

Annex A: City of Beaverton

1. Introduction

1.1. Planning Process Contact

The point of contact during the Washington County Natural Hazard Mitigation Plan (NHMP) planning process for the City of Beaverton was the Emergency Management Officer.

1.2. Annex Organization

This annex includes six sections that satisfy mitigation requirements in the Code of Federal Regulations (CFR) Title 44, Part 201 (44 CFR §201):

- **Section 1:** Introduction
- **Section 2:** Planning Process
- **Section 3:** Hazard Identification and Risk Assessment
- **Section 4:** Capability Assessment
- **Section 5:** Mitigation Strategy
- **Section 6:** Action Items

The information provided in this annex is for the City of Beaverton alone. All pertinent information about the City that is not identified in this annex is identified in other sections of this NHMP or within the respective appendices included as part of the overall Washington County NHMP.

1.3. NHMP Adoption Process

Once the Washington County NHMP received the designation “Approvable Pending Local Adoption” from the Federal Emergency Management Agency (FEMA), the City presented the plan to City Council for final public comment and local adoption. A copy of the resolution was inserted into the NHMP and is held on file in the City of Beaverton and Washington County.

2. Planning Process

(In compliance with 44 CFR §201.6(c)(1))

2.1. Development and Adoption Process

To apply for certain types of federal aid, technical assistance, and most post-disaster funding, local jurisdictions and special districts must comply with 44 CFR §201.3, which sets forth the requirement that communities develop a plan outlining their present and proposed efforts to mitigate risks from natural hazards.

City officials recognize the benefits of having a long-term, all-hazards approach to mitigating natural hazards. The passage of the Disaster Mitigation Act of 2000 (DMA 2000) enabled City officials to recognize the benefits of having a long-term, all-hazards approach to hazard mitigation and mitigating natural hazards. The City's involvement in the Washington County NHMP represents the collective efforts of the NHMP Steering Committee members, all participating local Technical Committee members, the public, and stakeholders.

The City developed this annex in accordance with guidance outlined in 44 CFR §201.6(c)(5) of DMA 2000. The complete NHMP and this annex identify hazards and mechanisms to minimize damages associated with these hazards as they occur in the geographical area of the City.

2.2. Organizing the Planning Effort

A comprehensive approach was taken in developing this NHMP. An open involvement process was established for the public and all stakeholders, which provided an opportunity for everyone to be engaged in the planning process and make their views known.

Two teams worked simultaneously on this mitigation plan:

1. **Hazard Mitigation Steering Committee:** This committee consisted of points of contact from each plan participant. The group met to discuss countywide topics, including hazards and mitigation strategies. The points of contact were the leads of their local Technical Committee.
2. **Local Technical Committee:** Each plan participant had a Technical Committee that consisted of the Steering Committee representative for that jurisdiction or special district, as well as designated representatives from within the organization. This team met to assess capabilities, hazards, and mitigation strategies within the planning area.

2.2.1. City of Beaverton's Technical Committee

This annex within the NHMP was developed by the City of Beaverton's local Technical Committee with support from IEM, a consulting firm hired to assist with the planning process. The efforts of the committee were led by the City's Emergency Management Officer throughout 2022.

Table 55: City of Beaverton Technical Committee Members for the 2023 NHMP

Position	Department	Role in Committee and Planning Process
Emergency Management Officer	Emergency Management	General oversight, hazard identification, and plan development
Emergency Manager	Emergency Management	Hazard identification and plan development
Emergency Management Coordinator	Emergency Management	Critical facilities
Sustainability Analyst	City Services and Engagement – Sustainability	Hazard identification and plan development
Project Engineer	Community Development – Site Development Division	Hazard identification and plan development

Position	Department	Role in Committee and Planning Process
City Building Official	Community Development Building Administration	Hazard identification and plan development
Geographic Information System (GIS) Manager	Information Services and Technology – GIS	Hazard identification and plan development
Economic Development Manager	Community Development – Economic Development	Hazard identification and plan development
Planning Division Manager	Community Development Division	Hazard identification and plan development
City Engineer	Public Works – Engineering Management Services	Hazard identification and plan development
Utility Manager	Public Works – Storm, Sewer, and Street Division	Hazard identification and plan development

DEM also supported or led the following activities associated with the development, approval, and adoption of the plan:

1. Facilitated the NHMP update process.
2. Based on committee direction and stakeholder and community input, prepared the first draft of the plan and provided technical writing assistance for plan review, editing, and formatting.
3. Submitted the proposed plan to the State of Oregon Department of Emergency Management (OEM) and FEMA for review and approval and completed edits or revisions requested by these organizations.
4. Coordinated the plan adoption processes with the City, OEM, and FEMA.

2.3. Public Participation

Public participation is an important component of this NHMP and also a required element as outlined in 44 CFR §201.6(c)(5), FEMA's mitigation planning guidance. Public participation offered community members the opportunity to voice their ideas, interests, and opinions about hazards that affect them and the best way to mitigate hazard impacts. As the City implements the mitigation actions identified in this annex, there will be additional opportunities for public participation.

Plan participants used a survey to collect information about community perceptions of natural hazards and priorities. The Steering and Technical Committees used the results to inform their risk assessments and mitigation strategies. Community members were also provided an opportunity to comment on a draft of the NHMP. See Volume III, Appendix B for additional information about the survey and opportunities for public comment.

3. Hazard Identification and Risk Assessment

(In compliance with 44 CFR §201.6(c)(2)(i), §201.6(c)(2)(ii), §201.6(c)(2)(ii)(A), §201.6(c)(2)(ii)(B), §201.6(c)(2)(ii)(C), §201.6(c)(2)(iii), and §201.6(c)(3)(ii))

The following information serves to assist the City of Beaverton in determining and prioritizing appropriate mitigation action items to reduce losses from identified hazards.

3.1. Changes in Development Since Adoption of the 2020 NHMP

(In compliance with 44 CFR §201.6(d)(3))

Since the 2020 Beaverton NHMP was adopted, the City's population has increased approximately 1.5%.^{238,239} The City has a limited supply of shovel-ready vacant land, and leadership has focused on using this land efficiently and effectively and utilizing and repurposing already developed land as part of its community development strategy. The City has prioritized investment in affordable housing, transit-oriented development, and revitalization of the downtown core to catalyze housing and transportation choices and retail amenities.

The City's 2020–2022 Strategic Plan created by the Community Development Department contains five strategic priorities and actions and success measures for these priorities.²⁴⁰ Actions include updating plans to create more equitable outcomes for low-income, historically underserved, and limited English proficiency communities, and implementation of the Beaverton Urban Renewal Agency's Five-Year Action Plan, which includes continued investment in the City's downtown area. Additionally, the Strategic Plan focuses on the development of the Cooper Mountain Community Plan to lay the groundwork for successful future neighborhood development, creation of the Cooper Mountain Utility Master Plan, updating the Transportation Systems Plan to address needed street network improvements, creating options the City might pursue to facilitate annexation to the City, and the overhaul of the development code for mixed use and commercial districts to facilitate mixed use and transit-oriented development.

The Beaverton Comprehensive Plan highlights the themes of livability, equity, sustainability, and resiliency, and the work and initiatives the City has undertaken since adoption of the 2020 NHMP have focused on these qualities.²⁴¹

3.2. Community Profile

This section provides information on City-specific characteristics. Additional discussion of the planning area's community characteristics is outlined in Volume III, Appendix A of the NHMP.

Some community characteristics may suggest how natural hazards may impact communities and how communities choose to plan for natural hazard mitigation. Identifying and considering the City-specific assets during the planning process may assist in identifying appropriate measures for natural hazard mitigation.

²³⁸ United States Census Bureau. (2010, April 1). QuickFacts Beaverton City, Oregon. Accessed September 22, 2022, from <https://www.census.gov/quickfacts/fact/table/beavertoncityoregon/PST045221>

²³⁹ World Population Review. (2022). Beaverton, Oregon Population 2022. <https://worldpopulationreview.com/us-cities/beaverton-or-population>

²⁴⁰ City of Beaverton. (2020). City of Beaverton Community Development 2020 Strategic Plan. <https://content.civicplus.com/api/assets/c0692800-0d0c-457e-833c-54754566574f>

²⁴¹ City of Beaverton. (n.d.). Comprehensive Plan for the City of Beaverton, Volume I: City of Beaverton Comprehensive Plan. <https://content.civicplus.com/api/assets/11e63537-b441-49ab-94f5-e3e8149197a9>

Table 56 below reflects the community demographics and vulnerable populations in the City. This information was gathered from the U.S. Census, Portland State University, and the City of Beaverton.

Table 56: Community Demographics*

Population	Total	Percent Change
2010 population ²⁴²	89,803	
2021 population ²⁴³	97,782	+9%
2035 forecasted population ²⁴⁴	112,608	+15%
Race and Ethnicity ²⁴⁵	Total	Percent of Population
White alone	71,033	72%
Asian alone	13,049	13%
Hispanic/Latino/a/x of any race	16,066	16%
Two or more races	5,789	6%
Black or African American alone	2,171	2%
American Indian and Alaska Native alone	338	0.3%
Native Hawaiian and Other Pacific Islander alone	488	0.5%
Language Spoken at Home ²⁴⁶	Percent of Population	
English only	74%	
Spanish	12%	
Asian and Pacific Island languages	8%	
Indo-European languages	5%	
Other languages	1%	
Vulnerable Age Groups ²⁴⁷	Percent of Population	
Less than 15 years of age	17%	
65 years and older	14%	

²⁴² United States Census Bureau. (2010, April 1). QuickFacts Beaverton City, Oregon. Accessed September 12, 2022, from <https://www.census.gov/quickfacts/fact/table/beavertoncityoregon/PST045221>

²⁴³ Portland State University Population Research Center. (2022). Population Estimate Reports. Accessed September 12, 2022, from <https://www.pdx.edu/population-research/population-estimate-reports>

²⁴⁴ Oregon Metro. (2013, January 15). 2035 Forecast of Population by City and County. Accessed September 12, 2022, from https://www.oregonmetro.gov/sites/default/files/2014/05/29/population_housing_forecasts_by_city_county.pdf

²⁴⁵ United States Census Bureau. (2021, July 1). 2016–2020 American Community Survey 5-Year Estimates, Demographic and Housing Estimates, Table DP05. Accessed September 12, 2022, from <https://data.census.gov/cedsci/table?q=beaverton%20oregon%20dp05>

²⁴⁶ United States Census Bureau. (2021, July 1). 2016–2020 American Community Survey 5-Year Estimates, Language Spoken at Home, Table S1601. Accessed September 12, 2022, from <https://data.census.gov/cedsci/table?q=beaverton%20oregon%20S1601>

²⁴⁷ United States Census Bureau. (2021, July 1). 2016–2020 American Community Survey 5-Year Estimates Age and Sex Estimates, Table S0101. Accessed September 12, 2022, from <https://data.census.gov/cedsci/table?q=beaverton%20oregon%20s0101>

Disability Status of Non-Institutionalized Civilians ²⁴⁸	Percent of Population
Total	12%
Less than 17 years of age	9%
65 years and older	70%

* Due to how respondents identify and answer questions, there may be overlapping responses, and results may equal greater than 100% of the population. Percentages are rounded.

3.2.1. Geography, Topography, and Climate

The City of Beaverton is seven miles west of downtown Portland in eastern Washington County and is part of the Portland metropolitan area. It is Oregon's sixth-largest city and the second-largest incorporated city in Washington County.

The City's terrain is predominately flat or rolling hills, with an average elevation of 189 feet. There are two prominent features around Beaverton: Portland's West Hills, which are to the northeast of the City, and Cooper Mountain, with an elevation of 730 feet, to the southwest of the City. Mount Williams, with an elevation of 471 feet in west Beaverton, and Sexton Mountain, with an elevation of 413 feet in southwest Beaverton, are two moderate landscape features within the City.

There are no rivers in the City; however, a number of creeks run through it that tend to flood during heavy rains. Beaverton Creek is the most significant creek in the City, and numerous wetlands surround the creek, which help control runoff and prevent flooding.

The climate in Beaverton is mild year-round. The City receives approximately 39.4 inches of rain per year, most of which falls from October through April, with December being the wettest month of the year. The average low temperature is 33 degrees Fahrenheit (°F), and the average high is 81 °F. The coldest temperatures typically occur in January, and the hottest occur in August. Average humidity ranges from 82% in the winter to 62% in the summer.

3.2.2. Transportation, Infrastructure, and Housing

3.2.2.1. Transportation

Transportation in Beaverton includes State and County highways, arterial streets, collector streets, neighborhood routes, local streets, the Tri-County Metropolitan Transit District (TriMet) bus service, the Metropolitan Area Express (MAX) Westside Light Rail, Westside Commuter Rail, and multiple bicycle routes. Beaverton's transportation network serves both residential and commercial commuters.

TriMet provides public transportation in Beaverton. TriMet's service includes bus, light rail, and commuter rail. The MAX Westside Light Rail line is aligned in an east–west direction from downtown Portland following Highways 26 and 217 to the Beaverton Transit Station and continuing west to downtown Hillsboro. TriMet's Westside Express Service (WES) commuter rail line lies in a north–south orientation, paralleling portions of Interstate 5 and Highway 217 from the Beaverton Transit Station to Wilsonville.

U.S. Highway 26, also known as the Sunset Highway, has the greatest traffic volume and serves as a central connecting route between the coast and downtown Portland. Oregon Highway 217 serves to connect Highway 26 to and from Interstate 5 and carries the second highest traffic volume in Washington County. Highway 26 runs east to west, while Highway 217 runs north to south. Both of these highways

²⁴⁸ United States Census Bureau. (2021, July 1). 2016–2020 American Community Survey 5-Year Estimates Disability Characteristics Estimates, Table S1810. Accessed September 12, 2022, from <https://data.census.gov/cedsci/table?q=beaverton%20oregon%20s1810>

are major traffic routes through and around Beaverton. Highway 210, also known as Scholls Ferry Road, also carries a high traffic volume. Highways 8 and 10 are major commuting routes as well but carry slightly lower traffic volumes.

3.2.2.2. Infrastructure

The City of Beaverton's critical and vulnerable facilities listed below in Table 57 may be vulnerable to one or more natural hazards.

Table 57: Critical Facility and Asset Inventory²⁴⁹

Name of Infrastructure, Facility, or Resource	Type of Asset	Address	Comments
Arco Iris Spanish Immersion School	School	8205 SW Creekside Place	The building was constructed between 1984 and 1993 and had a seismic retrofit in 2018, bringing it up to current seismic code. Damages from a 6.8 magnitude Portland Hills earthquake would potentially be moderate. Permanent ground deformation from liquefaction from a Cascadia Subduction Zone (CSZ) wet soil scenario is potentially moderate to very high. The property has a 0.2% chance of flooding.
Arts & Communication High School and Magnet Academy (ACMA)	School	11375 SW Center Street	The property is not vulnerable to flooding. Damages from a 6.8 magnitude Portland Hills earthquake would potentially be moderate to heavy. Permanent ground deformation from liquefaction from a CSZ wet soil scenario is potentially moderate.
Autumn of Life Senior Housing and Advisory Services	Assisted/Senior Living	14845 SW Murray Scholls place, Suite 110, PMB132	The building was constructed between 1984 and 1993. The property is not vulnerable to flooding. Damages from a 6.8 magnitude Portland Hills earthquake would potentially be moderate. Permanent ground deformation from liquefaction from a CSZ wet soil scenario is potentially moderate.
Beaverton Central MAX Station	Transportation	SW Hall Boulevard, north of Canyon Road	The property is not vulnerable to flooding. Damages from a 6.8 magnitude Portland Hills earthquake would potentially be moderate. Permanent ground deformation from liquefaction from a CSZ wet soil scenario is potentially moderate.

²⁴⁹ City of Beaverton 2023 NHMP planning documentation

Name of Infrastructure, Facility, or Resource	Type of Asset	Address	Comments
Beaverton City Hall	City Facility	12725 SW Millikan Way	The building was constructed between 1994 and the present. The property is not vulnerable to flooding. Damages from a 6.8 magnitude Portland Hills earthquake would potentially be moderate. Permanent ground deformation from liquefaction from a CSZ wet soil scenario is potentially moderate.
Beaverton City Library	City Facility	12375 SW 5th Street	The building was constructed between 1994 and the present. The property is not vulnerable to flooding. Damages from a 6.8 magnitude Portland Hills earthquake would potentially be moderate. Permanent ground deformation from liquefaction from a CSZ wet soil scenario is potentially moderate.
Beaverton City Library at Murray Scholls	City Facility	11200 SW Murray Scholls Place	The building was constructed between 1994 and the present. The property is not vulnerable to flooding. Damages from a 6.8 magnitude Portland Hills earthquake would potentially be moderate. Permanent ground deformation from liquefaction from a CSZ wet soil scenario is potentially moderate.
Beaverton Community Center	City Facility	12350 SW 5th Street, Suite 100	The building was constructed before 1984. The property is not vulnerable to flooding. Damages from a 6.8 magnitude Portland Hills earthquake would potentially be moderate. Permanent ground deformation from liquefaction from a CSZ wet soil scenario is potentially moderate.
Beaverton Creek MAX Station and Park and Ride	Transportation	SW 153rd Drive, south of Jenkins	The property is on the edge of a floodplain. Damages from a 6.8 magnitude Portland Hills earthquake would potentially be moderate to heavy. Permanent ground deformation from liquefaction from a CSZ wet soil scenario is potentially moderate to very high.

