

Learning From Earthquakes Virtual Earthquake Reconnaissance Team (VERT):

Phase 1 Response to M7.0 Portland Hills Earthquake, July 10, 2026

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For questions contact VERT co-chairs: Sabine Loos (sloos@umich.edu) & Andrew Makdisi (amakdisi@usgs.gov)



Please Note: This report is based on publicly available data within 48 hours of the event. The assessment provided in the report is performed by the judgment of the authors with limited access to ground-truthing.

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1. Earthquake Characteristics

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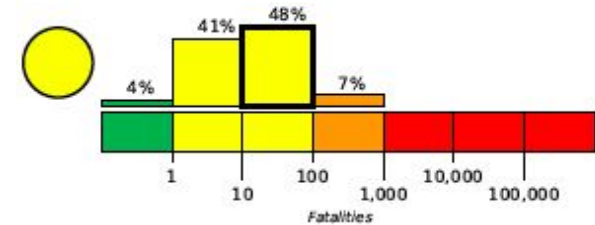
Impact on human safety:

- 10-100 fatalities estimated
- Over 1000 injuries reported

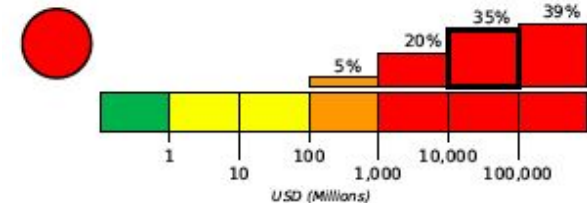
Impact on society:

- \$10B worth of estimated economic losses

Estimated Fatalities



Estimated Economic Losses



1. Earthquake Characteristics

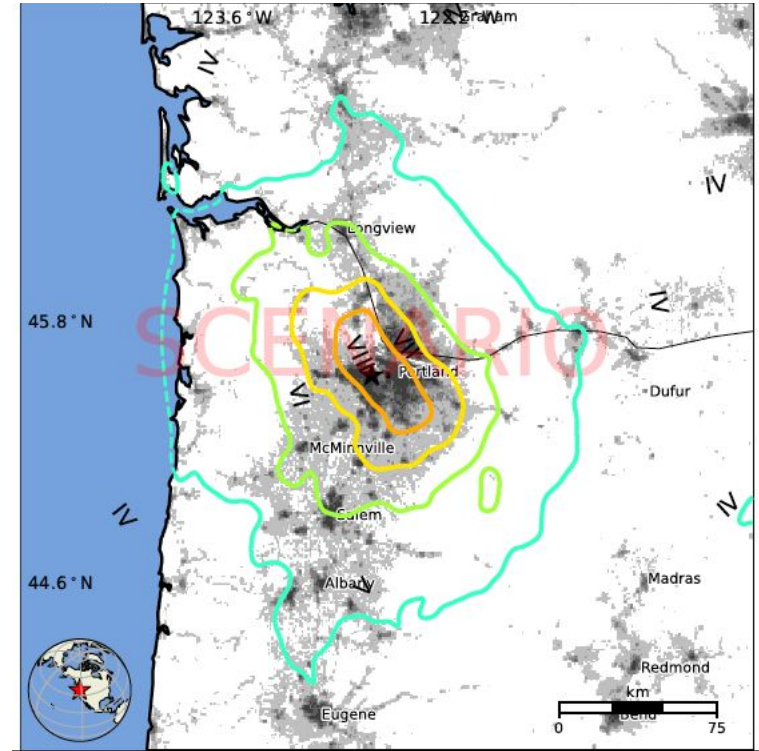
Date: July 10, 2026

Magnitude: M_w 7.0

Location:

- Epicenter located 5.2 miles from Portland, OR
- 45.5250°N and 122.7874°W

Depth: 9km



Estimated Population Exposed to Earthquake Shaking

ESTIMATED POPULATION EXPOSURE (k=x1000)		—*	—*	1,392k*	816k	549k	722k	1,229k	386k	0
ESTIMATED MODIFIED MERCALLI INTENSITY		I	II-III	IV	V	VI	VII	VIII	IX	X+
PERCEIVED SHAKING		Not felt	Weak	Light	Moderate	Strong	Very Strong	Severe	Violent	Extreme
POTENTIAL DAMAGE	Resistant Structures	None	None	None	V. Light	Light	Moderate	Mod./Heavy	Heavy	V. Heavy
	Vulnerable Structures	None	None	None	Light	Moderate	Mod./Heavy	Heavy	V. Heavy	V. Heavy

*Estimated exposure only includes population within the map area.

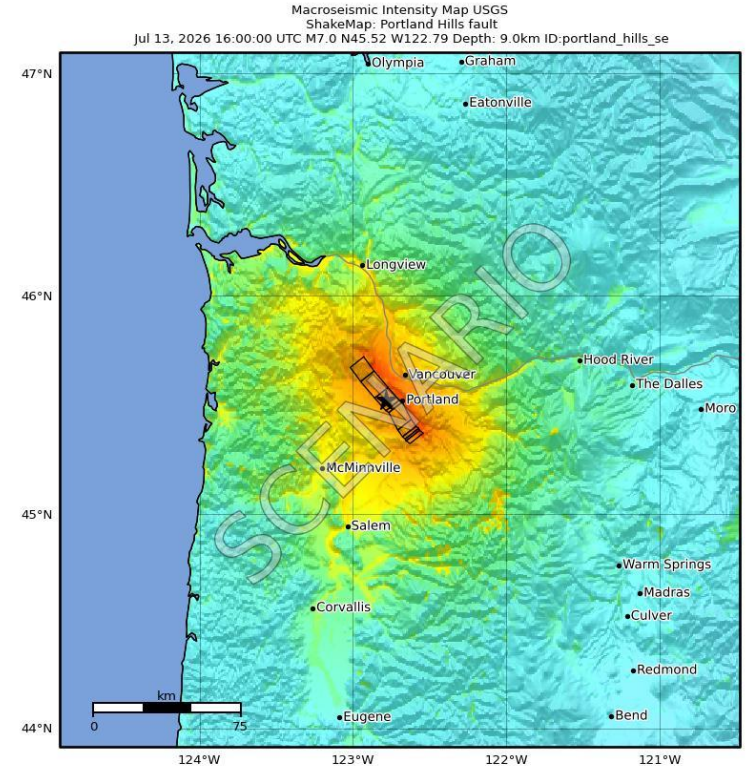
1. Earthquake Characteristics

Fault Mechanism:

- The earthquake resulted from thrust faulting on the Portland Hills fault

Max Intensity:

- Violent shaking
- Heavy damage



SHAKING	Not felt	Weak	Light	Moderate	Strong	Very strong	Severe	Violent	Extreme
DAMAGE	None	None	None	Very light	Light	Moderate	Moderate/heavy	Heavy	Very heavy
PGA(%g)	<0.0464	0.297	2.76	6.2	11.5	21.5	40.1	74.7	>139
PGV(cm/s)	<0.0215	0.135	1.41	4.65	9.64	20	41.4	85.8	>178
INTENSITY	I	II-III	IV	V	VI	VII	VIII	IX	X

Scale based on Worden et al. (2012) Version 1: Processed 2026-06-29T19:38:08Z
 △ Seismic Instrument ○ Reported Intensity ★ Epicenter □ Rupture

2. Alerts and Early Warnings

2. Alerts & Early Warnings

- USGS ShakeAlert
 - Sent via Wireless Emergency Alerts (WEA)
- Warning times [2, 3]
 - Portland: none
 - Beaverton, OR: 0-3 seconds
 - Salem, OR: 10-15 seconds
 - Eugene, OR: 30-40 seconds
 - Seattle, WA: 50-60 seconds

References

1. ShakeAlert. 2026. *What is ShakeAlert?* <https://www.shakealert.org/>
2. McGuire, J.J., Smith, D.E., Frankel, A.D., Wirth, E.A., McBride, S.K., and de Groot, R.M., 2021, Expected warning times from the ShakeAlert earthquake early warning system for earthquakes in the Pacific Northwest: U.S. Geological Survey Open-File Report 2021–1026, 37 p., <https://doi.org/10.3133/ofr20211026>.
3. University of Oregon. 2026. *ShakeAlert: An earthquake early warning system for the West Coast*. <https://ohaz.uoregon.edu/shakealert/#:~:text=The%20ShakeAlert%20EEW%20System%20is,to%20the%20ShakeAlert%20EEW%20System>.

