If the analyte was not detected for any PAH, then ND=0; If analyte was detected in at least 1 PAH, then ND=1/2PQL; If the average concentration (using ND=1/2 PQL) is greater than the maximum detected value, then ND=Maximum value.

Table IV-B.3: Typical Metals Concentrations in Catch Basin Sediments

PARAMETER	Ecology 1993	Thurston 1993	King County 1995	King county 1995	City of Seattle 2003 through 2011
Metals: Total (mg/kg)	(Min - Max)	(Min - Max)	(Min - Max)	Mean	Min - Max (Mean)
As	< 3 - 24	.39 - 5.4	4 - 56	0.250	<5 - 50 (9.3)
Cd	0.5 - 2.0	< 0.22 - 4.9	0.2 - 5.0	0.5	
Cr	19 - 241	5.9 - 71	13 - 100	25.8	
Cu	18 - 560	25 - 110	12 - 730	29	9.1 - 3,280 (166)
Pb	24 - 194	42 - 640	4 - 850	80	3 - 3,690 (154)
Ni	33 - 86	23 - 51	14 - 41	23	

Table IV-B.3: Typical Metals Concentrations in Catch Basin Sediments (continued)

PARAMETER	Ecology 1993	Thurston 1993	King County 1995	King county 1995	City of Seattle 2003 through 2011
Metals: Total (mg/kg)	(Min - Max)	(Min - Max)	(Min - Max)	Mean	Min - Max (Mean)
Zn	90 - 558	97 - 580	50 - 2000	130	44 - 4170 (479)
Hg	0.04 - 0.16	0.24 - 0.193			<0.03 - 3.8 (0.16)

Table IV-B.4: Pollutants in Catch Basin Solids - Comparison to Dangerous Waste Criteria

PARAMETER	Range of Values in Catch Basin Waste	Range of Values in Catch Basin Waste	Dangerous Waste Criteria
METALS	Total Metals (mg/kg)	TCLP Metals (mg/kg)	TCLP values (mg/l)
As	<3 - 56	< 0.02 - 0.5	5.0
Cd	< 0.22 - 5	0.0002 - 0.03	1.0
Cr	5.9 - 241	0.0025 - 0.1	5.0
Cu	12 - 730	0.002 - 0.88	none
Pb	4 - 850	0.015 - 3.8	5.0
Ni	23 - 86	< 0.01 - 0.36	none
Zn	50 - 2,000	0.04 - 6.7	none
Hg	0.02 - 0.19	0.0001 - 0.0002	0.2

Data from (Thurston County, 1993), (Herrera, 1995) and (Serdar, 1993)

Street Waste Liquids

General Procedures:

Street waste collection should emphasize retention of solids in preference to liquids. Street waste solids are the principal objective in street waste collection and are substantially easier to store and treat than liquids.

Street waste liquids require treatment before their discharge. Street waste liquids, which include eductor and street sweeping truck decant and drainage from piles and containers, usually contain high amounts of suspended and total solids and adsorbed metals. Treatment requirements depend on the discharge location.

The entity responsible for operation and maintenance of the system must approve discharges to sanitary sewer and storm sewer systems. Ecology will not generally require waste

discharge permits for discharge of stormwater decant to sanitary sewers or to stormwater treatment BMPs constructed and maintained in accordance with this manual.

Listed below is the required order of preference for disposal of liquid from collection of Street Wastes.

1. **Discharge of Street Waste liquids to a municipal sanitary sewer connected to a Public Owned Treatment Works (POTW).** Discharge to a municipal sanitary sewer requires the approval of the sewer authority. Approvals for discharge to a POTW will likely contain pretreatment, quantity, and location conditions to protect the POTW. Following the local sewer authority's conditions is a permit requirement.
2. **Discharge of Street Waste liquids may be allowed into a Basic or Enhanced Runoff Treatment BMP, if option 1 is not available.** Only discharge street waste liquid into the storm sewer system under the following conditions:
 - The preferred disposal option of discharge to sanitary sewer is not reasonably available.
 - The discharge is to a Basic or Enhanced Runoff Treatment BMP. If pretreatment does not remove visible sheen from oils, the Runoff Treatment BMP must be able to prevent the discharge of oils causing a visible sheen.
 - The discharge from the eductor truck is as near to the inlet of the Runoff Treatment BMP as practical, to minimize contamination or recontamination of the collection system.
 - The storm sewer system owner/operator has granted approval and has determined that the Runoff Treatment BMP will accommodate the increased loading. Part of the approval process may include pretreatment conditions to protect the Runoff Treatment BMP. Following local pretreatment conditions is a requirement of this permit.
 - Ecology must approve in advance flocculants for the pretreatment of street waste liquids. The liquids must be non-toxic under the circumstances of use.