Name of Infrastructure, Facility, or Resource	Type of Asset	Address	Comments
Beaverton High School	School	13000 SW 2nd Street	The building was constructed before 1984. The property has a 0.2% chance of flooding on the SW side, on Erickson Avenue. Damages from a 6.8 magnitude Portland Hills earthquake would potentially be moderate. Permanent ground deformation from liquefaction from a CSZ wet soil scenario is potentially moderate. A considerable portion of the school is URM. There have also been a number of undocumented additions to the original building causing the probable cost estimate. ²⁵⁰
Beaverton Public Works/Operations Department	City Facility	9600 SW Allen Boulevard	The building was constructed before 1984. The property is not vulnerable to flooding. Damages from a 6.8 magnitude Portland Hills earthquake would potentially be moderate to heavy. Permanent ground deformation from liquefaction from a CSZ wet soil scenario is potentially moderate to very high.
Beaverton Senior Care Home	Assisted/Senior Living	14890 SW Davis Road	The building was constructed between 1994 and the present. The property is not vulnerable to flooding. Damages from a 6.8 magnitude Portland Hills earthquake would potentially be moderate to heavy. Permanent ground deformation from liquefaction from a CSZ wet soil scenario is potentially moderate to very high. There is an active fault north of the facility.
Beaverton Public Safety Center and Emergency Operations Center	Law Enforcement – Emergency Operations Center – City Facility	6125 SW Hall Boulevard	The building was constructed in 2020 and was built to the latest seismic and Critical Infrastructure and Key Resources (CIKR) standards. Damages from a 6.8 magnitude Portland Hills earthquake and permanent ground deformation from liquefaction from a CSZ wet soil scenario are potentially minor.

²⁵⁰ KPFF Consulting Engineers. (2019, April 12). Seismic Assessments for the Beaverton School District. [Seismic Reports and Upgrades - Beaverton School District](#)

Name of Infrastructure, Facility, or Resource	Type of Asset	Address	Comments
Beaverton Creek Park and Ride	Transportation	SW Millikan Way	The property is in a floodplain. Damages from a 6.8 magnitude Portland Hills earthquake would potentially be moderate to heavy. Permanent ground deformation from liquefaction from a CSZ wet soil scenario is potentially moderate to very high.
Beaverton Transit Center	Transportation	4050 SW Lombard Avenue	The property is in a floodplain. Damages from a 6.8 magnitude Portland Hills earthquake would potentially be moderate. Permanent ground deformation from liquefaction from a CSZ wet soil scenario is potentially moderate.
Brookdale Beaverton	Assisted/Senior Living	16655 NW Walker Road	The building was constructed between 1994 and the present. There is a floodplain on the north side of the facility. Damages from a 6.8 magnitude Portland Hills earthquake would potentially be moderate to heavy. Permanent ground deformation from liquefaction from a CSZ wet soil scenario is potentially high to very high.
Canfield Place	Assisted/Senior Living	14570 SW Hart Road	The building was constructed between 1994 and the present. The property is not vulnerable to flooding. Damages from a 6.8 magnitude Portland Hills earthquake would potentially be moderate. Permanent ground deformation from liquefaction from a CSZ wet soil scenario is potentially moderate.

Name of Infrastructure, Facility, or Resource	Type of Asset	Address	Comments
Cedar Park Middle School	School	11100 SW Park Way, Portland, OR 97225	The building was constructed before 1984. The property is not vulnerable to flooding. Damages from a 6.8 magnitude Portland Hills earthquake would potentially be moderate. Permanent ground deformation from liquefaction from a CSZ wet soil scenario is potentially moderate. This building has been partially seismically upgraded; however, it still contains significant deficiencies, particularly around the concrete gymnasium, cafeteria, and wrestling rooms. The classroom wing does not have shear walls. ²⁵¹
Chehalem Elementary School	School	15555 SW Davis Road	The building was constructed before 1984. The property is not vulnerable to flooding. Damages from a 6.8 magnitude Portland Hills earthquake would potentially be moderate. Permanent ground deformation from liquefaction from a CSZ wet soil scenario is potentially moderate. The property is on an active fault line. A Seismic Assessment Report completed by the Beaverton School District noted seismic deficiencies in the building including, but not limited to, exterior concrete foundation walls not being adequately anchored to foundations and re-entrant corners lacking sufficient tensile capacity to develop strength of diaphragm. ²⁵²
Cherry Hill Adult Foster Home	Assisted/Senior Living	13890 SW Cherryhill Court	The building was constructed before 1984. The property is not vulnerable to flooding. Damages from a 6.8 magnitude Portland Hills earthquake would potentially be moderate. Permanent ground deformation from liquefaction from a CSZ wet soil scenario is potentially moderate. This facility is permanently closed.

²⁵¹ KPFF Consulting Engineers. (2019, April 12). Seismic Assessments for the Beaverton School District. [Seismic Reports and Upgrades - Beaverton School District](#)

²⁵² KPFF Consulting Engineers. (2019, April 12). Seismic Assessments for the Beaverton School District. [Seismic Reports and Upgrades - Beaverton School District](#)

Name of Infrastructure, Facility, or Resource	Type of Asset	Address	Comments
Clean Water Services Field Operations Facility	Utility	2025 SW Merlo Court	The property is not vulnerable to flooding. Damages from a 6.8 magnitude Portland Hills earthquake would potentially be moderate. Permanent ground deformation from liquefaction from a CSZ wet soil scenario is potentially high.
Conestoga Middle School	School	12250 SW Conestoga Drive	The building was constructed between 1994 and the present. The property is not vulnerable to flooding. Damages from a 6.8 magnitude Portland Hills earthquake would potentially be moderate. Permanent ground deformation from liquefaction from a CSZ wet soil scenario is potentially moderate. Wall segments in the building exceed allowable aspect ratios and may leave other lateral elements undersized. ²⁵³
Cooper Mountain Elementary School	School	7670 SW 170th Avenue	The building was constructed before 1984. The property is not vulnerable to flooding. Damages from a 6.8 magnitude Portland Hills earthquake would potentially be moderate. Permanent ground deformation from liquefaction from a CSZ wet soil scenario is potentially moderate to high. Seismic structural deficiencies include, but are not limited to, the connection of the concrete walls around the gymnasium to the diaphragm needs to be strengthened and wood posts in the 1987 addition are not attached to the foundations or wood floor framing. ²⁵⁴

²⁵³ KPFF Consulting Engineers. (2019, April 12). Seismic Assessments for the Beaverton School District. [Seismic Reports and Upgrades - Beaverton School District](#)

²⁵⁴ KPFF Consulting Engineers. (2019, April 12). Seismic Assessments for the Beaverton School District. [Seismic Reports and Upgrades - Beaverton School District](#)

Name of Infrastructure, Facility, or Resource	Type of Asset	Address	Comments
Cor Deo Christian Academy	School	5755 SW Erickson Avenue	The building was constructed before 1984. The property is not vulnerable to flooding. Damages from a 6.8 magnitude Portland Hills earthquake would potentially be moderate. Permanent ground deformation from liquefaction from a CSZ wet soil scenario is potentially moderate.
DaVita Kidney Care	Medical	1700 NW 167th Place, Suite 320	The building was constructed between 1984 and 1993. The property is not vulnerable to flooding. Damages from a 6.8 magnitude Portland Hills earthquake would potentially be moderate. Permanent ground deformation from liquefaction from a CSZ wet soil scenario is potentially high.
Edgewood Point Senior Living	Assisted/Senior Living	7733 SW Scholls Ferry Road	The building was constructed between 1994 and the present. The property is not vulnerable to flooding. Damages from a 6.8 magnitude Portland Hills earthquake would potentially be moderate. Permanent ground deformation from liquefaction from a CSZ wet soil scenario is potentially moderate.
Edison High School	School	9020 SW Beaverton Hillsdale Highway, Portland, OR 97225	The building was constructed before 1984. The property is not vulnerable to flooding. Damages from a 6.8 magnitude Portland Hills earthquake would potentially be moderate. Permanent ground deformation from liquefaction from a CSZ wet soil scenario is potentially moderate.

Name of Infrastructure, Facility, or Resource	Type of Asset	Address	Comments
Elmonica Elementary School	School	16950 SW Lisa St	The building was constructed between 1994 and the present. The property is not vulnerable to flooding. Damages from a 6.8 magnitude Portland Hills earthquake would potentially be moderate. Permanent ground deformation from liquefaction from a CSZ wet soil scenario is potentially high. Seismic structural deficiencies include, but are not limited to, no positive connections from wood posts to foundations at both 1988 and 1992 additions and roof pop-ups at additions require additional chords and collector members. ²⁵⁵
Elmonica MAX Station and Park and Ride	Transportation	1200 SW 170th Avenue	The property is not vulnerable to flooding. Damages from a 6.8 magnitude Portland Hills earthquake would potentially be moderate. Permanent ground deformation from liquefaction from a CSZ wet soil scenario is potentially high.
Farmington Square Beaverton	Assisted/Senior Living	14420 SW Farmington Road	The building was constructed between 1994 and the present. The property is not vulnerable to flooding. Damages from a 6.8 magnitude Portland Hills earthquake would potentially be moderate. Permanent ground deformation from liquefaction from a CSZ wet soil scenario is potentially moderate.

²⁵⁵ KPFF Consulting Engineers. (2019, April 12). Seismic Assessments for the Beaverton School District. [Seismic Reports and Upgrades - Beaverton School District](#)

Name of Infrastructure, Facility, or Resource	Type of Asset	Address	Comments
Fir Grove Elementary School	School	6300 SW Wilson Avenue	The building was constructed before 1984. The property is not vulnerable to flooding. Damages from a 6.8 magnitude Portland Hills earthquake would potentially be moderate. Permanent ground deformation from liquefaction from a CSZ wet soil scenario is potentially moderate. Seismic structural deficiencies include, but are not limited to, masonry reinforcement spacing is greater than maximum allowed, and 1954 addition only has one line of shear wall in the east–west direction. ²⁵⁶
Five Oaks Middle School	School	1600 NW 173rd Avenue	The building was constructed between 1984 and 1993. The property is not vulnerable to flooding. Damages from a 6.8 magnitude Portland Hills earthquake would potentially be moderate. Permanent ground deformation from liquefaction from a CSZ wet soil scenario is potentially high.
Fresenius Kidney Care Beaverton	Medical	2715 SW 153rd Drive	The building was constructed between 1994 and the present. The property is not vulnerable to flooding. Damages from a 6.8 magnitude Portland Hills earthquake would potentially be moderate. Permanent ground deformation from liquefaction from a CSZ wet soil scenario is potentially moderate. Seismic structural deficiencies include, but are not limited to, no connection being present between slabs and foundations elements and reinforced brick site walls potentially being a falling hazard. ²⁵⁷

²⁵⁶ KPFF Consulting Engineers. (2019, April 12). Seismic Assessments for the Beaverton School District. [Seismic Reports and Upgrades - Beaverton School District](#)

²⁵⁷ KPFF Consulting Engineers. (2019, April 12). Seismic Assessments for the Beaverton School District. [Seismic Reports and Upgrades - Beaverton School District](#)

Name of Infrastructure, Facility, or Resource	Type of Asset	Address	Comments
Fresenius Kidney Care Twin Oaks	Medical	15201 NW Greenbrier Parkway, Suite C2	The building was constructed between 1984 and 1993. The property is not vulnerable to flooding. Damages from a 6.8 magnitude Portland Hills earthquake would potentially be moderate. Permanent ground deformation from liquefaction from a CSZ wet soil scenario is potentially moderate to high.
Garden Home Community Library	Tualatin Hills Park and Recreation District facility	7475 SW Oleson Road, Portland, OR 97223	The property is not vulnerable to flooding. Damages from a 6.8 magnitude Portland Hills earthquake would potentially be moderate. Permanent ground deformation from liquefaction from a CSZ wet soil scenario is potentially moderate.
German American School of Portland	School	3900 SW Murray Boulevard	The building was constructed before 1984. The property is not vulnerable to flooding. Damages from a 6.8 magnitude Portland Hills earthquake would potentially be moderate to heavy. Permanent ground deformation from liquefaction from a CSZ wet soil scenario is potentially moderate to very high.
Greenway Elementary School	School	9150 SW Downing Drive	The building was constructed before 1984. The property is not vulnerable to flooding. Damages from a 6.8 magnitude Portland Hills earthquake would potentially be moderate. Permanent ground deformation from liquefaction from a CSZ wet soil scenario is potentially moderate. Seismic structural deficiencies include, but are not limited to, ties between foundation elements at play shelter do not exist and no out-of-plane support at gymnasium roof on the north side. ²⁵⁸

²⁵⁸ KPFF Consulting Engineers. (2019, April 12). Seismic Assessments for the Beaverton School District. [Seismic Reports and Upgrades - Beaverton School District](#)

Name of Infrastructure, Facility, or Resource	Type of Asset	Address	Comments
Beaverton Municipal Court (Griffith Building)	City Facility	4755 SW Griffith Drive	The building was constructed before 1984 and is not up to seismic standards. Damages from a 6.8 magnitude Portland Hills earthquake would potentially be moderate. Permanent ground deformation from liquefaction from a CSZ wet soil scenario is potentially moderate.
Hearthstone of Beaverton	Assisted/Senior Living	12520 SW Hart Road	The building was constructed between 1994 and the present. The property is not vulnerable to flooding. Damages from a 6.8 magnitude Portland Hills earthquake would potentially be moderate. Permanent ground deformation from liquefaction from a CSZ wet soil scenario is potentially moderate.
Hearthstone at Murrayhill	Assisted/Senior Living	10880 SW Davies Road	The building was constructed between 1994 and the present. The property is not vulnerable to flooding. Damages from a 6.8 magnitude Portland Hills earthquake would potentially be moderate to heavy. Permanent ground deformation from liquefaction from a CSZ wet soil scenario is potentially moderate to very high.
Highland Park Middle School	School	7000 SW Wilson Avenue	The building was constructed before 1984. The property is not vulnerable to flooding. Damages from a 6.8 magnitude Portland Hills earthquake would potentially be moderate. Permanent ground deformation from liquefaction from a CSZ wet soil scenario is potentially moderate. Seismic structural deficiencies include, but are not limited to, precast wall panels lacking a positive connection to the foundation and tectum roof in the gymnasium, shop, and wrestling room are not capable of transferring lateral forces. ²⁵⁹

²⁵⁹ KPFF Consulting Engineers. (2019, April 12). Seismic Assessments for the Beaverton School District. [Seismic Reports and Upgrades - Beaverton School District](#)

Name of Infrastructure, Facility, or Resource	Type of Asset	Address	Comments
Hiteon Elementary School	School	13800 SW Brockman Street	The building was constructed before 1984. The property is not vulnerable to flooding. Damages from a 6.8 magnitude Portland Hills earthquake would potentially be moderate. Permanent ground deformation from liquefaction from a CSZ wet soil scenario is potentially moderate. Seismic structural deficiencies include, but are not limited to, vertical reinforcement in the exterior masonry shear walls being spaced too far apart and the standalone 1989 covered play area has lateral support in only one direction. ²⁶⁰
Jesuit High School	School	9000 SW Beaverton Hillsdale Highway, Portland, OR 97225	The property is not vulnerable to flooding. Damages from a 6.8 magnitude Portland Hills earthquake would potentially be moderate. Permanent ground deformation from liquefaction from a CSZ wet soil scenario is potentially moderate.
Legacy-GoHealth Urgent Care	Medical	2870 SW Cedar Hills Boulevard	The building was constructed between 1994 and the present. The property is not vulnerable to flooding. Damages from a 6.8 magnitude Portland Hills earthquake would potentially be moderate. Permanent ground deformation from liquefaction from a CSZ wet soil scenario is potentially moderate.
Legacy Medical Group – Cornell	Medical	1960 NW 167th Place	The building was constructed before 1964. The property is not vulnerable to flooding. Damages from a 6.8 magnitude Portland Hills earthquake would potentially be moderate. Permanent ground deformation from liquefaction from a CSZ wet soil scenario is potentially high. This property also houses Providence Orthopedics.

