

City of Sandy Addendum to the Clackamas County Multi-Jurisdictional Natural Hazard Mitigation Plan



Photo Credit: City of Sandy

Effective:

April XX, 2024 – April XX, 2029

Prepared for
The City of Sandy



Updated:

Date, 2024, (Resolution # 2024-xx)

December 2, 2019, (Resolution # 2019-23)

2013

2009

This Natural Hazard Mitigation Plan was prepared by:



UNIVERSITY OF
OREGON

School of Planning, Public
Policy and Management

Institute for Policy
Research and Engagement

Planning grant funding provided by:

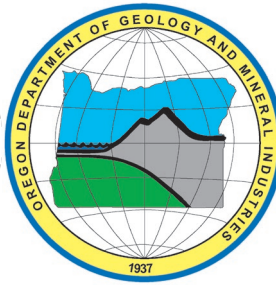


FEMA

Federal Emergency Management Agency (FEMA)

Project Award Number: DR-4562-39-P-OR

Additional Support Provided by:



This material is a result of tax-supported research and, as such, is not copyrightable.
It may be freely reprinted with the customary crediting of the source.

Table of Contents

PURPOSE	1
NHMP PROCESS, PARTICIPATION AND ADOPTION	1
<i>Convenor</i>	1
NHMP IMPLEMENTATION AND MAINTENANCE	2
<i>Implementation through Existing Programs</i>	3
CAPABILITY ASSESSMENT	3
<i>Existing Authorities</i>	3
Development Services	4
Public Works	4
City Administration	5
<i>Policies and Programs</i>	5
<i>Personnel</i>	6
<i>Capital Projects</i>	7
<i>Mitigation Successes</i>	7
<i>Capital Resources</i>	8
<i>Findings</i>	9
MITIGATION PLAN MISSION	9
MITIGATION PLAN GOALS	10
MITIGATION STRATEGY	11
<i>Action Items</i>	11
RISK ASSESSMENT	15
<i>Hazard Analysis</i>	15
<i>Community Characteristics</i>	16
Transportation and Infrastructure	17
Economy	17
<i>Community Lifelines</i>	20
Critical Facilities	20
Critical Infrastructure	21
Essential Facilities	21
Environmental Facilities	21
Vulnerable Populations	21
Hazardous Materials	22
Economic Assets/Population Centers	22
Cultural and Historic Assets	22
<i>Hazard Characteristics</i>	23
Drought	23
Earthquake (Cascadia Subduction Zone)	24
Earthquake (Crustal)	25
Flood	30
Landslide	33
Severe Weather	36
Extreme Heat	36
Windstorm	37
Winter Storm (Snow/Ice)	37
Volcanic Event	38
Wildfire	40
ATTACHMENT A: ACTION ITEM CHANGES	44
ATTACHMENT B: PUBLIC INVOLVEMENT SUMMARY	46
<i>Website Posting</i>	46
<i>HMAC</i>	47

List of Tables

TABLE SA-1 ACTION ITEMS	12
TABLE SA-2 HAZARD ANALYSIS MATRIX	16
TABLE SA-3 COMMUNITY CHARACTERISTICS.....	19
TABLE SA-4 CRITICAL FACILITIES IN SANDY	20
TABLE SA-5 RAPID VISUAL SURVEY SCORES.....	27
TABLE SA-6 EXPECTED DAMAGES AND CASUALTIES FOR THE CSZ FAULT AND PORTLAND HILLS FAULT: EARTHQUAKE, SOIL MOISTURE, AND EVENT TIME SCENARIOS.....	29
TABLE SA-7 STATUS OF ALL HAZARD MITIGATION ACTIONS IN THE PREVIOUS PLAN.....	44

List of Figures

FIGURE SA-1: UNDERSTANDING RISK.....	15
FIGURE SA-2 CASCADIA SUBDUCTION ZONE EXPECTED SHAKING.....	24
FIGURE SA-3 ACTIVE CRUSTAL FAULTS, EPICENTERS (1971-2008), AND SOFT SOILS	26
FIGURE SA-4 FEMA FLOOD ZONES	31
FIGURE SA-5 LANDSLIDE SUSCEPTIBILITY EXPOSURE.....	35
FIGURE SA-6 MOUNT HOOD HAZARDS MAP.....	39
FIGURE SA-7 LAHAR HAZARD ZONE AND CRITICAL FACILITIES	40
FIGURE SA-8 WILDFIRE RISK	42

Purpose

This is an update of the Sandy addendum to the Clackamas County Multi-Jurisdictional Natural Hazard Mitigation Plan (NHMP). This addendum supplements information contained in Volume I (Basic Plan) which serves as the NHMP foundation and Volume III (Appendices) which provide additional information. This addendum meets the following requirements:

- Multi-Jurisdictional **Plan Adoption** §201.6(c)(5),
- Multi-Jurisdictional **Participation** §201.6(a)(3),
- Multi-Jurisdictional **Mitigation Strategy** §201.6(c)(3)(iv) and
- Multi-Jurisdictional **Risk Assessment** §201.6(c)(2)(iii).

Updates to Sandy’s addendum are further discussed throughout the NHMP and within Volume III, Appendix B, which provides an overview of alterations to the document that took place during the update process.

Sandy adopted their addendum to the Clackamas County Multi-jurisdictional NHMP on [DATE TBD, 2024]. FEMA Region X approved the Clackamas County NHMP on [DATE TBD, 2024] and the City’s addendum on [DATE TBD, 2024]. With approval of this NHMP the City is now eligible to apply for the Robert T. Stafford Disaster Relief and Emergency Assistance Act’s hazard mitigation project grants through [DATE TBD-1, 2024].

NHMP Process, Participation and Adoption

This section of the NHMP addendum addresses 44 CFR 201.6(c)(5), *Plan Adoption*, and 44 CFR 201.6(a)(3), *Participation*.

In addition to establishing a comprehensive community-level mitigation strategy, the Disaster Mitigation Act of 2000 (DMA2K), and the regulations contained in 44 CFR 201, require that jurisdictions maintain an approved NHMP to receive federal funds for mitigation projects. Local adoption, and federal approval of this NHMP ensures that the city will remain eligible for pre- and post-disaster mitigation project grants.

The Oregon Partnership for Disaster Resilience (OPDR) at the University of Oregon’s Institute for Policy Research, and Engagement (IPRE) collaborated with the Oregon Office of Emergency Management (OEM), Clackamas County, and Sandy to update their NHMP.

The Clackamas County NHMP, and Sandy addendum, are the result of a collaborative effort between residents, public agencies, non-profit organizations, the private sector, and regional organizations. The Sandy HMAC guided the process of developing the NHMP.

Convener

The Sandy City Manager serves as the NHMP addendum convener. The convener of the NHMP will take the lead in implementing, maintaining, and updating the addendum to the Clackamas County NHMP in collaboration with the designated convener of the Clackamas County NHMP (Clackamas County Resilience Coordinator).

Representatives from the City of Sandy HMAC met formally and informally, to discuss updates to their addendum (Volume III, Appendix B). The HMAC reviewed and revised the City's addendum, with focus on the NHMP's risk assessment and mitigation strategy (action items).

This addendum reflects decisions made at the designated meetings and during subsequent work and communication with the Clackamas County Resilience Coordinator, and the OPDR. The changes are highlighted with more detail throughout this document and within Volume III, Appendix B. Other documented changes include a revision of the City's risk assessment and hazard identification sections, NHMP mission and goals, action items, and community profile.

The Sandy HMAC was comprised of the following representatives:

- Jeff Aprati – Deputy City Manager
- Jenny Coker -- Public Works Director
- Andi Howell – Transit Director
- Sean Lundry – Interim Police Chief
- Kelly O'Neill Jr. – Development Services Director
- Ernie Roberts – Police Chief
- A.J. Thorne – Assistant Public Works Director

The HMAC served as the local review body for the NHMP update.