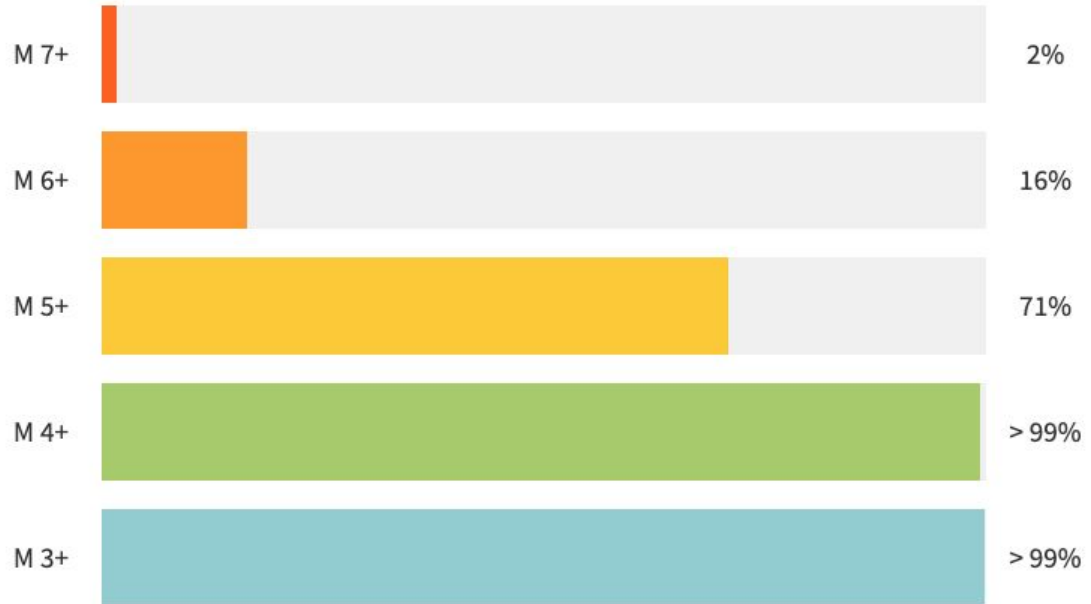
3. Aftershocks

3. Aftershocks

- Hundreds of aftershocks have been reported in the days following the earthquake
- Complicating search and rescue efforts as buildings have sustained more damage
- Aftershocks have triggered more landslides in the West Hills and along I-5, particularly near the Terwilliger curves
- Continued earthquakes exacerbating resident stress

3. Aftershock Forecast

According to our forecast, the chance of at least one aftershock within the next **week**:



4. Emergency Response

4. Emergency Response

- First responders

- Local: Portland Fire and Rescue, Portland Police Bureau, Multnomah County Sheriff's Office, Multnomah County Office of Emergency Management, Portland Bureau of Transportation, Washington County Emergency Management, Clackamas County Emergency Management, Tualatin Valley Fire and Rescue, Clark County Regional Emergency Management, Vancouver Fire Department
- Regionally: WSDOT, ODOT, DOGAMI, WGS, OEM, WEMD, TriMet, Portland Water Bureau, NW Natural and Portland General Electric, Oregon and Washington National Guards

4. Emergency Response

- Communications difficult due to loss of telecommunications infrastructure
 - Text to 911 instead of call
 - WEA/Emergency Alert Systems being utilized to communicate with public
- Response times slowed due to damaged infrastructure, bridge collapses
- Displacement
 - An expected 75k people are displaced with 33k needing shelter

5. Context

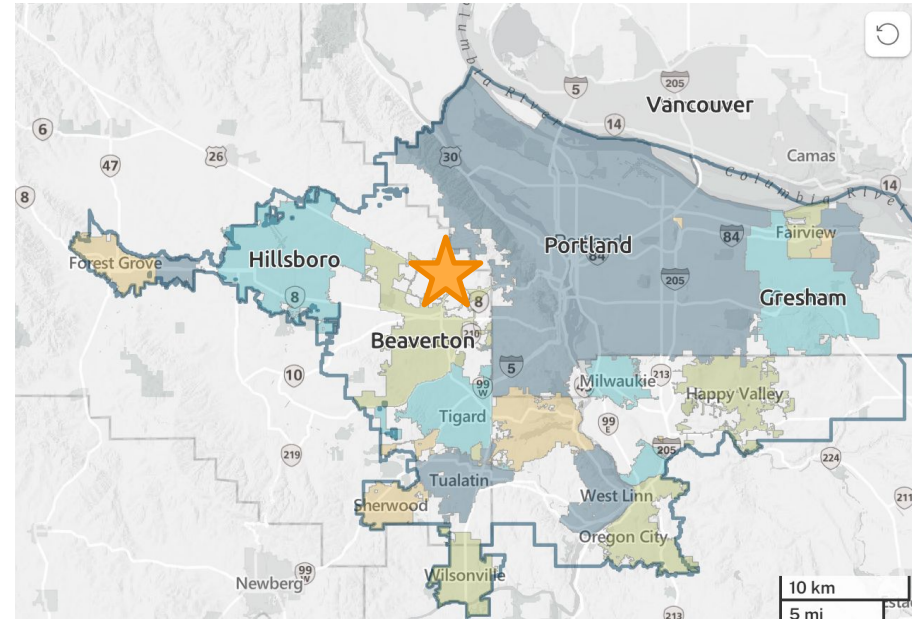
Oregon Context

5.1 The Built Environment

- Oregon and local jurisdictions follow the [Oregon State Building Code](#)
 - Adopts IBC and ASCE 7 with specific local modifications
 - Oregon Structural Specialty Code (OSSC)
- Building codes are strictly followed and enforced during review in the City of Portland
- Access to and use of a variety of construction materials depending on project needs: steel, concrete, masonry, and increasingly mass timber
- General seismic design category D under OSSC
- Design earthquake acceleration ~0.50g
- Resources
 - <https://world-housing.net/reports/>
 - Historic maps showing land use and development:
<https://efiles.portlandoregon.gov/record?q=saved:3634&sortBy=recCreatedOn&pagesize=100&Thumbnails=true>
 - <https://www.oregon.gov/bcd/codes-stand/Pages/design-criteria.aspx>

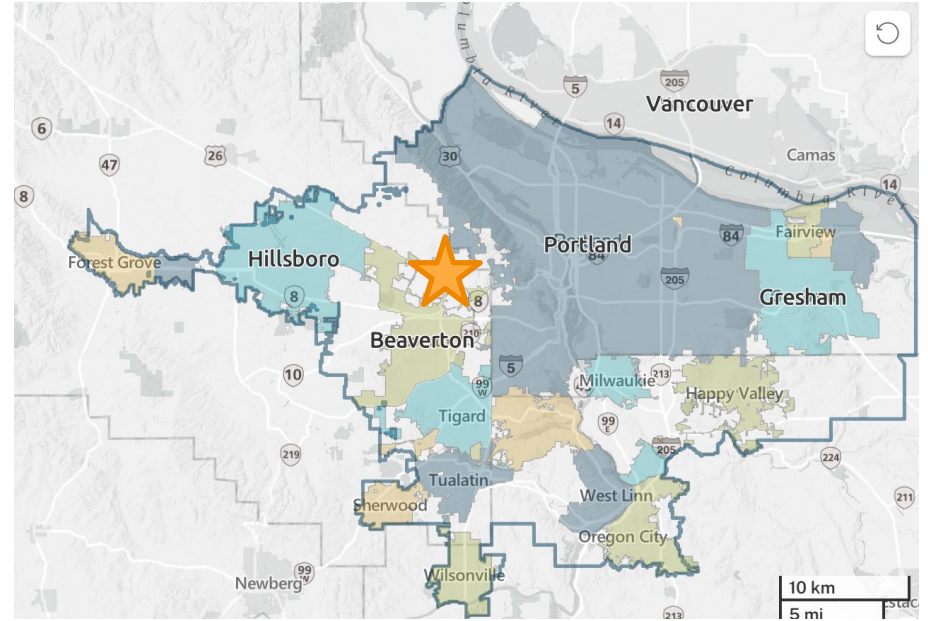
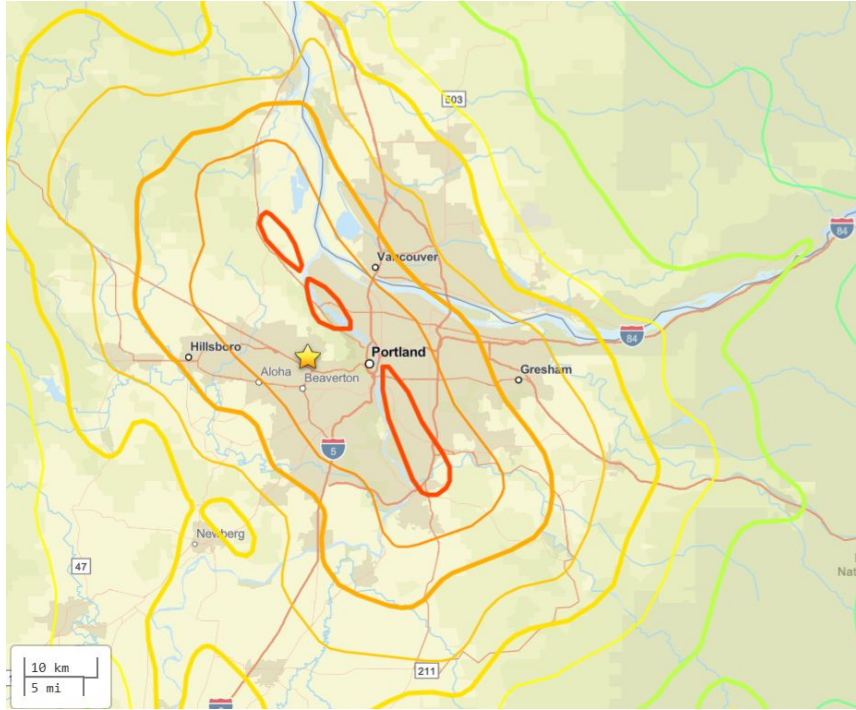
5.1 The Built Environment

- Portland Metropolitan Area: 24 cities within three counties
 - Clackamas County; Multnomah County; Washington County
 - Administrated by Metro [oregonmetro.gov]
 - Metro Council consists of a President (region-wide election) and six councilors (elected by district). Non-partisan elections every four years
 - Metro oversees Public Transportation; Waste; Housing (including homeless); Land Development; Parks; Arts and Events



<https://gis.oregonmetro.gov/metromap/>

5.1 The Built Environment



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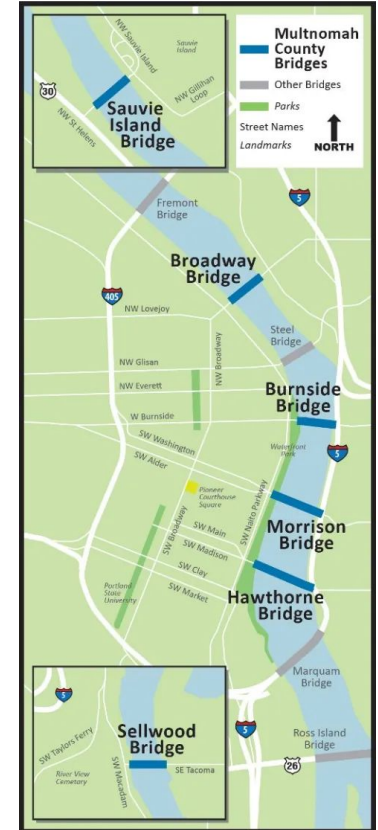
- Bridges

- ODOT Bridges:

- Interstate 15 Bridge linking Portland to Vancouver. Built 1917. Planned replacement. Currently vulnerable to liquefaction and **collapse**.
 - Marquam Bridge. Built 1966. Seismic retrofit 1995. Likely **moderate damage** and liquefaction.
 - Fremont Bridge. Built 1973. Likely **moderate damage**.
 - Ross Island Bridge (cars, ped). Built 1926. Likely **collapse**.
 - St. Johns Bridge (cars, bikes, ped). Built 1931. Likely **extensive damage**.

