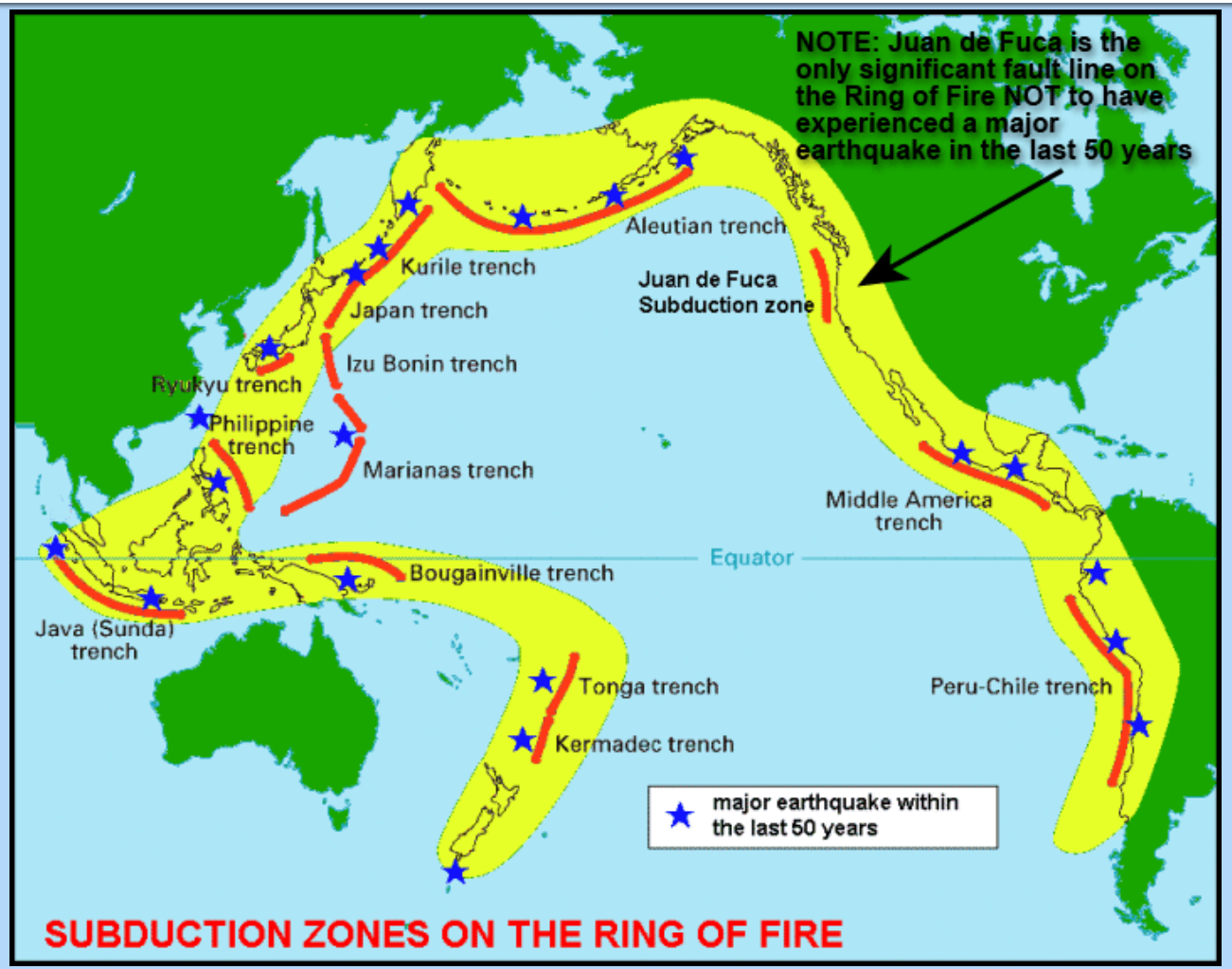
Cascadia Subduction Zone (CSZ) Earthquake Information Brief

Pierce County Department of Emergency Management
2501 South 35th Street, Suite D
Tacoma, WA 98409

