## 5.7 Port of Portland

### 5.7.1 Mitigation Actions

<table>
<tr><th>Hazard</th><th>Action ID</th><th colspan="8">Mitigation Actions – Port of Portland</th></tr>
<tr><td rowspan="8">Multi-Hazard</td><td rowspan="8">1</td><td colspan="8">Develop internal and external programming to inform and educate employees, tenants and business partners about hazards and potential ways to mitigate them.</td></tr>
<tr><td colspan="3">Plan Goals – 1,3</td><td colspan="5">Hazards Addressed – All Hazards</td></tr>
<tr><td colspan="3">Lifelines – Airport, Marine Port</td><td colspan="5">Prioritization Criteria</td></tr>
<tr><td>Implementation Lead</td><td>Coordinating Partnerships</td><td>Equity</td><td>Benefit</td><td>Cost</td><td>Risk</td><td>Capacity</td><td>Priority Score</td></tr>
<tr><td>Port of Portland Emergency Management</td><td>Port of Portland Operations</td><td>3</td><td>3</td><td>3</td><td>3</td><td>3</td><td>15</td></tr>
<tr><td colspan="8">Potential Funding – Port of Portland funding and federal grant programs</td></tr>
<tr><td colspan="8">Potential Implementation Methods – Emergency Management activities</td></tr>
<tr><td colspan="8">Notes - This action will help communities, particularly workers and nearby residents, improve their ability to mitigate risk and exposure through education.</td></tr>
</table>

| Hazard | Action ID | Mitigation Actions – Port of Portland | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Multi-Hazard | 2 | **Establish and maintain agreements with federal and state partners to support the use of Port facilities in response and recovery operations and identify collaborative opportunities with federal and state agencies to implement supporting on-site mitigation measures.** | | | | | | | | |
| | | Plan Goals – 1,2,3,5 | | Hazards Addressed – All Hazards | | | | | | |
| | | Lifelines – Airport, Marine Port | | **Prioritization Criteria** | | | | | | |
| | | **Implementation Lead** | **Coordinating Partnerships** | **Equity** | **Benefit** | **Cost** | **Risk** | **Capacity** | **Priority Score** | |
| | | Port of Portland Operations | Portland of Portland Government Affairs, FEMA, OEM | **3** | **3** | **3** | **3** | **3** | **15** | |
| | | **Potential Funding –** Port of Portland funding | | | | | | | | |
| | | **Potential Implementation Methods –** Emergency Management activities, Government Affairs | | | | | | | | |
| | | **Notes -** This low-cost, high benefit action will provide a direct benefit to those most impacted by a disaster by providing clear and pre-negotiated expectations; this will speed aid delivery and assistance. | | | | | | | | |
| Multi-Hazard | 3 | **Document facility, infrastructure and equipment vulnerabilities to high heat and wildfire smoke; evaluate mitigation actions; and implement actions as appropriate.** | | | | | | | | |
| | | Plan Goals – 3,4,5 | | Hazards Addressed – Severe Weather, Wildfire & Wildfire Smoke | | | | | | |
| | | Lifelines – Airport, Marine Port | | **Prioritization Criteria** | | | | | | |
| | | **Implementation Lead** | **Coordinating Partnerships** | **Equity** | **Benefit** | **Cost** | **Risk** | **Capacity** | **Priority Score** | |
| | | Port of Portland Planning and Development | Port of Portland Operations | **3** | **3** | **2** | **2** | **2** | **12** | |
| | | **Potential Funding –** Port of Portland funding | | | | | | | | |
| | | **Potential Implementation Methods –** Facility Planning activities, Operational work plans, Asset Management plans, Port CIP | | | | | | | | |
| | | **Notes -** High heat and wildfire smoke directly impacts outdoor workers at Port facilities. Mitigating risks will provide direct benefit to workers with direct exposure to high heat and smoke. | | | | | | | | |

| Hazard | Action ID | Mitigation Actions – Port of Portland | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Multi-Hazard | 4 | **Develop and implement communications plans and systems, including automated and robotic communications and notification systems at Port facilities to mitigate risks related to communication system loss in the event of an earthquake or flood.** | | | | | | | | |
| | | Plan Goals - 3 | | Hazards Addressed – Earthquake, Flood | | | | | | |
| | | Lifelines – Airport, Marine Port | | **Prioritization Criteria** | | | | | | |
| | | **Implementation Lead** | **Coordinating Partnerships** | **Equity** | **Benefit** | **Cost** | **Risk** | **Capacity** | **Priority Score** | |
| | | Portland of Portland Emergency Management | Port of Portland IT | **2** | **3** | **2** | **3** | **2** | **12** | |
| | | **Potential Funding –** Port of Portland funds, UASI, BRIC, other Federal grant programs | | | | | | | | |
| | | **Potential Implementation Methods –** Facility Planning activities, PDX Capital Improvement Plan, General Fund Capital Improvement Plan | | | | | | | | |
| | | **Notes -** This action will enable the Port to provide community response, providing broad social benefit by enabling support services at PDX facilities, which will increase aid distribution benefitting those impacted by disasters. | | | | | | | | |
| Multi-Hazard | 5 | **Harden security systems and upgrade communications to address seismic and flood risks.** | | | | | | | | |
| | | Plan Goals – 2,3 | | Hazards Addressed – Earthquake, Flood | | | | | | |
| | | Lifelines – Airport, Marine Port | | **Prioritization Criteria** | | | | | | |
| | | **Implementation Lead** | **Coordinating Partnerships** | **Equity** | **Benefit** | **Cost** | **Risk** | **Capacity** | **Priority Score** | |
| | | Port of Portland Engineering | Port of Portland Operations, IT | **1** | **3** | **2** | **2** | **2** | **10** | |
| | | **Potential Funding –** UASI and other federal grant programs | | | | | | | | |
| | | **Potential Implementation Methods –** General Fund Capital Improvement Plan | | | | | | | | |
| | | **Notes -** This action will help enable to use of Terminal 6 in maritime-based response. It provides community-wide benefit. | | | | | | | | |

| Hazard | Action ID | Mitigation Actions – Port of Portland | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Multi-Hazard | 6 | **Assess expected climate impacts on T6 and identify and implement needed mitigation investment to ensure continued performance and longevity given heat and flood risks.** | | | | | | | |
| | | Plan Goals – 1,3,4,5 | | Hazards Addressed – Flood, Severe Weather | | | | | |
| | | Lifelines – Airport, Marine Port | | **Prioritization Criteria** | | | | | |
| | | **Implementation Lead** | **Coordinating Partnerships** | **Equity** | **Benefit** | **Cost** | **Risk** | **Capacity** | **Priority Score** |
| | | Port of Portland Planning and Development | Port of Portland Operations, Engineering | **3** | **3** | **3** | **3** | **3** | **15** |
| | | **Potential Funding –** Port of Portland funding | | | | | | | |
| | | **Potential Implementation Methods –** Facility Planning Activities, General Fund Capital Improvement Plan | | | | | | | |
| | | **Notes -** T6 is expected to provide a critical community lifeline connection for maritime aid and fuel supplies. Ensuring the facilities is adapted to new conditions is critical to providing critical lifeline services. | | | | | | | |
| Earthquake | 7 | **Complete the engineering and design for and construct the resilient runway seismic mitigation, construct the resilient airfield regulator building with back-up power, and related improvements needed to ensure a resilient airfield.** | | | | | | | |
| | | Plan Goals – 2,3,5 | | Hazards Addressed – Earthquake | | | | | |
| | | Lifelines – Airport | | **Prioritization Criteria** | | | | | |
| | | **Implementation Lead** | **Coordinating Partnerships** | **Equity** | **Benefit** | **Cost** | **Risk** | **Capacity** | **Priority Score** |
| | | Port of Portland Engineering | Port of Portland Planning and Development, Operations | **3** | **3** | **1** | **3** | **3** | **13** |
| | | **Potential Funding –** Port of Portland funding, BRIC and other federal and state programs | | | | | | | |
| | | **Potential Implementation Methods –** PDX Capital Improvement Plan | | | | | | | |
| | | **Notes -** A seismically resilient airport is a community lifeline that will significant speed local and regional recovery. It will provide benefits to all communities, particularly communities with fewer household resources. A resilient runway, in particular, will speed up recovery times by weeks. Portland State equity impacts analysis identified that a resilience runway will have a high level of community benefit. | | | | | | | |