- Metro Bridges

- Tillikum Crossing (ped, bike, MAX trains, streetcars, buses) completed in 2015 to modern seismic standards. Likely **minor damage**, but approach **abutments are vulnerable to failure**.

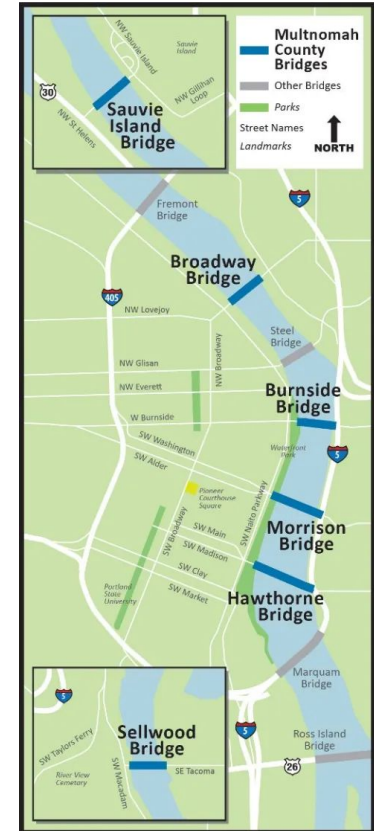


5.1 The Built Environment

Bridges

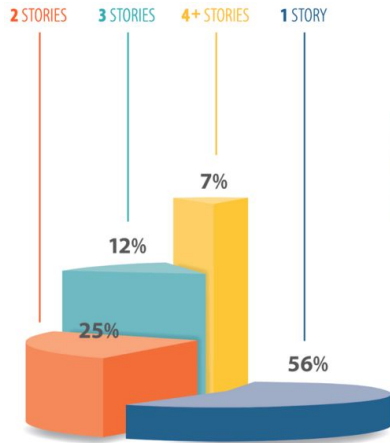
- Multnomah County Bridges.
 - *“Currently, none of downtown Portland’s Willamette River vehicular bridges will be immediately usable after a major earthquake”* Multnomah County website
 - Sellwood Bridge (cars, bike, ped). Rebuilt in 2016 to modern seismic standards for survival of largest earthquake, **moderate repairs** following smaller earthquake.
 - Burnside (cars, buses, bikes, ped). Drawbridge. Built 1926. Official emergency transportation route. Planned replacement in design phase. Likely **extensive damage**.
 - Broadway Bridge (cars, streetcar, bikes, ped). Drawbridge. Built in 1911-1912. Likely collapse.
 - Morrison Bridge (cars, bikes, ped). Connects to I-5 and I-84. Drawbridge. Likely **extensive damage**
 - Hawthorn Bridge (cars, peds, bikes, buses). Built in 1910. Vertical lift. Oregon’s busiest bike and transit bridge. Modifications to structure and deck. **Likely collapse**.
 - Sauvie Island Bridge (cars, agriculture transport, bikes, peds). Built 2008 to modern seismic standards. Likely **minor damage**. Connects Sauvie Island (largely agricultural) to mainland.
- Union Pacific Railroad
 - Steel Bridge (rail, cars, bikes, ped, MAX train). Vertical lift. Built 1912. **Likely collapse**.
- Based on various government reports:

<https://www.kgw.com/article/news/investigations/how-each-of-portlands-bridges-would-fare-in-an-earthquake/283-291066019>

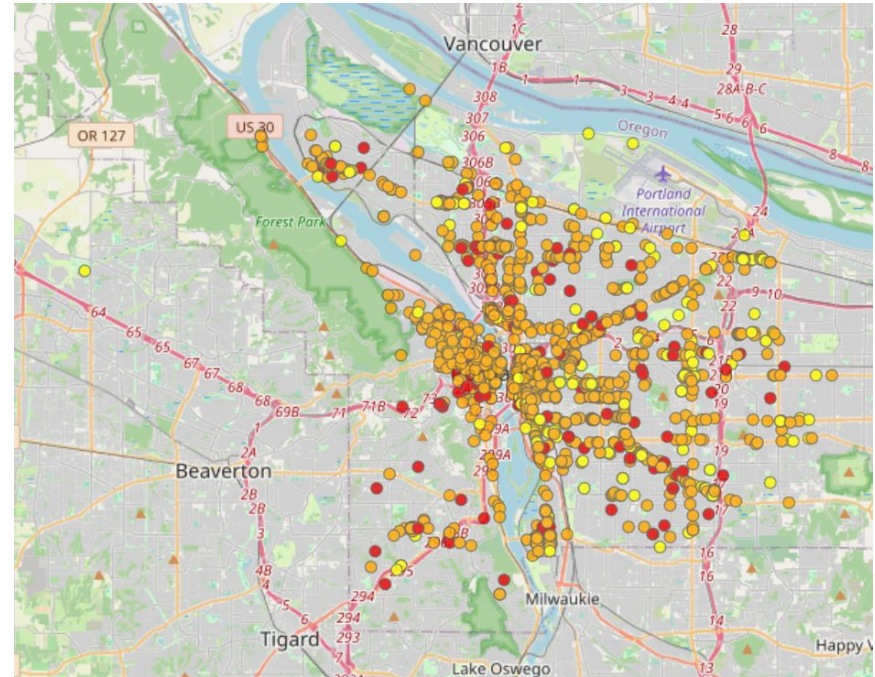


5.1 The Built Environment

- Unreinforced Masonry
 - Portland Permitting & Development estimates more than 1,600 known or suspected URM buildings.
 - Estimated less than 20% of known URM have been demolished or retrofitted
 - ~56% are single-story commercial buildings



<https://www.portland.gov/ppd/unreinforced-masonry-urm-buildings>



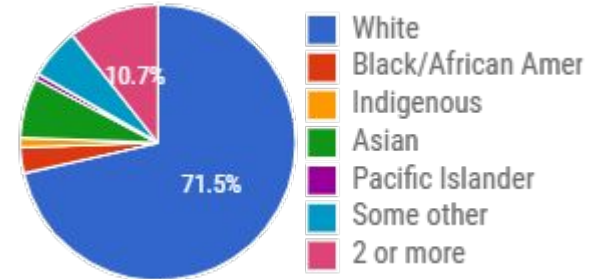
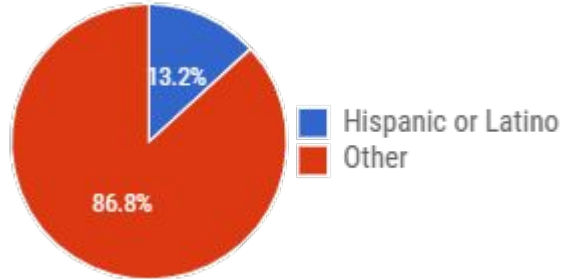
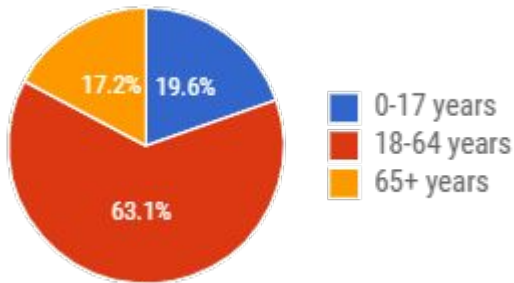
Map from a class project based on Portland URM database. Colors indicate building class. Database can be requested from the City of Portland.

<https://storymaps.arcgis.com/stories/891ec1ea9a804e32aa2b1eb68946564c>

5.2 Socioeconomic Factors

Portland Metropolitan Area

- Population size: 2.5 million (635k Portland) [[census.gov](https://www.census.gov)]
- Annual met. area population change: 0.22% [2020 to 2025; citypopulation.de]
- Demographics of Portland Metropolitan:



citypopulation.de

5.2 Socioeconomic Factors

Portland Metropolitan Area

- Current Dollar GDP 2024 [[Bureau of Economic Analysis](#)]:

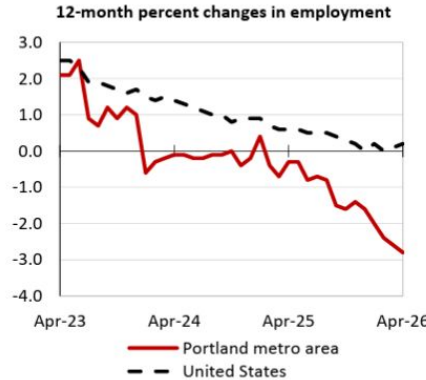
- Multnomah County: \$91 billion
- Washington County: \$63 billion
- Clackamas County: \$30 billion
- Clark County (Washington): \$33 billion

- Unemployment: 4.8%

- Resources

- <https://www.bea.gov/data/gdp/gdp-by-county>
- https://www.bls.gov/regions/west/summary/blssummary_portland_or_wa.pdf

Employment on nonfarm payrolls and employment by major industry sector, over-the-year changes



Portland metro area employment (number in thousands)	Apr. 2026	Change from Apr. 2025 to Apr. 2026	
		Number	Percent
Total nonfarm	1,207.4	-35.4	-2.8
Mining and logging	0.9	-0.2	-18.2
Construction	73.8	-4.1	-5.3
Manufacturing	111.7	-5.3	-4.5
Trade, transportation, and utilities	212.9	-5.3	-2.4
Information	23.3	-2.6	-10.0
Financial activities	69.0	-2.5	-3.5
Professional and business services	184.4	-9.1	-4.7
Education and health services	212.1	0.9	0.4
Leisure and hospitality	116.7	-3.0	-2.5
Other services	41.8	-2.1	-4.8
Government	160.8	-2.1	-1.3

Source: U.S. BLS, Current Employment Statistics.