NHMP Implementation and Maintenance

The City Council will be responsible for adopting the Sandy addendum to the Clackamas County NHMP. This addendum designates a HMAC and a convener to oversee the development and implementation of action items. Because the City addendum is part of the County's multi-jurisdictional NHMP, the City will look for opportunities to partner with the County. The City's HMAC will convene after re-adoption of the Sandy NHMP addendum on an annual schedule. The County is meeting on a semi-annual basis and will provide opportunities for the cities to report on NHMP implementation and maintenance during their meetings. The convener will serve as the conveners and will be responsible for assembling the HMAC. The HMAC will be responsible for:

- Reviewing existing action items to determine suitability of funding;
- Reviewing existing and new risk assessment data to identify issues that may not have been identified at NHMP creation;
- Educating and training new HMAC members on the NHMP and mitigation actions in general;
- Assisting in the development of funding proposals for priority action items;
- Discussing methods for continued public involvement;
- Evaluating effectiveness of the NHMP at achieving its purpose and goals (use Table 26, Volume I, Section 4, as one tool to help measure effectiveness); and
- Documenting successes and lessons learned during the year.

The HMAC will be responsible for the following activities described in detail in Volume I, Section 4:

The jurisdiction will utilize the same implementation and maintenance process identified in Volume I, Section 4.

The jurisdiction will provide continued public participation during the plan maintenance process through periodic presentations to elected officials, public meetings, postings on social media, and/or through interactive content on the jurisdiction’s website (for more information see Volume I, Section 4).

The jurisdiction will utilize the same action item prioritization process as the County (for more information see Volume I, Section 4 and Volume III, Appendix E).

Implementation through Existing Programs

This NHMP is strategic and non-regulatory in nature, meaning that it does not necessarily set forth any new policy. It does, however, provide: (1) a foundation for coordination and collaboration among agencies and the public in the city; (2) identification and prioritization of future mitigation activities; and (3) aid in meeting federal planning requirements and qualifying for assistance programs. The mitigation plan works in conjunction with other city plans and programs including the Comprehensive Land Use Plan, Capital Improvements Plan, and Building Codes, as well as the Clackamas County NHMP, and the State of Oregon NHMP.

The mitigation actions described herein (and in Attachment A) are intended to be implemented through existing plans and programs within the city. Plans and policies already in existence have support from residents, businesses, and policy makers. Where possible, Sandy will implement the NHMP’s recommended actions through existing plans and policies. Many land-use, comprehensive and strategic plans get updated regularly, allowing them to adapt to changing conditions and needs. Implementing the NHMP’s action items through such plans and policies increases their likelihood of being supported and implemented. Implementation opportunities are further defined in action items when applicable.

Capability Assessment

The Capability Assessment identifies and describes the ability of the City of Sandy to implement the mitigation strategy and associated action items. Capabilities can be evaluated through an examination of broad categories, including: existing authorities, policies, programs, funding, and resources.

Existing Authorities

Hazard mitigation can be executed at a local scale through three (3) methods: integrating hazard mitigation actions into other local planning documents (i.e., plan integration), adopting building codes that account for best practices in structural hardening, and codifying land use regulations and zoning designations that prescribe mitigation into development requirements. The extent to which a municipality or multi-jurisdictional effort leverages these approaches is an indicator of that community’s capabilities.

Comprehensive Plan

Oregon’s Statewide Planning Goal 7 requires comprehensive planning within every jurisdiction that is designed to reduce risks to people and property from natural hazards.

Sandy addresses Statewide Planning Goal 7 Natural Hazards as part of their Comprehensive Plan Element, Natural Hazards. This element was written in 1997 and focuses on steep slopes “and other natural hazards.” The City is working on the first comprehensive revision to the comprehensive plan since 1997. “Envision Sandy 2050” is drafting the Goals and Policies for the four key topic areas: Community and Culture, Transportation and Infrastructure, Parks, Trails, and Natural Resources, and Natural Hazards and Resiliency.

Planned updates to the jurisdiction's Goal 7 element or its broader comprehensive plan will reflect the data and findings within this NHMP and integrate analyses of future climate and natural hazard impacts into the community's long-range plans.

Transportation System Plan

The City adopted a new transportation system plan in 2023. Goal 1.4 of the transportation system plan states to ensure sufficient capacity to accommodate future travel demand (transit, bicycle, pedestrian, etc.) to, within, and through the City of Sandy. Goal 5 is to minimize environmental impacts on natural resources and encourage carbon-neutral or efficient transportation alternatives. Goal 8.1 states to ensure the transportation system provides equitable access to underserved, disadvantaged, and vulnerable populations and is easy to use and accommodating to travelers of all ages. These three goals, along with many others, will prepare Sandy for natural hazards.

Land Use Regulations

Existing land use policies that define zoning and address hazardous conditions provide another source of mitigation capability.

- Title 13 Water and Sewer, includes stormwater, water, and sanitary sewer system rules and regulations.
- Chapter 17 Development Code, includes allowed uses and development standards for all zones, including hillside development and the flood and slope hazard overlay zone.

Structural Building Codes

The Oregon Legislature recently adopted updated building codes for both residential (2023 adoption) and commercial structures (2022) since the last update of this Plan. These building codes are based on the 2021 version of the International Building Code, International Fire Code, and International Existing Building Code.

Development Services

The Sandy Planning Division is the oversight entity for all matters related to the City's land use development process, long range planning, and some components of [urban renewal](#). It is responsible for the administration of state, county, and local land use policies and regulations as they relate to the preservation and quality development of property lying within the city limits and urban growth boundary (UGB). Planning works closely with Building, Engineering, and Fire in the review of development applications and building permits. They also work closely with the County and neighboring jurisdictions to ensure plans are aligned.

The Sandy Building Division administers and enforces the 2022 Oregon Structural Specialty Code. Clackamas Fire District uses the 2022 Oregon Fire Code. As a result, both new residential and commercial structures are required to build according to the latest seismic and wind hardening standards in addition to requiring fire resistant building materials for those structures constructed in proximity or within the WUI.

The Sandy Development Services Director oversees and enforces the Flood and Slope Hazard Area code. Minimum submission requirements stipulate an Elevation Certificate is required at submittal if property is in a flood hazard area and requires a two (2) foot free board and other flood construction requirements.

Public Works

The Public Works staff is responsible for the day-to-day operation and maintenance of all public facilities in the City of Sandy. Services include water, sewer, streets, parks and building maintenance, stormwater,

engineering, and erosion control. Much of their work is associated with the reduction of hazards to the community and the implementation of resilience measures.

City Administration

The City Council of Sandy has the responsibility of developing and adopting the annual city budget. Integrating hazard mitigation goals and projects into the annual budget is key to implementing the plan. The City Council tries to broadly address resilience planning needs while it determines city and departmental priorities and looks for multiple-impact projects wherever possible. They also work with staff to apply for federal and state grant funding to pursue larger projects that are outside of general fund capacity.

Policies and Programs

This Plan directs Sandy and Clackamas County to explore integration into other planning documents and processes. Sandy has made significant progress in integrating the NHMP into its portfolio of planning processes and programs over the last five years.

Urban Renewal Plan

The City has undertaken several urban renewal projects within the downtown, based on the adopted Sandy Urban Renewal Plan (originally adopted in 1998, and updated in 2008, 2015, and 2018). These include undergrounding of utilities on Pioneer and Proctor Boulevards, fire protection improvements (including fire station improvements), and City Hall improvements (added in 2018).

Drinking Water System Reinvestment Project

Sandy's Drinking Water System Reinvestment Project is a long-term effort that will help to meet Sandy's future drinking water needs using several complementary strategies: repairing facilities and reinvesting in water source treatment and storage infrastructure, building new infrastructure to have access to Bull Run water, exploring groundwater sources, and keeping rates affordable.

2022 Water Master Plan

As part of the Drinking Water System Reinvestment Project, the City adopted a revised Water System Master Plan (WSMP) in 2022. It estimates future water requirements including potential water system expansion areas, identifies deficiencies and recommend water facility improvements that may correct system deficiencies and provide for growth, and updated the 5-year water system Capital Improvement Plan.