²⁶⁰ KPFF Consulting Engineers. (2019, April 12). Seismic Assessments for the Beaverton School District. [Seismic Reports and Upgrades - Beaverton School District](#)

Name of Infrastructure, Facility, or Resource	Type of Asset	Address	Comments
Legacy Medical Group – Cardiology	Medical	1960 NW 167th Place, Cornell Medical Plaza, Suite 205	The building was constructed before 1964. The property is not vulnerable to flooding. Damages from a 6.8 magnitude Portland Hills earthquake would potentially be moderate. Permanent ground deformation from liquefaction from a CSZ wet soil scenario is potentially high.
Legacy Medical Group – Raleigh Hills	Medical	8329 SW Beaverton Hillsdale Highway, Portland, OR 97225	The building was constructed between 1994 and the present. The property is not vulnerable to flooding. Damages from a 6.8 magnitude Portland Hills earthquake would potentially be moderate. Permanent ground deformation from liquefaction from a CSZ wet soil scenario is potentially moderate.
Legacy Medical Group – Westside Internal Medicine	Medical	2725 SW Cedar Hills Boulevard, Suite 250	The building was constructed between 1994 and the present. The property is not vulnerable to flooding. Damages from a 6.8 magnitude Portland Hills earthquake would potentially be moderate. Permanent ground deformation from liquefaction from a CSZ wet soil scenario is potentially moderate.
Living Wisdom School	School	4855 SW Watson Avenue	The building was constructed before 1984. The property is not vulnerable to flooding. Damages from a 6.8 magnitude Portland Hills earthquake would potentially be moderate. Permanent ground deformation from liquefaction from a CSZ wet soil scenario is potentially moderate.
Kaiser Permanente Cedar Hills Dental and Medical Office	Medical	12450 SW Walker Road	The building was constructed between 1984 and 1993. The property is not vulnerable to flooding. Damages from a 6.8 magnitude Portland Hills earthquake would potentially be moderate. Permanent ground deformation from liquefaction from a CSZ wet soil scenario is potentially moderate.

Name of Infrastructure, Facility, or Resource	Type of Asset	Address	Comments
Kaiser Permanente Beaverton Medical Office	Medical	4855 SW Western Avenue	The building was constructed between 1994 and the present. The property is not vulnerable to flooding. Damages from a 6.8 magnitude Portland Hills earthquake would potentially be moderate. Permanent ground deformation from liquefaction from a CSZ wet soil scenario is potentially moderate.
Maryville Memory Care	Assisted/Senior Living	4520 SW 148th Avenue	The building was constructed before 1984. The property is not vulnerable to flooding. Damages from a 6.8 magnitude Portland Hills earthquake would potentially be moderate. Permanent ground deformation from liquefaction from a CSZ wet soil scenario is potentially moderate.
Maryville Nursing Center	Assisted/Senior Living	14645 SW Farmington Road	The building was constructed before 1984. The property is not vulnerable to flooding. Damages from a 6.8 magnitude Portland Hills earthquake would potentially be moderate. Permanent ground deformation from liquefaction from a CSZ wet soil scenario is potentially moderate.
McKay Elementary School	School	7485 SW Schools Ferry Road	The building was constructed before 1984. The property is not vulnerable to flooding. Damages from a 6.8 magnitude Portland Hills earthquake would potentially be moderate. Permanent ground deformation from liquefaction from a CSZ wet soil scenario is potentially moderate. Seismic structural deficiencies include, but are not limited to, wood posts from 1950 not having a positive connection to the foundations or the wood framing at the second floor and many interior and exterior shear walls only have gypsum board sheathing rather than plywood sheathing and require strengthening. ²⁶¹

²⁶¹ KPFF Consulting Engineers. (2019, April 12). Seismic Assessments for the Beaverton School District. [Seismic Reports and Upgrades - Beaverton School District](#)

Name of Infrastructure, Facility, or Resource	Type of Asset	Address	Comments
McKinley Elementary School	School	1500 NW 185th Avenue	The building was constructed before 1984. The property is not vulnerable to flooding. Damages from a 6.8 magnitude Portland Hills earthquake would potentially be moderate. Permanent ground deformation from liquefaction from a CSZ wet soil scenario is potentially high. Seismic structural deficiencies include, but are not limited to, wood framed walls and foundations missing positive connections in multiple areas and many inadequate shear wall to roof diaphragm connections. ²⁶²
Merlo Station Community High School	School	1841 SW Merlo Drive	The property is not vulnerable to flooding. Damages from a 6.8 magnitude Portland Hills earthquake would potentially be moderate. Permanent ground deformation from liquefaction from a CSZ wet soil scenario is potentially high. Seismic structural deficiencies include, but are not limited to, no foundation ties connecting the strip footings to the precast tilt-up shear walls and the diaphragm is unblocked and spans more than 40 feet. ²⁶³
Merlo/SW 158th Avenue MAX Station and Park and Ride	Transportation	SW Merlo Road & 158th Avenue	The property is not vulnerable to flooding. Damages from a 6.8 magnitude Portland Hills earthquake would potentially be moderate. Permanent ground deformation from liquefaction from a CSZ wet soil scenario is potentially high.
Millikan Way MAX Station and Park and Ride	Transportation	SW Millikan Way & 141st Avenue	Access to the property is compromised by the flood zones A and AE that surround the facility. Damages from a 6.8 magnitude Portland Hills earthquake would potentially be moderate. Permanent ground deformation from liquefaction from a CSZ wet soil scenario is potentially moderate.

²⁶² KPFF Consulting Engineers. (2019, April 12). Seismic Assessments for the Beaverton School District. [Seismic Reports and Upgrades - Beaverton School District](#)

²⁶³ KPFF Consulting Engineers. (2019, April 12). Seismic Assessments for the Beaverton School District. [Seismic Reports and Upgrades - Beaverton School District](#)

Name of Infrastructure, Facility, or Resource	Type of Asset	Address	Comments
Montclair Elementary School	School	7250 SW Vermont Street, Portland, OR 97223	The building was constructed before 1984. Flood zones A and AE surround the school. Damages from a 6.8 magnitude Portland Hills earthquake would potentially be moderate to heavy. Permanent ground deformation from liquefaction from a CSZ wet soil scenario is potentially moderate to very high. Seismic structural deficiencies include, but are not limited to, wood posts not having positive connections to foundations and some interior wood shear walls using gypsum board as primary sheathing. ²⁶⁴
MorningStar Assisted Living & Memory Care of Beaverton	Assisted/Senior Living	14475 SW Barrows Road	The building was constructed between 1994 and the present. The property is not vulnerable to flooding. Damages from a 6.8 magnitude Portland Hills earthquake would potentially be moderate to heavy. Permanent ground deformation from liquefaction from a CSZ wet soil scenario is potentially moderate to very high.
Mountainside High	School	12500 SW 175th Avenue	The building was constructed between 1994 and the present. The property is not vulnerable to flooding. Damages from a 6.8 magnitude Portland Hills earthquake would potentially be moderate. Permanent ground deformation from liquefaction from a CSZ wet soil scenario is potentially moderate.
Murray Highland Memory Care	Assisted/Senior Living	4900 SW Murray Boulevard	The building was constructed between 1994 and the present. Damages from a 6.8 magnitude Portland Hills earthquake would potentially be moderate. Permanent ground deformation from liquefaction from a CSZ wet soil scenario is potentially moderate.

²⁶⁴ KPFF Consulting Engineers. (2019, April 12). Seismic Assessments for the Beaverton School District. [Seismic Reports and Upgrades - Beaverton School District](#)

Name of Infrastructure, Facility, or Resource	Type of Asset	Address	Comments
Nancy Ryles Elementary School	School	10250 SW Cormorant Drive	The building was constructed in the 1990s. The property is not vulnerable to flooding. Damages from a 6.8 magnitude Portland Hills earthquake would potentially be heavy. Permanent ground deformation from liquefaction from a CSZ wet soil scenario is potentially moderate to very high. A landslide deposit less than or equal to 15 feet is on the west side of the school, along with a 25% slope on the west side of the property. Seismic structural deficiencies include, but are not limited to, roof chords being discontinuous at sloped roof pop-ups and gypsum wallboard being used for shear walls in several locations throughout the 1991 structure. ²⁶⁵
Oregon Health & Science University (OHSU) Diagnostic Imaging	Medical	1500 NW Bethany Boulevard, Suite 195	The building was constructed before 1984. Flood zones A and AE are on the property. Damages from a 6.8 magnitude Portland Hills earthquake would potentially be moderate to heavy. Permanent ground deformation from liquefaction from a CSZ wet soil scenario is potentially high to very high.
OHSU Medical Clinic	Medical	15700 SW Greystone Court	The building was constructed between 1994 and the present. The property is not vulnerable to flooding. Damages from a 6.8 magnitude Portland Hills earthquake would potentially be moderate. Permanent ground deformation from liquefaction from a CSZ wet soil scenario is potentially moderate.
Pacific Academy/Cascade Academy/Columbia Academy	School	14255 SW Brigadoon Court, Suite 140	The building was constructed between 1984 and 1993. The property is not vulnerable to flooding. Damages from a 6.8 magnitude Portland Hills earthquake would potentially be moderate to heavy. Permanent ground deformation from liquefaction from a CSZ wet soil scenario is potentially moderate to very high.

²⁶⁵ KPFF Consulting Engineers. (2019, April 12). Seismic Assessments for the Beaverton School District. [Seismic Reports and Upgrades - Beaverton School District](#)

Name of Infrastructure, Facility, or Resource	Type of Asset	Address	Comments
Patricia Reser Center for the Arts	Cultural Resource	12625 SW Crescent Street	The building was constructed in 2020. Damages from a 6.8 magnitude Portland Hills earthquake and permanent ground deformation from liquefaction from a CSZ wet soil scenario are potentially moderate; however, the facility was built to the latest seismic standards.
Prestige Senior Living Beaverton Hills	Assisted/Senior Living	4525 SW 99th Avenue	The building was constructed between 1994 and the present. There is a floodway and flood zones A and AE north of the facility. Damages from a 6.8 magnitude Portland Hills earthquake would potentially be moderate. Permanent ground deformation from liquefaction from a CSZ wet soil scenario is potentially moderate.
Pilgrim Lutheran School	School	5650 SW Hall Boulevard	The property is not vulnerable to flooding. Damages from a 6.8 magnitude Portland Hills earthquake would potentially be moderate. Permanent ground deformation from liquefaction from a CSZ wet soil scenario is potentially moderate.
Prince of Peace Lutheran School	School	14175 NW Cornell Road, Portland, OR 97229	The property is not vulnerable to flooding. Damages from a 6.8 magnitude Portland Hills earthquake would potentially be moderate. Permanent ground deformation from liquefaction from a CSZ wet soil scenario is potentially moderate.
Providence ExpressCare – Murrayhill	Medical	14600 SW Murray Scholls Drive	The building was constructed between 1994 and the present. The property is not vulnerable to flooding. Damages from a 6.8 magnitude Portland Hills earthquake would potentially be moderate. Permanent ground deformation from liquefaction from a CSZ wet soil scenario is potentially moderate. Providence Immediate Care – Scholls is also at this location.

Name of Infrastructure, Facility, or Resource	Type of Asset	Address	Comments
Providence Infusion – West Portland	Medical	10126 SW Park Way, Portland, OR 97225	The building was constructed before 1984. The property is not vulnerable to flooding. Damages from a 6.8 magnitude Portland Hills earthquake would potentially be moderate. There is no potential permanent ground deformation from liquefaction from a CSZ wet soil scenario.
Providence Medical Group – Progress	Medical	12345 SW Horizon Boulevard, Suite 57 A	The building was constructed between 1994 and the present. The property is not vulnerable to flooding. Damages from a 6.8 magnitude Portland Hills earthquake would potentially be moderate. Permanent ground deformation from liquefaction from a CSZ wet soil scenario is potentially moderate.
Providence Medical Group – Sunset	Medical	417 SW 117th Avenue, Suite 200, Portland, OR 97225	The building was constructed between 1994 and the present. The property is not vulnerable to flooding. Damages from a 6.8 magnitude Portland Hills earthquake would potentially be moderate to heavy. Permanent ground deformation from liquefaction from a CSZ wet soil scenario is potentially moderate to very high. There is a slope equal to or greater than 25% on the property.
Rachel Carson School of Environmental Science	School	11100 SW Park Way, Portland, OR 97225	The property is not vulnerable to flooding. Damages from a 6.8 magnitude Portland Hills earthquake would potentially be moderate. Permanent ground deformation from liquefaction from a CSZ wet soil scenario is potentially moderate.

Name of Infrastructure, Facility, or Resource	Type of Asset	Address	Comments
Raleigh Hills Elementary School	School	5225 SW Scholls Ferry Road, Portland, OR 97225	The building was constructed before 1984. The property is not vulnerable to flooding. Damages from a 6.8 magnitude Portland Hills earthquake would potentially be moderate. Permanent ground deformation from liquefaction from a CSZ wet soil scenario is potentially moderate. Seismic structural deficiencies include, but are not limited to, nonexistent ties between foundation elements at play shelter and exterior concrete foundation walls not being adequately anchored to diaphragms for out-of-plan forces at original construction and additions. ²⁶⁶
Ridgewood Elementary School	School	10100 Inglewood Street, Portland, OR 97225	The property is not vulnerable to flooding. Damages from a 6.8 magnitude Portland Hills earthquake would potentially be moderate. There is no potential permanent ground deformation from liquefaction from a CSZ wet soil scenario.
Right Fit Senior Living Solutions	Assisted/Senior Living	12745 SW Beaverdam Road, Suite 315	The property is not vulnerable to flooding. Damages from a 6.8 magnitude Portland Hills earthquake would potentially be moderate. Permanent ground deformation from liquefaction from a CSZ wet soil scenario is potentially moderate.
Scholls Heights Elementary School	School	16400 SW Loon Drive	The building was constructed between 1994 and the present. The property is not vulnerable to flooding. Damages from a 6.8 magnitude Portland Hills earthquake would potentially be moderate. Permanent ground deformation from liquefaction from a CSZ wet soil scenario is potentially moderate. Seismic structural deficiencies include, but are not limited to, roof chords being discontinuous at sloped roof pop-ups and a roof diaphragm containing plywood but not being blocked in all locations. ²⁶⁷

²⁶⁶ KPFF Consulting Engineers. (2019, April 12). Seismic Assessments for the Beaverton School District. [Seismic Reports and Upgrades - Beaverton School District](#)

²⁶⁷ KPFF Consulting Engineers. (2019, April 12). Seismic Assessments for the Beaverton School District. [Seismic Reports and Upgrades - Beaverton School District](#)

Name of Infrastructure, Facility, or Resource	Type of Asset	Address	Comments
Sexton Mountain Elementary School	School	15645 SW Sexton Mountain Road	The building was constructed between 1984 and 1993. The property is not vulnerable to flooding. Damages from a 6.8 magnitude Portland Hills earthquake would potentially be moderate. Permanent ground deformation from liquefaction from a CSZ wet soil scenario is potentially moderate. Seismic structural deficiencies include, but are not limited to, wall segments exceeding allowable aspect ratios and walls appearing not to have hold-downs. ²⁶⁸
Southridge High School	School	9625 SW 125th Avenue	The building was constructed before 1984. The property is not vulnerable to flooding. Damages from a 6.8 magnitude Portland Hills earthquake would potentially be moderate to heavy. Permanent ground deformation from liquefaction from a CSZ wet soil scenario is potentially moderate. Seismic structural deficiencies include, but are not limited to, seven inch diagonal braces possibly not meeting moderate ductility requirements and seismic isolation joint at auditorium being inadequate to handle horizontal displacement in two directions. ²⁶⁹
Southwest Christian School	School	14605 SW Weir Road	The building was constructed between 1984 and 1993. The property is not vulnerable to flooding. Damages from a 6.8 magnitude Portland Hills earthquake would potentially be moderate. Permanent ground deformation from liquefaction from a CSZ wet soil scenario is potentially moderate.

²⁶⁸ KPFF Consulting Engineers. (2019, April 12). Seismic Assessments for the Beaverton School District. [Seismic Reports and Upgrades - Beaverton School District](#)

²⁶⁹ KPFF Consulting Engineers. (2019, April 12). Seismic Assessments for the Beaverton School District. [Seismic Reports and Upgrades - Beaverton School District](#)

Name of Infrastructure, Facility, or Resource	Type of Asset	Address	Comments
St. Cecilia School	School	12250 SW 5th Street	The building was constructed before 1984. The property is not vulnerable to flooding. Damages from a 6.8 magnitude Portland Hills earthquake would potentially be moderate. Permanent ground deformation from liquefaction from a CSZ wet soil scenario is potentially moderate.
St. Stephens Academy	School	7275 SW Hall Boulevard	The building was constructed between 1984 and 1993. The property is not vulnerable to flooding. Damages from a 6.8 magnitude Portland Hills earthquake would potentially be moderate. Permanent ground deformation from liquefaction from a CSZ wet soil scenario is potentially moderate.
Sunset High School	School	13840 NW Cornell Road, Portland, OR 97229	The building was constructed before 1984. The property is not vulnerable to flooding. Damages from a 6.8 magnitude Portland Hills earthquake would potentially be moderate. Permanent ground deformation from liquefaction from a CSZ wet soil scenario is potentially moderate. Seismic structural deficiencies include, but are not limited to, long window lines at exterior elevations create weak lines of lateral support and a narrow shear wall at the east wall of shop additions. ²⁷⁰
Sunset Transit Center Park and Ride	Transportation	10470 SW Barnes Road, Portland, OR 97225	The property is not vulnerable to flooding. Damages from a 6.8 magnitude Portland Hills earthquake would potentially be moderate. There is no potential for permanent ground deformation from liquefaction from a CSZ wet soil scenario.