The discharger shall determine if reasonable availability of sanitary sewer discharge exists, by evaluating such factors as distance, time of travel, load restrictions, and capacity of the Runoff Treatment BMP.

3. **Operators may return water removed from stormwater ponds, vaults, and oversized catch basins to the storm sewer system.** Stormwater ponds, vaults, and oversized catch basins contain substantial amounts of liquid, which hampers the collection of solids and poses problems in hauling the removed waste away from the site. Water removed from these facilities may be discharged back into the pond, vault, or catch basin provided:
 - Operators may discharge clear water removed from a stormwater treatment structure directly to a down gradient cell of a treatment pond or into the storm sewer system.
 - Turbid water may be discharged back into the structure it was removed from if the removed water has been stored in a clean container (eductor truck, Baker tank, or other appropriate container used specifically for handling stormwater or clean water); and

there will be no discharge from the treatment structure for at least 24 hours.

- The storm sewer system owner/operator must approve the discharge.

Table IV-B.5: Typical Street Waste Decant Values Compared to Surface Water Quality Criteria

PARAMETER	State Surface Water Quality Criteria		Range of Values Reported	
METALS	Freshwater Acute (ug/l - dissolved metals)	Freshwater Chronic (ug/l - dissolved metals)	Total Metals (ug/l)	Dissolved Metals (ug/l)
Arsenic	360	190	100 - 43,000	60 - 100
Cadmium*	2.73	0.84	64 - 2,400	2 - 5
Chromium (total)			13 - 90,000	3 - 6
Chromium (III)*	435	141		
Chromium (VI)	0.5	10		
Copper*	13.04	8.92	81 - 200,000	3 - 66
Lead*	47.3	1.85	255 - 230,000	1 - 50
Nickel*	1114	124	40 - 330	20 - 80
Zinc*	90.1	82.3	401 - 440,000	1,900 - 61,000
Mercury	2.10	0.012	0.5 - 21.9	

*Hardness dependent; hardness assumed to be 75 mg/L

Table IV-B.6: Typical Values for Conventional Pollutants in Street Waste Decant

PARAMETER	Ecology 1993 (Min - Max)	King County 1995 (Min - Max)
Values as mg/l; except where stated	Mean	Mean
pH	6.94	6.18 - 7.98
Conductivity (umhos/cm)	364	184 - 1,110
Hardness (mg/l CaCO ₃)	234	73 - 762
Fecal Coliform (MPN/100 ml)	3,000	
BOD	151	28 - 1,250

Table IV-B.6: Typical Values for Conventional Pollutants in Street Waste Decant (continued)

PARAMETER	Ecology 1993	(Min - Max)	King County 1995	(Min - Max)
Values as mg/l; except where stated	Mean		Mean	
COD	900	120 - 26,900		
Oil & Grease	11	7.0 - 40	471	15 - 6,242
TOC	136	49 - 7,880	3,670	203 - 30,185
Total Solids	1,930	586 - 70,400		
Total Dissolved Solids	212	95 - 550		
Total Suspended Solids	2,960	265 - 111,000		
Settleable Solids (ml/l/hr)	27	2 - 234	57	1 - 740
Turbidity (ntu)	1,000	55 - 52,000	4,673	43 - 78,000