| Hazard | Action ID | Mitigation Actions – Port of Portland | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Earthquake | 8 | **Set performance goals, update or expand seismic risk assessments and feasibility studies, identify and prioritize mitigation strategies and make investments for the airfield, concourses, terminal, maintenance facilities, parking and transportation infrastructure, passenger processing and critical utility systems, and other PDX systems and facilities as appropriate.** | | | | | | | | |
| | | Plan Goals – 3,5 | | Hazards Addressed – Earthquake | | | | | | |
| | | Lifelines – Airport | | **Prioritization Criteria** | | | | | | |
| | | **Implementation Lead** | **Coordinating Partnerships** | **Equity** | **Benefit** | **Cost** | **Risk** | **Capacity** | **Priority Score** | |
| | | Port of Portland Planning and Development | Port of Portland Operations | **2** | **2** | **2** | **3** | **3** | **12** | |
| | | **Potential Funding –** Port of Portland funding, BRIC and other federal grant programs | | | | | | | | |
| | | **Potential Implementation Methods –** PDX Master Plan, Facility Planning Activities, PDX Capital Improvement Plan | | | | | | | | |
| | | **Notes -** A seismically resilient airport is a community lifeline that will significant speed local and regional recovery. It will provide benefits to all communities, particularly communities with fewer household resources. | | | | | | | | |
| Earthquake | 9 | **Identify system failure points and mitigate harm to people, the environment, and infrastructure systems by implementing Earthquake Early Warning systems.** | | | | | | | | |
| | | Plan Goals – 1,2,3 | | Hazards Addressed – Earthquake | | | | | | |
| | | Lifelines – Airport, Marine Port | | **Prioritization Criteria** | | | | | | |
| | | **Implementation Lead** | **Coordinating Partnerships** | **Equity** | **Benefit** | **Cost** | **Risk** | **Capacity** | **Priority Score** | |
| | | Port of Portland Planning and Development | Port of Portland Engineering, Operations | **1** | **3** | **2** | **3** | **3** | **12** | |
| | | **Potential Funding –** Port of Portland funding, BRIC and other federal and state programs | | | | | | | | |
| | | **Potential Implementation Methods –** PDX Capital Improvement Plan, General Fund Improvement Plan | | | | | | | | |
| | | **Notes -** This project will mitigate harm within the airport for airport workers and passengers; benefits are generally limited to those on site at the time of the event. | | | | | | | | |

| Hazard | Action ID | Mitigation Actions – Port of Portland | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Earthquake | 10 | **Review and update the T6 seismic plan to address completed projects and identify new needs.** | | | | | | | | |
| | | Plan Goals – 3,5 | | Hazards Addressed – Earthquake | | | | | | |
| | | Lifelines – Marine Port | | **Prioritization Criteria** | | | | | | |
| | | **Implementation Lead** | **Coordinating Partnerships** | **Equity** | **Benefit** | **Cost** | **Risk** | **Capacity** | **Priority Score** | |
| | | Port of Portland Planning and Development | Port of Portland Operations, Engineering | **2** | **3** | **3** | **2** | **2** | **12** | |
| | | **Potential Funding –** Port of Portland funding, BRIC and other federal programs | | | | | | | | |
| | | **Potential Implementation Methods –** Facility Planning Activities, General Fund Capital Improvement Plan | | | | | | | | |
| | | **Notes -** This action will help enable to use of Terminal 6 in maritime-based response. It provides community-wide benefit. | | | | | | | | |
| Earthquake | 11 | **Support investments in fueling facilities to mitigate harm resulting from an earthquake.** | | | | | | | | |
| | | Plan Goals – 1,2,3,4,5 | | Hazards Addressed – Earthquake | | | | | | |
| | | Lifelines – Airport | | **Prioritization Criteria** | | | | | | |
| | | **Implementation Lead** | **Coordinating Partnerships** | **Equity** | **Benefit** | **Cost** | **Risk** | **Capacity** | **Priority Score** | |
| | | Port of Portland Planning and Development | PDX Fuel Company | **3** | **3** | **1** | **3** | **1** | **11** | |
| | | **Potential Funding –** | | | | | | | | |
| | | **Potential Implementation Methods –** Facility Planning Activities, PDX Capital Improvement Plan | | | | | | | | |
| | | **Notes -** This action will significantly improve health and safety outcomes and protect Columbia River water quality; the Columbia River runs along numerous communities and provides a secondary water supply for the City of Portland. | | | | | | | | |

| Hazard | Action ID | Mitigation Actions – Port of Portland | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Earthquake | 12 | **Assess seismic vulnerabilities of flood and stormwater management infrastructure that serves PDX and implement appropriate mitigation measures and risk mitigation plans; plan for and invest to improve seismic resilience and power reliability for pump stations that serve or support PDX, and mitigate flood exposure risk for critical airport facilities.** | | | | | | | |
| | | Plan Goals – 2,3,5 | | Hazards Addressed – Earthquake | | | | | |
| | | Lifelines – Airport | | **Prioritization Criteria** | | | | | |
| | | **Implementation Lead** | **Coordinating Partnerships** | **Equity** | **Benefit** | **Cost** | **Risk** | **Capacity** | **Priority Score** |
| | | Port of Portland Planning and Development | MCDD, UFSWQD (when created), Port of Portland Engineering | **3** | **3** | **1** | **3** | **1** | **11** |
| | | **Potential Funding –** Port of Portland funding, UFSWQD funding, federal and state grants | | | | | | | |
| | | **Potential Implementation Methods –** Facility Planning Activities, PDX Capital Improvement Plan | | | | | | | |
| | | **Notes -** PDX relies on the consistent functioning of levee and pump system to keep the airfield dry. Mitigating flood risk following an earthquake will allow PDX to provide a critical lifeline connection and support essential aid distribution to impacted communities. | | | | | | | |
| Earthquake | 13 | **Complete the construction of seismic resilience improvements at Berth 603 to enable T6 to mitigate seismic risk.** | | | | | | | |
| | | Plan Goals – 3,5 | | Hazards Addressed – Earthquake | | | | | |
| | | Lifelines – Marine Port | | **Prioritization Criteria** | | | | | |
| | | **Implementation Lead** | **Coordinating Partnerships** | **Equity** | **Benefit** | **Cost** | **Risk** | **Capacity** | **Priority Score** |
| | | Port of Portland Engineering | Port of Portland Operations | **2** | **3** | **1** | **3** | **1** | **10** |
| | | **Potential Funding –** BRIC, PIDP, RAISE and other federal grant programs | | | | | | | |
| | | **Potential Implementation Methods –** General Fund Capital Improvement Plan | | | | | | | |
| | | **Notes -** This action will help enable to use of Terminal 6 in maritime-based response. It provides community-wide benefit. | | | | | | | |