²⁷⁰ KPFF Consulting Engineers. (2019, April 12). Seismic Assessments for the Beaverton School District. [Seismic Reports and Upgrades - Beaverton School District](#)

Name of Infrastructure, Facility, or Resource	Type of Asset	Address	Comments
Sunshine Montessori Preschool and Kindergarten	School	4845 SW Murray Boulevard	The building was constructed between 1984 and 1993. The property is not vulnerable to flooding. Damages from a 6.8 magnitude Portland Hills earthquake would potentially be moderate. Permanent ground deformation from liquefaction from a CSZ wet soil scenario is potentially moderate.
The Portland Clinic – Medical Clinic	Medical	15950 SW Millikan Way	The building was constructed between 1994 and the present. The property is not vulnerable to flooding. Damages from a 6.8 magnitude Portland Hills earthquake would potentially be moderate to heavy. Permanent ground deformation from liquefaction from a CSZ wet soil scenario is potentially high to very high.
The Portland Clinic – Urgent Care Clinic	Medical	9250 SW Hall Boulevard	The building was constructed between 1984 and 1993. The property is not vulnerable to flooding. Damages from a 6.8 magnitude Portland Hills earthquake would potentially be moderate. Permanent ground deformation from liquefaction from a CSZ wet soil scenario is potentially moderate.
Terra Linda Elementary	School	1998 NW 143rd Avenue, Portland, OR 97229	The property is not vulnerable to flooding. Damages from a 6.8 magnitude Portland Hills earthquake would potentially be moderate. Permanent ground deformation from liquefaction from a CSZ wet soil scenario is potentially moderate. Seismic structural deficiencies include, but are not limited to, wood posts in the 1989 addition not having a positive connection to the foundation and wood ledgers in cross-grain bending at some roof connections. ²⁷¹

²⁷¹ KPFF Consulting Engineers. (2019, April 12). Seismic Assessments for the Beaverton School District. [Seismic Reports and Upgrades - Beaverton School District](#)

Name of Infrastructure, Facility, or Resource	Type of Asset	Address	Comments
Tumwater Middle School	School	650 NW 118th Avenue Portland, OR 97229	The property is not vulnerable to flooding. Damages from a 6.8 magnitude Portland Hills earthquake would potentially be moderate. Permanent ground deformation from liquefaction from a CSZ wet soil scenario is potentially moderate.
Tunai Adult Care Home	Assisted/Senior Living	13045 SW Combine Street	The building was constructed before 1984. The property is not vulnerable to flooding. Damages from a 6.8 magnitude Portland Hills earthquake would potentially be moderate to heavy. Permanent ground deformation from liquefaction from a CSZ wet soil scenario is potentially moderate.
Tualatin Valley Fire & Rescue (TVF&R) – Station 53 Progress	Fire – TVF&R	8480 SW Scholls Ferry Road	The property is not vulnerable to flooding. Damages from a 6.8 magnitude Portland Hills earthquake would potentially be moderate. Permanent ground deformation from liquefaction from a CSZ wet soil scenario is potentially moderate.
TVF&R – Station 61 Butner Road	Fire – TVF&R	13730 SW Butner Road	The property is not vulnerable to flooding. Damages from a 6.8 magnitude Portland Hills earthquake would potentially be moderate. Permanent ground deformation from liquefaction from a CSZ wet soil scenario is potentially moderate.
TVF&R – Station 66 South Beaverton	Fire – TVF&R	13900 SW Brockman Street	The property is not vulnerable to flooding. Damages from a 6.8 magnitude Portland Hills earthquake would potentially be moderate. Permanent ground deformation from liquefaction from a CSZ wet soil scenario is potentially moderate.
TVF&R – Station 67 Farmington	Fire – TVF&R	13810 SW Farmington Road	The property is not vulnerable to flooding. Damages from a 6.8 magnitude Portland Hills earthquake would potentially be moderate. Permanent ground deformation from liquefaction from a CSZ wet soil scenario is potentially moderate.

Name of Infrastructure, Facility, or Resource	Type of Asset	Address	Comments
TVF&R – Station 70 Raleigh Hills	Fire – TVF&R	8299 SW Beaverton Hillsdale Highway, Portland, OR 97225	The building was constructed between 1994 and the present. The property is not vulnerable to flooding. Damages from a 6.8 magnitude Portland Hills earthquake would potentially be moderate. Permanent ground deformation from liquefaction from a CSZ wet soil scenario is potentially moderate.
Valley Catholic High School	School	4275 SW 148th Avenue	The property is not vulnerable to flooding. Damages from a 6.8 magnitude Portland Hills earthquake would potentially be moderate. Permanent ground deformation from liquefaction from a CSZ wet soil scenario is potentially moderate.
Vineyard Home Senior Living	Assisted/Senior Living	15675 SW Hart Road	The building was constructed between 1984 and 1993. The property is not vulnerable to flooding. Damages from a 6.8 magnitude Portland Hills earthquake would potentially be moderate to heavy. Permanent ground deformation from liquefaction from a CSZ wet soil scenario is potentially moderate.
Vose Elementary School	School	11350 SW Denney Road	The building was constructed in 2019. The property is not vulnerable to flooding. Damages from a 6.8 magnitude Portland Hills earthquake would potentially be moderate. Permanent ground deformation from liquefaction from a CSZ wet soil scenario is potentially moderate.
Washington County Sheriff's Office – East Precinct	Law Enforcement– County Sheriff's Office	3700 SW Murray Boulevard	The building was constructed before 1984. The property is north of a flood zone. Damages from a 6.8 magnitude Portland Hills earthquake would potentially be moderate to heavy. Permanent ground deformation from liquefaction from a CSZ wet soil scenario is potentially moderate to very high.
Waterhouse Ridge Memory Care	Assisted/Senior Living	1115 NW 158th Avenue	The building was constructed between 1994 and the present. The property is not vulnerable to flooding. Damages from a 6.8 magnitude Portland Hills earthquake would potentially be moderate to heavy. Permanent ground deformation from liquefaction from a CSZ wet soil scenario is potentially high.

Name of Infrastructure, Facility, or Resource	Type of Asset	Address	Comments
West Sylvan Middle School	School	8111 SW West Slope Drive, Portland, OR 97225	The building was constructed between 1984 and 1993. The property is not vulnerable to flooding. Damages from a 6.8 magnitude Portland Hills earthquake would potentially be moderate. Permanent ground deformation from liquefaction from a CSZ wet soil scenario is potentially high.
Whitford Middle School	School	7935 SW Scholls Ferry Road	The building was constructed before 1984. The property is not vulnerable to flooding. Damages from a 6.8 magnitude Portland Hills earthquake would potentially be moderate. Permanent ground deformation from liquefaction from a CSZ wet soil scenario is potentially moderate. Seismic structural deficiencies include, but are not limited to, tectum roofs at gymnasium, shop, and wrestling room are not capable of transferring lateral forces and precast wall panels that lack a positive connection to the foundation capable of developing strength of the wall. ²⁷²
William Walker Elementary School	School	11940 SW Lynnfield Lane, Portland, OR 97225	The property is not vulnerable to flooding. Damages from a 6.8 magnitude Portland Hills earthquake would potentially be moderate. Permanent ground deformation from liquefaction from a CSZ wet soil scenario is potentially moderate.
YMCA Kindergarten	School	15650 NW Blueridge Dr	The property is not vulnerable to flooding. Damages from a 6.8 magnitude Portland Hills earthquake would potentially be moderate. Permanent ground deformation from liquefaction from a CSZ wet soil scenario is potentially high.

²⁷² KPFF Consulting Engineers. (2019, April 12). Seismic Assessments for the Beaverton School District. [Seismic Reports and Upgrades - Beaverton School District](#)

Name of Infrastructure, Facility, or Resource	Type of Asset	Address	Comments
Young Learners Preschool	School	1800 NW 169th Place Suite C-100	The building was constructed between 1984 and 1993. The property is not vulnerable to flooding. Damages from a 6.8 magnitude Portland Hills earthquake would potentially be moderate. Permanent ground deformation from liquefaction from a CSZ wet soil scenario is potentially high.

3.2.2.3. Housing

Housing characteristics are an important factor in mitigation planning. The information below shows that most housing units are owner-occupied and consist of one-unit buildings built before 1999. The older the housing, the more at risk it can be to damage from natural hazards such as earthquakes and windstorms, including tornadoes.

Table 58: Housing Characteristics*

Households	Total
Total households ²⁷³	41,026
Units in Housing Structure ²⁷⁴	Percent of Housing
One-unit structures	55%
Two-or-more-unit structures	44%
Manufactured homes and all other types	<1%
Year Housing Structure Built ²⁷⁵	Percent of Housing
Pre-1979	41%
1980–1999	37%
2000 to present	22%
Housing Tenure and Vacancy	Percent of Housing
Owner-occupied ²⁷⁶	50%
Renter-occupied ²⁷⁷	50%
Vacant ²⁷⁸	2%

* Due to how respondents answer questions there may be overlapping responses and results may equal greater than 100%. Percentages are rounded.

²⁷³ United States Census Bureau. (2021, July 1). 2021 American Community Survey 1-Year Estimates, Households and Families, Table S1101. Accessed September 12, 2022, from <https://data.census.gov/cedsci/table?q=beaverton%20oregon%20S1101&tid=ACSST1Y2021.S1101>

²⁷⁴ United States Census Bureau. (2021, July 1). 2021 American Community Survey 1-Year Estimates, Households and Families, Table S1101. Accessed September 12, 2022, from <https://data.census.gov/cedsci/table?q=beaverton%20oregon%20S1101&tid=ACSST1Y2021.S1101>

²⁷⁵ United States Census Bureau. (2021, July 1). 2016–2020 American Community Survey 5-Year Estimates, Physical Housing Characteristics for Occupied Housing Units, Table S2504. Accessed September 12, 2022, from <https://data.census.gov/cedsci/table?q=beaverton%20oregon%20S2504&tid=ACSST1Y2021.S2504>

²⁷⁶ United States Census Bureau. (2021, July 1). 2021 American Community Survey 1-Year Estimates, Households and Families, Table S1101. Accessed September 12, 2022, from <https://data.census.gov/cedsci/table?q=beaverton%20oregon%20S1101&tid=ACSST1Y2021.S1101>

²⁷⁷ United States Census Bureau. (2021, July 1). 2021 American Community Survey 1-Year Estimates, Households and Families, Table S1101. Accessed September 12, 2022, from <https://data.census.gov/cedsci/table?q=beaverton%20oregon%20S1101&tid=ACSST1Y2021.S1101>

²⁷⁸ United States Census Bureau. (2021, July 1). 2020 Decennial Census Occupancy Status, Table H1. Accessed September 28, 2022, from <https://data.census.gov/cedsci/table?q=beaverton%20oregon%20h1>

3.2.3. Economy

Beaverton's economy is a mix of high-tech and software companies, professional and business services, and retail trade. It supports both traditional and knowledge-based industries and provides goods and services to export markets and local consumers. Some of the City's large private employers include Nike, Comcast, Leupold and Stevens, Reser's Fine Foods, and Pacific Office Automation. As part of the Silicon Forest, Beaverton is the location of numerous technology organizations and companies, including the Linux Technology Center of IBM, Tektronix, Analog Devices, VeriWave, and the Oregon Technology Business Center, a non-profit tech startup incubator. Phoenix Technologies operates its Northwestern Regional Office in Beaverton. Some of the largest public and institutional employers include City of Beaverton, Beaverton School District, and Providence Health Plans.

Table 59: Income Characteristics^{279*}

Households by Income Category	Percent of Households
Less than \$5,000	3%
\$5,000 to \$9,999	2%
\$10,000 to \$14,999	2%
\$15,000 to \$19,999	3%
\$20,000 to \$24,999	4%
\$25,000 to \$34,999	7%
\$35,000 to \$49,999	11%
\$50,000 to \$74,999	18%
\$75,000 to \$99,999	15%
\$100,000 to \$149,999	19%
\$150,000 or more	18%
Median Household Income	
\$76,520	

* Due to how respondents answer questions, there may be overlapping responses, and results may equal greater than 100%. Percentages are rounded.

²⁷⁹ United States Census Bureau. (2021, July 1). American Community Survey 5-year Estimates, Financial Characteristics, Table S2503. Accessed September 12, 2022, from <https://data.census.gov/cedsci/table?q=beaverton%20oregon%20S2503>

3.3. Natural Hazard Profiles

The City of Beaverton's Technical Committee utilized the OEM's hazard analysis methodology to examine hazard vulnerability and probability by collecting information about history, probability, vulnerability, and maximum threat for each hazard that impacts the City. This methodology does not compare hazards to each other or rank hazards against each other. Instead, this process provides a sense of hazard priorities or relative risk and allows comparison of the same hazard across participants.

Each of the hazards examined by this analysis was scored using a formula that incorporates the four rating criteria, a weight factor, and three levels of severity: low, medium, and high. The score range for this methodology is 24 (lowest possible) to 240 (highest possible). For additional detail about the OEM risk and hazard analysis methodology, see Volume I, Section 2.

The scores for each hazard that impact the City are presented below. Due to geographic location, topography, and density of the built environment, the City cannot be impacted by dam failure or wildland fire.

Table 60: Natural Hazard Scores

Natural Hazard	History	Vulnerability	Maximum Threat	Probability	Score
Dam failure	–	–	–	–	–
Drought	Low	High	High	High	198
Earthquake	Low	High	High	Medium	196
Extreme heat	Low	High	High	High	212
Flooding, including channel migration and streambed erosion	High	Medium	Medium	High	188
Landslide	Low	Low	Low	Medium	86
Volcanic ash	Low	Medium	High	High	178
Wildland fire	–	–	–	–	–
Windstorm, including tornado	High	High	High	High	208
Winter storm	High	Medium	High	High	203

Full descriptions of each hazard are provided in Volume I, Section 2. The potential effects of climate change on the magnitude and frequency of natural hazard events are described in each hazard description, also in Volume I, Section 2.

The timeframe of data collected during the planning process for the City of Beaverton was November 1, 2016, to February 22, 2022. Hazard events that occurred during this period and were deemed significant by the City's Technical Committee are included in this annex's hazard profiles.

The following hazard profiles are in alphabetical order and include a brief hazard description, significant events since the 2017 NHMP update, if applicable, and potential impacts and vulnerabilities. The potential impacts for each hazard are presented in the same order, as applicable: populations, economies, structures, improved property, critical facilities and infrastructure, historical properties and cultural resources, and natural environments.

3.3.1. Dam Failure

Due to geographic location and topography, the City cannot be directly impacted by dam failure.

3.3.2. Drought

Drought typically occurs as a regional event and often affects more than one city and county simultaneously. Drought may occur in the City of Beaverton and may affect the agricultural and recreational economic sectors, which are a small part of the City's overall economy. Potential impacts of and vulnerabilities to drought are identified below.

3.3.2.1. Potential Impacts

The potential impacts from a drought event are identified below. The type, magnitude, and extent of impacts can vary based on the scale of the event.

- Reduction or loss of water supply, water use restrictions, and lack of potable water supply.
- Health effects, including increased heat-related, waterborne, and cardiorespiratory illnesses, as well as mental health conditions.
- Reduced economic productivity or business closures, including agriculture, livestock, recreation, energy, tourism, timber, and fisheries.
- Supply chain restrictions, including food shortages.
- Loss of power or reduced availability of electricity due to infrastructure damage and high demand.
- Property and infrastructure damage due to expansive soils, which are clay-based soils that expand and contract based on the amount of moisture in the soil.
- Damage to natural environments, including low water levels in lakes, rivers, and other water bodies, reduced plant growth, local species reduction or extinction, increased water temperature, and deteriorated water quality, which may result in fish kills and increased waterborne pollutants.
- Concurrent hazards, including extreme heat, wildfire, flooding, and landslides.