Wastewater System Improvements

The City of Sandy adopted a new Wastewater System Facilities Plan in 2019. However, despite improved operations, the City's wastewater treatment plant has been unable to reliably meet federal/state permit requirements. In 2022, Oregon DEQ mandated that Sandy discontinue wastewater effluent to Tickle Creek. A temporary moratorium on land use permits with new sanitary sewer connections was established in October 2022 (through October 2023) to give sewer system improvements time to catch up with the community's growth and aging infrastructure.

The City is currently working with engineers and consultants to explore alternative treatment options and water recycling opportunities and prepare the preliminary design plans for wastewater treatment plant upgrades and repairs to the collection system. This project, called "Sandy Clean Waters," is on track for completion by 2026.

Stormwater Management Incentive Program

The City of Sandy has initiated a stormwater management incentive program to encourage multi-family, commercial, and industrial property owners to reduce runoff by treating and disposing of stormwater on-site. The resulting decrease in runoff entering the stormwater system will reduce capital and maintenance costs to the City and the decrease in runoff and pollution loading will improve the water quality of streams in and around Sandy and reduce potential urban flooding.

Community Wildfire Protection Plan

The Clackamas County Community Wildfire Protection Plan (CWPP) will be incorporated into this Plan as a functioning annex.

National Flood Insurance Program

Sandy participates in the National Flood Insurance Program. The Planning Division is responsible for administering the day-to-day activities of the city's floodplain program. They are assisted by the Building Division, the Public Works Department, and by the City Administrator.

Specifically, the Planning Division:

- maintains and administers Sandy's floodplain regulations;
- reviews and issues floodplain development permits;
- maintains elevation certificates for all new and substantially improved structures (and maintains an extensive database of historic elevation certificates);
- ensures that encroachments do not occur within the regulated floodway;
- implements measures to ensure that new and substantially improved structures are protected from flood losses;
- maintains floodplain studies and maps and makes this information available to the public;
- maintains a flood information website with digital flood insurance rate map (DFIRM) data;
- conducts site visits to assess conditions and provide technical assistance to the public;
- maintains a library of historical flood related information;
- informs the public of flood insurance requirements; and
- conducts outreach and training about flood hazards and development within the floodplain.

The City completed an amendment to the Flood and Slope Hazard (FSH) Overlay District in Chapter 17.60 of Title 17 of the Sandy Municipal Code. This was completed in 2019 in consultation with the Oregon Department of Land Conservation and Development (DLCD), on behalf of FEMA. Their flood prevention code section is based on the Oregon Model Flood Hazard Prevention code, which includes provisions addressing substantial improvement/substantial damage.

There are only nine (9) floodplain insurance policies active in Sandy as of May 2, 2023, none of which are owned by the City.

Personnel

The following Sandy personnel have assignments related to natural hazard mitigation planning and implementation:

Emergency Management: Police Chief

Public Information Officer: Deputy City Manager

Floodplain Manager: Development Services Director

Grant writing (for Public Works or emergency management): Assistant Public Works Director

Capital improvement planning: Public Works Director

Capital improvement execution: Public Works Director

Sandy does not have any employees solely designated to Emergency Management or Mitigation. These personnel integrate hazards and resilience planning into their greater work programs to the best of their abilities. However, there is limited capacity to expand upon their capabilities or workloads.

Capital Projects

Sandy has implemented recommendations from the last NHMP into its capital improvement projects over the last 5 years, including:

- **(Stormwater) Stormwater drainage improvements/replacement at Strawbridge Parkway and Tupper Road (2022 and 2023.)** Completed an emergency repair of a sinkhole from a failed stormwater line.
- **(Water) Sandercock Reservoir Repairs (2023).** Completed an urgent structural repair to a critical drinking water reservoir for our resilient groundwater drinking source.
- **(Street) 362nd Avenue and Bell Street Improvements Project** - Highway 26 is an essential transportation corridor. Connecting 362nd and Bell allows first responders to avoid the highway and allows secondary emergency access to the high school as well as an alternate evacuation route for residents.
- **(Sewer) Sandy Clean Waters Program - Phase 1A.** Rehabilitation and Repairs of Collection System basins 2 and 8 and 6 and 7, as well as the Wastewater Treatment Plant Immediate Repairs Project including a fiber optic upgrade. Phase 1A was a collective investment of \$30 million in conveyance and wastewater treatment system improvements to comply with the City's NPDES permit and protect Tickle Creek and the downstream Clackamas River.¹

Mitigation Successes

The community has several examples of mitigation success including the following projects funded through FEMA [Hazard Mitigation Assistance](#) and the Oregon Infrastructure Finance Authority's [Seismic Rehabilitation Grant Program](#)².

FEMA Funded Mitigation Successes

- None identified.

Seismic Rehabilitation Grant Program Mitigation Successes

- 2017: Sandy Fire District Station 82 (\$1,189,967)

² The Seismic Rehabilitation Grant Program (SRGP) is a state of Oregon competitive grant program that provides funding for the seismic rehabilitation of critical public buildings, particularly public schools, and emergency services facilities.

Capital Resources

Sandy maintains several capital resources that have important roles to play in the implementation of the natural hazard mitigation plan.

Communication towers include:

- AT&T Wireless Services, Inc. 40494 Highway 26 Sandy, OR (1) cell tower
- U S West Newvector Group, Inc. Dba 17100 Bluff Rd Sandy, OR (1) cell tower
- Clackamas 800 Radio Group 16950 Bluff Road Sandy, OR (1) radio tower

Critical facilities with power generators for use during emergency blackouts include:

- Sandy Police Department - propane generator - 39850 Pleasant Street
- Sandy City Hall - Automatic Transfer Switch - Natural Gas - 39250 Pioneer BLVD.
- Sandy Operations Center - Automatic Transfer Switch - Natural Gas - 16610 Champion Way
- Sandy Wastewater Treatment Plant - Automatic Transfer Switch - Diesel - 33400 Jarl Rd., Boring, OR 97009
- Alder Creek Water Treatment Plant - Manual Transfer Switch - Diesel - 52500 Hwy 26
- Terra Fern Pump Station and Reservoir - Automatic Transfer Switch - Diesel - 51515 E Terra Fern Dr.
- Revenue Reservoir - Automatic Transfer Switch - Natural Gas - 17160 Revenue Ave.
- Hudson Pump Station - Automatic Transfer Switch - Diesel - 39175 SE Hudson Rd.
- Southwest Wastewater Pump Station - Automatic Transfer Switch - Natural Gas - 18770 SE Jacoby Rd.
- Meinig Ave Wastewater Pump Station - Automatic Transfer Switch - Natural Gas - 17174 SE Meinig Ave.
- Sleepy Hollow Wastewater Pump Station - Automatic Transfer Switch - Natural Gas - 17591 Constable Dr.
- Snowberry Wastewater Pump Station - Automatic Transfer Switch - Natural Gas - 37810 Cascadia Village Dr.
- Northside Wastewater Pump Station - Automatic Transfer Switch - Diesel - 36145 Hwy 26

Warming or cooling shelters include:

- Ant Farm Cafe 39140 Proctor Blvd
- Sandy Library 38980 Proctor Blvd
- Sandy Community Center 38348 Pioneer Blvd

Food pantries include:

- Sandy Community Action Center, 38982 Pioneer Blvd

Fueling storage:

- Sandy Public Works has initiated a temporary pilot onsite fueling project that will provide critical emergency fuel reserve. The project is in the final stages of implementation. In conducting this pilot study they plan to evaluate the potential cost savings with onsite fueling while providing an emergency fuel reserve to mitigate risks associated with natural hazards. In recent years, Sandy

has seen extended power outages due to wildfire Public Safety Power Shutoffs (PSPS), winter weather events limiting local fuel deliveries, along with other climate related events. The fuel reserve will help provide a buffer to continue operating our water and sewer utility systems via generator power in the event of larger power outages or fuel shortages.