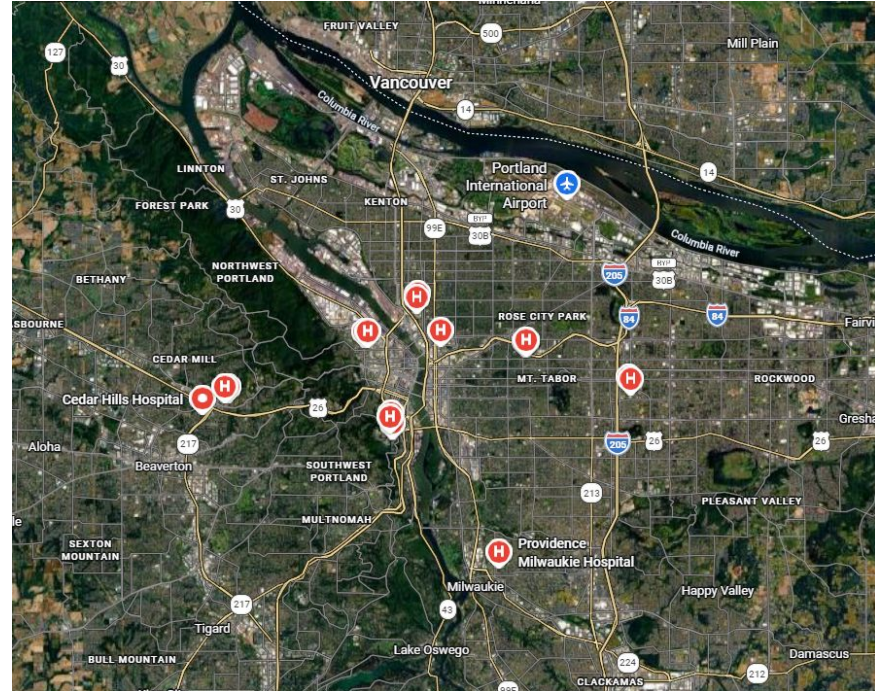
5.2 Socioeconomic Factors

Portland, Oregon Metropolitan Area

- Access to Education:
 - Portland Public Schools: 43k students in 81 schools; 8k employees [pps.net]
 - Seismic retrofits ongoing through 2013 bonds. Focused targeted and full retrofits of URM school buildings. [https://bond.pps.net/seismic-improvements]
 - Beaverton School District: 37k students in 54 schools; 5k employees [www.Beaverton.k12.or.us]
 - 2014 bond for seismic upgrades: three new schools and four replaced [https://www.beaverton.k12.or.us]
 - Vancouver Public Schools (~20k students); Hillsboro School District (~19k students); David Douglas School District (~10k students); North Clackamas School District (~17k students)
 - Post-secondary education
 - Portland Community College (~55,000)
 - Portland State University (~20,000 enrolled)
 - University of Portland (~3,500 enrolled)
 - Clackamas College (~5,000)
 - Clark College (~10,000)
 - Pacific University (~3,000)
 - Reed College (~600)
 - Lewis & Clark (~2,000)

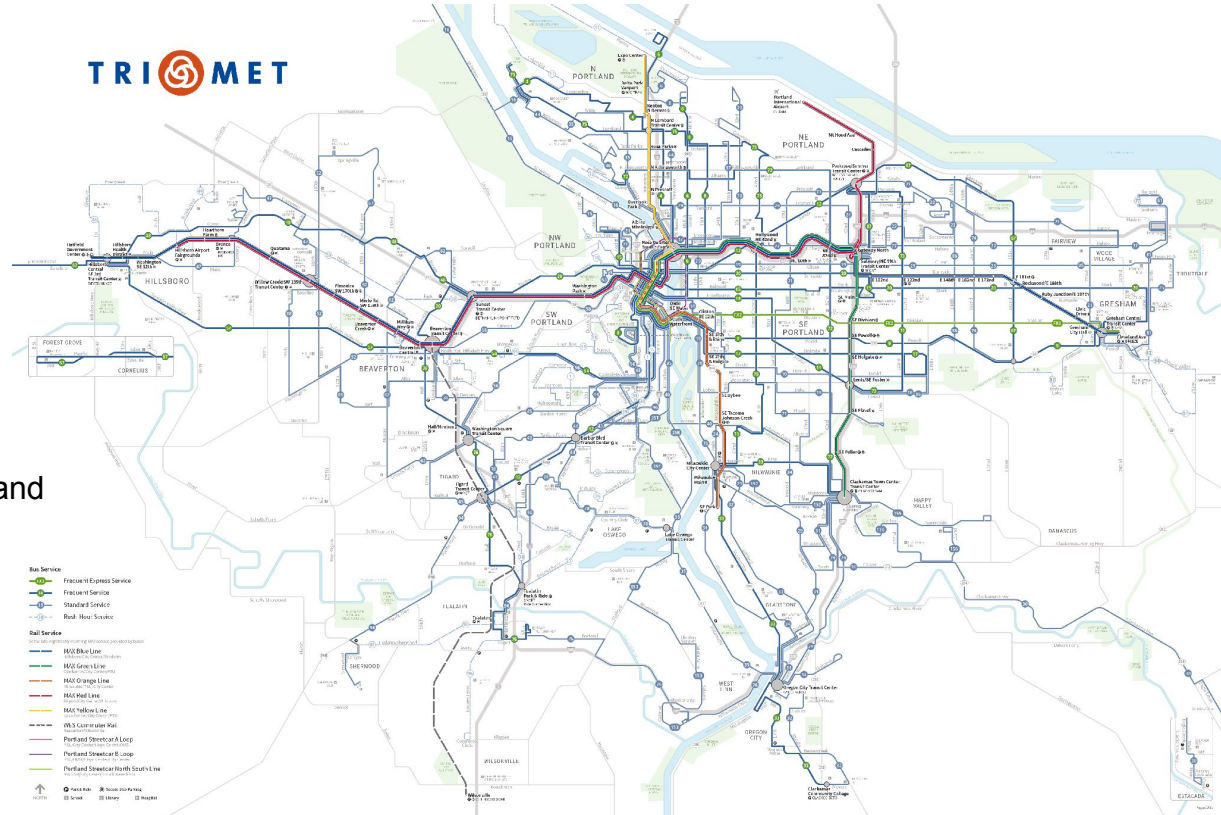
5.2 Socioeconomic Factors

- Access to Healthcare in Portland:
 - Modern hospitals and healthcare facilities
 - Oregon Health Sciences University (Southwest)
 - VA Portland (Southwest)
 - Providence Portland (Northeast)
 - Adventist Health Portland (SE)
 - Legacy Emanuel (North)
 - Kaiser Permanente Sunnyside (SE)
 - Providence St. Vincent S (SW)
 - Legacy Good Samaritan (NW)
 - Randall Childrens (NE)
 - Shriners Childrens (SW)
 - Providence Milwaukie (SE)



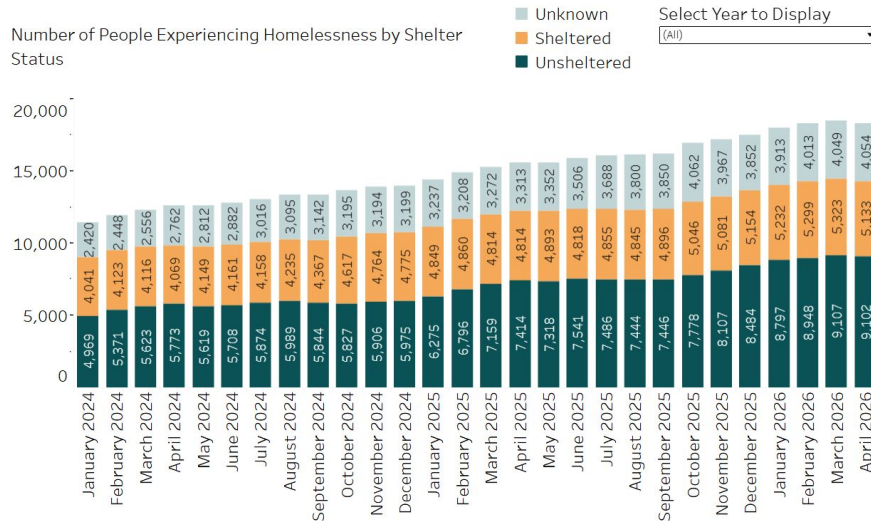
5.2 Socioeconomic Factors

- Access to Public Transportation
 - Managed by TriMet:
 - Buses
 - Rail (MAX and WES)
 - Streetcars in central Portland
 - Some public transportation links Portland to Vancouver (Amtrak and C-TRAN)