3.3.2.2. Vulnerabilities

All populations, economies, structures, improved property, critical facilities and infrastructure, historical properties and cultural resources, and natural environments in the City are vulnerable to drought. This includes:

- People in the City with preexisting health conditions, those without access to clean water, children, pregnant women, and older adults.
- Those who are employed in water-dependent sectors, such as agriculture and recreation, may experience a reduction in income.
- The water supply in the upper Tualatin River, the City's source of groundwater.
- Critical transportation infrastructure, including State and County highways, arterial streets, collector streets, neighborhood routes, local streets, and eight TriMet stations and bus and rail service equipment.
- Other critical infrastructure and facilities vulnerable to drought include 46 schools, 18 medical facilities, 7 city facilities, 18 assisted living facilities, 5 fire department facilities, 2 police facilities, one Clean Water Services field operations facility, and one arts center.²⁸⁰

²⁸⁰ City of Beaverton 2023 NHMP planning documentation

3.3.3. Earthquake

The City could experience earthquakes that originate from the Cascadia Subduction Zone (CSZ), Portland Hills Fault Zone, and Gales Creek Fault Zone. It could also experience liquefaction and landslides as the result of an earthquake. Beaverton has mostly silt-type soil, which is subject to liquefaction. The soil can lose its ability to support structures, flow down even very gentle slopes, and erupt to the ground surface to form sand boils. Potential impacts of and vulnerabilities to earthquake are identified below.

3.3.3.1. Potential Impacts

The potential impacts from an earthquake event are identified below. The type, magnitude, and extent of impacts can vary based on the scale of the event.

- Injuries or deaths.
- Mental health impacts, including post-traumatic stress disorder.
- Public health hazards resulting from disruption of drinking water and wastewater systems.
- Need for widespread search and rescue operations.
- Displaced residents in need of sheltering.
- Delayed emergency response times due to debris, blocked transportation routes, and damaged infrastructure and vehicles.
- Economic impacts to governments, including reduced future revenues, increased costs resulting from response activities, and increased future costs resulting from recovery and reconstruction activities.
- Industries can experience commerce losses from power interruptions, damaged buildings and assets, and road closures. Industries can also sustain direct losses to buildings, personnel, and other vital equipment.
- Personal and household economic impacts from loss of income, increased medical costs, and property damage that may not be covered by insurance.
- Damage to ground utilities; residential, public, and private buildings; and transportation systems above and below.
- Disruption of essential infrastructure systems, such as power systems, public utilities, and telecommunications.
- Blocked road and rail transportation routes due to debris from trees and damaged property, ground deformation, and liquefaction.
- Downed or damaged power lines that can lead to wildfires.
- Power outages and natural gas leaks.
- Hazardous material releases due to infrastructure and facility damage.
- Harm to ecosystems from loss of habitat, death and destruction of vegetation and animals, and erosion.
- Change in water flows, including paths of rivers and streams.
- Damage to crops, livestock, vegetation, parks, and natural systems.
- Concurrent hazards initiated by an earthquake, including flood, wildland fire, and landslide.

3.3.3.2. Vulnerabilities

All populations, economies, structures, improved property, critical facilities and infrastructure, historical properties and cultural resources, and natural environments in the City are vulnerable to earthquakes. This includes:

- Areas near the epicenter of an earthquake event are likely to incur a significant amount of damage to all buildings, infrastructure, facilities, and property.
- Underground infrastructure, such as pipelines and utility lines, buildings, and roads, are vulnerable to damage from liquefaction due to the silt-type soil in the City. This includes the Clean Water Services field operations facility located in the City.
- Buildings with very high or high collapse potential include residential and commercial buildings constructed prior to 1990. Of the critical facilities and infrastructure identified by the City, 50 are known to be built prior to 1993. This includes 6 assisted living facilities, 9 medical facilities, including a level II hospital, 5 city facilities, including the public works operations facility and the municipal court, 29 schools, and the Washington County Sheriff's Office East Precinct location.²⁸¹
- There is one assisted living facility and one elementary school that are located on an active fault line. The municipal court building is not built up to seismic standards.²⁸²
- Potential shaking damage and permanent ground deformation levels due to liquefaction that may impact the City's identified critical facilities and infrastructure are as follows:²⁸³
 - Perceived shaking and damage potential from a Portland Hills 6.8 magnitude earthquake may cause heavy damage to one elementary school, moderate to heavy damage to 23 critical facilities, and moderate damage to 100 critical facilities.
 - A CSZ wet soil scenario could result in liquefaction that may cause various permanent ground deformation levels, impacting critical facilities and infrastructure throughout the City, including:
 - ◆ Very high to high permanent ground deformation at 3 facilities.
 - ◆ High permanent ground deformation at 18 facilities.
 - ◆ Very high to moderate permanent ground deformation at 13 facilities.
 - ◆ High to moderate permanent ground deformation at 2 facilities.
 - ◆ Moderate permanent ground deformation at 83 facilities.
- Using 2022 Hazus®-MH information, it is estimated a 6.7 magnitude Gales Creek Fault earthquake event would result in 87 yellow-tagged buildings, 5 red-tagged buildings, and \$109,000,000 in total economic losses.²⁸⁴
- A 2018 Oregon Department of Geology and Mineral Industries (DOGAMI) report shows the following²⁸⁵:
 - A CSZ magnitude 9.0 earthquake in "dry" soil conditions could result in \$1,230,000,000 in building repair costs, 548,000 tons of debris, 1,227 long-term displaced residents, and up to 1,068 deaths.

²⁸¹ City of Beaverton 2023 NHMP planning documentation

²⁸² City of Beaverton 2023 NHMP planning documentation

²⁸³ City of Beaverton 2023 NHMP planning documentation

²⁸⁴ Oregon Department of Geology and Mineral Industries. (2022). Open-File Report O-22-04: Natural Hazard Risk Report for Washington County. <https://www.oregongeology.org/pubs/ofr/O-22-04/p-O-22-04.htm>

²⁸⁵ Oregon Department of Geology and Mineral Industries. (2018). Open File Report O-18-02: Earthquake Regional Impact Analysis for Clackamas, Multnomah, and Washington Counties, Oregon. https://www.oregongeology.org/pubs/ofr/O-18-02/O-18-02_report.pdf

- A CSZ magnitude 9.0 earthquake in “wet” soil conditions could result in \$1,943,000 in building repair costs, 751,000 tons of debris, 6,267 long-term displaced residents, and up to 1,946 deaths.
- A Portland Hills Fault magnitude 6.8 earthquake in “dry” soil conditions could result in \$3,510,000 in building repair costs, 1,310,000 tons of debris, 5,597 long-term displaced residents, and up to 3,508 deaths.
- A Portland Hills Fault magnitude 6.8 earthquake in “wet” soil conditions could result in \$5,201,000 in building repair costs, 1,775,000 tons of debris, 19,130 long-term displaced residents, and up to 5,711 deaths.

3.3.4. Extreme Heat

Because extreme heat events have increased in frequency, severity, and impacts, the NHMP Steering Committee chose to include this hazard for the first time in the Washington County NHMP. Potential impacts of and vulnerabilities to extreme heat and previous significant events are identified below.

3.3.4.1. Significant Events

Extreme heat was not included in previous NHMPs. The City identified three significant extreme heat events it has experienced.

- **June 26–29, 2021:** The maximum temperature reached 115 °F. Throughout Washington County there were numerous fatalities, closures and postponements of businesses and events, and buckled roads, and cooling shelters were opened. There was one heat-related death in the City.
- **July 19–30, 2021:** The highest temperature reached was 96 °F. City events were modified or canceled, economic impacts occurred due to the limited possibility of safe outdoor work, and cooling shelters were opened.
- **August 11–14, 2021:** The high temperature at Hillsboro Airport was 103 °F, with a heat index of 109 °F on August 11 and 12. Peak afternoon temperatures ranged from 100 °F to 105 °F. Throughout Washington County there were fatalities, closures and postponements of businesses and events, and cooling shelters were opened.

3.3.4.2. Potential Impacts

The potential impacts from an extreme heat event are identified below. The type, magnitude, and extent of impacts can vary based on the scale of the event.

- Injuries or deaths.
- Heat illnesses, including heat rashes, heat cramps, heat exhaustion, heat stroke, and death.
- Extended operational hours of County staff and additional resources needed for response to the event, including the operation of daytime cooling centers and overnight cooling shelters.
- Strain on or loss of water supply due to increased demand.
- Industries can experience commerce losses from power interruptions, damaged buildings and assets, and road closures. Industries can also sustain direct losses to buildings, personnel, and other vital equipment.
- Economic losses from decreased worker efficiency and effectiveness and time lost on the job when workers take more frequent or longer breaks to avoid overheating.
- Economic impacts from closure of outdoor activities and events, such as farmers markets and concerts.
- Property damage, such as roof expansions, leading to warped, cracked, and leaking shingles; dry, cracked, and leaking caulking around flashing and joints; cracked foundations; excessive drying of wood structures; and melted siding.
- Disruption of essential infrastructure systems from overheated and damaged utilities, including power, water, transportation, and communication systems.
- Impacts to roadways as heat expands concrete or causes cracking and buckling. Public transit can also be impacted due to melted cables, sagging wires, and warping tracks.
- Damage to crops, livestock, parks, and natural systems.

- Impacts to greenspaces, such as scorch and sunscald of new foliage, branches or tops of trees dying, and significant stress and die-off of native trees, particularly Douglas fir and cedar. These impacts are intensified if drought is also occurring.
- Concurrent hazards include drought and wildland fire.

3.3.4.3. Vulnerabilities

All populations, economies, structures, improved property, critical facilities and infrastructure, historical properties and cultural resources, and natural environments in the City are vulnerable to extreme heat.

Populations substantially vulnerable to extreme heat include:

- People who work or spend a significant amount of time outdoors, including those in construction, landscaping, maintenance and repair, roofing, and solid waste collection.
- People who live and/or work in buildings without air conditioning or cooling equipment.
- People living, working, or spending time in heat islands within the City.
- People living outdoors or in the upper floors of multi-family housing units.
- Populations with higher heat sensitivity, including older adults, infants and children, pregnant women, people with preexisting or chronic diseases, and those who take certain medications that affect thermoregulation or block nerve impulses. This includes those living in or spending time in the City's 18 assisted living facilities and 46 schools.
- People with limited mobility and no access to cooling systems who may not be able to travel to cooling centers or shelters.
- People who live in social isolation, including linguistic isolation, or those living alone with few social relationships.
- People with mental health conditions. Extreme heat can be associated with higher levels of aggression, violence, and suicidal behavior.
- Factors including race and ethnicity, income, and educational attainment are negatively correlated with heat-related illness.

Additional vulnerabilities to extreme heat include:

- Plants, animals, ecosystems, and natural environments are vulnerable to high rates of mortality due to excessive heat.
- Bridge infrastructure is vulnerable to thermal expansion of bridge joints and paved surfaces and deterioration of steel, asphalt, protective cladding, coats, and sealants.
- Asphalt pavement is vulnerable to accelerated deterioration through softening, rutting, and migration of liquid asphalt.
- Vehicles, including first responder vehicles, are vulnerable to engine overheating and tire deterioration.
- Aboveground utility and power lines may droop or sag and create a heightened fire risk.

3.3.5. Flooding, Including Channel Migration and Streambed Erosion

Some degree of flooding is common throughout the County, with events typically occurring from October through April. The City is primarily affected by urban and riverine flooding, and any low-lying area has the potential to flood. All stormwater runoff is directed to the nearest creek or stream. Water is not intentionally directed into the sanitary sewer system. Riverine flooding, when rivers and streams flow over their banks, is the largest single form of flooding in the City. Potential impacts of and vulnerabilities to flooding are identified below.

3.3.5.1. Potential Impacts

The potential impacts from a flooding event are identified below. The type, magnitude, and extent of impacts can vary based on the scale of the event.

- Injuries or deaths.
- Public health concerns, such as the spread of infectious diseases, exposure to hazardous materials and debris, and water quality issues.
- Displaced residents in need of sheltering.
- Delayed emergency response times and disruption of traffic due to high water, debris, blocked transportation routes, and damaged infrastructure and vehicles.
- Economic impacts to governments, including reduced future revenues, increased costs resulting from response activities, and increased future costs resulting from recovery and reconstruction activities.
- Industries can experience commerce losses from power interruptions, damaged buildings and assets, and road closures. Industries can also sustain direct losses to buildings, personnel, and other vital equipment.
- Personal economic impacts from loss of income and property damage that may not be covered by insurance.
- Damage and destruction to the built environment, including above- and belowground utility lines; residential, public, and private buildings; and transportation systems.
- Disruption of essential infrastructure systems, such as power systems, public utilities, telecommunications, and transportation routes.
- Harm to ecosystems from loss of habitat, death and destruction of vegetation and animals, and erosion.
- Damage to crops, livestock, vegetation, and parks.

3.3.5.2. Vulnerabilities

Population, economic, built environment, critical facility, infrastructure, and natural environment vulnerabilities to a flooding event include:

- Populations without access to private transportation for the purpose of evacuation.
- There are 15 critical facilities vulnerable to flooding due to proximity to floodplains and flood zones A and AE, including three schools, four TriMet stations, four assisted living facilities, two medical facilities, and the Washington County Sheriff's Office East Precinct location.²⁸⁶
- Repetitive loss (RL) properties within the City.

²⁸⁶ City of Beaverton 2023 NHMP planning documentation

- Properties without flood insurance.
- Special Flood Hazard Areas (SFHAs) within the City.
- The potential for property damage from Beaverton Creek flooding is especially severe due to the inadequate size and moderate grade of the channel; culverts and bridges that constrict creek flow; and previously constricted banks that result in increased upstream flood heights.
 - The potential for property damage is significant due to the extensive commercial and residential development within the Beaverton Creek floodplain.
- The following creeks are located in the City and can be a source of flooding:
 - Beaverton Creek is the most significant creek in the City and flows through the major commercial area.
 - ◆ This creek has five tributaries within the City:
 - South Fork of Beaverton Creek
 - Johnson Creek
 - Hall Creek
 - Willow Creek
 - Cedar Mill Creek
 - Erickson Creek
 - South Johnson Creek
 - Fanno Creek
- The floodplains in the City are generally located along Beaverton Creek, Fanno Creek, and Fanno Creek tributaries. There are approximately 750 acres within the 100-year floodplain, and a total of 845.69 acres of tax lots are within the 100-year floodplain. Within these tax lots, there are 320 total structures valued at \$339,537,830.
- There are 18 National Flood Insurance Program (NFIP)-designated flood loss properties dispersed throughout the City; however, concentrations of these properties may be found near the following locations:
 - Highway 217 and Denny Road. The flooding source is Fanno Creek.
 - Near Highway 217 between the Beaverton–Hillsdale Highway and Canyon Road. The flooding source is Beaverton Creek.
 - Near the intersection of Murry and Allen Boulevards. The flooding source is Johnson Creek.
- Flood loss estimates determined by Hazus-MH include²⁸⁷:
 - 10-year flood scenario
 - ◆ Number of buildings lost: 203
 - ◆ Loss estimate: \$11,197,000
 - 50-year flood scenario
 - ◆ Number of buildings lost: 310

²⁸⁷ Oregon Department of Geology and Mineral Industries. (2022). Open-File Report O-22-04: Natural Hazard Risk Report for Washington County. <https://www.oregongeology.org/pubs/ofr/O-22-04/p-O-22-04.htm>

- ◆ Loss estimate: \$18,191,000
- 100-year flood scenario
 - ◆ Number of buildings lost: 355
 - ◆ Loss estimate: \$22,809,000
- 500-year flood scenario
 - ◆ Number of buildings lost: 429
 - ◆ Loss estimate: \$32,268,000

Table 61: Land Use Types in Beaverton within the 100-Year Floodplain

Land Use Type	Total Parcels in 100-Year Floodplain	Total Value of Exposed Parcels	Total Area in Jurisdiction (Acres)	Total Area in the 100-Year Floodplain (acres)	Percentage of Area in the 100-Year Floodplain
Agriculture	0	\$0	71.54	0	0%
Commercial	204	\$1,007,950,200	1978.34	571.73	28.9%
Forest	1	\$59,240	86.91	2.73	3.14%
Industrial	2	\$12,269,700	50.58	10.81	21.37%
Multi-Family Residential	112	\$697,276,560	842.57	192.82	22.88%
Public	166	\$371,981,710	2016.17	867.75	43.04%
Rural	0	\$0	0	0	0%
Single-Family Residential	322	\$175,225,090	3654.5	100.38	2.75%
Vacant	35	\$2,925,210	396.96	50.09	12.62%
Other	86	\$75,145,630	974.95	288.86	29.63%
Total	928	\$2,342,833,340	10,072.52	2085.17	20.70%

Table 62: Buildings in Beaverton within FEMA-Mapped Floodplains

Building Classification	Buildings within Beaverton	Buildings within 100-Year Floodplain	Buildings within 500-Year Floodplain	Buildings within Combined 500-Year & 100-Year Floodplain
Total Buildings	28,220	480	171	651
Percentage of Buildings within Beaverton	100%	1.7%	0.6%	2.3%

3.3.6. Landslide

There is evidence that steep slopes within the City have experienced four minor and two major ancient slides. Other than these ancient slides, there are no known active locations susceptible to landslides. Potential impacts of and vulnerabilities to landslides are identified below.

3.3.6.1. Potential Impacts

Potential impacts from a landslide event are identified below. The type, magnitude, and extent of impacts can vary based on the scale of the event.