Ring of Fire



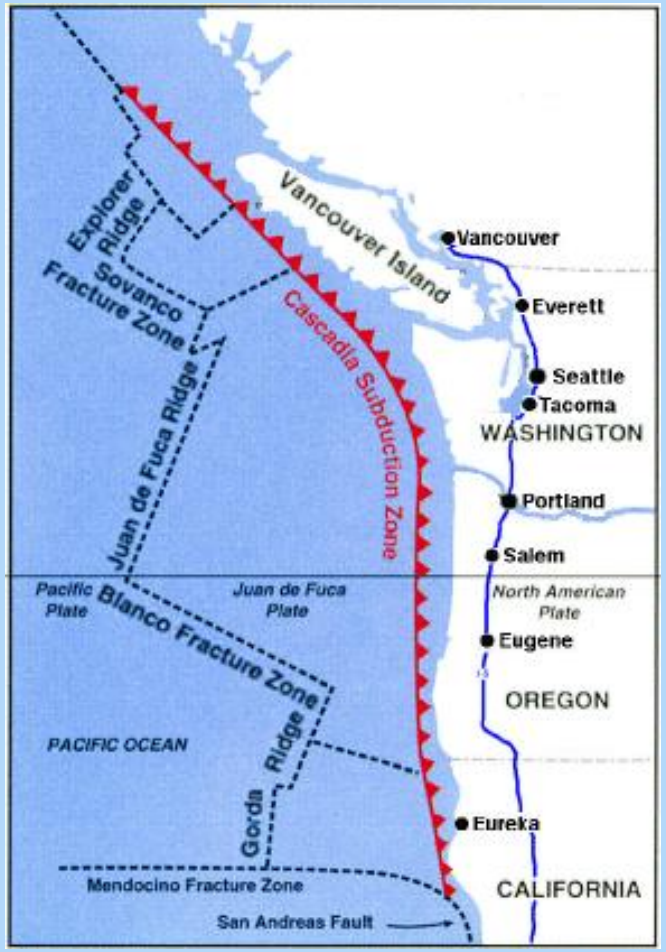
The Ring of Fire accounts for 90% of all earthquakes, and 81% of the world's largest earthquakes

Subduction zones are shown in red

The CSZ fault line is part of the Ring of Fire

The CSZ is the only significant fault line on the Ring of Fire without a major quake in the last 50 years (see blue stars)

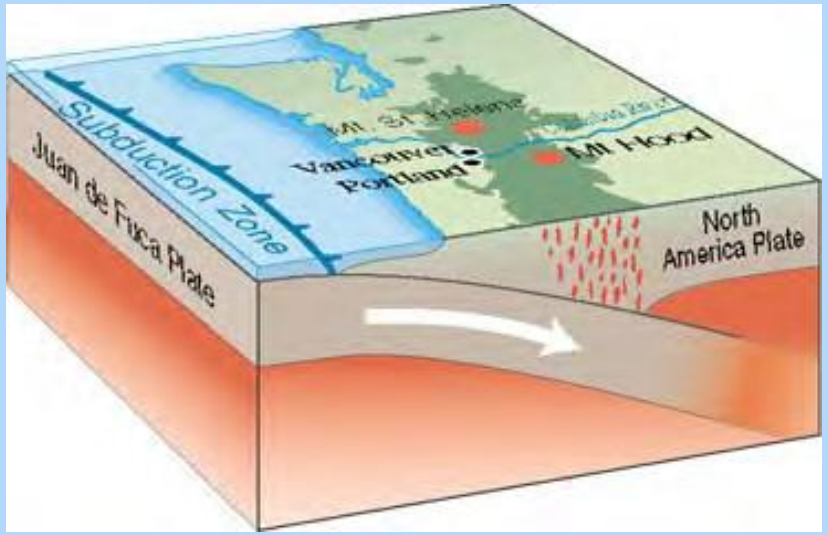
Cascadia Subduction Zone (CSZ)



The CSZ runs 800 miles from Southern British Columbia to Northern California, and lies 50 to 80 miles off the Pacific Coast

The heavy Juan de Fuca plate is sliding under the lighter North American plate

A magnitude 9.0+ CSZ earthquake has occurred every 250 to 500 years – most around 240 years. The last CSZ earthquake occurred 316 years ago (Jan 26, 1700).



FEMA & HITRAC Modeling of CSZ Earthquake

- FEMA commissioned a multi year *HITRAC study and produced the Region X Response Plan (Published December 2013)

The HITRAC study modeling stops at the Cascade Crest. There are no modeled effects for East of the Cascades.