| Hazard | Action ID | Mitigation Actions – Port of Portland | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Earthquake | 14 | **Mitigate seismic risk by developing a Disaster Recovery Site for technology infrastructure.** | | | | | | | |
| | | Plan Goals – 3 | | Hazards Addressed – Earthquake | | | | | |
| | | Lifelines – Airport | | **Prioritization Criteria** | | | | | |
| | | **Implementation Lead** | **Coordinating Partnerships** | **Equity** | **Benefit** | **Cost** | **Risk** | **Capacity** | **Priority Score** |
| | | Port of Portland IT | Port of Portland Operations | **2** | **2** | **2** | **3** | **1** | **10** |
| | | **Potential Funding –** Port of Portland funding | | | | | | | |
| | | **Potential Implementation Methods –** Business Continuity Planning, Technical Services Program | | | | | | | |
| | | **Notes -** This action will enable the Port to provide community response, providing broad social benefit by enabling support services at PDX facilities, which will increase aid distribution benefitting those impacted by disasters | | | | | | | |
| Earthquake | 15 | **Plan for and invest in seismically resilient on-site emergency power and district energy systems to mitigate earthquake risk.** | | | | | | | |
| | | Plan Goals – 2,3 | | Hazards Addressed – Earthquake | | | | | |
| | | Lifelines – Airport | | **Prioritization Criteria** | | | | | |
| | | **Implementation Lead** | **Coordinating Partnerships** | **Equity** | **Benefit** | **Cost** | **Risk** | **Capacity** | **Priority Score** |
| | | Port of Portland Planning and Development | Port of Portland Operations, Engineering | **2** | **2** | **1** | **1** | **1** | **7** |
| | | **Potential Funding –** Port of Portland funding, federal and state grant programs | | | | | | | |
| | | **Potential Implementation Methods –** Utility Resilience Planning, PDX and General Fund Capital Improvement Plan | | | | | | | |
| | | **Notes -** This action will enable the Port to provide community response, providing broad social benefit by enabling support services at PDX facilities, which will increase aid distribution benefitting those impacted by disasters. | | | | | | | |

| Hazard | Action ID | Mitigation Actions – Port of Portland | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Volcano | 16 | **Develop a mitigation plan to protect against damage from volcanic ash.** | | | | | | | |
| | | Plan Goals - 3 | | Hazards Addressed – Earthquake | | | | | |
| | | Lifelines – Airport | | **Prioritization Criteria** | | | | | |
| | | **Implementation Lead** | **Coordinating Partnerships** | **Equity** | **Benefit** | **Cost** | **Risk** | **Capacity** | **Priority Score** |
| | | Port of Portland Planning and Development | Port of Portland Operations | **1** | **1** | **2** | **1** | **1** | **6** |
| | | **Potential Funding –** Port of Portland funding, grants | | | | | | | |
| | | **Potential Implementation Methods –** Facility Planning Activities | | | | | | | |
| | | **Notes -** This action will help protect airport operations, providing general community-wide benefit and lifeline connection. | | | | | | | |

### 5.7.2 District Overview

The 2022 Multnomah County Multi-Jurisdictional Hazard Mitigation Plan includes the Port of Portland's first NHMP, and collects years of work the Port has already done to evaluate and mitigate risk to visitors, facilities and employees from natural hazards.

Originally created by the Oregon Legislature in 1891 to dredge a shipping channel from Portland 100 miles to the sea, the Port is today charged with promoting aviation, maritime, commercial, and industrial interests within Clackamas, Multnomah, and Washington Counties. The mission of the Port of Portland is to build shared prosperity for the region through travel, trade, and economic development. The Port's vision is to contribute to a prosperous region, where quality jobs, multigenerational wealth and access to markets are equitably shared.

The Port is directed by a nine-member commission, whose members are appointed by the Governor of the State of Oregon and confirmed by the Oregon Senate.

The Port manages marine and airport facilities throughout the region that link intermodal transportation systems connecting people and local markets with each other, the nation, and beyond, and supports river navigation. In Multnomah County, the Port's facilities include Portland International Airport (Oregon's only major commercial airport) and three active marine

terminals—two on the Willamette and Terminal 6, a major container terminal on the Columbia River. The Port also owns Troutdale Airport (a general aviation airport) in the City of Troutdale and Hillsboro Airport (a general aviation airport) located in the City of Hillsboro in Washington County and not part of this plan. The Port also has a portfolio of industrial land holdings across the region.

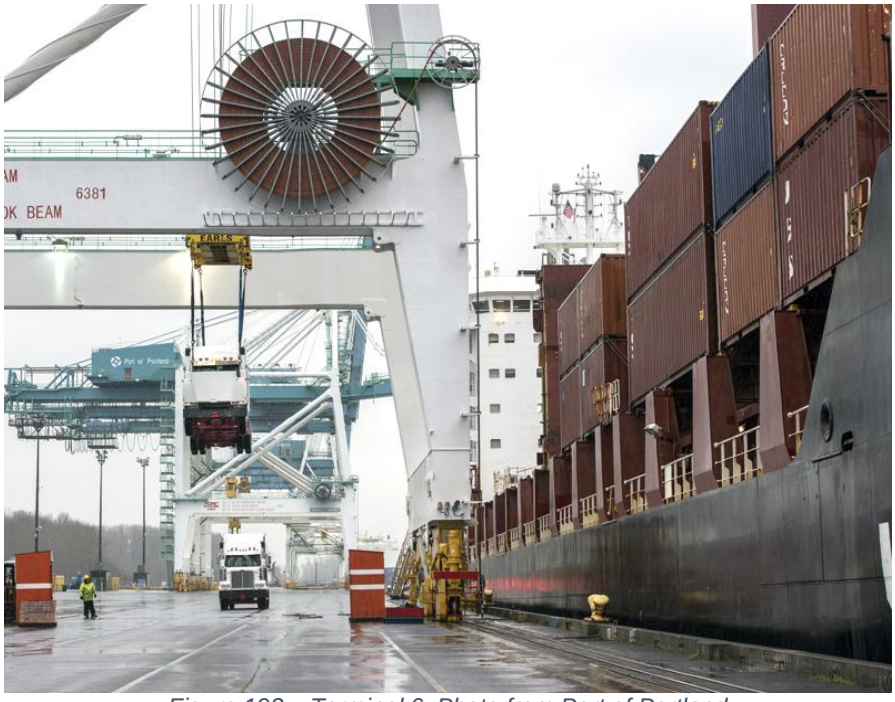


*Figure 193 – Terminal 6. Photo from Port of Portland*

Following the development of the first Oregon Resilience Plan, the Port's awareness of seismic risk increased, as did the Port's understanding of the essential roles it could play in supporting response and recovery. The release of the plan prompted the Port to complete a corporate seismic risk assessment, adopt a seismic resilience policy, and to develop a resilience program, initially focusing on mitigating seismic risks to Port infrastructure and facilities, but also addressing other relevant natural hazard risks. The Port has also evaluated climate and public health vulnerabilities.