Findings

Several important findings from this capability assessment informed the design of the Plan's mitigation strategy and aided in prioritizing action items.

Staffing Limitations and Capacity

Sandy staff are assigned hazard mitigation responsibilities as a (small) part of their larger job responsibilities. Restricted capacity reduces the breadth of the programming the community can undertake in any year. The city relies upon its relationships with the County and other cities within its region to expand its operations.

Reliance upon outside funding streams and local match requirements

Sandy operates on a limited budget with many conflicting priorities. This leaves few opportunities for using local financial resources to implement hazard mitigation work. They lean heavily upon state and federal grant funds as the primary means for securing mitigation funding. Hazard mitigation grants such as HMGP and BRIC require 10-25% local funding match, as well as extra staff capacity and expertise to navigate the application process and manage the funding.

Leveraging Partnerships with Public and Nonprofit Entities

Regional planning displayed in Community Wildfire Protection Planning process demonstrates the City's ability to effectively share information and identify priority needs.

Mitigation Plan Mission

The 2024 HMAC reviewed the previous NHMP Mission and Goals in comparison to the State NHMP Goals and determined that they would make necessary updates to include references to community lifelines and to advance equity and inclusion in hazard mitigation.

The NHMP mission states the purpose and defines the primary functions of NHMP. It is intended to be adaptable to any future changes made to the NHMP and need not change unless the community's environment or priorities change.

The mission of the NHMP is to:

Enhance county resiliency and capacity to address natural hazards by promoting sound public policy and effective mitigation strategies designed to equitably reduce risk and impacts on community members, community lifelines, historic and cultural resources property, and ecological systems.

This can be achieved by increasing public awareness, documenting the resources for risk reduction and loss-prevention, and identifying activities to guide the county towards building a safer, more sustainable community.

Mitigation Plan Goals

Mitigation plan goals are more specific statements of direction that residents and public and private partners can take while working to reduce the risk from natural hazards. These statements of direction form a bridge between the broad mission statement and action items. The goals listed here serve as checkpoints as agencies and organizations begin implementing mitigation action items.

Meetings with the HMAC, previous hazard event reports, and the previous NHMPs served as methods to obtain input and identify priorities in developing goals for reducing risk and preventing loss from natural hazards.

All the NHMP goals are important and are listed below in no order of priority. Establishing community priorities within action items neither negates nor eliminates any goals, but it establishes which action items to consider implementing first, should funding become available.

Goal 1: Protect Life and Property

- Develop and implement mitigation and climate adaptation projects and policies that aid in protecting lives by making homes, businesses, community lifelines, and other property more resilient to natural hazards and impacts from climate change.
- Establish mitigation projects and policies that minimize losses and repetitive damages from recurring disasters while promoting insurance coverage for severe hazards
- Improve hazard identification and risk assessment information to inform and provide recommendations for enhanced resilience in new development decisions, and promote preventative measures for existing development in areas vulnerable to natural hazards.

Goal 2: Enhance Natural Systems

- Incorporate natural hazard mitigation planning and activities into watershed planning, natural resource management, natural systems enhancement, and land use planning to protect life, property, and ecological system.

Goal 3: Augment Emergency Services

- Strengthen emergency operations by enhancing communication, collaboration, and coordination of natural hazard mitigation activities and policies across agencies at all levels and regions of government, sovereign tribal nations, and the private sector.

Goal 4: Encourage Partnerships for Implementation

- Improve communication, coordination, and participation among and with public agencies, community members, community lifelines, and private sector organizations to prioritize and implement hazard mitigation activities and policies.
- Enhance efforts toward identifying and optimizing opportunities across state agencies, surrounding communities, and private entities for resource sharing, mutual aid, and funding sources/support.

Goal 5: Promote Public Awareness

- Build community resilience and awareness and reduce the effects of natural hazards and climate change through community-wide engagement, collaboration, resource-sharing, learning, leadership-building, and identifying mitigation project-related funding opportunities.

Goal 6: Advance Equity and Inclusion

- Mitigate the inequitable impacts of natural hazards by prioritizing the directing of resources and efforts to build resilience and engagement in the most vulnerable communities least able to prepare, respond, and recover.
- Strengthen efforts aimed at increasing engagement, outreach, and collaboration with community and cultural organizations and agencies that are dedicated to providing services and support to vulnerable and underserved communities.

Mitigation Strategy

This section of the NHMP addendum addresses 44 CFR 201.6(c)(3)(iv), *Mitigation Strategy*.

The City's mitigation strategy (action items) was first developed during the 2009 NHMP planning process and revised during subsequent NHMP updates. During these processes, the HMAC assessed the City's risk, identified potential issues, and developed a mitigation strategy (action items).

During the 2023 update process, the City re-evaluated their mitigation strategy (action items). During this process action items were updated, noting if the action is complete, not complete and whether the actions were still relevant; any new action items were identified at this time (see Attachment B for more information on changes to action items).

Action Items

Table SA-1 documents the title of each action along with, the lead organization, partners, timeline, cost, and potential funding resources. The HMAC decided to modify the prioritization of action items in this update to reflect current conditions (risk assessment), needs, and capacity. High priority actions are shown with orange highlight. The City will focus their attention, and resource availability, upon these achievable, high leverage, activities over the next five-years. Although this methodology provides a guide for the HMAC in terms of implementation, the HMAC has the option to implement any of the action items at any time. This option to consider all action items for implementation allows the committee to consider mitigation strategies as new opportunities arise, such as capitalizing on funding sources that could pertain to an action item that is not currently listed as the highest priority. Refer to Attachment A for changes to actions since the previous NHMP.

Table SA-1 Action Items

Action Item #	Statement	Impacted Hazard									Implementation and Maintenance			
		Drought	Earthquake	Extreme Heat	Flood	Landslide	Volcanic Event	Wildfire	Windstorm	Winter Storm	Lead/Partners	Timeline	Potential Funding Source	Estimated Cost
1	Maintain public education programs to inform the public about methods for mitigating the impacts of natural hazards.	X	X	X	X	X	X	X	X	X	City Administration	Ongoing	Local Resources. DLCD TA	Low
2	Integrate the goals and action items from the Natural Hazards Mitigation Plan into existing regulatory documents and programs, where appropriate.	X	X	X	X	X	X	X	X	X	Development Services	Medium	Local Resources. DLCD TA, FEMA HMA-C&CB	High
3	Improve vegetation management throughout the city. Use zoning codes to regulate development and apply code enforcement to mitigate impacts.								X	X	Development Services	Ongoing	Local Resources, FEMA HMA	High
4	Encourage structural mitigation practices in developments at risk to natural hazards.		X		X	X			X	X	Development Services	Ongoing	Local Resources. DLCD TA, FEMA HMA-C&CB	Low to High
5	Develop a community resilience hub designed to support residents and coordinate resource distribution before, during, or after a natural hazard event. Hub could also provide refuge site from cold, heat, and poor air quality.	X	X	X	X	X	X	X	X	X	Development Services	Medium	Local Resources, FEMA HMA-C&CB,	Medium (scoping) to High (implementation)
6	Maintain and update mapping for the Flood Slope Hazard Overlay District as identified in Chapter 17.60 of the Sandy Development Code.		X		X	X					Development Services	Medium	Local Resources, FEMA HMA-C&CB	High

Action Item #	Statement	Impacted Hazard									Implementation and Maintenance			
		Drought	Earthquake	Extreme Heat	Flood	Landslide	Volcanic Event	Wildfire	Windstorm	Winter Storm	Lead/Partners	Timeline	Potential Funding Source	Estimated Cost
7	Install temporary diesel and gasoline fuel reserves tanks for public works, police, and transit.		X		X	X		X		X	Public Works	Short	Local Resources, State and Federal Grants, FEMA HMA	High
8	Explore opportunities to partner with local agencies to hire a dedicated emergency manager.	X	X	X	X	X	X	X	X	X	City Administration	Medium	Local Resources, State and Federal Grants	High
9	Reduce negative impacts of earthquakes by performing seismic evaluations and retrofits (structural and non-structural).		X								Development Services, Public Works	Ongoing	Local Resources. DLCD TA, FEMA HMA (FMA)	High
10	Ensure continued compliance in the National Flood Insurance Program (NFIP) through enforcement of local floodplain management ordinances.				X						Development Services	Ongoing	Local Resources, FEMA HMA	Low
11	Implement actions identified in the Drinking Water Master Plan.	X	X		X						Public Works	Ongoing	Local Resources, FEMA HMA	Low to High
12	Implement actions identified in the Wastewater Facility Plan.	X			X						Public Works	Ongoing	Local Resources, FEMA HMA	Low to High