Table IV-B.7: Street Waste Decant Values Following Settling

PARAMETER; Total Metals in mg/l	Portland - Inverness Site Min - Max	King County - Renton Min - Max	METRO Pretreatment Discharge Limits
Arsenic	0.0027 - 0.015	< MDL - 0.12	4
Cadmium	0.0009 - 0.0150	< MDL - 0.11	0.6
Chromium	0.0046 - 0.0980	0.017 - 0.189	5
Copper	0.015 - 0.8600	0.0501 - 0.408	8
Lead	0.050 - 6.60	0.152 - 2.83	4
Nickel	0.0052 - 0.10	0.056 - 0.187	5
Silver	0.0003 - 0.010	< MDL	3
Zinc	0.130 - 1.90	0.152 - 3.10	10
Settleable Solids; ml/L	No Data	0.02 - 2.0	7
Nonpolar FOG	5.7 - 25	5 - 22	100
Ph (std)	6.1 - 7.2	6.74 - 8.26	5.0 - 12.0
TSS	2.8 - 1310		
Recorded Total Monthly Flow; Gallons	Data not available	31,850 - 111,050	
Recorded Max. Daily	Data not available	4,500 - 18,600	25,000 GPD

**Table IV-B.7: Street Waste Decant Values Following Settling
(continued)**

PARAMETER; Total Metals in mg/l	Portland - Inverness Site Min - Max	King County - Renton Min - Max	METRO Pretreatment Discharge Limits
Flow; Gallons			
Calculated Average Daily Flow; GPD	Data not available	1,517 - 5,428	
1) Data from King County's Renton Facility (data from 1998 - 1999) and the City of Portland's Inverness Site (data from 1999 - 2001); detention times not provided			

Collection Site Assessment

Ecology suggests a collection site assessment to identify spills or locations that potentially contain dangerous wastes.

The collection site assessment will aid in determining if waste is a dangerous waste and in deciding what to test for if dangerous waste is suspected. The collection site assessment will also help determine if the waste meets the requirements of the receiving facility.

There are three steps to a collection site assessment:

1. A **historical review** of the site for spills, previous contamination and nearby cleanup sites or dangerous waste facilities.

The historical review will be easier if done on an area wide basis prior to scheduling any waste collection. The historical review should be more thorough for operators who have never collected waste at the site before. At a minimum, the historical review should include operator knowledge of the area's collection history or records from previous waste collections.

Private operators should ask the owner of the site for records of previous contamination and the timing of the most recent cleaning. Ecology's Hazardous Substance Information Office maintains a Toxic Release Inventory and a Facility/Site Database, tracking more than 15,000 sites.

Ecology's online Facility/Site Database is available at www.ecy.wa.gov/fs/.

The database allows anyone with web-access to search for facility information by address, facility name, town, zip code, and SIC code, etc. It lists why Ecology is tracking each one (NPDES, TSCA, RCRA, Clean Air Act, etc.), as well as who to call within Ecology to find out more about the given facility. EPA's toxic release website is http://i-aspub.epa.gov/triexplorer/tri_release.chemical

2. A **visual inspection** for potential contaminant sources such as a past fire, leaking tanks and electrical transformers, and surface stains.

Take a look at the area for contaminant sources prior to collection of the waste. If the inspection finds a potential contaminant source, delay the waste collection until the potential contaminant is assessed.

A second portion of the visual inspection is a good housekeeping assessment of the area. Locations with poor housekeeping commonly cut corners in less obvious places. Inspect these sites in greater detail for illegal dumping and other contamination spreading practices.

3. Sweeping route, catch basin, waste, and container inspection before and during collection.

The inspection of the waste and catch basin or vault is the last and perhaps most critical step in the collection site assessment.

For example, if the stormwater facility has an unusual color in or around it, then it is possible someone dumped something near it or into it. Some colors to be particularly wary of are yellow/green from antifreeze dumping and black and rainbow sheen from oil and/or grease dumping. In addition, if the inspector observes any staining or corrosion, then a solvent may have been dumped.

Fumes are also good indicators of potential contamination. Avoid deliberate smelling of catch basins for worker safety, but suspicious odors may be encountered from catch basins thought to be safe. Some suspicious odors are rotten eggs (hydrogen sulfide is present), gasoline or diesel fumes, or solvent odors. If unusual odors are noted, contact a dangerous waste inspector before cleaning the basin.

Finally, operator experience is the best guide to avoid collection of contaminated waste.