As a public infrastructure and development agency, it is critical the Port provides air and marine access at all times, but especially in response to natural hazard occurrences. This critical function is amplified when considering the needs to bring in aid and supplies.

Within Multnomah County, the Port identified two critical community assets to be the focus of this plan and the Port's mitigation strategy: Portland International Airport (PDX) and Marine Terminal 6 (T6). These are the Port's largest facilities and the facilities with the greatest capacity to support large scale response and to significantly drive recovery if hazard risks are mitigated.

*Mitigation Core Capabilities*

As a public agency the Port has a role in helping to improve regional health, safety, and resilience. Mitigation requires capabilities necessary to reduce loss of life and property by lessening the impacts of disasters. Provided below is a summary of the Port's core mitigation capabilities:

- Planning and Long-Term Vulnerability Reduction: The Port of Portland's Planning and Development Department coordinates and implements long range airport planning, consistent with FAA requirements, as well as facility planning for the marine terminals. The Port also manages comprehensive capital improvement and asset management programs for marine terminals and three airports: PDX and two general aviation airports, one in Multnomah County (Troutdale Airport) and one in Washington County (Hillsboro Airport). The Port's Emergency Management Department manages emergency response and multiple services described under the *Operational Coordination, Administration, and Technical* category below. These functions enable planning, design, and development of infrastructure mitigation plans and projects.

- Operational Coordination, Administration and Technical: The Port has a variety of organizational, administration, and technical capabilities that enable the Port to plan for and implement mitigation projects across an array of action types and to coordinate and manage emergency response following a destructive event. The Port's Airport Communication Center (ACC) includes three call centers: Emergency Communication Center (ECC), Maintenance Operations Center and Customer Service call center. The ECC is staffed at all times and serves as the 911 center for PDX and the surrounding community. The ECC dispatches police, fire, and emergency medical services, in addition to issuing emergency notifications and fire alarm monitoring and dispatching. The majority of the communication services for PDX are provided through the ACC. The ACC also handles airport paging, customer service issues, access control system, CCTV monitoring, real time security violation tracking, as well as construction and exclusions logs. The Port also operates secure international marine facilities, which are staffed 24/7.

- Education: The Port's Emergency Management department has done outreach within the PDX Airport and Port of Portland communities, offering resiliency and preparedness presentations, participation incentives, and educational opportunities to the more than 10,000 PDX employees and hundreds of Port of Portland staff. Through this outreach, we've better prepared PDX and Port of Portland employees for seismic and other natural hazard events.

- Financial: The Port of Portland has resources and funds to complete mitigation projects, and projects would be reviewed for funding options through the Port's capital improvement and asset management programs. Non-capital projects—such as plan development and education—can be supported through the same mechanisms the Port uses for activities for other purposes. The Port's bonding and tax authorities and parameters are defined in Oregon Revised Statute 778.

### *Critical Community Assets*

Within the Multnomah County Multi-Jurisdictional Natural Hazard Mitigation Plan, the Port of Portland focuses on mitigating natural hazard risks to two community assets of regional and statewide importance: Portland International Airport (PDX) and Marine Terminal 6 (T6).

Risks at these facilities need to be mitigated to ensure the Port can provide essential services and support during emergency response and disaster recovery. Port goals and actions within this plan are intended to mitigate risks at those two facilities to improve Oregon's disaster resilience and to provide key lifeline connections in the event of a natural disaster. These facilities can support the work of Federal, State, and regional and local response and are essential to facilitating recovery.

Portland International Airport (PDX) – PDX is located in the north-central portion of Multnomah County behind the Columbia River levee system. Access to PDX is from NE Airport Way which connects to I-205 and 82nd Avenue. Marine Drive runs along the north side of the airport and separates the airport from the Columbia River. NE 33rd Avenue is the westernmost border of the airport. PDX is located within the protection area of the Multnomah County Drainage District.

PDX provides access to commercial, freight, and private air service. In 2019, PDX served nearly 20 million passengers, and was a major air freight gateway, essential to meet the needs of key Oregon industries. In 2022, passenger volumes are starting to return to pre-pandemic levels. Air freight remains strong.


*Figure 194 - Location of the Portland International Airport*

PDX facilities include the main Terminal area, which is currently under expansion, and the B, C, D, and E concourses. There are three large parking structures; a Rental Car Center, which includes the Port's Emergency Operations Center; a separate Maintenance Campus in the southeast portion of the Port's properties; FAA structures; emergency response facilities; private aviation and air cargo operations, among other operations.

Mitigating natural hazard risks at PDX increases near-term regional and statewide access to emergency supplies and response aid, which supports emergency response and enables longer-term recovery.

Following the development of the first Oregon Resilience Plan, the Port's awareness of seismic risk increased, as did the Port's understanding of the essential roles it could play in supporting response and recovery. The release of the plan prompted the Port to complete a corporate seismic risk assessment, adopt a seismic resilience policy, and to develop a resilience program, initially focusing on mitigating seismic risks to Port infrastructure and facilities, but also addressing other relevant natural hazard risks. The Port has also evaluated climate and public health vulnerabilities.

Marine Terminal 6 **–** Terminal 6 (T6) is a 419-acre multi-purpose marine terminal along the Columbia River in Portland. It is in the northwestern corner of Portland in an area dominated by industrial uses and open space areas at the confluence of the Columbia and Willamette Rivers and bordered to the south by Smith and Bybee Lakes. T6 features five active vessel berths capable of handling oversized, breakbulk cargo, automobiles, renewable energy cargo, and containers. Along with access to major east-west and north-south highways, it has direct multimodal connectivity and on-dock rail access to the transcontinental rail network, supported by a 52.5-acre intermodal rail terminal. As one of a limited number of Pacific coast deep-water ports, the Port of Portland is crucial to the regional and national economy, facilitating $15.4 billion worth of trade throughout the Pacific Northwest and Midwest. T6 is the major container shipping port on the south side of the Columbia River. Mitigating risks at T6 provides an opportunity to support emergency supply and fuel distribution via ship to Oregon and supports longer-term recovery.


*Figure 195 - Location of Marine Terminal 6 (T6)*

***Recent Hazard Mitigation Activities***

The Port has invested in research and analysis to better understand hazard risks and has completed or is completing significant investments that mitigate natural hazard risks to PDX and T6. Provided below are summaries of the Port's recent successes.

Corporate Seismic Risk Assessment – In 2015, the Port completed an assessment of seismic risk and vulnerabilities of multiple structures at PDX and identified approaches for mitigating seismic vulnerability and/or additional studies needed to better understand mitigation options. Multiple projects in the Port's current expansion of PDX are the result of the 2015 Corporate Seismic Risk Assessment.

Resilient Runway Analyses – The Port completed numerous analyses to understand the seismic vulnerabilities of the PDX runways, to develop concepts for how to mitigate risks to runways, the benefits and costs of seismically mitigating one runway, and the community equity benefits of having a functional runway at PDX following a major Cascadia Subduction Zone earthquake.

- *Applied technical research with Oregon State University (OSU) and private consultants* – OSU researchers completed in situ testing of soils at PDX to understand how the soil column performs at different depths. The OSU study provided critical additional background information for Port consultants, GRI, Inc., to complete a conceptual design for mitigating vertical settlement due to liquefaction at PDX's South Runway.