- Injuries or deaths.
- Displaced residents in need of sheltering.
- Delayed emergency response times due to debris, blocked transportation routes, and damaged infrastructure and vehicles.
- Mobility or access issues for residents due to blocked or damaged transportation routes.
- Economic impacts to governments, including reduced future revenues, increased costs resulting from response activities, and increased future costs resulting from recovery and reconstruction activities.
- Industries can experience commerce losses from power interruptions, damaged buildings and assets, and road closures. Industries can also sustain direct losses to buildings, personnel, and other vital equipment.
- Personal and household economic impacts from loss of income and property damage that may not be covered by insurance.
- Debris flows.
- Damage and destruction to the built environment, including above- and belowground utility lines; residential, public, and private buildings; and transportation systems.
- Disruption of essential infrastructure systems, such as power systems, public utilities, telecommunications, and transportation routes.
- Power outages and natural gas leaks.
- Disruption of traffic due to damaged or destroyed transportation systems.
- Harm to ecosystems from loss of habitat, death and destruction of vegetation and animals, and erosion.
- Damage to crops, livestock, vegetation, and parks.

3.3.6.2. Vulnerabilities

The type, magnitude, and extent of landslide events may vary based on the scale of the event.

- The potential for landslide impacts is relatively minimal except for small areas in the southwestern portion of the City.²⁸⁸

²⁸⁸ Oregon Department of Geology and Mineral Industries. (2022). Open-File Report O-22-04: Natural Hazard Risk Report for Washington County. <https://www.oregongeology.org/pubs/ofr/O-22-04/p-O-22-04.htm>

- Per DOGAMI, 0.3% of building value within the City has a very high susceptibility to landslide exposure, 1.5% of building value within the City has a high susceptibility, and 31% of building value within the City has a moderate susceptibility.²⁸⁹
- One elementary school has a landslide deposit less than or equal to 15 feet and a 25% slope on the west side of the property, and one health care facility has a slope equal to or greater than 25% on its property.²⁹⁰
- The landslide hazard is pervasive in a large percentage of undeveloped land and may present challenges for future planning and mitigation efforts. Creating awareness of nearby areas susceptible to the landslide hazard is a significant step toward reducing risk for every community in Washington County.

²⁸⁹ Oregon Department of Geology and Mineral Industries. (2022). Open-File Report O-22-04: Natural Hazard Risk Report for Washington County. <https://www.oregongeology.org/pubs/ofr/O-22-04/p-O-22-04.htm>

²⁹⁰ City of Beaverton 2023 NHMP planning documentation

3.3.7. Volcanic Ash

Volcanic activity is possible in mountains near the County. It is anticipated that ashfall from a volcanic eruption has the potential to impact the City, although the scale and types of impacts and vulnerabilities may differ depending on which volcano erupts, the level of eruption, and the wind direction during and after eruption. Potential impacts of and vulnerabilities to volcanic ash are identified below.

3.3.7.1. Potential Impacts

Though unlikely, the impacts of a significant ashfall can be substantial, including:

- Indirect injuries and deaths, such as those sustained during ash cleanup operations or in traffic accidents.
- Short-term health effects, including respiratory effects.
- Widespread public health issues stemming from failing or damaged infrastructure, such as lack of clean water and sanitation. This includes public water systems that rely on outdoor reservoirs.
- The need to shelter individuals to protect them from poor air quality, including houseless persons and persons displaced from their residences due to poor residential air filtration systems.
- Delayed emergency response times due to decreased visibility and increased traffic hazards.
- Extended operational hours of County staff and resources needed for response to the event.
- Economic impacts to governments, including reduced future revenues, increased costs resulting from response activities, and increased future costs resulting from recovery and cleanup activities.
- Industries can experience commerce losses from power interruptions, damaged buildings and assets, and road closures. Industries can also sustain direct losses to buildings, personnel, and other vital equipment.
- Personal and household economic impacts from loss of income, increased medical costs, and property damage that may not be covered by insurance.
- Damage to the built environment, including aboveground utility lines; residential, public, and private buildings; and transportation systems.
- Disruption of essential infrastructure systems, such as power systems, public utilities, drainage systems, telecommunications, and transportation routes.
- Downed or damaged power lines can lead to wildfires.
- Damage to crops, livestock, vegetation, parks, and natural systems.

3.3.7.2. Vulnerabilities

All populations, economies, structures, improved property, critical facilities and infrastructure, historical properties and cultural resources, and natural environmental assets in the City are vulnerable to volcanic ash. This includes:

- People in the City with chronic lung problems and other preexisting health conditions, children, pregnant women, and older adults. This includes those living in or spending time in the City's 18 assisted living facilities, 46 schools, and 18 medical facilities.
- People without access to effective dust masks, eye protection, and drinking water and food uncontaminated by ash.

- Critical transportation infrastructure, including State and County highways, arterial streets, collector streets, neighborhood routes, local streets, and eight TriMet stations and bus and rail service equipment.
- Equipment at the City's seven fire department facilities, three police facilities, and one public works facility.
- Other critical infrastructure, including the Clean Water Services field operations facility, medical centers and the hospital, communication structures, drainage systems, and emergency generators.
- Artwork and other items of cultural importance at the Patricia Reser Center for the Arts.

3.3.8. *Wildland Fire*

Due to the density of the built environment, the City cannot be impacted by wildland fire. The most recent Washington County Wildfire Protection Plan shows the City as a High Density Urban area that is not a Forest Service Community at Risk and is not in one of the plan's strategic planning areas for wildland fire protection. Historically, the City has been more likely to be affected by smoke and poor air quality due to wildland fires outside its boundaries.

3.3.8.1. **Significant Events Since Adoption of the 2020 NHMP**

The City has not been directly impacted by a wildland fire event since the 2020 NHMP was adopted. However, in September 2020, multiple wildfires occurred concurrently in the County, outside the County, and outside the state, and significant smoke from the fires drifted into the City. At this time, the Air Quality Index in the City was between 108 and 328, with particulate matter 2.5 micrometers or smaller (PM_{2.5}).²⁹¹

Residents were advised to limit outdoor activities, susceptible populations (the very young, the elderly, and those who are frail) experienced increased breathing difficulties and outdoor events were cancelled, leading to economic impacts due to loss of revenue.

²⁹¹ The World Air Quality Index Project. (2022). Air Quality Historical Data Platform. City of Beaverton. <https://aqicn.org/data-platform/register/>

3.3.9. Windstorm, Including Tornado

The City sits at an elevation of 194 feet and historically has not experienced the same frequency of windstorms as that seen in parts of the county with higher elevations.

3.3.9.1. Potential Impacts

The potential impacts from a windstorm event are identified below. The type, magnitude, and extent of impacts can vary based on the scale of the event.

- Injuries or deaths.
- Displaced residents in need of sheltering.
- Delayed emergency response times due to debris, blocked transportation routes, and damaged infrastructure and vehicles.
- Extended operational hours of County staff and resources needed for response to the event.
- Economic impacts to governments, including reduced future revenues, increased costs resulting from response activities, and increased future costs resulting from recovery and reconstruction activities.
- Industries can experience commerce losses from power interruptions, damaged buildings and assets, and road closures. Industries can also sustain direct losses to buildings, personnel, and other vital equipment.
- Personal and household economic impacts from loss of income, increased medical costs, and property damage that may not be covered by insurance.
- Damage and destruction to the built environment, including aboveground utility lines; residential, public, and private buildings; and transportation systems. Significant damage could lead to the complete loss of structures or totaled vehicles.
- Disruption of essential infrastructure systems, such as power systems, public utilities, telecommunications, and transportation routes.
- Debris from trees and damaged property causing blocked road and rail transportation routes.
- Downed or damaged power lines can lead to wildfires.
- Power outages.
- Harm to ecosystems from loss of habitat, and death and destruction of vegetation and animals.
- Damage to crops, livestock, vegetation, parks, and natural systems.

3.3.9.2. Vulnerabilities

All populations, economies, structures, improved property, critical facilities and infrastructure, historical properties and cultural resources, and natural environments in the City are vulnerable to windstorms, including tornadoes. This includes:

- Critical facilities and infrastructure identified by the City, including 46 schools, 18 medical facilities, 7 city facilities, 18 assisted living facilities, 5 fire department facilities, 2 police facilities, one Clean Water Services field operations facility, and one arts center.²⁹²

²⁹² City of Beaverton 2023 NHMP planning documentation

- Older buildings and infrastructure not built to withstand high winds, including manufactured homes and buildings. This may include the 50 critical facilities known to be built prior to 1993, which are 6 assisted living facilities, 9 medical facilities, including a level II hospital, 5 city facilities, including the public works operations facility and the municipal court, 29 schools, and the Washington County Sheriff's Office East Precinct location.²⁹³
- Equipment at the City's five fire department facilities, two police facilities, and one Clean Water Services field operations facility.
- Aboveground utility and power lines, and infrastructure including roads, bridges, and TriMet light rail.
- Other critical infrastructure, including communication structures and emergency generators.
- Trees and outdoor signs.
- If the windstorm is accompanied by rain, blowing leaves and debris may clog catch basins, which can contribute to localized inundation flooding.

²⁹³ City of Beaverton 2023 NHMP planning documentation

3.3.10. Winter Storm

The City has an elevation of 189 feet and historically has not experienced the same frequency and intensity of winter storms as that seen in parts of the county with higher elevations. Heavy snowfall rarely occurs in Beaverton. When it does occur, many of the subsequent problems are related to the public's lack of familiarity in dealing with such conditions.

3.3.10.1. Potential Impacts

The potential impacts from a winter storm event are identified below. The type, magnitude, and extent of impacts can vary based on the scale of the event.

- Injuries or deaths, including from carbon monoxide poisoning, falls from slick or icy conditions, frostbite, and hypothermia.
- Delayed emergency response times due to debris, blocked transportation routes, damaged infrastructure and vehicles, and difficulty using fire hydrants because of frozen or damaged water system components.
- Stranded travelers due to ice, snow, and transportation impacts.
- Extended operational hours of County staff and resources needed for response to the event.
- Economic impacts to governments, including reduced future revenues, increased costs resulting from response activities, and increased future costs resulting from recovery and reconstruction activities.
- Industries can experience commerce losses from power interruptions, damaged buildings and assets, and road closures. Industries can also sustain direct losses to buildings, personnel, and other vital equipment.
- Personal and household economic impacts from loss of income, increased medical costs, and property damage that may not be covered by insurance.
- Damage and destruction to the built environment, including aboveground utility lines; residential, public, and private buildings; and transportation systems.
- An increased number of house fires due to unsafe alternate heating methods.
- Significant property damage and loss of water due to frozen or damaged pipes or the thawing of frozen pipes.
- Disruption of essential infrastructure systems, such as power systems, public utilities, telecommunications, and transportation routes.
- Debris from trees and damaged property, causing blocked road and rail transportation routes.
- Downed or damaged power lines can lead to wildfires, and tree debris can create fuel load for wildfire.
- Power outages.
- Harm to ecosystems from loss of habitat, and death and destruction of vegetation and animals.
- Damage to crops, livestock, vegetation, parks, and natural systems.
- Concurrent hazards, including flooding.

3.3.10.2. Vulnerabilities

All populations, economies, structures, improved property, critical facilities and infrastructure, historical properties and cultural resources, and natural environments in the City are vulnerable to winter storms. This includes:

- People who do not have access to sufficient heating, insulated clothing, or dry living conditions, including unhoused populations.
- Older adults and infants, people who take specific medications, people who have certain medical conditions, and people who have been drinking alcohol are at increased risk for hypothermia. This may include those living in or spending time in the City's 18 assisted living facilities, 46 schools, and 18 medical facilities.
- People improperly using generators and heating devices.
- Critical infrastructure and facilities vulnerable to winter storms include 46 schools, 18 medical facilities, 7 city facilities, 18 assisted living facilities, 5 fire department facilities, 2 police facilities, one Clean Water Services field operations facility, and one arts center.²⁹⁴
- Older buildings and infrastructure not built to withstand the weight and impacts of large amounts of snow and ice landing on the roof. This may include the 50 critical facilities known to be built prior to 1993, which are 6 assisted living facilities, 9 medical facilities, including a level II hospital, 5 city facilities, including the public works operations facility and the municipal court, 29 schools, and the Washington County Sheriff's Office East Precinct location.²⁹⁵
- Critical transportation infrastructure, including State and County highways, arterial streets, collector streets, neighborhood routes, local streets, and eight TriMet stations and bus and rail service equipment.
- Equipment at the City's seven fire department facilities, three police facilities, and one public works facility.
- Other critical infrastructure, including communication structures and emergency generators.

²⁹⁴ City of Beaverton 2023 NHMP planning documentation

²⁹⁵ City of Beaverton 2023 NHMP planning documentation

3.4. Historical Events

Hazard events that have affected the entire planning area since the 2017 NHMP update are detailed in Volume I, Section 2. The City has experienced impacts from widespread extreme heat events since the 2020 City of Beaverton NHMP.

One disaster declaration was issued by the City since the 2020 NHMP update. A disaster declaration for the COVID-19 pandemic was in effect from March 13, 2020, to March 31, 2021. Although pandemic is not a hazard included in this NHMP, this declaration is noted because FEMA provided support and Hazard Mitigation Grant Program funding during the event.

3.5. Overall Vulnerability

Based on the analysis completed by the Technical Committee, extreme heat, windstorm, including tornado, winter storm, drought, and earthquake present the highest relative risk to the City of Beaverton. These hazards can create widespread events, and all populations, economies, structures, improved property, critical facilities and infrastructure, historical properties and cultural resources, and natural environments in the City can be vulnerable to these hazards.

Areas of greatest vulnerability to these hazards within the City include:

- Higher vulnerability populations, such as those with preexisting health conditions, older adults, children, and pregnant women. This may include those living in or spending time in the City's 18 assisted living facilities, 46 schools, and 18 medical facilities.
- Populations that are unhoused, do not have access to private transportation, and/or are without access to air conditioning, cooling equipment, sufficient heating, and clean water.
- People living, working, or spending time in heat islands within the City.
- Populations with limited income and financial resources.
- Populations whose primary language is not English.
- Industries that can experience commerce losses from power interruptions, damaged buildings and assets, and road closures. Industries can also sustain direct losses to buildings, personnel, and other vital equipment.
- Economic impacts to the City, including loss of local revenue due to business and property tax losses, reduced future revenues, reduced recreation and tourism activity, increased costs resulting from response activities, and increased future costs resulting from recovery and reconstruction activities.
- Critical facilities and infrastructure identified by the City, including 46 schools, 18 medical facilities, 7 city facilities, 18 assisted living facilities, 5 fire department facilities, 2 police facilities, one Clean Water Services field operations facility, and one arts center.²⁹⁶
- Older buildings and infrastructure not built to current building codes or seismic standards may be more vulnerable. This may include the 50 critical facilities known to be built prior to 1993, which are 6 assisted living facilities, 9 medical facilities, including a level II hospital, 5 city facilities, including the public works operations facility and the municipal court, 29 schools, and the Washington County Sheriff's Office East Precinct location.²⁹⁷

²⁹⁶ City of Beaverton 2023 NHMP planning documentation

²⁹⁷ City of Beaverton 2023 NHMP planning documentation

- There is one assisted living facility and one elementary school that are located on an active fault line.²⁹⁸
- Critical transportation infrastructure, including State and County highways, arterial streets, collector streets, neighborhood routes, local streets, and eight TriMet stations and bus and rail service equipment.
- Equipment at the City's five fire department facilities, two police facilities, and one Clean Water Services field operations facility.
- Water supply in the upper Tualatin River, the City's source of groundwater.

4. Capability Assessment

(In compliance with 44 CFR §201.6(c)(3))

The following capability assessment and safe growth analysis examine the ability of the City to implement and manage a comprehensive mitigation strategy. Strengths, opportunities, and resources of the jurisdiction are identified to develop an effective hazard mitigation action plan. The capabilities identified in this assessment were evaluated collectively to develop feasible recommendations that support the implementation of effective mitigation activities.

A capability questionnaire was distributed to the City of Beaverton Technical Committee to initiate this assessment. The survey included questions regarding existing plans, policies, and regulations that contribute to or hinder the ability to implement hazard mitigation activities, including legal and regulatory capabilities, administrative and technical capabilities, education and outreach capabilities, and fiscal capabilities. The Technical Committee also completed a safe growth analysis to identify potential gaps in growth guidance instruments and improvements that could be made to reduce vulnerability to future development.

4.1. Planning and Regulatory Assessment

Planning and regulatory capabilities include plans, policies, codes, and ordinances within the City that can prevent and reduce the impacts of hazards.

The City's Comprehensive Plan, Capital Improvement Plan, Local Emergency Operations Plan, Stormwater Management Plan, and Community Wildfire Protection Plan address natural hazards, identify projects that may be included in the mitigation strategy, and may serve as vehicles for implementing mitigation actions.