- Modeling Factors
  - February 6, 9:41am PST, weekday
  - Complete rupture of the CSZ fault line
  - Epicenter 60 miles off Oregon coast, 120 miles West of Eugene
  - M9.0 earthquake, with ground shaking up to 5 minutes
  - Tsunami wave heights 20 to 80 feet
  - Aftershocks of M7.0 or greater
  - Additional tsunamis caused by aftershocks

Note: Damage caused by aftershocks, follow on tsunamis, and secondary effects is not included in damage estimates. Model ran a data set that was the best available in Oct 2012

*HITRAC – Homeland Infrastructure Threat and Risk Analysis Center, the Department of Homeland Security (DHS) Infrastructure-intelligence fusion center.

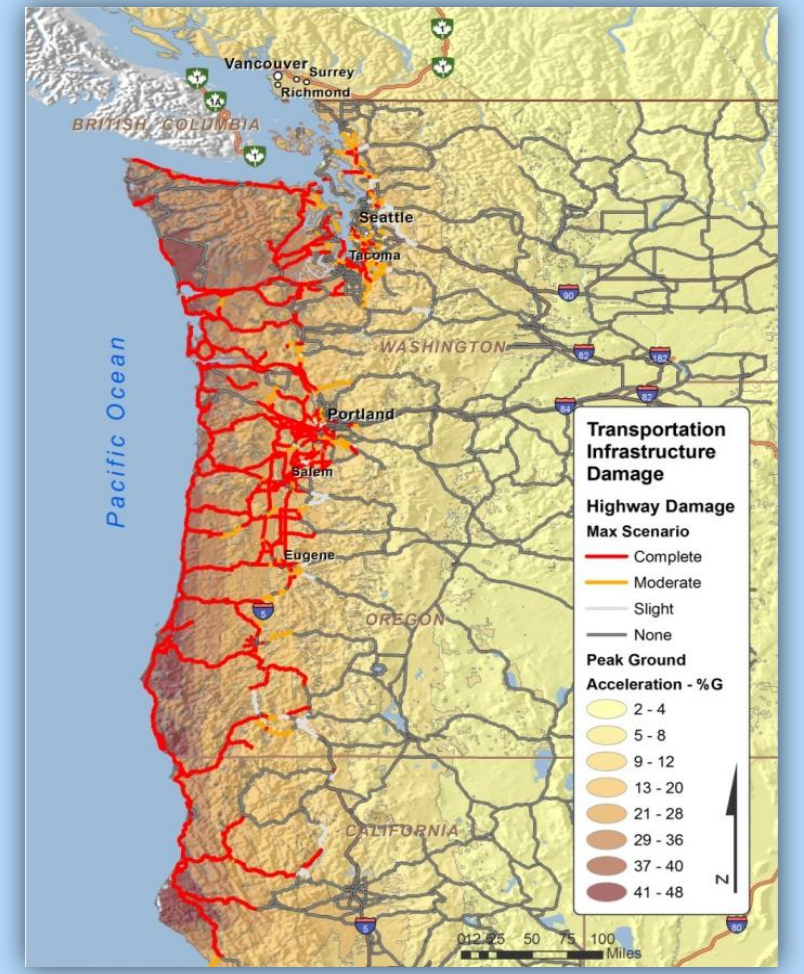
General Impacts Overview

- Approximately 15,000 deaths (OR, WA); tens-of-thousands injured
- 9 million citizens directly impacted
- Over 800,000 requiring shelter; 2,500,000 require mass feeding
- Significant damage to transport systems:

  Ground - Road, bridges, Rail

  Air - Airports, runways

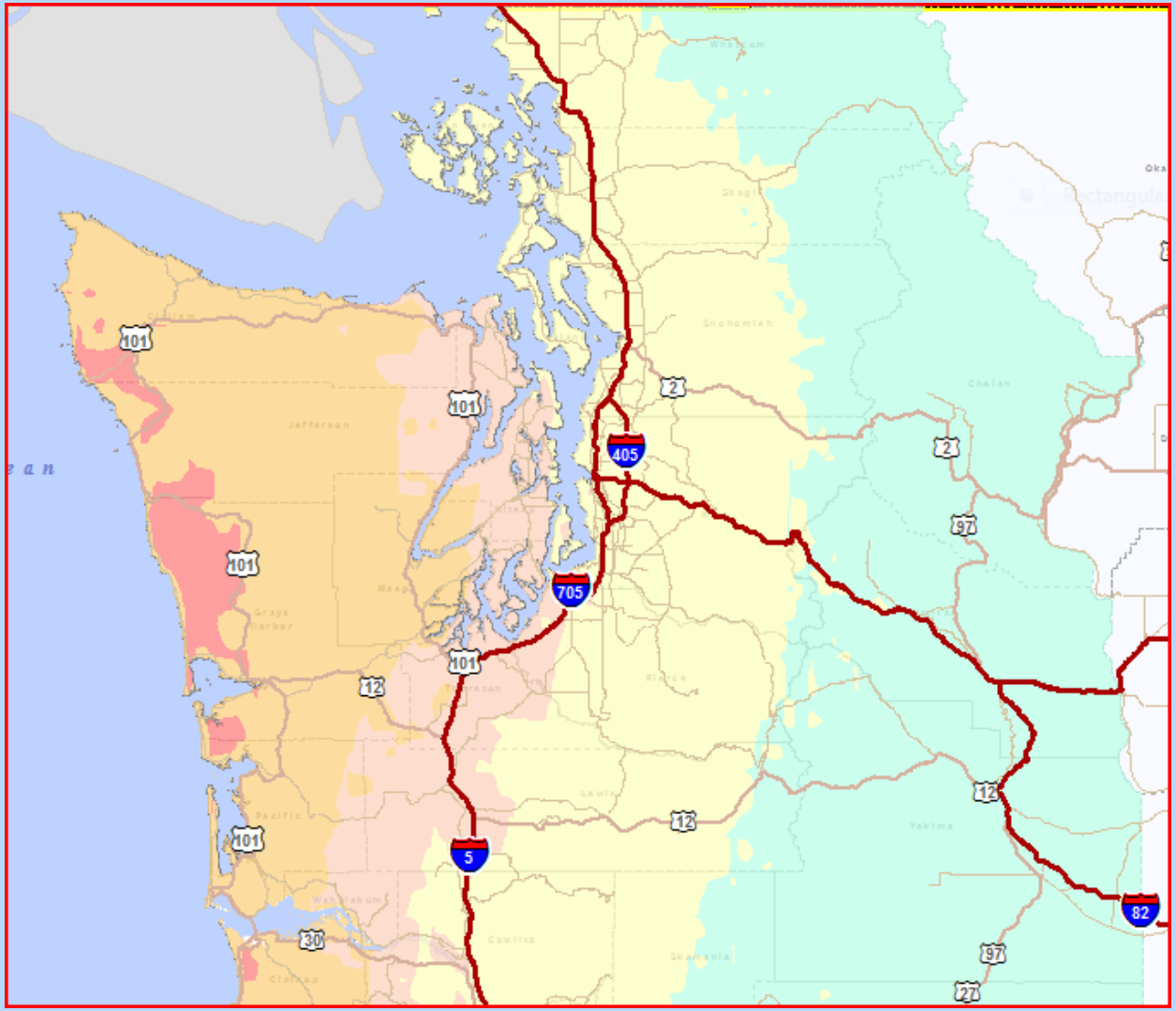
  Water - Ports, Waterways, Ferry Systems
- Significant damages to critical infrastructure lifelines (power, fuels, natural gas, water & wastewater systems, communications etc.)
- Extensive impacts to public safety facilities including police, fire, EOCs, etc.



Map: Highway Road Segments in the Cascadia Region with expected 'Complete' damages (red) source: HITRAC.