5.2 Socioeconomic Factors

- Homeless population
 - Homelessness is considered a crisis in Multnomah County
 - > 18,000 people experiencing homelessness in April 2026
 - Monthly [data dashboard](#) by the Homeless Services Department
 - Overnight shelters, emergency shelters, safe rest villages, and sanctioned camping areas



5.3. Governance

- Oregon Governor: Tina Kotek (2023)
- Washington Governor: Bob Ferguson (January 2025)
- Portland Mayor: Keith Wilson (January 2025)
- Beaverton Mayor: Lacey Beaty (January 2021)
- Hillsboro Mayor: Beach Pace (January 2025)
- Gresham Mayor: Travis Stovall (2021)
- Metro Council President: Juan Carlos Gonzalez (2018)
- Portland [Bureau of Emergency Management](#): promotes readiness, coordinate response, build resilience.
- Oregon [Department of Emergency Management](#): Emergency Management, Hazard Preparedness, Emergency Operations

5.4. Hazard Exposure

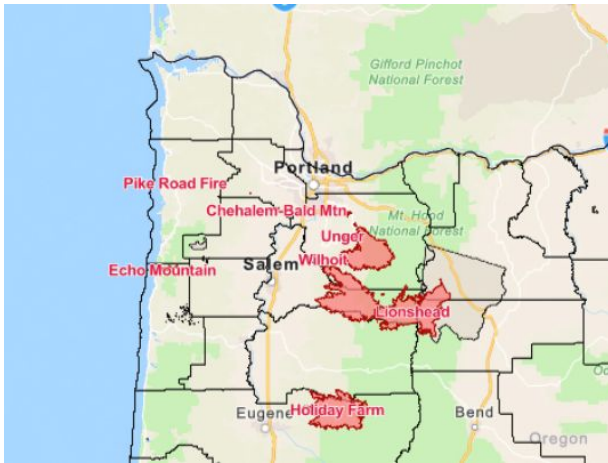
- Previous Events
 - Flooding: Major flood in 1997 from a rain on snow event. Many landslides associated with this event.
 - Wildfires: Forest Park is vulnerable. Local areas have significant wildfire risk.
 - Snowstorms / Icestorms: 2023 icestorm shut the city down for a week; 2023 April snowstorm results in many down trees and property damage.
 - Volcanoes: Nearby Mount St. Helens; Mount Hood.
 - Liquefaction
- Resources:
 - <https://www.emdat.be/>

5.4.1 Hazard Exposure: Past Earthquakes

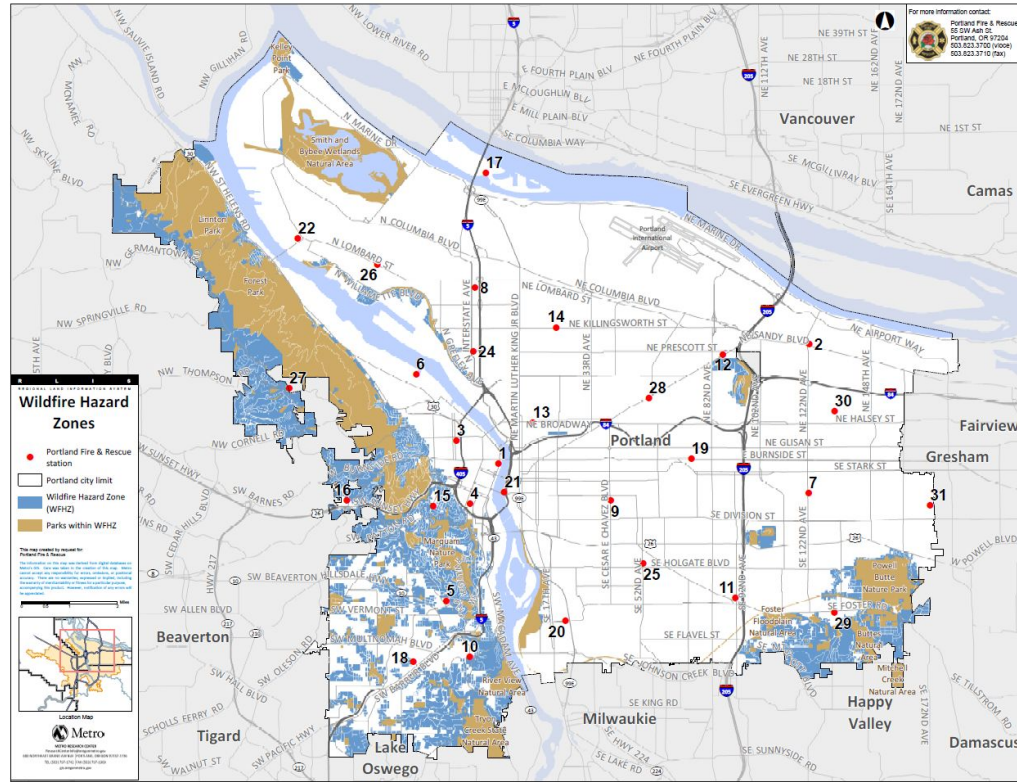
- Cascadia Subduction Zone
 - January 26, 1700
 - Average Cascadia Subduction Zone event return period is ~250 years
 - Occurred prior to Lewis and Clark expedition
 - Event has not occurred since the region was significantly settled or developed
- Nisqually Earthquake
 - February 28, 2001
 - M6.8; interslab
 - Epicenter near Olympia, Washington. Felt in Oregon.

5.4.2.1 Hazard Exposure: Wildfires

- High to extreme wildfire risk ~July to September
- Major fires Labor Day 2020 with nine fatalities and 1000s homes burned
- Statewide hazard map released in 2025 was repealed (2025 Senate Bill 83) after pressure from landowners



<https://www.opb.org/article/2025/08/28/6-ways-visualize-2020-labor-day-fires/>



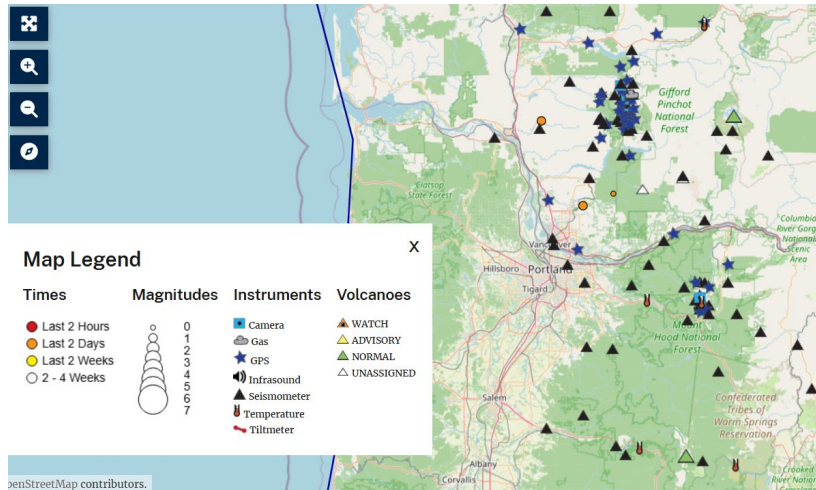
<https://www.portland.gov/fire/your-safety/documents/wildfire-hazard-zone-map/download>

5.4.2.2 Hazard Exposure: Snowstorms

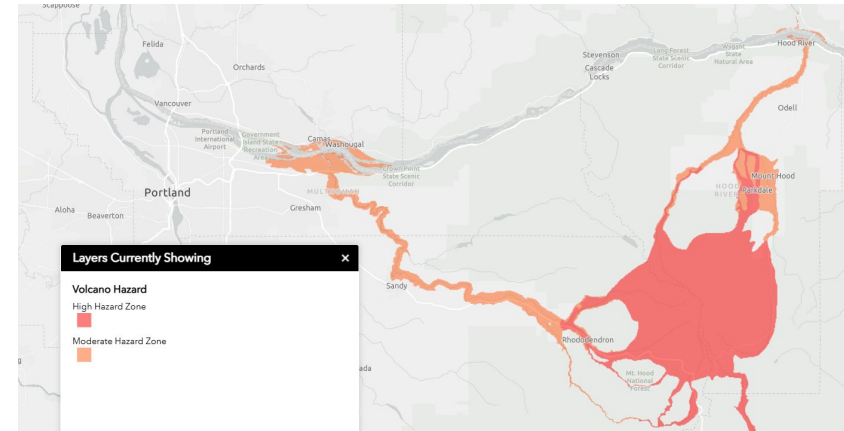
- Area may receive one or two major storms per year that cause major disruptions
 - Elevation in the area affects impact – higher areas in Washington Park, Forest Park, Council Crest, Mount Scott may be impacted while other areas are not
 - February 2023 a few inches predicted but received 11 inches (schools not released in time, transportation severely disrupted)
 - January 2024 snowstorm turned to ice and effectively shut the city down for ~5 days.
 - 100,000s lost power
 - Saturated soils with iceload on trees caused 100s of downed trees and significant property damage

5.4.2.3 Hazard Exposure: Volcanoes

- Volcanoes: Nearby Mount St. Helens; Mount Hood; Mount Jefferson
- USGS: probability of an eruption in the Portland/Vancouver metro area is very low