Action Item #	Statement	Impacted Hazard									Implementation and Maintenance			
		Drought	Earthquake	Extreme Heat	Flood	Landslide	Volcanic Event	Wildfire	Windstorm	Winter Storm	Lead/Partners	Timeline	Potential Funding Source	Estimated Cost
13	Promote and protect the use of naturally flood prone open space or wetlands as flood storage areas.				X						Development Services	Ongoing	Local Resources, FEMA HMA, CWDG, ODF, OSFM	Low
14	Maintain and update an inventory of streets and properties threatened by landslides.					X					Development Services	Ongoing	Local Resources, FEMA HMA-C&CB	High
15	Reduce negative effects from severe windstorm and severe winter storm events.								X	X	Public Works	Ongoing	Local Resources, FEMA HMA	Medium
16	Coordinate wildfire mitigation action items through the Clackamas County Community Wildfire Protection Plan.								X		Sandy Fire District	Ongoing	Local Resources, FEMA HMA, CWDG, ODF, OSFM	Low to High

Source: Sandy NHMP HMA, updated 2023

Cost: Low (less than \$50,000), Medium (\$50,000-\$100,000), High (more than \$100,000)

Timing: Ongoing (continuous), Short (1-2 years), Medium (3-5 years), Long (5 or more years)

Priority Actions: Identified with orange highlight

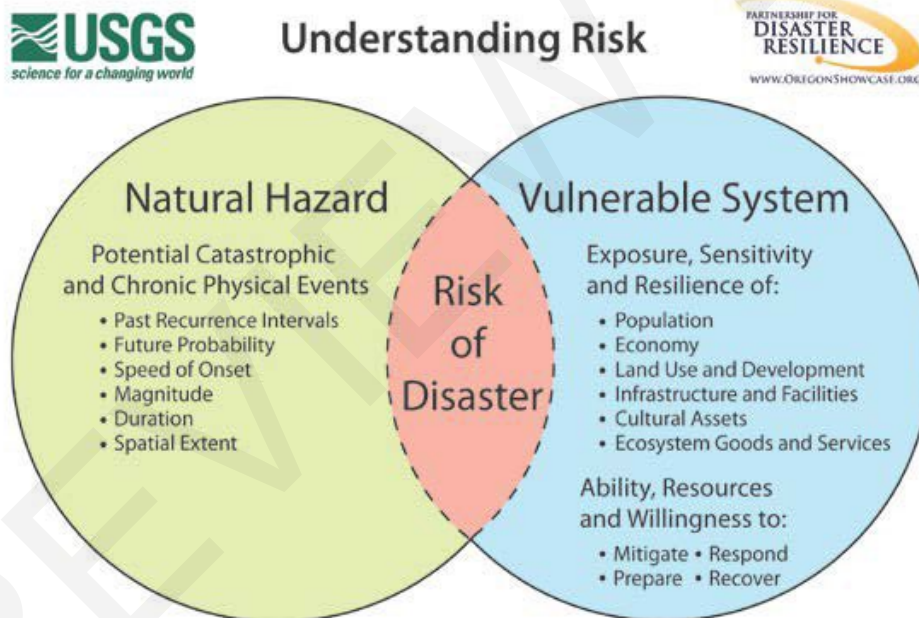
Risk Assessment

This section of the NHMP addendum addresses 44 CFR 201.6(b)(2) - Risk Assessment. In addition, this chapter can serve as the factual basis for addressing Oregon Statewide Planning Goal 7 – Areas Subject to Natural Hazards. Assessing natural hazard risk has three phases:

- **Phase 1:** Identify hazards that can impact the jurisdiction. This includes an evaluation of potential hazard impacts – type, location, extent, etc.
- **Phase 2:** Identify important community assets and system vulnerabilities. Example vulnerabilities include people, businesses, homes, roads, historic places and drinking water sources.
- **Phase 3:** Evaluate the extent to which the identified hazards overlap with or have an impact on, the important assets identified by the community.

The local level rationale for the identified mitigation strategies (action items) is presented herein and within Volume I, Section 3 and Volume III, Appendix C. The risk assessment process is graphically depicted in Figure SA-1. Ultimately, the goal of hazard mitigation is to reduce the area of risk, where hazards overlap vulnerable systems.

Figure SA-1: Understanding Risk



Source: USGS- Oregon Partnership for Disaster Resilience Research Collaboration, 2006

Hazard Analysis

The Sandy HMAC developed their hazard vulnerability assessment (HVA), using their previous HVA and the County’s HVA as a reference. Changes from their previous HVA and the County’s HVA were made where appropriate to reflect distinctions in vulnerability and risk from natural hazards unique to Sandy, which are discussed throughout this addendum. Table SA-2 shows the HVA matrix for Sandy listing each

hazard in order of rank from high to low. For local governments, conducting the hazard analysis is a useful step in planning for hazard mitigation, response, and recovery. The method provides the jurisdiction with a sense of hazard priorities but does not predict the occurrence of a hazard. Three chronic hazards (wildfire, drought, and winter storm) and one catastrophic hazard (Cascadia earthquake) rank as the top hazard threats to the City (Top Tier). Windstorm, crustal earthquake, and extreme heat comprise the next highest ranked hazards (Middle Tier), while landslide, volcanic event, and flood comprise the lowest ranked hazards (Bottom Tier).

Table SA-2 Hazard Analysis Matrix

Hazard	History	Vulnerability	Maximum Threat	Probability	Total Threat Score	Hazard Rank	Hazard Tiers
Wildfire	18	45	100	63	226	1	Top Tier
Drought	10	35	100	56	201	2	
Winter Storm	14	30	70	49	163	3	
Earthquake - Cascadia	2	45	80	35	162	4	
Windstorm	16	30	70	42	158	5	Middle Tier
Earthquake - Crustal	6	50	80	21	157	6	
Extreme Heat Event	10	35	70	35	150	7	
Landslide	14	20	40	63	137	8	Bottom Tier
Volcanic Event	2	40	80	7	129	9	
Flood	10	20	30	56	116	10	

Source: Sandy HMAC, 2023.

Community Characteristics

Table SA-3 and the following section provides information on City specific demographics and assets. Many of these community characteristics can affect how natural hazards impact communities and how communities choose to plan for natural hazard mitigation. Considering the City specific assets during the planning process can assist in identifying appropriate measures for natural hazard mitigation.

Population, Housing, and Income

Located on Highway 26, Sandy is a scenic community with beautiful views and vast outdoor recreational opportunities and serves as a gateway for tourists visiting Mount Hood and the Mount Hood National Forest. Sandy’s residents enjoy a rural lifestyle while still having the urban amenities of Portland, located just 25 miles to the northwest. Sandy was originally settled in 1853 and incorporated in 1911. Today it has an area today of 3.57 square miles. The City has doubled its population since 2000 and is expected to double its population again by 2040.

Sandy’s largest body of water is the Sandy River. Smaller tributaries include Tickle Creek, Cedar Creek, and Badger Creek. The topography in Sandy is quite diverse, ranging from the steep Sandy River canyon to relatively flat farmland. The areas to the east and south of the city are mostly forested land, and areas to the north and west of the city are primarily farmland.

The City is within the Sandy River watershed at 967 feet above sea level. Because of its location Sandy’s climate is consistent with the Marine west coast climate zone, with warm summers and cool, wet winters. Sandy receives most of its precipitation between October and May, averaging 79 inches of rain, and about one (1) inch of snow, per year.