- *National Institute of Building Sciences Resilient Runway Benefit Cost Assessment* – A National Institute of Building Sciences study indicated that investing in a resilient runway would provide a 50:1 benefit to cost ratio for each dollar spent on runway resilience. The benefit to cost ratio was based on preventing runway damage, enhancing response logistics including allowing the arrival of medical and structural engineering support, and avoiding business interruption. The study did not assess qualitative community benefits, or the financial benefit of preserving airfield access for the Oregon Air National Guard, which is located adjacent to PDX's South Runway.

- *Portland State University Runway Equity Study* – Researchers at Portland State University completed qualitative and quantitative analyses aimed at understanding the community-level benefits of having a resilient runway. The analyses indicated that a fast recovery is a top priority for people of color, and that the presence of functional facilities, like PDX—even if not directly accessed—will help provide a feeling of hope and progress, along with providing quantitative benefits in terms of response and recovery capacity.

In 2021 and 2022, the Port of Portland secured significant support from the State of Oregon and a federal congressional allocation to complete the engineering and construction documents for mitigating seismic risk on PDX's South Runway.

PDX Next Seismic Improvements – As part of the Port's major expansion of PDX, numerous seismic mitigation projects have been completed or are underway. Specifically, through PDXNext, the Port constructed a concourse extension on a resilient structural slab that is designed to be repairable after a major Cascadia Subduction Zone earthquake. Significant improvements are being made in the Terminal core area which will dramatically increase seismic performance and health and safety for travelers and workers. The Port also constructed the new Emergency Operations and Communications Center on a base isolated floor; this location is built to be immediately operational following a major earthquake.

Seismic Resilience Plan: Marine Facilities – In 2019, the Port completed a marine facility resilience plan to identify projects needed to mitigate seismic risk at Port marine facilities and identify where to focus the Port's resilience investments. This plan includes a comprehensive list of needed seismic improvements and identifies the Port's focus on mitigating risks at T6.

PDX Climate Vulnerabilities Assessment – In 2022, the Port completed a high-level scan of major climate vulnerabilities at PDX. The analysis found that high heat, smoke, and higher intensity rain events related to climate change pose the greatest risks to PDX.

Terminal 6 Resilience Assessment – In 2022, the Department of Homeland Security Cybersecurity and Infrastructure Security Agency finalized its Resilience Guide. It identified T6

as a critical facility to assist in mitigating for Cascadia Subduction Zone seismic events and assessed the degree to which investments in infrastructure can mitigate impacts from seismic events.

***Recent Hazard Events***

Port of Portland facilities were most recently impacted by the severe Wildfire Smoke event in September 2020. Regional fires caused air quality to reach severely unhealthy levels, with smoke infiltrating Port properties and affecting outdoor workers and passengers. Operational impacts included canceled flights due to low visibility, temporary closure of some businesses inside the airport, suspension of outdoor construction projects, and moving employees indoors when able. Extreme high heat also impacted construction projects, employees working outside, and taxed systems necessary to mitigate heat and smoke impacts.

Operational impacts and actions on the marine side were similar in that terminal managers provided critical employees, like security officers, with N95 masks and other health and safety services to enable continuation of outside work activities.

Winter storms impacted operations in both 2017 and 2021—in both cases causing runway closures and stranding passengers, as well as impacting transportation access to and from Port facilities.

## 5.7.3 Port of Portland Local Hazard Analysis

***Earthquake – Risk Rating High***

***See Earthquake Section for more detailed risk and vulnerability information.***

The risk of a subduction zone, crustal, or intraplate earthquake is the most significant risk faced by the Port of Portland's critical facilities. Both PDX and T6 are located in floodplains with loose, sandy soils that are extremely susceptible to soil liquefaction and resultant loss of load bearing strength. Most critical Port buildings at PDX are supported on piles, which provide better performance in earthquakes, but with varying levels of structural resilience. As noted under Recent Mitigation Successes, seismic performance has been or is being upgraded in PDX structures including the Terminal Core, the Rental Car Center which includes the Port's Emergency Operations Center, and in the Concourse E extension. Older buildings would face considerable risk in a moderate earthquake, and floor slabs in all buildings could be damaged.

Airfield pavement, roadways and buried utilities are also at considerable risk, and areas near the Columbia River are subject to lateral spreading as well as settlement due to liquefaction.

Marine terminals would suffer similar impacts, with shipping berths and other structures being located on the water and having inherent structural vulnerability to severe lateral spreading. Upgrades in the last ten years have made some marine facilities more resistant to earthquakes, but a larger event could disrupt some areas from four months to nearly two years.

An interactive version of this map can be found here (Earthquake Hazard – Earthquake Liquefaction (Soft Soil) Hazard)

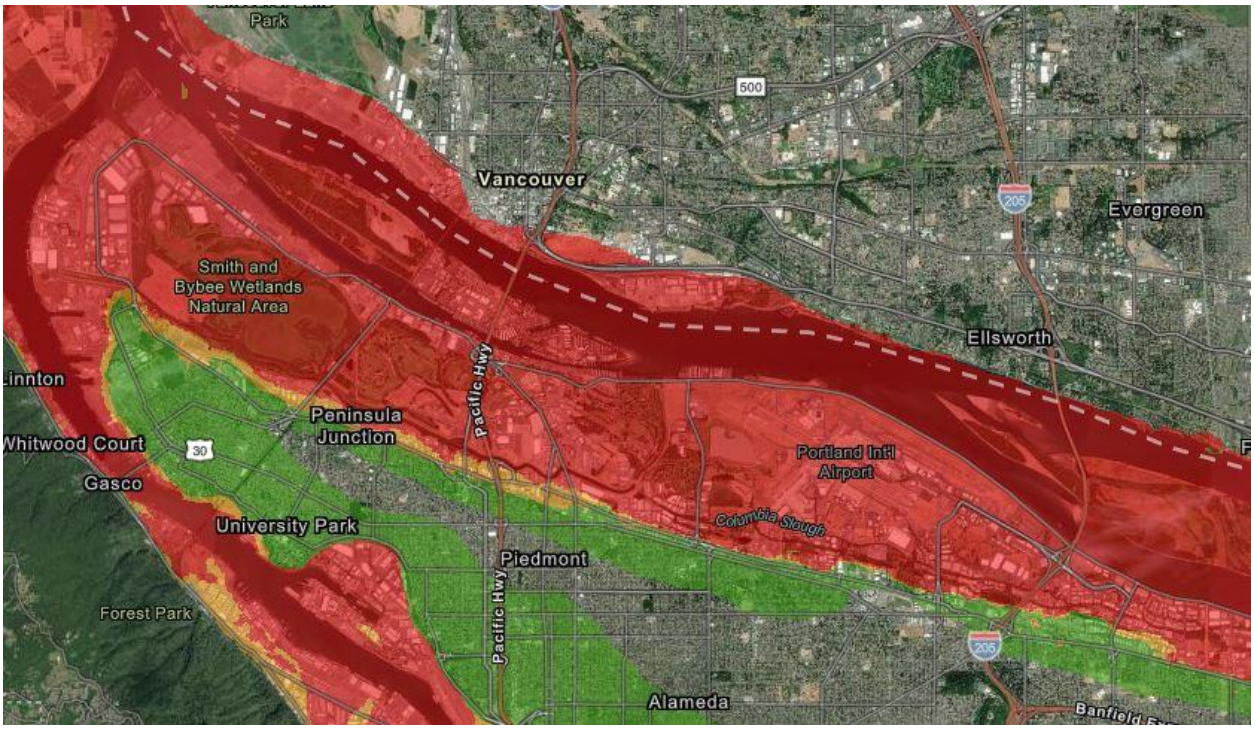


*Figure 196 - Map showing soil liquefaction risk at the Port of Portland's critical community assets. Areas in red, which include the Portland International Airport and Terminal 6, have high risk of soil liquefaction. Map from DOGAMI HazVu site.*

### *Flood – Risk Rating Moderate*

**See Flood Section for more detailed risk and vulnerability information.**

Flood is considered a moderate threat in the Port of Portland's risk rankings. Because of flood protection infrastructure, PDX remains dry from river flooding and generally only is required to react to stormwater management issues in the interior of the levee system. T6 could be subject to Willamette and Columbia River flooding, but only catastrophic events are currently shown to cause widespread site flooding. A levee failure during a flood stage would likely be the worst-case scenario for the Port of Portland and could cause catastrophic damage.