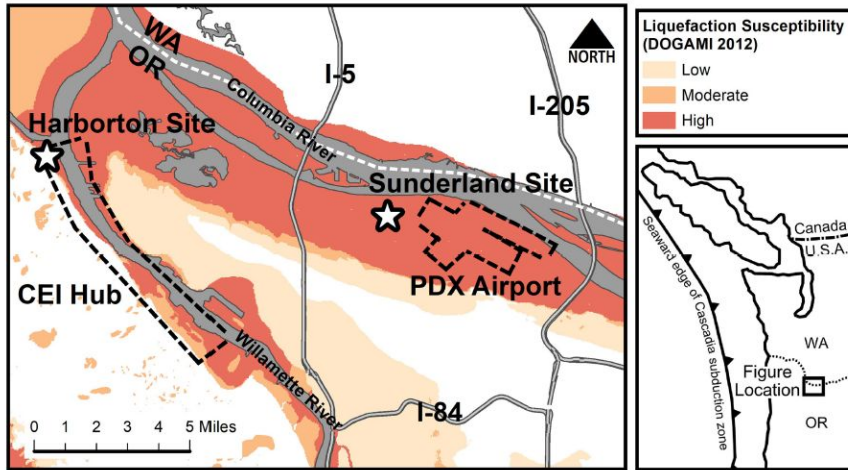
<https://www.usgs.gov/observatories/cvo>



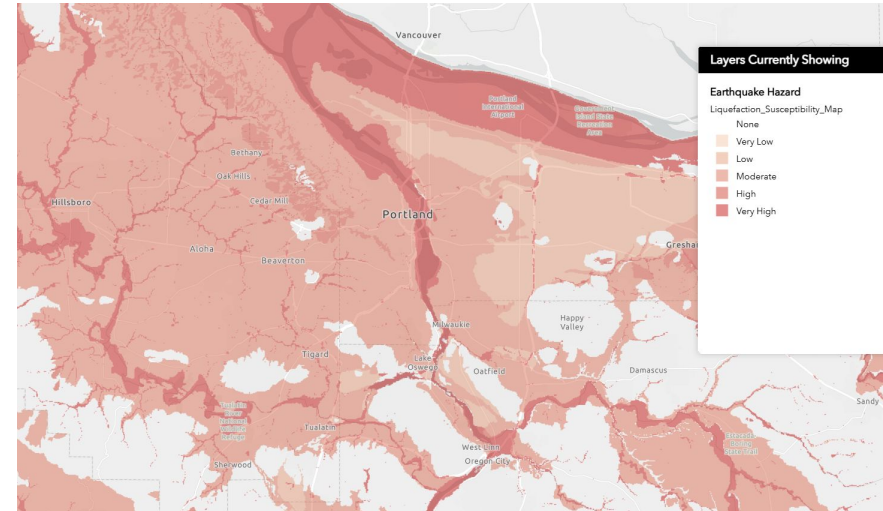
<https://gis.dogami.oregon.gov/maps/hazvu/>

5.4.2.3 Hazard Exposure: Liquefaction

- Young (Quaternary to Holocene) alluvial soils from the Willamette Rivers and Columbia Rivers.
- Dredged fill in industrial areas along the Willamette River.
- Expected to impact industrial areas, bridges, CEI hub



Moug et al. (2022)



<https://gis.dogami.oregon.gov/maps/hazvu/>

5.4.2.3 Hazard Exposure: Liquefaction

Portland Water Bureau Liquefaction Assessment

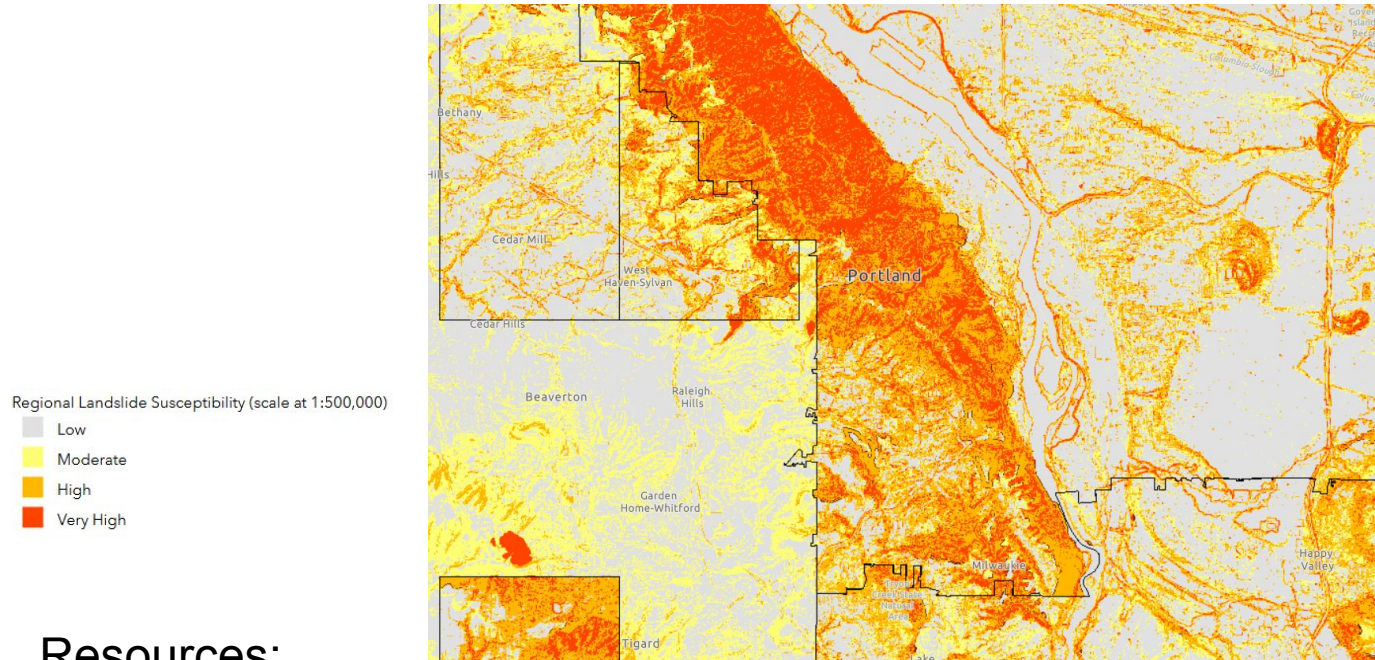
https://www.portlandmaps.com/arcgis/rest/services/Public/PWB_Seismic_2016/MapServer

- developed for a M9.0 Cascadia scenario
- Estimate landslide deformation, ground settlement, lateral spread

Key contacts:

- Mike Greenfield (mike@greenfieldgeotechnical.com) ; Steven Kramer (kramer@uw.edu)

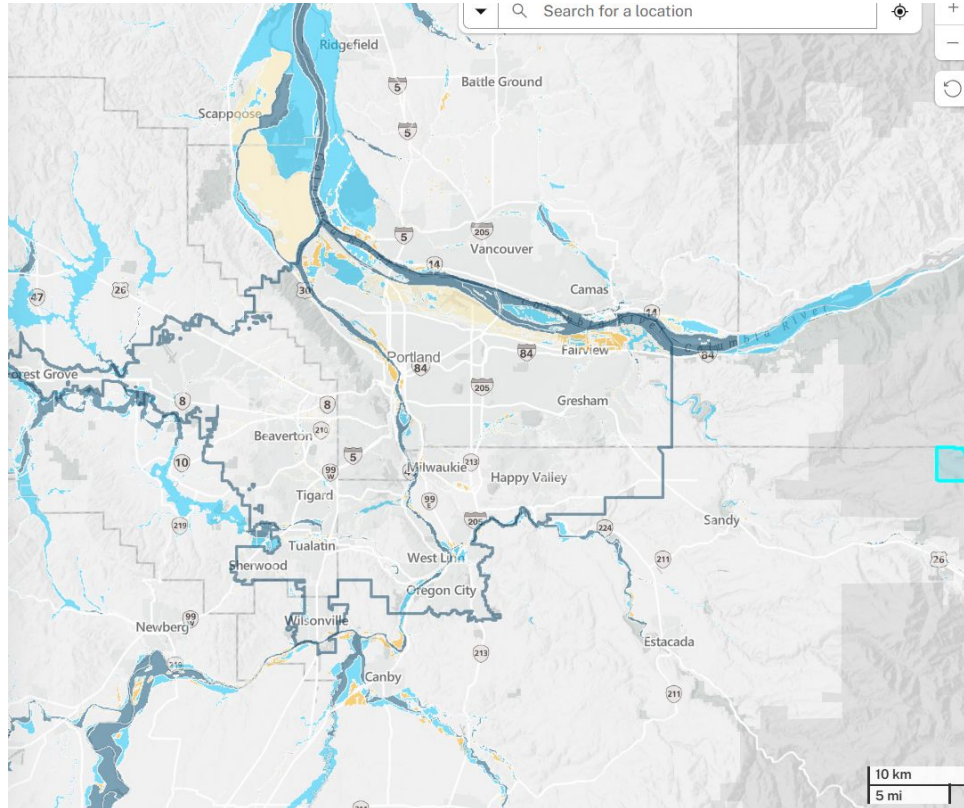
5.4.2.3 Hazard Exposure: Landslides



- Resources:

- <https://www.oregon.gov/dogami/slido/pages/index.aspx>
- [Landslide hazard and risk study of central and western Multnomah County](#)

5.4.2.6 Hazard Exposure: Floods



Legend

- 1% Annual Chance Flood Hazard
- Regulatory Floodway
- Special Floodway
- 0.2% Annual Chance Flood Hazard
- Area with Reduced Flood Risk Due to Levee

FEMA Flood Hazard Areas

<https://gis.oregonmetro.gov/metromap>

5.4.2.6 Hazard Exposure: Floods

- 1894 flood
- Major flooding on the Columbia River in 1948 (Vanport)
 - Failed railroad levee/embankment.
 - 18,000 people displaced.
 - Area redeveloped non-residential
- Major flooding in 1996
 - \$500 million property damage
 - High rains, followed by warm rain on snow event



High water mark from 1894 flooding. From City Auditor – Archive Maps (link provided above)

5.5. Community Organizations

- Neighborhood Emergency Teams (NETS)
 - Residents trained by Portland Bureau of Emergency Management and Portland Fire and Rescue to give assistance to their own neighborhood
- Community Organizations Active in Disaster (COAD)
 - Network of community-based organizations, nonprofits, small businesses, faith groups to strengthen emergency readiness, response and recovery
- Tank the Tanks Linnton
 - Linnton neighborhood organization focused on hazard elimination at the Critical Energy Infrastructure hub
 - Focused on advocacy, but a connected and active neighborhood group.