The City's Comprehensive Plan 2035, created in 2022, includes discussion of natural hazards and the need for increasing awareness about hazards and ways to mitigate them. Additionally, land use policies discourage development or redevelopment within natural hazard areas. The Comprehensive Plan also discusses the need to provide future growth through strategic infill, while also providing adequate space for expected future growth in areas located outside natural hazard areas.

The City's capital improvement program provides funding for hazard mitigation projects identified in this NHMP. The program also limits expenditures on projects that would encourage development in areas vulnerable to natural hazards. The City's infrastructure policies do not limit extension of existing facilities and services that would encourage development in areas vulnerable to natural hazards.

²⁹⁸ City of Beaverton 2023 NHMP planning documentation

A Climate Action Plan, adopted in 2019, contains 86 actions across 5 framework categories designed to reduce community emissions and safeguard Beaverton from the impacts of higher temperatures. The plan serves as the guiding document for the city's climate action work and promotes mitigation efforts, such as planning for flooding, landslides, and wildfire.

The continuity of operations plans for some City departments were complete in response to the COVID-19 pandemic.

Transportation planning initiatives, including the Transportation System Plan, Active Transportation Plan, and Transportation Element of the City's Comprehensive Plan, discuss designing facilities to respect the characteristics of natural hazards. These initiatives may be used to identify projects that can be included in the mitigation strategy and can be used to implement mitigation actions. The Regional Disaster Preparedness Organization with Metro is working to update the regional Emergency Transportation Route maps, and the City is a part of this effort.

The City's corridor plans recognize the need to avoid areas susceptible to the impact of natural hazards and to mitigate natural hazards in such areas. Beaverton transportation planning initiatives, including the Transportation System Plan and Active Transportation Plan, limit access to identified hazard areas and are used to guide growth into safe locations. The City and its transportation plans do not have movement systems designed to function under disaster conditions, such as during an evacuation. The community also supports a Bicycle Advisory Committee to promote bicycling and related modes of active transportation within and around the City of Beaverton.

Land use planning and ordinances are adequately administered and enforced and are an effective measure for reducing hazard impacts. These include zoning, subdivision, floodplain, and natural hazard-specific ordinances and the utilization of flood insurance rate maps.

The City's Community Development Department leads and facilitates review of land use applications and enforces site plan review requirements. The City of Beaverton utilizes the most current building codes as they are adopted by the State of Oregon. The City's building code contains provisions to strengthen construction to withstand hazard forces, including efforts to elevate structures.

City zoning ordinances within the development code conform to the City's Comprehensive Plan by discouraging development or redevelopment within areas known to be affected by natural hazards. Ordinances include prohibiting development within wetlands, floodways, and floodplains, or filling areas thus identified. Community maps also include natural hazard overlay zones that establish conditions for land use within such hazard zones. Rezoning procedures recognize natural hazard areas as off limits to any zoning changes that would allow for increased activity or development in the area, but zoning changes allow greater intensity or density of use by using infill in currently established sections of the City.

The City's development code regulates subdivision proposals to minimize flood damage by including requirements for adequate drainage that will reduce exposure to current and future structures from flood damage by establishing base flood elevations. The City does support development of conservation subdivisions that devote at least half of potentially buildable land area to undivided, permanently protected open space; nor does it allow conservation subdivisions or cluster subdivisions in order to conserve environmental resources or permit density transfer where hazard areas exist.

City environmental systems discourage development in areas currently or potentially affected by hazards. Identified hazard areas are mapped. City policies, including land use policies, are designed to maintain and restore protective ecosystems. The City does not have policies that provide incentives to development that is located outside protective ecosystems.

Tualatin Valley Fire & Rescue (TVF&R) provides fire protection and emergency medical services to the City. TVF&R's Insurance Services Office (ISO) rating is two. Many City policies and procedures are related to and support the goals in this NHMP, safe growth objectives, and public safety. The monitoring

and implementation section of the NHMP covers these and all other hazard mitigation strategies discussed in the plan.

4.1.1. National Flood Insurance Program Compliance

Participation in the NFIP is based on a voluntary agreement between a community and FEMA. For communities that adopt a floodplain management ordinance to reduce flood risks to new construction, federally backed flood insurance is made available to property owners in the community. Compliance with the NFIP, however, extends beyond participation in the program. The three basic components of the NFIP include floodplain identification and mapping risk, responsible floodplain management, and making flood insurance available to property owners.

An RL property is a property insured under the NFIP that the program has paid at least two claims of more than \$1,000 in any 10-year period since 1978, regardless of any change(s) of ownership during that period. As of September 30, 2021, there are six City-identified RL properties in the City. FEMA notes that there are seven properties; however, one is outside City limits. There are no severe repetitive loss (SRL) properties in the City.

All but one of the RL properties experienced two losses each. The other RL property has experienced three losses. There are no clusters or concentrations of RL properties within the City; however, two of the properties are neighboring homes that suffered losses during the same event. The second loss for each of these two properties occurred at different times.

4.1.1.1. National Flood Insurance Program Details

Insurance Summary

There are currently 275 NFIP policies in force in the City with coverage totaling \$80,376,300. A total amount of \$448,027 has been paid on 31 claims, and no substantial damage claims have been paid.

There are 355 structures exposed to the 1% annual chance of flooding within the community.²⁹⁹

Staff Resources

There are no barriers to running an effective NFIP program in the City. The City's NFIP Coordinator is certified and works in the Community Development Department. The planner who executes floodplain management functions also handles development applications outside the floodplain. NFIP administration services in the City include permit review for new development in the floodplain and alterations, GIS management of floodplain data and determining the base flood elevation, education with homeowners and property owners, coordination with the Community Development Department on structural reviews, and review of capital projects affecting the floodplain.

Compliance History

The City is in good standing with the NFIP and there are no outstanding compliance issues. The most recent Community Assistance Visit (CAV) or Community Assistance Contact (CAC) was on May 25, 2016.

The City will continue to maintain NFIP compliance during the next five years of NHMP implementation by enforcing floodplain management requirements, including addressing flood concerns that may arise in developing new construction and making substantial improvements to structures located within SFHAs;

²⁹⁹ Oregon Department of Geology and Mineral Industries. (2022). Open-File Report O-22-04: Natural Hazard Risk Report for Washington County. <https://www.oregongeology.org/pubs/ofr/O-22-04/p-O-22-04.htm>

maintaining and using floodplain mapping as part of the City's land management plan; and making code amendments needed to maintain compliance.

Regulation

The City entered the NFIP on February 1, 1974, and retains both digital and paper flood insurance rate maps (FIRMs). Floodplain development regulations meet the minimum FEMA and state requirements.

To receive a permit for development within the floodplain, the applicant must provide the following information in addition to that normally required for a building permit: elevation of the lowest floor, and certification showing that floodproofing has been maintained on the structure. The City Engineer may also require the applicant to provide a detailed hydrologic data report and an environmental assessment report. There are also established construction standards for property built in SFHAs. Section 8.02.140 of the City's building code includes a Structural Specialty Code Appendix G Flood-Resistant Construction, which provides comprehensive regulations aimed at minimizing public and private losses due to flood conditions in specific flood hazard areas through the management of flood hazard areas.

Community Rating System

The City does not participate in the NFIP Community Rating System program.

4.2. Administrative and Technical Assessment

This portion of the assessment includes staff and their skills and tools that can be used for mitigation planning and to implement specific mitigation actions.

The City's Planning Commission is the decision-making authority for applications that deal with uses of land. The commission also advises the City Council on development code text amendments, zone changes, and applications to amend the City's Comprehensive Plan. The Mitigation Technical Committee works together effectively to update and maintain the NHMP.

The Public Works Operations and Maintenance Division administers maintenance programs to reduce risk, including tree trimming and landscaping, street inspections, underground sanitary sewer and storm drainage pipes, and water quality facilities. The City also has in place multiple effective mutual aid agreements and planning partnerships, including intergovernmental agreements, the Oregon Water/Wastewater Agency Response Network, Washington County Emergency Management Cooperative, the Regional Disaster Preparedness Organization, and the Cooperative Public Agencies of Washington County.

The City of Beaverton has adequate staffing levels to enforce regulations. Staff are trained on hazards and mitigation efforts, and coordination on mitigation initiatives with staff is effective. The Chief Building Official is part of the Community Development Department and is a full-time position. This department also employs full-time staff dedicated to building inspection, planning and zoning, site development, transportation planning, and floodplain management. The Emergency Management Program includes full-time staff and reports directly to one of the Assistant City Managers.

Staff with the capacity to support the mitigation strategy work in multiple City departments. Such staff includes planners and engineers with an understanding of natural hazards; engineers and professionals trained in construction practices related to buildings and infrastructure; staff with education or expertise to assess vulnerability to hazards; and GIS staff and coordinators.

The Climate Action Task Force serves as a community engagement forum for climate action. It enhances the City Council's awareness of community perspectives related to climate change and provides feedback on the potential impact of climate action-related projects and activities on members of the community affected by natural hazards such as those included in this NHMP.

Additionally, the City's many technical capabilities include assets that have been used to assess or mitigate risk and are available to do so in the future. Warning systems include the Everbridge Public Warning Platform and Washington County's OR-Alert mass notification alert system. Grant writing is completed by individual departments as needed. The City maintains a robust GIS program that has created mapping products specific to each department. Hazard data and information can be pulled from a variety of sources, including historical records and DOGAMI.

4.3. Education and Outreach Assessment

Education and outreach programs and methods currently in place were assessed to determine the City's capabilities. These programs and their communications channels may be used to implement mitigation activities and communicate hazard-related information.

The City of Beaverton Emergency Management Program participates in public engagement, education, and outreach efforts using a variety of methods. Mitigation and preparedness resources for businesses, communities, older adults, and special needs populations are available on the City's website, and the City's social media accounts and "Your City" newsletter are utilized to increase awareness and publicize educational material.

Additionally, the City involves residents in mitigation efforts through the support of a Community Emergency Response Team (CERT), Neighborhood Association Committee, Homeowners Owners Associations, and the Beaverton Committee for Community Involvement. There are also Neighborhood Emergency Preparedness Fairs, where both English- and Spanish-language print materials and hazard guidance are distributed. The Neighborhood Association Committee's Neighborhood Matching Grant Program is available to fund resilience projects and related efforts.

4.4. Financial Assessment

The City has access to, or is eligible to potentially use, the following funding resources for hazard mitigation initiatives:

- Capital improvements project funding
- Authority to levy taxes for specific purposes
- Fees for water, sewer, gas, and/or electric services
- Impact fees for new development
- Stormwater utility fees
- Incurrence of debt through general obligation bonds and/or special tax bonds
- Incurrence of debt through private activities
- Federal funding sources, including the Office of Housing and Urban Development (HUD) Community Development Block Grant (CDBG); the Department of Homeland Security's Urban Areas Security Initiative (UASI); FEMA's Building Resilient Infrastructure and Communities (BRIC) program; FEMA's Hazard Mitigation Assistance Grants; and the Department of Homeland Security's State Homeland Security Program (SHSP)
- State funding programs, including the State Preparedness and Incident Response Equipment (SPIRE) Grant Program

4.5. Capability Expansion and Improvement

Actions that can expand and improve existing authorities, plans, policies, and resources for mitigation include continuing to update City plans as necessary to ensure they are current and reflect the needs of

the community; budgeting for mitigation actions; passing policies and procedures that support mitigation actions; and adopting and implementing stricter mitigation regulations.

5. Mitigation Strategy

(In compliance with 44 CFR §201.6(c)(3)(i), §201.6(c)(3)(ii), §201.6(c)(3)(iii), §201.6(c)(3)(iv), and §201.6(c)(4)(ii))

The mitigation strategy serves as the long-term blueprint for reducing the potential losses identified in the risk assessment. The Robert T. Stafford Disaster Relief and Emergency Assistance Act (Stafford Act) directs local mitigation plans to describe a jurisdiction's hazard mitigation actions and to establish a strategy for implementing current and proposed actions. As such, all requirements set forth in 44 CFR provide guidance for developing state and local mitigation plans that lead to the creation and support of the mitigation strategy.

5.1. Mitigation Goals

The Washington County NHMP Steering Committee reviewed and evaluated goals outlined in the 2017 Washington County NHMP; the 2020 City of Beaverton NHMP; the 2011 LHMPs for the Cities of Cornelius and Forest Grove; and the 2020 State of Oregon NHMP. The goals from each plan were grouped by topic and synthesized to create the seven goals detailed in Volume I, Section 3. These goals are also the basis of the Washington County NHMP and discuss what the Steering Committee intends to accomplish by implementing this plan.

5.2. Mitigation Successes

*Beaverton Purple Pipe*³⁰⁰

The Beaverton Purple Pipe program is a water system that will route cleaned, non-potable stormwater for irrigation and stream recharge to irrigate green spaces like parks, school grounds, and yards. The program waters green spaces and conserves chlorinated, fluoridated high-quality water for drinking and other consumable uses.

As of June 2022, approximately 3.5 miles of Purple Pipe have been installed in the South Cooper Mountain area. The distribution system is anticipated to be built-out in this area over a five-year period. Also as of June 2022, design of the stormwater treatment system to filter and treat raw stormwater received by the Sterling Park Stormwater Detention Facility and other associated improvements is complete. Construction is anticipated to begin in September 2022 to achieve substantial completion by June 2023.

Willamette Water Supply

The Willamette Water Supply will provide seismic resiliency and a separate source of drinking water with separate transmission pipeline and water storage facilities

³⁰⁰ City of Beaverton. (n.d.). Beaverton Purple Pipe. <https://beavertonoregon.gov/1523/Beaverton-Purple-Pipe>

5.3. Plan Incorporation and Integration into Existing Planning Mechanisms

Based on the requirements in 44 CFR §201.6(c)(4)(ii), the vulnerability and capabilities assessment for the City was carefully reviewed and considered when developing the mitigation actions for this plan. The City's Technical Committee will establish a process in which the mitigation strategy, goals, objectives, and actions outlined in this plan will be incorporated into the existing local planning strategies.

Once the plan is adopted, the committee will coordinate implementation with the responsible parties in the City and with external stakeholders as needed. The primary means for integrating mitigation strategies will be through the revision, update, and implementation of plans and regulations as feasible, including the City's Comprehensive Plan, Capital Improvement Plan, and land development regulation.

The members of the City's Technical Committee will remain charged with ensuring the goals and strategies of new and updated local planning documents for their jurisdictions and special districts are consistent with the goals and actions in the NHMP and will not contribute to increased hazard vulnerability.

5.3.1. *Comprehensive Plan*

The most extensive update to the City's Comprehensive Plan occurred in 2002. Plan elements are being updated as necessary to reflect the current and future condition and needs of the community, including recent development, demographic trends, and projected growth. Typically, elements are updated every 10 years. Additional details about hazard mitigation will be added to plan elements as they are updated, as applicable.

5.3.2. *Building and Zoning Codes*

The City's building code implements and enforces the State of Oregon building codes. These codes include project specifications to mitigate against the potential effects of earthquakes, expansive soils, and flooding, and will be reviewed and amended, as necessary. Ongoing City GIS analyses include studying the age of buildings located in Beaverton against major changes to the building code in an effort to mitigate against seismic hazards. This involves modifying the building code as needed.

5.3.3. *Public Engagement, Education, and Outreach*

The City of Beaverton Emergency Management Program will continue to participate in public engagement, education, and outreach efforts using a variety of methods. Mitigation and preparedness resources for businesses, communities, older adults, and those with special needs are available on the City's website and the City's social media accounts. The "Your City" newsletter is utilized to increase awareness and publicize the availability of educational material. Hard copies of such material is offered in City buildings with a high-traffic volume to reach persons who may not have access to the Internet.

Additionally, the City will continue to involve residents in the Community Emergency Response Team (CERT), Neighborhood Association Committees, Homeowners Owners Associations, and the Beaverton Committee for Community Involvement. Neighborhood Emergency Preparedness Fairs offer the opportunity to share English- and Spanish-language material, and the Neighborhood Association Committee's Neighborhood Matching Grant Program will continue to be available for projects that promote resiliency.

5.3.4. Land Development Regulations

The City's land development code, implemented by the Community Development Department, regulates residential land use districts, commercial land use districts, employment and industrial land use districts, and multiple other land use districts. This code includes specifications for the range of built and natural environmental projects and includes landscape, open space, and natural areas design standards, floodplain regulations, habitat friendly development practices, trees and vegetation, utility undergrounding, and natural resources.³⁰¹

Updates to this code and additions for other areas of hazard mitigation strategies can be integrated into future amendment efforts, as appropriate.

5.3.5. Floodplain Management Program and/or National Flood Insurance Program

The City of Beaverton Community Development Department and Emergency Management staff will continue to review information about RL properties and incorporate new findings into the City's mitigation strategy, as appropriate. The City's floodplain management program is implemented through the City's code. Updates to the codes relating to floodplains and additions for other areas of hazard mitigation can be integrated into future amendment efforts.

5.3.6. Stormwater Management Plans and Procedures

The City will review and update stormwater codes, including Chapters 4.06 and 4.07, as needed to support mitigation goals.