The entirety of PDX is located in an area protected from flood by the Multnomah County Drainage District. Some small interior drainage channels and ponding areas are mapped on FEMA maps as risk zones, but they are contained or small in size and do not indicate flooding risk to structures or other infrastructure, even in a larger 500-year event.

An interactive version of this map can be found here (Flood Hazard – Effective FEMA Flood Data)


*Figure 197 - Map showing mapped flood risk at and near the Portland International Airport. Areas in blue are the 1% annual chance (100-year) floodplain and purple is the 0.2% annual chance (500-year) floodplain. The floodway is shown in red. Levee protection has removed most of PDX from having mapped floodplain on FEMA's Flood Insurance Rate Maps. Map from DOGAMI HazVu site.*

A failure of flood control systems could be very damaging to PDX facilities, causing major disruption to the community, significant building damage and creating risk of hazardous material discharge. Maintaining on-site pump systems is a priority for the Port, as are large-scale levee maintenance activities. The DOGAMI risk assessment for a breach or overtopping of the levee system recommended a detailed economic impact study that would include an assessment of direct business income loss as well as long-term, regional indirect impacts of the closure and restoration of the Portland International Airport due to flooding.

T6 is not protected by a levee system and does have some risk to flooding of facilities directly adjacent to the Columbia River. A larger 500-year event could see flooding across lots and facilities from both the Columbia River and backflow from the Willamette River on the Columbia Slough.

An interactive version of this map can be found here (Flood Hazard – Effective FEMA Flood Data)


*Figure 198 - Map showing mapped flood risk at Terminal 6. Areas in blue are the 1% annual chance (100-year) floodplain and purple is the 0.2% annual chance (500-year) floodplain. The floodway is shown in red. Map from DOGAMI HazVu site.*

### *Landslide – Risk Rating Low*

***See Landslide Section for more detailed risk and vulnerability information.***

Landslide is considered a low-risk hazard at PDX and Terminal 6, which are located in flat floodplains. There is no identified susceptibility to deep landslides anywhere on Port property and shallow landslide potential is primarily limited to road berms, levees and other small-scale engineered slopes.

An interactive version of this map can be found here (Landslide Susceptibility – Susceptability to Shallow Landslides)

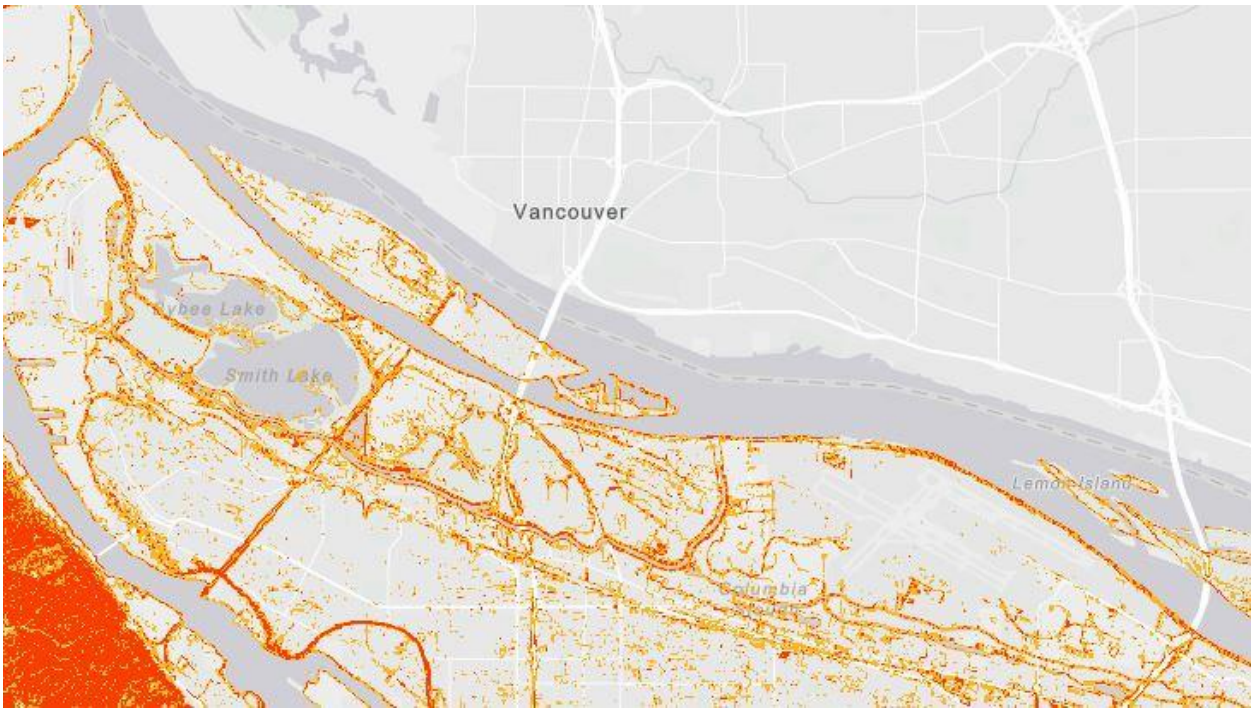


*Figure 199 - Map showing shallow landslide risk at the Port of Portland's critical community assets. Red areas have the higher risk, with orange having more moderate risk and yellow areas with lower risk. Areas with no color have no landslide risk. Map from DOGAMI's SLIDO site.*

### *Severe Weather – Risk Rating Moderate*

***See Severe Weather Section for more detailed risk and vulnerability information.***

Climate events impact the Port by interrupting operations at air or marine terminals because of unsafe conditions. Those conditions may cause health and safety impacts to the portion of the Port's workforce that is required to work outdoors, or prevent access to facilities. Disruptions from these events have been short-term in recent years, even when events have been extreme, leading to a moderate risk classification.

The Port's built environment is reflective of needs and requirements for the types of facilities. At both PDX and T6, vast paved areas on the airfield and in parking areas, and vast paved areas to support cargo movement mean that tree canopy is limited, and urban heat island effects are quite severe. Since there are no residential areas affected by these heat islands, their impact is primarily to employees at risk working in these areas during high heat events. There were no heat-related deaths at Port facilities during the 2021 Heat Dome event.