Key Resources

- [DOGAMI O-18-02](#): Earthquake regional impact analysis for Clackamas, Multnomah, and Washington Counties, Oregon (M9 Cascadia)
- [2013 Oregon Resilience Plan](#)
- <https://www.portlandmaps.com>: aerial photos, historic maps, property information (owner, permits, landuse, crime)
- [EcoNorthwest report](#): Impacts of Fuel Releases from the CEI Hub.
 - Commissioned by the Portland Bureau of Emergency Management

Washington Context

5.1. The Built Environment - Washington

Building Codes

- **Governing code:** Washington State Building Code (WAC), which adopts the 2021 International Building Code (IBC) with state-specific amendments. [1, 2]
- Seismic provisions reference ASCE 7 (as incorporated through the IBC). [1, 2]

Code Compliance

- Generally followed for structural elements.
- Non-structural compliance is weaker, especially outside Seattle and Bellevue.

Prevalent Construction Materials

- **Commercial:** steel, concrete, masonry (URM inventory in progress [3]).
- **Residential:** primarily timber.

5.1. The Built Environment - Washington

Seismic Design History [15]

- Region classified as approximately Seismic Zone 2 (per the Uniform Building Code) until the 1990s.
- Significant increase in design seismicity in the late 1990s, driven by growing awareness of the Cascadia Subduction Zone (CSZ) hazard and a general increase in national seismic hazard modeling sophistication.

Retrofit Culture

- No blanket retrofit mandates, hospital retrofit mandates, etc.
- School seismic retrofit program in place.

Buildings constructed before 1990 expected to be under-designed relative to modern seismic design standards and retrofits are sporadic.

5.1. The Built Environment - Washington

- Assumed Site Class D, ASCE 7-22
- Seismic design category: D [4]
- Design earthquake acceleration (S_{DS}): 0.73g [4]
- Peak ground acceleration (PGA): 0.48g [4]

The screenshot displays a mobile application interface for site analysis. On the left, a 'Location' panel shows the following details:

- Location: 296 ft with respect to North American Vertical Datum of 1988 (NAVD 88)
- Lat: 45.6313
- Long: -122.61259
- Standard: ASCE/SEI 7-22
- Risk Category: III
- Soil Class: D - Stiff Soil

Below this panel, there is a 'Seismic' section with an 'Overlay' toggle and a 'Risk Category III' label. At the bottom of the location panel are 'FULL REPORT' and 'SUMMARY' buttons. A disclaimer states: 'All data are per the requirements of published ASCE standards; local requirements may vary.' The ASCE logo and a 'Do Not Share My Personal Information' button are also visible.

On the right, a 'REPORT SUMMARY' overlay window is open, displaying the following data:

Site Information	
Elevation:	296 ft (NAVD 88)
Lat:	45.6313
Long:	-122.61259
Standard:	ASCE/SEI 7-22
Risk Category:	III
Soil Class:	D - Stiff Soil
Seismic Data	
S_S	0.87
S_1	0.33
S_{MS}	1.1
S_{M1}	0.73
S_{PS}	0.73
S_{D1}	0.49
T_L	16
PGA_M	0.48
V_{200}	260
Seismic Design Category	D
Note	Where values of the multi-period 5% damped MCER response spectrum are not available from the USGS Seismic Design Geodatabase, the design response spectrum shall be permitted to be determined in accordance with Section 11.4.5.2

5.2. Socioeconomic Factors – Washington

Vancouver

- 2026 population ~201,530, up ~5.4% since the 2020 census. [5]
- Largest city in Clark County and 4th-largest in WA. [5]
- Portland-Vancouver-Hillsboro metro (suburb of Portland).
- Median household income ~\$81,338, 10% poverty rate. [5]
- Commercial/industrial.
- Partial economic and service dependence on Portland, could be disrupted by damage to I-5 bridge.
- Limited transportation network redundancy, potential for islanding/isolation.

5.2. Socioeconomic Factors – Washington

Longview

- 2026 population ~38,506, slow growing, up ~1.7% since the 2020 census. [6]
- Median household income ~\$61,747, 16% poverty rate. [6]
- Commercial/industrial; deep-water port economy and historic lumber mill city.
- Partial economic and service dependence on Astoria/Oregon, could be disrupted by damage to Lewis and Clark Bridge.
- Limited transportation network redundancy, potential for islanding/isolation.

5.2. Socioeconomic Factors – Washington

Centralia

- 2026 population ~19,393, up ~5.4% since the 2020 census. [7]
- Median household income \$56,219, 20% poverty rate. [7]
- Commercial/industrial/rural; historic railroad town now hub for lodging, retail, tourism, regional shipping/warehousing along I-5 corridor between Portland and the Puget Sound.
- Limited transportation network redundancy, potential for islanding/isolation.

Grays Harbor and Pacific Counties

- Rural, coastal, supported by tourism.
- Very limited transportation network redundancy, high potential for islanding/isolation

5.3. Governance – Washington

Federal: FEMA

Provides supplemental grants to state, tribal, and local governments and certain private non-profits after a disaster, opens Disaster Recovery Centers, and funds hazard-mitigation grants.

Regional: USGS Pacific Northwest Seismic Network [8]

Hazard monitoring and early warning.

State: Washington Emergency Management Division (WA EMD) [9]

EMD leads and coordinates mitigation, preparedness, response, and recovery statewide; operates the State Emergency Operations Center (EOC).

State: Washington State Department of Transportation [10]

Emergency Relief Program coordinates resources and funding reimbursement during disasters for public works agencies.

Local: County and Municipal Management [10]

Local EOCs and EMDs coordinate with WA EMD.

5.3. Governance – Washington

Insurance [11]

Insurance available, there if a lender requires it but uncommon:

- 11% of homeowners insured against earthquakes
- 43% of commercial properties.

5.4. Hazard Exposure – Washington

1700, ~M9.0 Cascadia Subduction Zone earthquake [12]

- Strong ground shaking throughout the Pacific Northwest and a devastating tsunami affecting the coastline across the Pacific Ocean.
- Coseismic subsidence dropped the coastline 1-2 m, killing coastal forests (e.g., Copalis Beach, WA).

1993, M5.6 Scotts Mills earthquake [13]

- URM buildings suffered the worst impacts, e.g., Molalla High School lost its chimney and two gables with two brick walls partially collapsing.
- Only minor injuries were reported; outcomes could have been far worse if it had it struck during a school day (often called the “Spring Break quake”).

2001, M6.8 Nisqually earthquake [14]

- 400 injuries and one reported death.
- ~\$305 million in insured losses and \$2 billion in total damage; most economic loss came from non-structural damage and business disruption.

~1000 URMs red- or yellow-tagged as unsafe to occupy; retrofitted and newer code-compliant buildings performed measurably better.

5.4. Hazard Exposure – Washington

Other Hazards

- **Tsunamis.** Open-coast inundation (severe for Ocean Shores/Grays Harbor in CSZ event) and river-channel tsunami effects along the Columbia/Cowlitz (relevant to Longview/Vancouver), which could be generated by earthquake-triggered landslides in this scenario. Vertical evacuation infrastructure under development.
- **Liquefaction.** The Columbia/Cowlitz floodplains underlying Vancouver and Longview's port/industrial zones are among the areas most susceptible in this region.
- **Landslides.** Steep terrain and saturated soils make coseismic and rainfall-triggered landslides a significant hazard; these can also generate localized river tsunamis/seiches.
- **Volcanoes.** The Cascade arc (Mount St. Helens, Mount Rainier, Mount Adams, Mount Hood) poses ashfall and lahar hazards.
- **Flooding & winter storms.** Riverine flooding. Atmospheric rivers.

References

1. City of Vancouver. 03-15-2024. *The City of Vancouver adopted Codes*. <https://www.cityofvancouver.us/business/permits-licenses-and-inspections/building-codes-and-regulations/>
2. Washington State Building Code Council. 02-01-2021. *State Codes, Regulations & Guidelines*. <https://sbcc.wa.gov/state-codes-regulations-guidelines>
3. Washington State Department of Commerce. 10-01-2018. *Unreinforced Masonry Building Inventory*. <https://www.commerce.wa.gov/unreinforced-masonry-building-inventory/>
4. American Society of Civil Engineers. 06-24-2026. *ASCE Hazard Tool*. <https://ascehazardtool.org>
5. World Population Review. 06-24-2026. *Vancouver*. <https://worldpopulationreview.com/us-cities/washington/vancouver>
6. World Population Review. 06-24-2026. *Longview*. <https://worldpopulationreview.com/us-cities/washington/longview>
7. World Population Review. 06-24-2026. *Centralia*. <https://worldpopulationreview.com/us-cities/washington/centralia>
8. Pacific Northwest Seismic Network. 06-24-2026. <https://pnsn.org/>
9. Washington Emergency Management Division. 06-24-2026. *Emergency Management Division*. <https://mil.wa.gov/emergency-management-division>
10. Municipal Research and Services Center of Washington (MRSC). 06-24-2026. *Local Government Emergency Planning*. <https://mrsc.org/explore-topics/public-safety/emergencies/emergency-planning>
11. PCRG Insurance. 06-24-2026. *When the ground moves: Why earthquake coverage matters most in Washington*. <https://www.pcrinsurance.com/when-the-ground-moves-why-earthquake-coverage-matters-in-washington-state/>
12. Pacific Northwest Seismic Network. 06-24-2026. *1700 Cascadia Subduction Zone Earthquake*. <https://pnsn.org/education/pnw-earthquakes/notable/1700-cascadia>
13. Pacific Northwest Seismic Network. 06-24-2026. *1993 Scotts Mills Earthquake*. <https://pnsn.org/education/pnw-earthquakes/notable/scotts-mills>
14. Pacific Northwest Seismic Network. 06-24-2026. *2001 Nisqually Earthquake*. <https://pnsn.org/education/pnw-earthquakes/notable/nisqually>
- Degenkolb. 02-09-2017. *Washington Building Code History*. https://www.eeri.org/images/sesi/WashingtonBuildingCodeHistory-Rev_2-09-2017.pdf