5.3.7. Emergency Plans That Address Evacuation and Sheltering

The City works with Washington County on sheltering efforts as needed and will continue to do so.

5.3.8. Funding Opportunities

The City of Beaverton Emergency Management Program will continue to review annual, post-disaster, and stand-alone grant opportunities for potential mitigation project funding opportunities. Various City departments develop Capital Improvement Programs and review them on an annual basis. The NHMP Steering Committee will work with these departments to identify action items from the City's Capital Improvement Plan that may be integrated into appropriate sections of the plan.

³⁰¹ City of Beaverton. (2022). Beaverton Development Code. <https://online.encodeplus.com/regs/beaverton-or/doc-viewer.aspx#secid--1>

6. Action Items

The City of Beaverton’s action items in the 2020 NHMP were determined by the 2020 City of Beaverton planning team. Action items listed therein and the status of each action are outlined in Section 6.1 below.

New action items for the 2023 NHMP were determined by the City’s Technical Committee and based on the review of the community’s risk assessment; the City’s existing capabilities; and the status of previously identified mitigation action items. This comprehensive range of actions considers existing local plans and regulations; structure and infrastructure projects; natural systems protections; and education and awareness programs. A summary of these actions and full action item planning worksheets are provided in Sections 6.2 and 6.3 below. Additional information about how these actions were developed, evaluated, and prioritized is in Volume I, Section 3.

6.1. Status of City of Beaverton Action Items from the 2020 City of Beaverton NHMP

Table 63: Status of Action Items from the 2020 NHMP

Action Item Number*	Action Item Description	Hazard(s) Addressed	Current Status
Short-Term 2	Reduce non-structural hazards in homes, schools, businesses, and government offices.	Earthquake	Ongoing
Short-Term 3	Pursue structural mitigation of critical facilities, infrastructure, public buildings, and schools for the earthquake threat.	Earthquake	Ongoing
Short-Term 4	Improve technical data and analysis of earthquake hazards.	Earthquake	Current
Long-Term 1	Establish a program aimed at helping private property owners and businesses preform structural retrofiting.	Earthquake	Ongoing
Long-Term 3	Develop public/private partnerships to pursue efficient methods to retrofit structures.	Earthquake	Ongoing
Long-Term 4	Improve local capabilities to preform earthquake building safety evaluations.	Earthquake	Ongoing

Action Item Number*	Action Item Description	Hazard(s) Addressed	Current Status
Long-Term 5	Provide information to Beaverton residents about earthquakes and opportunities to mitigate earthquake hazards in their homes.	Earthquake	Current
Short-Term 2	Analyze each repetitive loss property to identify viable mitigation options.	Flooding	Ongoing
Short-Term 3	Develop mitigation and preparedness measures for critical public infrastructure and facilities located in flood hazard areas.	Flooding	Ongoing
Long-Term 1	Develop acquisition and management strategies to preserve open space in the floodplain.	Flooding	Ongoing
Long-Term 1	Improve knowledge of landslide hazard areas and understanding of vulnerability and risk to life and property in those areas.	Landslide	Current
Long-Term 2	Limit activities in identified hazard areas through regulation and public outreach.	Landslide	Ongoing
Long-Term 3	Protect existing development in landslide-prone areas.	Landslide	Ongoing
Long-Term 3	Develop and maintain a comprehensive impacts database and when possible, map historical severe weather events in Beaverton.	Severe Weather**	Ongoing
Short-Term 1	Identify critical facilities and industries that may be affected by ashfall and collaborate with them on ashfall emergency response.	Volcano, Volcanic Ash	Ongoing
Short-Term 2	Collaborate with U.S. Geological Survey Cascades Volcano Observatory and related agencies to increase awareness of volcanic response efforts through ashfall-related messages.	Volcano, Volcanic Ash	Ongoing
Short-Term 2	Identify and pursue funding opportunities to develop and implement local mitigation activities.	Multi-Hazard	Ongoing
Short-Term 3	Develop public and private partnerships to foster natural hazard program coordination and collaboration within the Beaverton Urban Service Boundary.	Multi-Hazard	Ongoing
Short-Term 4	Encourage Beaverton households and businesses to purchase natural hazard insurance.	Multi-Hazard	Ongoing
Long-Term 1	Increase technical knowledge of natural hazards and mitigation strategies in Beaverton and implement policies and programs based on this knowledge.	Multi-Hazard	Ongoing

Action Item Number*	Action Item Description	Hazard(s) Addressed	Current Status
Long-Term 3	Create and maintain a system to support populations with special needs within Beaverton’s city limits.	Multi-Hazard	Ongoing

* Number given to action item in 2020 City of Beaverton NHMP

** Not a hazard in the 2023 Washington County NHMP

6.2. City of Beaverton Action Items: 2023 Washington County NHMP

Table 64: City of Beaverton Action Items

Action Item Number	Action Item Description	Hazard(s) Addressed	Priority
Short-Term 1*	Identify funding sources for implementing earthquake mitigation in Beaverton.	Earthquake	
Long-Term 1	Harden and improve the City water system.	Earthquake	
Long-Term 2	Improve and replace the City sewer system.	Earthquake	
Long-Term 3	Improve, replace, and expand the City stormwater system.	Earthquake	
Long-Term 2*	Provide flood event education and outreach to households and businesses.	Flooding	
Long-Term 5*	Update the City code to improve risk reduction and prevention of natural hazard impacts.	Flooding	
Long-Term 6*	Create a regional partnership to reduce flood loss across the region.	Flooding	
Long-Term 2*	Establish a plan for ash removal following a volcanic event.	Volcanic ash	

* Number given to action item in 2020 City of Beaverton NHMP

Estimated Benefit	
Primary Benefit(s)	Financial Benefit(s) (Est. Cost x 6)
Implementation of earthquake mitigation projects that result in the protection of people and property throughout the City.	To be determined
Project Timeline	
Expected Timeline for Completion	
Short-term <input type="checkbox"/> Mid-term <input type="checkbox"/> Long-term <input checked="" type="checkbox"/> Ongoing <input type="checkbox"/>	
Implementation Progress Report for Plan Maintenance	
Date	
What progress in implementation has been made to date?	
What challenges in implementation have been experienced?	
What are the next steps in implementation?	

Table 66: Harden and Improve the City Water System

Mitigation Action Information	
Title of action	Harden and Improve the City Water System
Type of action	Plans/regulations <input type="checkbox"/> Natural systems protection <input type="checkbox"/> Structure and infrastructure project <input checked="" type="checkbox"/> Public education/awareness <input type="checkbox"/>
Action description	Make the City’s water supply more resilient to earthquake hazards by seismically hardening and improving the system.
Hazard(s) addressed	Dam failure <input type="checkbox"/> Flood <input type="checkbox"/> Windstorm, incl. tornado <input type="checkbox"/> Drought <input type="checkbox"/> Landslide <input type="checkbox"/> Winter storm <input type="checkbox"/> Earthquake <input checked="" type="checkbox"/> Volcanic ash <input type="checkbox"/> Extreme heat <input type="checkbox"/> Wildland fire <input type="checkbox"/>
How does the action address identified current or future risks and vulnerabilities?	Water is critical for public drinking, firefighting, and sanitation and ensuring it is resilient against earthquake hazards it vital to community health and recovery.
Mitigation Action Integration	
Alignment with NHMP goals	Goal 1 <input checked="" type="checkbox"/> Goal 4 <input type="checkbox"/> Goal 7 <input checked="" type="checkbox"/> Goal 2 <input type="checkbox"/> Goal 5 <input type="checkbox"/> Goal 3 <input type="checkbox"/> Goal 6 <input type="checkbox"/>
Integration into other initiatives	To be determined
Alignment with existing plans and policies	To be determined
Mitigation Action Implementation Plan	
Priority	Low <input type="checkbox"/> Medium <input checked="" type="checkbox"/> High <input type="checkbox"/>
Lead position, office, department, or division responsible for implementation	Emergency Management
Potential Funding Sources	
Non-Federal Funding Sources	Federal Funding Sources
General Fund	BRIC and FMA grants through FEMA
Estimated Cost	To be determined
Estimated Benefit	
Primary Benefit(s)	Financial Benefit(s) (Est. Cost x 6)
Reduction of risk to people and property from earthquakes and lack of water.	To be determined

Project Timeline	
Expected Timeline for Completion	
Short-term <input type="checkbox"/> Mid-term <input type="checkbox"/> Long-term <input checked="" type="checkbox"/> Ongoing <input type="checkbox"/>	
Implementation Progress Report for Plan Maintenance	
Date	
What progress in implementation has been made to date?	
What challenges in implementation have been experienced?	
What are the next steps in implementation?	

Table 67: Improve and Replace the City Sewer System

Mitigation Action Information	
Title of action	Improve and Replace the City Sewer System
Type of action	Plans/regulations <input type="checkbox"/> Natural systems protection <input type="checkbox"/> Structure and infrastructure project <input checked="" type="checkbox"/> Public education/awareness <input type="checkbox"/>
Action description	Assess the seismic strength of the City’s sewer system and develop improvements accordingly.
Hazard(s) addressed	Dam failure <input type="checkbox"/> Flood <input type="checkbox"/> Windstorm, incl. tornado <input type="checkbox"/> Drought <input type="checkbox"/> Landslide <input type="checkbox"/> Winter storm <input type="checkbox"/> Earthquake <input checked="" type="checkbox"/> Volcanic ash <input type="checkbox"/> Extreme heat <input type="checkbox"/> Wildland fire <input type="checkbox"/>
How does the action address identified current or future risks and vulnerabilities?	The City’s sewer system could be vulnerable to seismic activity. If damaged, the system could release untreated water or sewage into the City.
Mitigation Action Integration	
Alignment with NHMP goals	Goal 1 <input checked="" type="checkbox"/> Goal 4 <input type="checkbox"/> Goal 7 <input type="checkbox"/> Goal 2 <input type="checkbox"/> Goal 5 <input type="checkbox"/> Goal 3 <input type="checkbox"/> Goal 6 <input type="checkbox"/>
Integration into other initiatives	To be determined
Alignment with existing plans and policies	To be determined
Mitigation Action Implementation Plan	
Priority	Low <input type="checkbox"/> Medium <input checked="" type="checkbox"/> High <input type="checkbox"/>
Lead position, office, department, or division responsible for implementation	Emergency Management
Potential Funding Sources	
Non-Federal Funding Sources	Federal Funding Sources
General Fund	BRIC and FMA grants through FEMA
Estimated Cost	To be determined
Estimated Benefit	
Primary Benefit(s)	Financial Benefit(s) (Est. Cost x 6)
Decrease or eliminate earthquake risk to City’s sewer system.	To be determined

Project Timeline	
Expected Timeline for Completion	
Short-term <input type="checkbox"/> Mid-term <input type="checkbox"/> Long-term <input checked="" type="checkbox"/> Ongoing <input type="checkbox"/>	
Implementation Progress Report for Plan Maintenance	
Date	
What progress in implementation has been made to date?	
What challenges in implementation have been experienced?	
What are the next steps in implementation?	

Table 68: Improve, Replace, and Expand the City Stormwater System

Mitigation Action Information	
Title of action	Improve, Replace, and Expand the City Stormwater System
Type of action	Plans/regulations <input type="checkbox"/> Natural systems protection <input type="checkbox"/> Structure and infrastructure project <input checked="" type="checkbox"/> Public education/awareness <input type="checkbox"/>
Action description	Assess the seismic strength of the City’s stormwater system and develop improvements accordingly.
Hazard(s) addressed	Dam failure <input type="checkbox"/> Flood <input type="checkbox"/> Windstorm, incl. tornado <input type="checkbox"/> Drought <input type="checkbox"/> Landslide <input type="checkbox"/> Winter storm <input type="checkbox"/> Earthquake <input checked="" type="checkbox"/> Volcanic ash <input type="checkbox"/> Extreme heat <input type="checkbox"/> Wildland fire <input type="checkbox"/>
How does the action address identified current or future risks and vulnerabilities?	The City’s stormwater system could be vulnerable to seismic activity. If damaged, the system could release untreated water into the City and increase flooding hazards.
Mitigation Action Integration	
Alignment with NHMP goals	Goal 1 <input checked="" type="checkbox"/> Goal 4 <input type="checkbox"/> Goal 7 <input type="checkbox"/> Goal 2 <input type="checkbox"/> Goal 5 <input type="checkbox"/> Goal 3 <input type="checkbox"/> Goal 6 <input type="checkbox"/>
Integration into other initiatives	To be determined
Alignment with existing plans and policies	To be determined
Mitigation Action Implementation Plan	
Priority	Low <input type="checkbox"/> Medium <input checked="" type="checkbox"/> High <input type="checkbox"/>
Lead position, office, department, or division responsible for implementation	Emergency Management
Potential Funding Sources	
Non-Federal Funding Sources	Federal Funding Sources
General Fund	BRIC and FMA grants through FEMA
Estimated Cost	To be determined
Estimated Benefit	
Primary Benefit(s)	Financial Benefit(s) (Est. Cost x 6)
Decrease or eliminate earthquake risk to City’s stormwater system.	To be determined
Project Timeline	

Expected Timeline for Completion	
Short-term <input type="checkbox"/> Mid-term <input type="checkbox"/> Long-term <input checked="" type="checkbox"/> Ongoing <input type="checkbox"/>	
Implementation Progress Report for Plan Maintenance	
Date	
What progress in implementation has been made to date?	
What challenges in implementation have been experienced?	
What are the next steps in implementation?	

Integration into other initiatives	To be determined	
Alignment with existing plans and policies	To be determined	
Mitigation Action Implementation Plan		
Priority	Low <input type="checkbox"/> Medium <input checked="" type="checkbox"/> High <input type="checkbox"/>	
Lead position, office, department, or division responsible for implementation	Emergency Management	
Potential Funding Sources		
Non-Federal Funding Sources		Federal Funding Sources
General Fund		BRIC and FMA grants through FEMA
Estimated Cost	To be determined	
Estimated Benefit		
Primary Benefit(s)		Financial Benefit(s) (Est. Cost x 6)
Increased flood mitigation throughout the City for people and property.		To be determined
Project Timeline		
Expected Timeline for Completion		
Short-term <input type="checkbox"/> Mid-term <input type="checkbox"/> Long-term <input checked="" type="checkbox"/> Ongoing <input type="checkbox"/>		
Implementation Progress Report for Plan Maintenance		
Date		
What progress in implementation has been made to date?		
What challenges in implementation have been experienced?		
What are the next steps in implementation?		

Alignment with existing plans and policies	To be determined	
Mitigation Action Implementation Plan		
Priority	Low <input type="checkbox"/> Medium <input checked="" type="checkbox"/> High <input type="checkbox"/>	
Lead position, office, department, or division responsible for implementation	Emergency Management	
Potential Funding Sources		
Non-Federal Funding Sources		Federal Funding Sources
General Fund		BRIC and FMA grants through FEMA
Estimated Cost	To be determined	
Estimated Benefit		
Primary Benefit(s)		Financial Benefit(s) (Est. Cost x 6)
Increased flood mitigation throughout the City for people and property.		To be determined
Project Timeline		
Expected Timeline for Completion		
Short-term <input type="checkbox"/> Mid-term <input type="checkbox"/> Long-term <input checked="" type="checkbox"/> Ongoing <input type="checkbox"/>		
Implementation Progress Report for Plan Maintenance		
Date		
What progress in implementation has been made to date?		
What challenges in implementation have been experienced?		
What are the next steps in implementation?		

Potential Funding Sources	
Non-Federal Funding Sources	Federal Funding Sources
General Fund	BRIC and FMA grants through FEMA
Estimated Cost	To be determined
Estimated Benefit	
Primary Benefit(s)	Financial Benefit(s) (Est. Cost x 6)
Understanding the full flood risk of the City will allow for proper mitigation against the hazard citywide through plans/regulations, structure and infrastructure projects, natural systems protection, and public education and awareness actions.	To be determined
Project Timeline	
Expected Timeline for Completion	
Short-term <input type="checkbox"/> Mid-term <input type="checkbox"/> Long-term <input checked="" type="checkbox"/> Ongoing <input type="checkbox"/>	
Implementation Progress Report for Plan Maintenance	
Date	
What progress in implementation has been made to date?	
What challenges in implementation have been experienced?	
What are the next steps in implementation?	

Estimated Benefit	
Primary Benefit(s)	Financial Benefit(s) (Est. Cost x 6)
Coordinated response to volcanic ash removal will speed up clean up and recovery.	To be determined
Project Timeline	
Expected Timeline for Completion	
Short-term <input type="checkbox"/> Mid-term <input type="checkbox"/> Long-term <input checked="" type="checkbox"/> Ongoing <input type="checkbox"/>	
Implementation Progress Report for Plan Maintenance	
Date	
What progress in implementation has been made to date?	
What challenges in implementation have been experienced?	
What are the next steps in implementation?	