Between 2016 and 2021 the City grew by 2,336 people (22%; as of 2022 the population is 12,991). Between 2022 and 2040 the population is forecast to grow by 24% to 16,144.

Most of the population is White/Caucasian (84%) and about 18% of the population is Hispanic or Latino. The poverty rate is 8% (6% of children under 18, 16% for people 65 and older), 6% do not have health insurance, and 58% of renters pay more than 30% of their household income on rent (32% for owners). About 22% of the population has a bachelor's degree or higher (6% do not have a high school degree). Approximately 13% of the population lives with a disability (40% of population 65 and older), and 41% are either below 15 (27%) or over 65 (14%) years of age. About 7% of the population are 65 or older and living alone and 16% are single parents.

The City includes a diversity of land uses but is zoned primarily residential. About 84% of housing units are single-family, 11% are multifamily, and 4% are mobile homes. Eleven (11%) of homes were built before 1970 and 65% were built after 1990. Newer homes are more likely to be built to current seismic, flood, wildfire, and other hazard standards. Almost three-quarter (74%) of housing units are owner occupied, 22% are renter occupied, and 4% are vacant.

Transportation and Infrastructure

Downtown Sandy is an asset to the community and the city has undertaken several urban renewal projects to increase the community's prosperity by enabling an economically viable and vibrant city. The 3/4 mile stretch between Bluff Road and Ten Eyck Road is the heart of the city and offers shopping, dining and entertainment. Sandy's downtown is also home to a variety of city services including City Hall, Sandy Fire and Police, the City Library and Community Center.

Sandy's commercial sector is centered along Highway 26. Industry is primarily located in the western portion of the city. Most residential properties are in the southern part of town, although the northern part of town is also zoned for residential use.

Transportation is an important consideration when planning for emergency service provisions. Growth within the city will put pressure on both major and minor roads, especially if the main mode of travel is by single occupancy vehicles.

Motor vehicles represent the dominant mode of travel through and within Sandy. Twelve percent (12%) of renters and less than 1% of owners do not have a vehicle. Most workers drive alone to work (80%); 7% carpool, less than 1% use public transit, 1% either walk or use a bicycle, and 12% work at home. The City owns and operates a regional transit system, Sandy Area Metro (SAM), and collaboratively administers Clackamas County's Mt Hood Express (MHX) service. All transit services pause at the City's Transit Center in the downtown Centennial Plaza.

Economy

Sandy is dominated by small businesses, with more than 77% of businesses employing fewer than five employees.

About 51% of the resident population 16 and over is in the labor force (5,083 people) and are employed in a variety of occupations including professional (16%), office and administrative (16%), transportation and material moving (12%), management, business, and financial (11%), and sales related (9%) occupations.

Most workers residing in the city (89%, 5,485 people) travel outside of the city for work primarily to Portland, Gresham, and surrounding areas.³ A significant population of people travel to the city for work, (81% of the workforce, 2,828 people) primarily from Gresham, Portland, and surrounding areas.⁴

³ U.S. Census Bureau. LEHD Origin-Destination Employment Statistics (2002-2021). Longitudinal-Employer Household Dynamics Program, accessed on December 21, 2023 at <https://onthemap.ces.census.gov>.

⁴ Ibid.

Table SA-3 Community Characteristics

Population Characteristics			Household Characteristics		
2016 Population Estimate	10,655	Population Growth	Housing Units		
2022 Population Estimate	12,991	22%	Single-Family (includes duplexes)	3,784	84%
2040 Population Forecast*	16,144	24%	Multi-Family	514	11%
Race			Mobile Homes (includes RV, Van, etc.)	202	4%
American Indian and Alaska Native		< 1%	Household Type		
Asian		2%	Family Household	3,273	76%
Black/ African American		< 1%	Married couple (w/ children)	1,475	34%
Native Hawaiian and Other Pacific Islander		0%	Single (w/ children)	683	16%
White		84%	Living Alone 65+	292	7%
Some Other Race		0%	Year Structure Built		
Two or More Races		5%	Pre-1970	508	11%
Hispanic or Latino/a (of any race)			1970-1989	1,080	24%
Limited or No English Spoken	276	2%	1990-2009	1,893	42%
Vulnerable Age Groups			2010 or later	1,019	23%
Less than 5 Years	858	7%	Housing Tenure and Vacancy		
Less than 15 Years	2,503	20%	Owner-occupied	3,316	74%
65 Years and Older	1,428	12%	Renter-occupied	1,001	22%
85 Years and Older	185	2%	Seasonal	0	0%
Age Dependency Ratio		0.47	Vacant	183	4%
Disability Status (Percent age cohort)			Vehicles Available (Occupied Units)		
Total Disabled Population	1,639	13%	No Vehicle (owner occupied)	12	< 1%
Children (Under 18)	170	5%	Two+ vehicles (owner occupied)	2,761	83%
Working Age (18 to 64)	902	12%	No Vehicle (renter occupied)	120	12%
Seniors (65 and older)	567	40%	Two+ vehicles (renter occupied)	473	47%
Income Characteristics			Employment Characteristics		
Households by Income Category			Labor Force (Population 16+)		
Less than \$15,000	198	5%	In labor Force (% Total Population)	6,259	51%
\$15,000-\$29,999	323	8%	Unemployed (% Labor Force)	267	4%
\$30,000-\$44,999	456	11%	Occupation (Top 5) (Employed 16+)		
\$45,000-\$59,999	342	8%	Professional & Related	982	16%
\$60,000-\$74,999	391	9%	Office & Administrative	967	16%
\$75,000-\$99,999	815	19%	Transportation and Material Moving	738	12%
\$100,000-\$199,999	1,464	34%	Management, Business, & Financial	711	11%
\$200,000 or more	328	8%	Sales & Related	590	9%
Median Household Income			Health Insurance		
		\$88,775	No Health Insurance	709	6%
Gini Index of Income Inequality			Public Health Insurance	3,733	30%
		0.36	Private Health Insurance	9,673	78%
Poverty Rates (Percent age cohort)			Transportation to Work (Workers 16+)		
Total Population	944	8%	Drove Alone	4,746	80%
Children (Under 18)	172	6%	Carpooled	420	7%
Working Age (18 to 64)	540	7%	Public Transit	7	< 1%
Seniors (65 and older)	232	16%	Motorcycle	7	< 1%
Housing Cost Burden (Cost > 30% of household income)			Bicycle/Walk	46	1%
Owners with a Mortgage	843	32%	Work at Home	699	12%
Owners without a Mortgage	251	36%			
Renters	579	58%			

Source: U.S. Census Bureau, 2016-2021 American Community Survey; Portland State University, Population Research Center, "Annual Population Estimates", 2016 & 2022; Portland State University, Population Research Center, "Population Forecast Tables", (2023, [Preliminary](#)).

Note: ACS 5-year estimates represent average characteristics from 2012-2016 or 2017-2021. Sampling error may result in low reliability of data. This information or data is provided with the understanding that conclusions drawn from such information are the responsibility of the user. Refer to the original source documentation to better understand the data sources, results, methodologies, and limitations of each dataset presented.

Community Lifelines

This section outlines the resources, facilities, and infrastructure that, if damaged, could significantly impact the public safety, economic conditions, and environmental integrity of the city. [Community Lifelines](#) are the most fundamental services in the community that, when stabilized, enable all other aspects of society to function. Mitigating these facilities will increase the community’s resilience.

The community lifelines identified below were identified by the City of Sandy. This integrated network of assets, services, and capabilities are used day-to-day to support the recurring needs of the community and enable all other aspects of society to function. Decisive intervention (e.g., rapid re-establishment or employment of contingency response solutions) is required to maintain/reestablish these facilities and services following a hazard incident.