Primary Earthquake Impacts

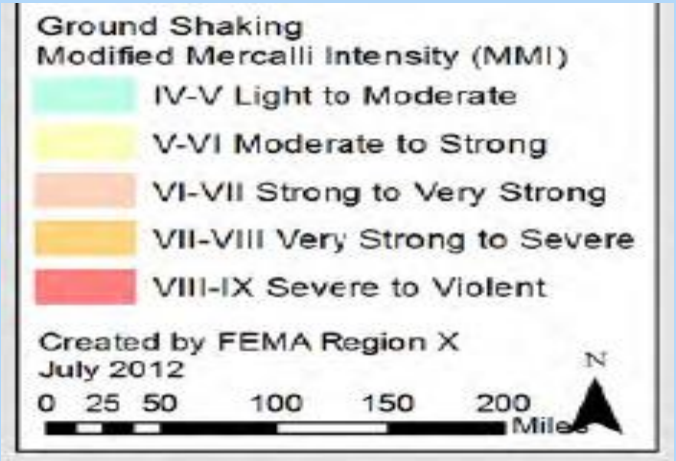
Ground Shaking



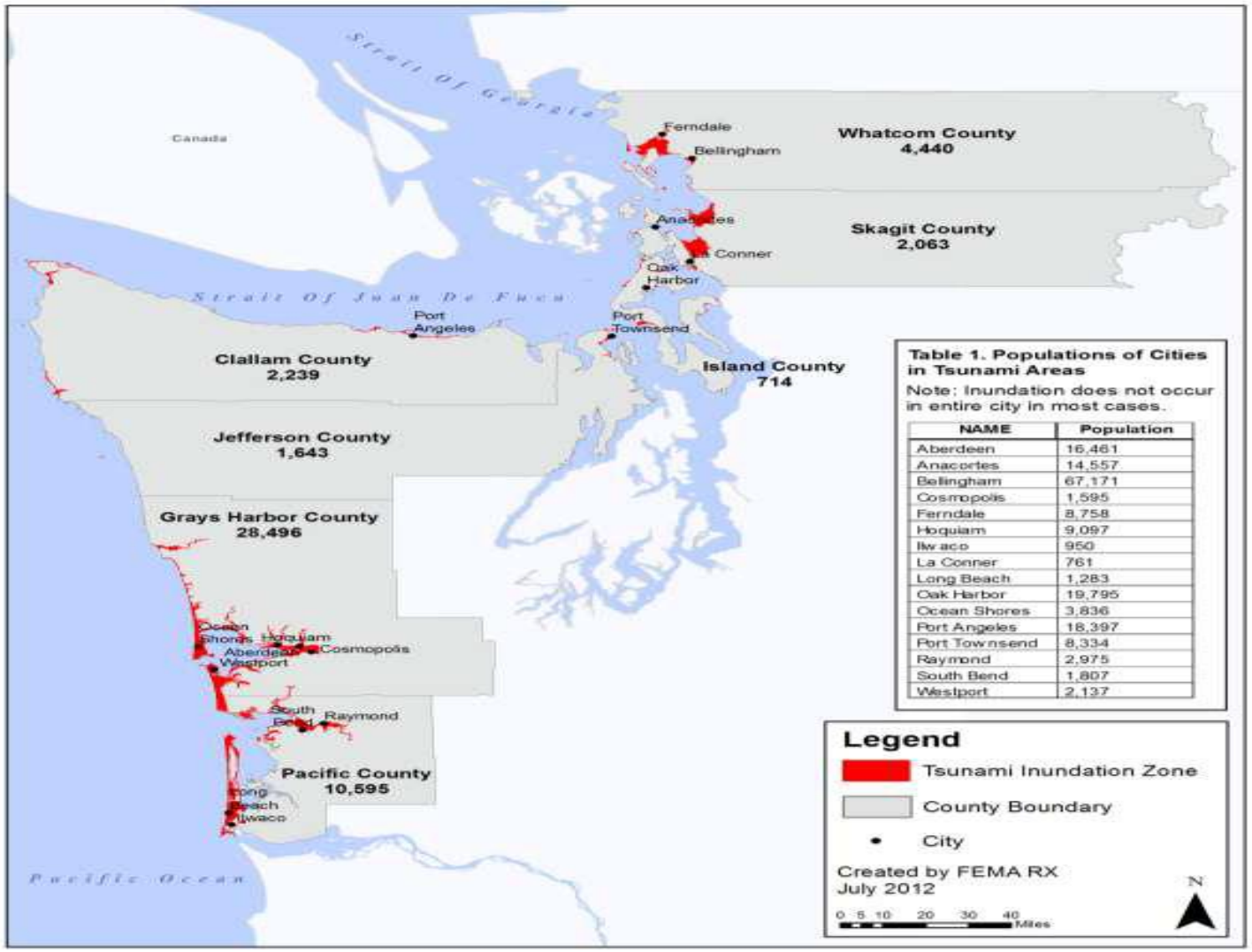
Ground shaking is most extreme on the coast (very strong to violent).

Ground shaking in the I-5 corridor is moderate to very strong.