An interactive version of this map can be found here

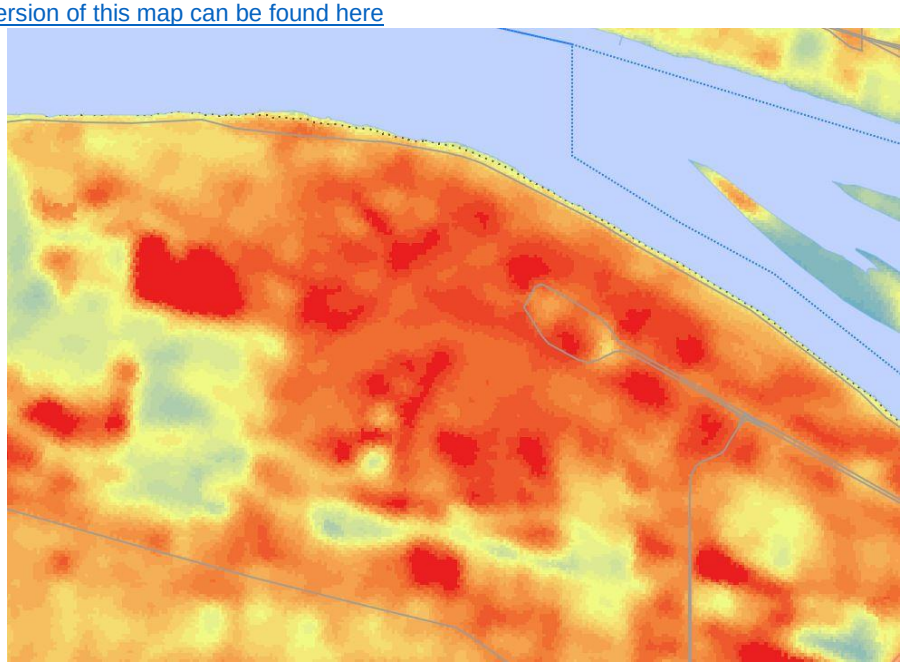

*Figure 200 - Map showing heat island effects at PDX, with areas in red having the most intense effects. Map from Metro.*

An interactive version of this map can be found here

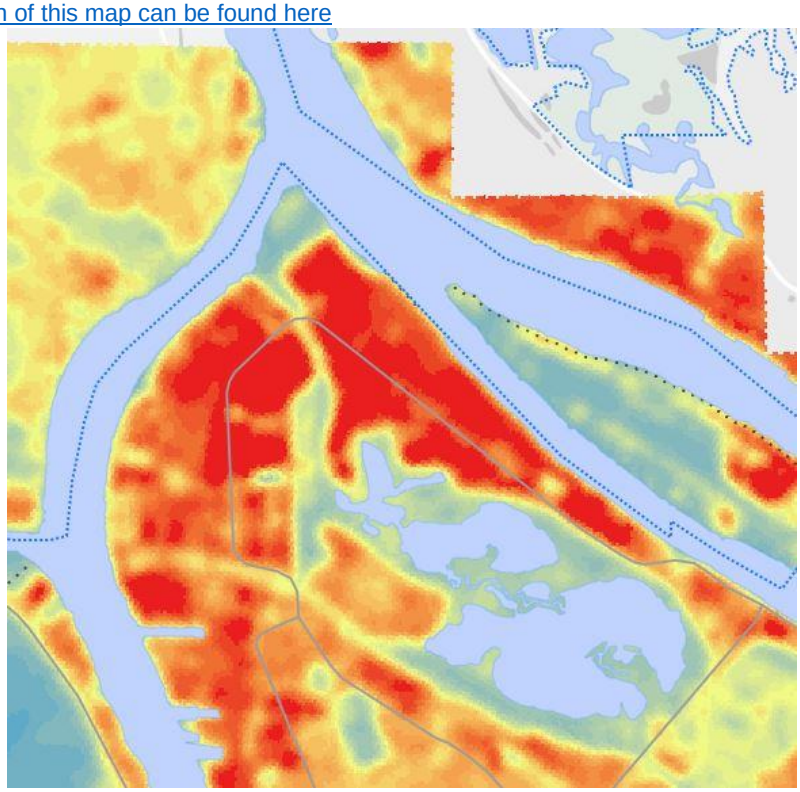

*Figure 201 - Map showing heat island effects at T6 with areas in red having the most intense effects. Map from Metro.*

Winter storms have created disruptions in recent years by closing operations or creating risk for employees or those attempting to travel to Port facilities.
Significant windstorms have not been as prevalent in the last several years, but another event similar to the Columbus Day Storm in 1962 could be enormously disruptive. In that event, hurricane force winds flipped over small airplanes and a repeated incident would test the resilience of structures at both facilities.

Drought is not a significant issue for port operations. Water supply comes from the City of Portland sources at the Bull Run Reservoir and backup wells in the Columbia River Wellfield. Both sources are recharged through rain and are not reliant on snowpack to maintain surface water levels in the summer. The Port also has water rights for non-potable use at PDX.

### *Volcano – Risk Rating Low*

***See Volcano Section for more detailed risk and vulnerability information.***

The primary risk to Port operations from a volcanic eruption comes from impacts to air operations and HVAC systems from falling ash in a regional eruption. Volcanic ash is disruptive to operations of airplanes, by damaging surfaces, machinery and instruments. Significant ash events have completely shut down air travel when wind patterns have carried it over urban areas, even when volcanoes are some distance away. Ash can also disrupt airport operations when ground accumulations are sufficient to make runways unusable, and in large enough events accumulating ash could be a threat to the operation and stability of some Port buildings.

The threat of a lahar, a fast-moving debris flow that could flow down the Sandy River after an eruption of Mount Hood, has been the main focus of volcano risk in this plan. A lahar from a worst-case eruption of Mount Hood, could cause catastrophic damage at the Troutdale Airport, but PDX is located too far west to likely see any significant impacts.

### *Wildfire and Wildfire Smoke – Risk Rating Moderate*

***See Wildfire and Wildfire Smoke Section for more detailed risk and vulnerability information.***

The risk classification of moderate is primarily due to vulnerability to wildfire smoke. As with severe heat events, outdoor workers would be at risk from respiratory hazard and potential combined effects from heat. Jet traffic was able to continue during the worst of the 2020 September Wildfire Smoke event, but continued operations meant employees were required to continue working in unhealthy air, requiring personal safety measures. Terminal 6 continued operations in 2020, unimpeded by the wildfire smoke event although employees were similarly affected as at PDX.

Port facilities themselves are at low risk from wildfire. The intense development and lack of tree canopy at both facilities make anything more than small grass fires unlikely. There is some risk of larger wildfire in open spaces near PDX, but significant transmission is not anticipated. Fire risk maps from the Oregon Wildfire Risk Explorer only include fire probability for wildfires of 250 acres or more, so events that could threaten structures on a small scale may not be captured.