Critical Facilities

Facilities that are critical and essential to government response, and recovery activities (i.e. life, safety, property, and environmental protection). These facilities include: 911 Centers, Emergency Operations Centers, Police, and Fire Stations, Public Works facilities, sewer, and water facilities, hospitals, bridges, roads, shelters, and more. Table SA-4 includes critical facilities identified in the DOGAMI Risk Report (2024) and assumed impact from individual hazards.

Table SA-4 Critical Facilities in Sandy

Critical Facilities by Community	Flood 1% Annual Chance	CSZ 9.0 Earthquake Moderate to Complete Damage	Canby-Molalla Fault Mw-6.8 Moderate to Complete Damage	Landslide High and Very High Susceptibility	Channel Migration Zone	Wildfire High or Moderate Risk	Volcanic Lahar
	Exposed	>50% Prob.	>50% Prob.	Exposed	Exposed	Exposed	Exposed
Cedar Ridge Middle School	-	X	-	-	-	-	-
Legacy Medical Group – Firwood	-	-	-	-	-	-	-
Mount Hood National Forest - Headquarters	-	-	-	-	-	-	-
Sandy Operations Center	-	-	-	-	-	-	-
Sandy Grade School	-	-	-	-	-	-	-
Sandy High School	-	-	-	-	-	-	-
Sandy Police Department	-	-	-	-	-	-	-
Sandy RFPD 72 - Main Station	-	-	-	-	-	-	-

Source: DOGAMI, *Multi-Hazard Risk Report for Clackamas County, Oregon* (O-24-XX, September 2023 Draft), Table A-24.

Highlighted cells are tentative to be confirmed by DOGAMI in their final Risk Report (expected April 2024)

Additional Critical Facilities not included in the DOGAMI Risk Report:

- Sandy Operations Center (Public Works and Transit and Fuel reserves)

Critical Infrastructure

Infrastructure that provides necessary services for emergency response include:

Drinking Water

- Alder Creek Water Treatment Plant (including Raw Water Booster Pump Station)
- Terra Fern Pump Station
- Hudson Pump Station
- Transfer Pump Station

Wastewater

- Jarl Road Wastewater Treatment Plant (including Effluent Pump Station)
- Marcy Street Pump Station
- Sandy Bluff Pump station
- Meinig Avenue Pump Station
- Jacoby Pump station
- Sleepy Hollow Pump Station
- Snowberry Pump Station

Other

- AT&T and T-Mobile Cellular Towers
- PGE Substation – Hwy 26 and Bluff Road
- Highway 211
- Highway 26
- Alder Creek Watershed
- SandyNet Infrastructure and Facilities

Essential Facilities

Facilities that are essential to the continued delivery of key government services, and/or that may significantly impact the public's ability to recover from the emergency. These facilities may include: community gathering places, commercial centers, and other public facilities such as school fields.

Essential facilities within Sandy include: Sandy High School, Cedar Ridge Middle School, Sandy Grade School, Firwood Grad School, Oregon Trail Primary Academy, Adventist Health Clinic and Urgent Care, Sandy Health Center, Fred Meyer (& pharmacy), Safeway (& pharmacy), Mt. Hood National Forest Headquarters, Walgreens (pharmacy), and community churches.

Environmental Facilities

Environmental assets are those parks, green spaces, wetlands, and rivers that provide an aesthetic and functional ecosystem service for the community include: Barlow Ridge Park, Hamilton Ridge Park, Salmon Creek Park, Timberline Ridge Park, Bornstedt Park, Cascadia Park, Champion Way Park, Deer Point Park, Ponder Lane, Sandy Bluff Park, Tupper Park, Sandy Community Campus and Skate Park, Meinig Memorial Park, Knollwood Park, Sandy River Park, and Trickle Creek Park.

Vulnerable Populations

Vulnerable populations, including seniors, disabled residents, women, and children, as well those people living in poverty, often experience the impacts of natural hazards and disasters more acutely. Populations that have special needs or require special consideration include: Avamere Assistant Living, Cedar Park Garden Apartments, Country Garden Apartments, Evans Street Senior Apartments, Firwood Village Apartments, Harlon Garden Apartments, Hummingbird Apartments, Mt. Hood Senior Living, and Hood Chalet Mobile Estates.

Hazardous Materials

Facilities that, if damaged, could cause serious secondary impacts may also be considered “critical.” Hazardous materials sites are particularly vulnerable to earthquake, landslide, volcanic event, wildfire, and winter storm hazards. A hazardous material facility is one example of this type of critical facility. Those sites that store, manufacture, or use potentially hazardous materials include: Gas Stations, , Advanced Plastics Inc, Amerigas Propane Champion Collision, US Metal Works Inc., Performance Auto Body, Sandy Auto Body, and Sandy Funeral Home.

Economic Assets/Population Centers

Economic assets include businesses that employ large numbers of people and provide an economic resource to the city of Happy Valley. If damaged, the loss of these economic assets could significantly affect economic stability, and prosperity. Population Centers usually are aligned with economic centers and are a concern during evacuation/notification during a hazard event. The five largest employers in Sandy are Oregon Trail School District, Safeway, US Metal Works (truck bins, air pneumatic systems, conveyors), Quality Tank and Construction, and Web Steel Buildings NW.

Cultural and Historic Assets

The cultural and historic heritage of a community is more than just tourist charm. For families that have lived in the city for generations and new resident alike, it is the unique places, stories, and annual events that makes the community an appealing place to live. The cultural and historic assets are both intangible benefits and obvious quality-of-life- enhancing amenities. Because of their role in defining and supporting the community, protecting these resources from the impact of disasters is important.

An example of the types of properties that should be considered before, during, and after an event include the following properties within Sandy:

- RS Smith Motor Company Building (39150 Pioneer Blvd) (National Register Listed)
- Jonsrud Viewpoint
- Junker Business Building
- Centennial Plaza
- Sandy Historical Society Museum
- Veterans Memorial Square
- Sandy Public Library
- Sandy Community/Senior Center

Hazard Characteristics

Drought

The HMAC determined that the City’s probability for drought is **high** and that their vulnerability to drought is **moderate**. *These ratings did not change since the previous version of this NHMP.*

Volume I, Section 2 describes the characteristics of drought hazards, history, as well as the location, extent, and probability of a potential event. Due to the climate of Clackamas County, past and present weather conditions have shown an increasing potential for drought.

The City of Sandy has three water sources: Alder Creek (small tributary of the Sandy River), Brownell Springs (city-owned natural spring on Lenhart Butte), and Portland Water Bureau. During the spring, fall, and winter, approximately one third of supply comes from each source, while during the summer Brownell Springs is reduced to our Senior Water rights and produces only 6%, while Alder Creek and Portland provide about 42% of supply each. The Alder Creek site, located within the Alder Creek watershed (3,915 acres), provides about 1.3MGD (million gallons per day, approximately equal to half the water rights the city has on Alder Creek). This reduced production is due to the deteriorated conditional of the water treatment plant whose facilities are past their useful life. The site includes a treatment plant, reservoirs, piping, and pump stations built in 1977 and last updated in 2001. Brownell Springs can reliably support about 90,000 gallons per day and is located on 22 acres of City-owned land on the north face of Lenhart Butte.

The Portland Water Bureau source has been providing about 500,000 gallons per day (up to a maximum of 3 MGD) since 2013. In addition, the city holds water rights to withdraw up to 25 CFS (cubic feet per second – roughly 16 MGD) from the Salmon River near the Mount Hood National Forest Boundary (current agreements limit future withdrawal to 16.3 CFS – roughly 1-.5 MGD). However, it should be noted that it will take approximately 15-20 years before the City would be able to access the Salmon Creek Water right. The existing water rights and system is considered adequate to supply the City’s expected growth with the planned connection to Portland Water Bureau’s new treatment facility in 2027. Until the new pipeline is constructed, which will also connect the City of Sandy to the Columbia wellfield via the Portland Water Bureau, the City remains vulnerable to droughts due to limitations at the existing Portland Connection, and vulnerabilities with Alder Creek.

Vulnerability Assessment

Due to insufficient data and resources, Sandy is currently unable to perform a quantitative risk assessment, or exposure analysis, for this hazard. For a list of facilities and infrastructure vulnerable to this hazard see the Community Assets Section and Table SA-4.