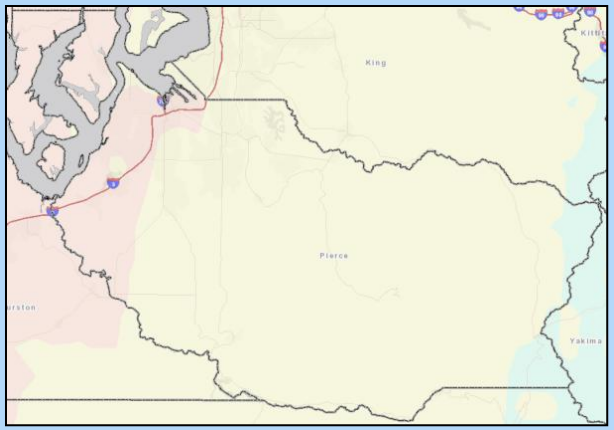
Ground shaking in the Cascade foothills is light to moderate.



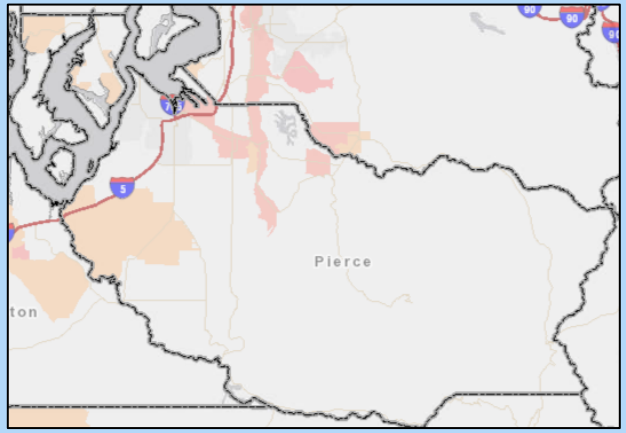
Tsunami Inundation Areas



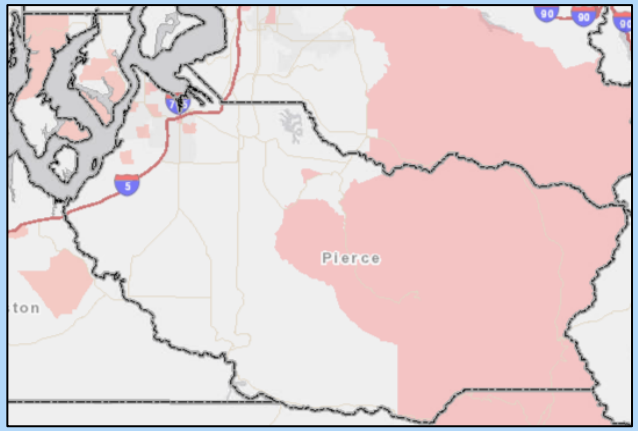
Pierce County – Earthquake Impacts



Ground Shaking



Liquefaction Potential

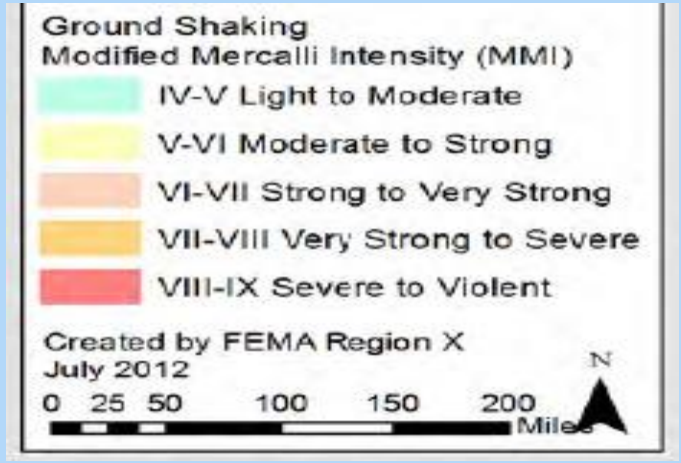


Landslide Potential

Tsunami Impact: No impact

Liquefaction Impact: High liquefaction potential exists in the Fife/Port of Tacoma region, as well as the area around Tacoma Narrows and Port Orchard.