[An interactive version of this map can be found here (Wildfire Potenial Impacts – Overall Potential Impacts)]

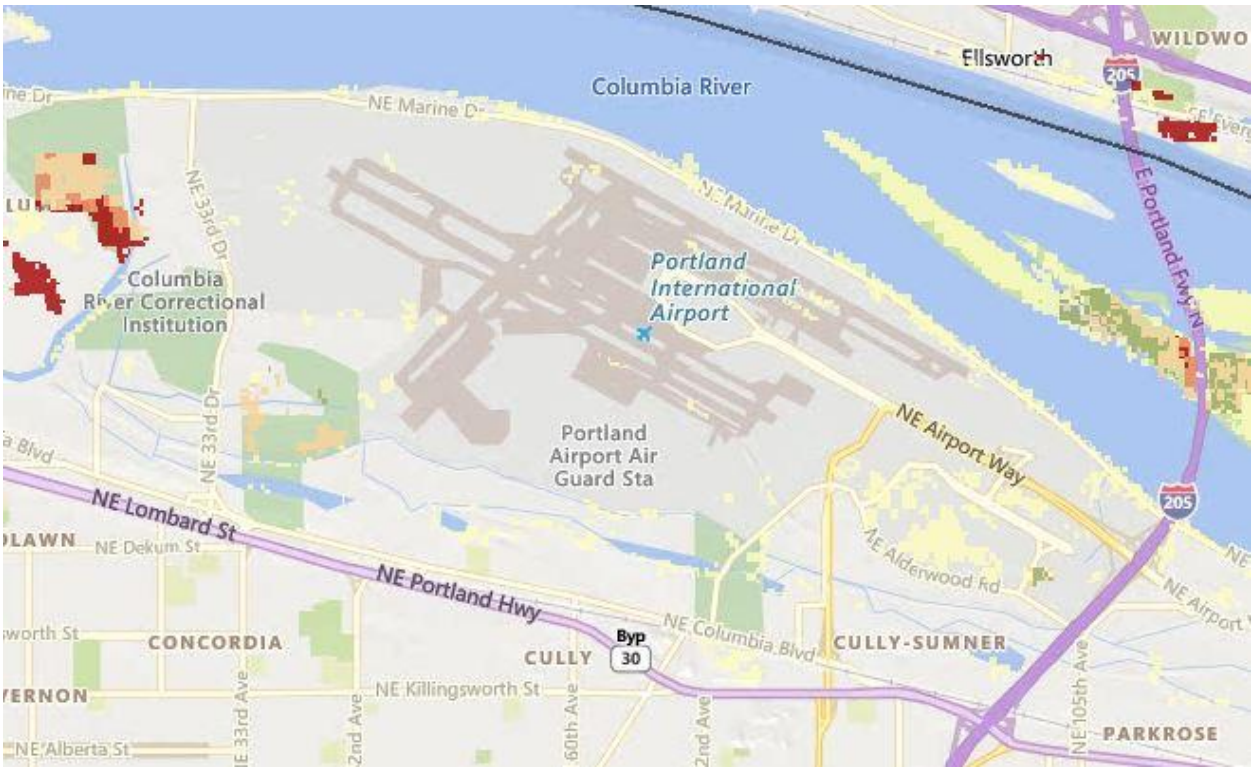


*Figure 202 - Map showing areas with risk of ignition of a wildfire of 250 acres or more near PDX. Areas in red would have the highest wildfire impacts to people or infrastructure. Map from Oregon Wildfire Explorer with data from PNW-QWRA.*

### 5.7.4 Hazard Risk Scoring

The identified levels of risk from each hazard were determined by the Port of Portland, using a scoring methodology designed by Oregon Emergency Management, and applied across the state to contextualize local risk perception.

| Port of Portland Hazard Risk Analysis | | | | | | |
|---|---|---|---|---|---|---|
| Hazard | History (Weight Factor = 2) | Vulnerability | | Probability (Weight Factor = 7) | Risk Score | Initial Risk Ranking |
| | | Average (WF = 5) | Max (WF = 10) | | | |
| Earthquake | 2 x 1 | 5 x 10 | 10 x 10 | 7 x 5 | 187 | **High** |
| Flood | 2 x 1 | 5 x 10 | 10 x 10 | 7 x 2 | 166 | **Moderate** |
| Landslide | 2 x 1 | 5 x 3 | 10 x 3 | 7 x 1 | 54 | **Low** |
| Severe Weather – Extreme Heat, Winter Storm, Windstorm, Drought | 2 x 4 | 5 x 6 | 10 x 7 | 7 x 8 | 164 | **Moderate** |
| *Extreme Heat* | 2 x 5 | 5 x 7 | 10 x 8 | 7 x 8 | 181 | |
| *Winter Storm* | 2 X 5 | 5 x 7 | 10 x 8 | 7 x 8 | 181 | |
| *Windstorm* | 2 x 4 | 5 x 7 | 10 x 8 | 7 x 8 | 179 | |
| *Drought* | 2 x 1 | 5 x 1 | 10 x 4 | 7 x 8 | 103 | |
| Volcano | 2 x 1 | 5 x 7 | 10 x 8 | 7 x 1 | 124 | **Low** |
| Wildfire and Wildfire Smoke | | | | | 157 | **Moderate** |
| *Wildfire* | 2 x 2 | 5 x 5 | 10 x 5 | 7 x 3 | 100 | |
| *Wildfire Smoke* | 2 x 4 | 5 x 8 | 10 x 8 | 7 x 10 | 198 | |

## 5.7.5 Port of Portland Plans and Other Implementation Processes

### Overview

The Port of Portland's hazard mitigation implementation strategy is driven by its values and principles and the need to maintain key air service and maritime community lifelines in the wake of a natural hazard event and to improve the resilience of facilities under changing conditions. Resilience is advanced internally through the Port's Resilience Program, through cross-departmental teams aimed at improving energy efficiency, and through the Port's Stormwater Master Plan. As a result, mitigation projects are competitive when determining investment priorities. Close coordination with the Columbia Corridor Drainage District enhances flood resilience for facilities in levee-protected areas.

- Port of Portland Capital Improvement Plan
  - The Capital Improvement Plan (CIP) allocates funding from all Port funding sources (Airline, Port, and General Fund cost centers) that could be used for natural hazards mitigation.
- PDX Stormwater Master Plan, 2015
  - The PDX Stormwater Master Plan identifies specific projects and performance standards that mitigate risks related to stormwater, and support the development of specific mitigation projects.
- PDX Master Plan, currently under update
  - The PDX Master Plan will consider and integrate needs to improve hazard resilience – building on the Port's many seismic risk studies and the climate vulnerabilities assessment. The content of the master plan provides policy guidance for many Port projects included in the Port CIP.
- 2015 Port Seismic Risk Assessment
  - The Port Seismic Risk Assessment identifies seismic vulnerabilities at numerous Port facilities; and it provides recommendations for specific actions the Port can implement to mitigate seismic risk.
- 2021 Portland Resilient Runway Benefit-Cost Analysis, National Institute of Building Sciences
  - The NIBS's cost benefit-assessment assesses risks from a Cascadia Subduction Zone earthquake in the region, and provides detailed information on the benefits of constructing a resilient runway at PDX. This report will be used to educate communities about risk, and to provide information on the quantitative benefits of investing in mitigation. It can also be used by others to develop additional risk mitigation actions.
- Portland Resilient Runway Equity Study, Portland State University
  - The Resilient Runway Equity Study provides a quantitative and qualitative portrait of which workers would be most negatively impacted by a long-term airport shut down as the result of a catastrophic earthquake and documents the community benefit of investing in PDX resilience, providing important background information on how seismic investments benefit the community, particularly communities with fewer resources.
- Dynamic In Situ Nonlinear Inelastic Response of a Deep Medium Dense Sand Deposit; Amalesh Jana and Armin Studlein

- This technical analysis provided important information on the specific soil conditions along the Columbia River in the PDX area, which greatly improves the specificity of the design of mitigation projects. This information can also be used by regional partners to inform their project designs.