6. Secondary Hazards

6.1. Tsunami

- Not necessarily a tsunami risk but there is high likelihood of a seiche occurring in the Willamette River
 - Potential for major environmental pollution due to presence of heavy industry and Superfund sites described in planning committee call
- Columbia River / shipping channel → same challenge, potential damage to shipping docks and ports



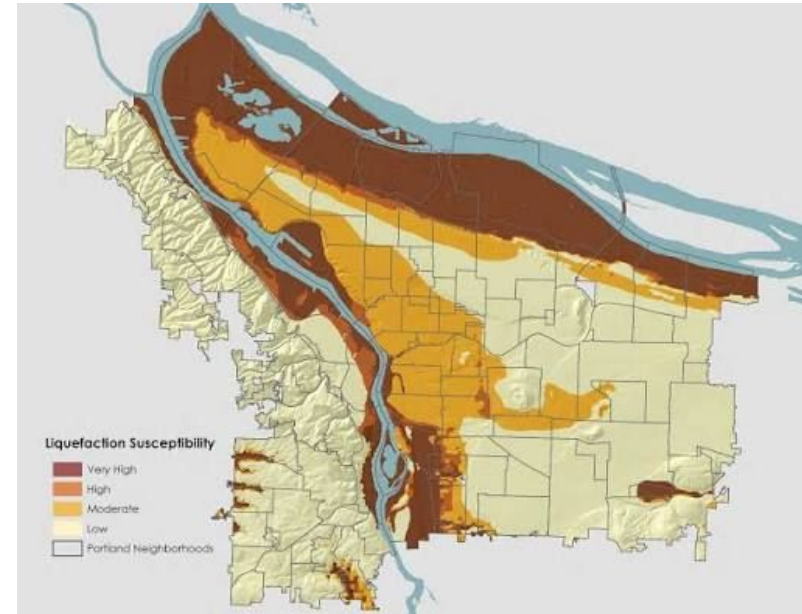
Above – Bridge crossings on the Willamette River in Portland



Left – Terminal 5 in the Port of Portland

6.2. Geotechnical Hazards

- Widespread liquefaction in low-lying areas along Willamette and Columbia
 - Affecting Swan Island and Mock Crest Margin industrial areas, Port of Portland and PDX, Northwest Industrial Area and CEI Hub
- Multiple landslides and rockslides in West Hills and along Clackamas River Bluffs
- Hundreds of miles of roads closed due to landslides/rockfall , more than 200 road blockages



Portland Liquefaction Susceptibility [1]

7. Earthquake Impacts

7.1. Hospitals

- Hospital functionality:
 - OHSU physically isolated but structure intact
 - Legacy Good Samaritan: Experiencing structural and non-structural failure in older portions of hospital complex
 - Legacy Emanuel Medical Center: Operating as Level 1 Trauma Center on generator power, patients being treated outside in triage tents
 - Overall room availability decreased significantly, emergency surgeries limited to “life or limb”
- Municipal water systems largely failed across the city, hospitals have limited water supply, some internal flooding reported due to ruptured sprinkler lines
- Hospitals have backup power supply but OHSU/Doernbecher Children’s Hospital at risk of running out of fuel due to landslides cutting off road access

7.2. Schools

- School retrofits
 - Oregon: Statewide grant program for school retrofits started in 2010, 300-400 buildings have been retrofit so far
 - Portland: bond money for school retrofits starting with high schools, then middle, then elementary
 - Beaverton: also had bond money for retrofits, most are completed
 - Washington: Modeling program off Oregon's with a focus on coastal schools due to potential for tsunamis and higher seismic risk
 - Camas: has bond money and has been proactive about retrofits

7.2. Schools

- Over half of Portland Public Schools built pre-1940, many dealing with structural cracking or are partially collapsed
 - Most heavily affected schools in western Portland along fault and northeast/southeast Portland where there are more historic buildings
- More than 80 schools across the Portland metro are closed
 - 45,000 to 55,000 students affected by closures
- School closures
 - All schools in the Portland metro area expected to be closed for 1-2 weeks, modern and retrofitted buildings likely to reopen once utilities are restored
 - Schools that were not retrofitted and that have significant damage are likely to be permanently closed, displacing students and leading to school consolidations

7.3. Housing (Single-Family Homes)

- Portland homes built before 1980 have a cripple wall that has buckled and collapsed, dropping homes multiple feet off foundations and rupturing gas lines and water mains
 - Estimated 70,000 to 110,000 homes in Multnomah, Clackamas, and Washington counties with cripple walls
- Homes built before 1970s rarely bolted to foundations, have been slid off foundations horizontally
 - ~38% of homes in the Portland metro
- Liquefaction in neighborhoods along Willamette and Columbia rivers causing foundation cracking and sinking
- Landslides impacting housing in the West hills

7.4. Other Building Damage

- More than 100k buildings damaged, repair costs estimated to exceed \$60B
- URM buildings (~60% of total building stock) have partially or totally collapsed
- Concrete buildings without ductile steel reinforcement – severe structural cracking and failure of weight-bearing pillars

Building Inspection Tagging (Counts)



Total Economic Loss

Total:

\$108B

Top Counties	State	Total
Multnomah	OR	\$58B
Washington	OR	\$22.7B
Clackamas	OR	\$22.2B
Clark	WA	\$2.88B
Marion	OR	\$653M
Columbia	OR	\$538M
Cowlitz	WA	\$300M

7.4. Other Building Damage

- Downtown high rises
 - Pre-1990 buildings: structural stress and broken joints, damage to exterior facades
 - Modern buildings: elevators stopped working, stairs blocked by debris, many buildings non-functional
- Manufacturing / Industrial buildings
 - Severe foundation tilting due to soil liquefaction in industrial buildings along Willamette/Columbia Rivers

7.5. Utilities

- **Critical Energy Infrastructure Hub – major petrochemical hub with over 600 storage tanks**
 - Supplies jet fuel/gasoline/diesel for Portland metro and PDX airport
 - Overlaps with existing Superfund sites along Willamette River
 - Built on unstable, liquefiable soils, major earthquake could result in “catastrophic failure” and “an oil spill larger than the Deepwater Horizon disaster” [1]
- **Substations, transformers, and transmission towers located on liquefiable soils near the Willamette River are damaged**
 - Blackout along the I-5 corridor
- **Cell towers damaged and remaining networks are slowed, making cellphone communication nearly impossible**
- **Wastewater disruptions**
 - Potential for displacement of residents from sewer disruptions

7.5. Utilities

Lifeline	Status
Electric power	Significant initial disruption due to damaged substations, transformers and transmission towers Blackout along I-5
Gas	~ 3,000 gas main breaks reported More than 20,000 gas leaks
Water	Sewer disruptions possible due to damaged wastewater lines
Telecommunications/Internet	Communications towers damaged, networks slowed, cell phone communication nearly impossible
Oil	Severe damage to CEI Hub leading to oil spill and release of other harmful pollutants
Airport	PDX experiencing moderate damage to runways, airport currently closed
Port	Moderate (major?) damage to ports along Columbia and Willamette Rivers
Public Transit	Transit and transportation throughout the area hampered by bridge damage

7.6. Transportation

- None of Portland's Willamette River vehicular bridges immediately usable [1]
- Collapse of many bridges around the area, including I-5 crossing between OR and WA
- Public transit inoperable, damage to/collapse of bridges for MAX trains, streetcars, and busses
 - Union Pacific Railroad Steel Bridge collapse
- Maritime traffic stopped underneath damaged and collapsed bridges along Columbia and Willamette Rivers

[1] Multnomah County. 10/20/2025. *Citing ongoing federal uncertainty, County moving forward with design, pushing back construction for Earthquake Ready Burnside Bridge Project.*
<https://multco.us/news/news-release-citing-ongoing-federal-uncertainty-county-moving-forward-design-pushing-back>



Columbia River I-5 Bridge



Collapse of Burnside Bridge in EQ (simulated by Multnomah County)

7.X. Transportation

- Portland International Airport – liquefaction affecting runways
 - Improvements started to ensure one runway stays open following an EQ, but are not completed so airport shutdown [2]
- Ports in Vancouver and Portland along Columbia and Willamette Rivers
 - Saturated hazardous waste/energy infrastructure along Columbia and Willamette Rivers [3]
 - Several storage tanks have sunk into liquefiable soils, others failed during shaking and released liquid fuel into the Willamette River
 - Some tanks separated from pipes and are releasing petrochemicals into the ground
 - Residents reported smoke and strong chemical odor in the area

[2] Century West. 01/2026. *Designing a recovery/earthquake ready runway at Portland International Airport.* <https://centurywest.com/designing-a-recovery-earthquake-ready-runway-at-portland-international-airport/>

[3] US EPA. 09/2025. *Portland Harbor Superfund site updates.* <https://semspub.epa.gov/work/10/100658653.pdf>