Landslide Impact: The highest potential for landslides are in the east county area and Mount Rainier National Parks



Coordinated Response

Cascadia Rising 2016 Exercise (June 7-10)

Scenario projections

- Coast of Washington
  - 9.0 M
  - Significant damage
  - Tsunami – 50,000 people in inundation zone
- Pierce County – 7.1 M
  - Landslides/liquefaction
  - Infrastructure damage

Cascadia Rising Major Players

Federal

- Department of Defense
- Federal Emergency Management
- Department U.S. Transportation
- U.S. Northern Command
- U.S. Coast Guard

State

- Washington Emergency Management Division
- Oregon Emergency Management
- Idaho Bureau of Homeland Security
- Washington National Guard
- Emergency Management British Columbia

Local

- 21 Washington Counties
- Numerous Pierce County Cities
- Private sector
- Non-profit organizations

** Largest exercise in the history of the Northwest*

Cascadia Rising - PCDEM

- Outreach to county departments, the private sector, non-profits, and all cities and towns in Pierce County.
- Partnerships established with WA National Guard, Port of Tacoma, Northwest Healthcare Response Network, the Regional Water Co-operative, and more.
- Exercise design
  - Coordinate with partners
  - “Writing the script”
  - Tabletops, workshops, and functional exercise
- PCDEM staff serve as facilitators and coordinators

Cascadia Rising Timeline

Extent of Play

- 2 days
- 3 core capabilities
  - Critical Transportation
  - Operational Communication
  - Mass Care (Feeding and Hydration)

Functional Exercise

- June 7-10
- PCEOC activated June 8 and 9
- June 7 and 10 simulated for partners play

After Action Review

- 3rd Week of June
- Drives out the Improvement Plan

Pierce County Emergency Management Plans

- PCDEM: Comprehensive Emergency Management Plan (CEMP), Continuity of Operations Plan (COOP), Continuity of Government Operations (COGO) Plan, Emergency Operations Plan (EOP), Mitigation Plan, Hazardous Chemicals Plan, Joint Information Center (JIC) Plan, Duty Officer Standard Operations Guides
- PC Departments: COOPs, SOP/SOGs, Other
- Puget Sound Regional Catastrophic Disaster Coordination Plan

Pierce County Preparedness Training

- Pierce County Neighborhood Emergency Teams (PC-NET): 300+ communities trained
- Community Emergency Response Teams (CERT): Tacoma City, Lakewood, University Place
- PC DEM Public Education Program
- PC DEM 9-1-1 Education Program
- PC DEM Shelter Program
- Citizen Corps
- PC-TV Earthquake Preparedness Public Education Segments

Pierce County EQ Preparedness Exercises

- Pinecone 2012
- Evergreen Tremor 2015
- PC Medical Examiner Mass Fatality Exercise 2015
- Annual “Great Shakeout” Exercise
- Annual NW Regional Aviation Search & Rescue Exercise
- Cascadia Rising 2016

Pierce County Next Steps

- Continue Public Awareness and Preparedness Education Campaign
- Continue participating in Earthquake Response Exercises
- Continue working with local and regional partners and stakeholders to refine EQ response plans
- Continue working with PC Departments on improving resiliency through infrastructure improvements and responder training

CSZ Earthquake Summary

- An Earthquake on the Cascadia Subduction Zone is overdue
- It will be 9+ in magnitude and have catastrophic impact on the region
- Communications, transportation and utility networks will be destroyed or heavily damaged, greatly limiting the ability to provide for the needs of residents (medical care, water, food, shelter, etc.)

CSZ Earthquake Summary

- There are national, regional and local plans to respond to the quake
- Outside help will begin arriving 3-10 days after the quake but will not be able to meet all projected needs
- Recovery will take a long time… it will take several months to a year to restore some sense of normalcy. Full recovery will take years.

CSZ modeled Critical Facility Impacts to WA and OR (I-5 Corridor to Coast)

Type of Facility	No. of Critical Facilities with Moderate to Complete Damage	Total Number of Facilities	Percent of Critical Facilities with Moderate to Complete Damage
Potable Water Facilities	**92**	**104**	**88%**
Ports Facilities	**632**	**716**	**88%**
Rail Facilities	**97**	**116**	**84%**
Waste Water	**249**	**323**	**77%**
Fire Stations	**1,333**	**2,051**	**75%**
Natural Gas Facilities	**106**	**147**	**72%**
Airports	**65**	**98**	**66%**
Communications	**682**	**1032**	**66%**
Electric Power Facilities	**743**	**1281**	**58%**
Hospitals	**189**	**357**	**53%**
Police	**204**	**420**	**49%**
EOCs	**46**	**102**	**45%**
Hwy Bridges	**1,952**	**7,702**	**25%**
Nursing Homes	**3,344**	**3,511**	**95%**

Questions?

Lowell Porter, Director, (253) 798-7711

Scott Heinze, Deputy Director, (253) 405-3585