Future Projections

According to the Oregon Climate Change Research Institute “Future Climate Projections, Clackamas County,”⁵ drought, as represented by low summer soil moisture, low spring snowpack, low summer runoff, and low summer precipitation, is projected to become more frequent in Clackamas County by the 2050s.

Increasingly frequent droughts will have economic and social impacts upon those who depend upon predictable growing periods (ranches, farms, vineyards, gardeners) as well as upon the price and

⁵ Oregon Climate Change Research Institute, *Future Climate Projections, Clackamas County, Oregon*. February 2023.

availability of fresh vegetables. It may also stress local jurisdiction’s ability to provide water for irrigation or commercial and household use.

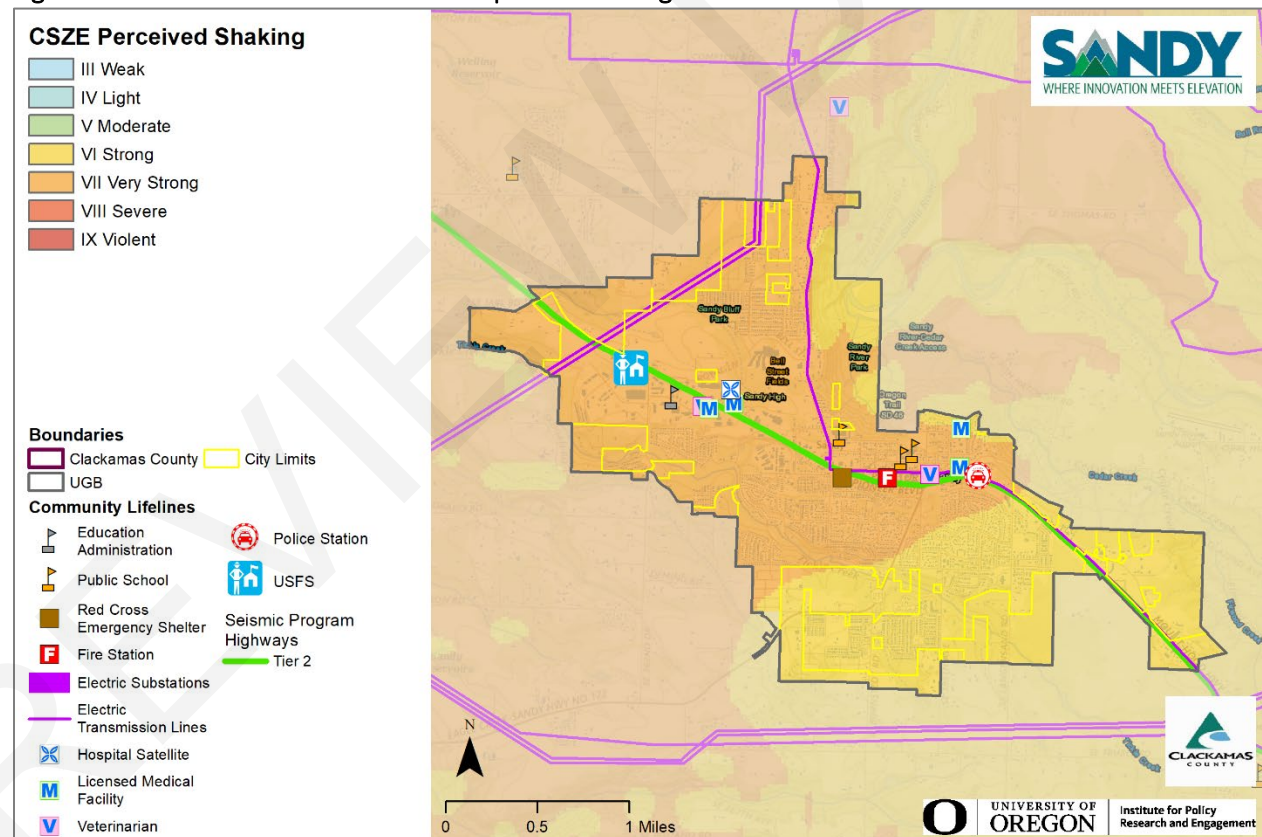
Earthquake (Cascadia Subduction Zone)

The HMAC determined that the City’s probability for a Cascadia Subduction Zone (CSZ) earthquake is **moderate** and that their vulnerability to a CSZ earthquake is **high**. *These ratings did not change since the previous version of this NHMP.*

Volume I, Section 2 describes the characteristics of earthquake hazards, history, as well as the location, extent, and probability of a potential event. Generally, an event that affects the County is likely to affect Sandy as well. The causes and characteristics of an earthquake event are appropriately described within Volume I, Section 2 as well as the location and extent of potential hazards. Previous occurrences are well documented within Volume I, Section 2 and the community impacts described by the County would generally be the same for Sandy as well.

Figure SA-2 displays relative shaking hazards from a Cascadia Subduction Zone earthquake event. As shown in the figure, most of the city is expected to experience very strong shaking (orange), while areas around the city will experience severe shaking (light red) (shown by the red northeast corner) in a CSZ event.

Figure SA-2 Cascadia Subduction Zone Expected Shaking



Within the Northern Willamette Valley/Portland Metro Region, three potential faults and/or zones can generate high-magnitude earthquakes. These include the Cascadia Subduction Zone, Gales Creek-Newberg-Mt Angel Structural Zone, Portland Hills Fault Zone, and the Canby-Molalla Fault Zone (discussed in the crustal earthquake section).

Cascadia Subduction Zone

The Cascadia Subduction Zone is a 680-mile-long zone of active tectonic convergence where oceanic crust of the Juan de Fuca Plate is subducting beneath the North American continent at a rate of 4 cm per year. Scientists have found evidence that 11 large, tsunami-producing earthquakes have occurred off the Pacific Northwest coast in the past 6,000 years. These earthquakes took place roughly between 300 and 5,400 years ago with an average occurrence interval of about 510 years. The most recent of these large earthquakes took place in approximately 1700 A.D.⁶

The city's proximity to the Cascadia Subduction Zone, potential slope instability and the prevalence of certain soils subject to liquefaction and amplification combine to give the city a moderate-risk profile. Due to the expected pattern of damage resulting from a CSZ event, the Oregon Resilience Plan divides the State into four distinct zones and places the city predominately within the "Valley Zone" (Valley Zone, from the summit of the Coast Range to the summit of the Cascades). Within the Northwest Oregon region, damage and shaking is expected to be strong and widespread - an event will be disruptive to daily life and commerce and the main priority is expected to be restoring services to business and residents.

Earthquake (Crustal)

The HMAC determined that the City's probability for a crustal earthquake is **low** and that their vulnerability to crustal earthquake is **high**. *These ratings did not change since the previous version of this NHMP.*

Volume I, Section 2 describes the causes and characteristics of earthquake hazards, history, as well as the location, extent, and probability of a potential event. Generally, an event that affects the County is likely to affect Sandy as well. Figure SA-3 shows a generalized geologic map of the Sandy area that includes the areas for potential regional active faults, earthquake history (1971-2008), and soft soils (liquefaction) hazard. The figure shows the areas of greatest concern within the City limits as red and orange.

Earthquake-induced damages are difficult to predict, and depend on the size, type, and location of the earthquake, as well as site-specific building, and soil characteristics. Presently, it is not possible to accurately forecast the location or size of earthquakes, but it is possible to predict the behavior of soil at any site. In many major earthquakes, damages have primarily been caused by the behavior of the soil.

The Canby-Molalla Fault runs through the center of the City and can generate high- magnitude earthquakes. The City is also about 15 miles away from the Portland Hills Fault Zone (discussed in greater detail below). Historical records count over 56 earthquakes in the Portland-metro area. The more severe ones occurred in 1877, 1880, 1953 and 1962. The most recent severe earthquake was the March 25, 1993, Scotts Mills quake. It was a 5.6 magnitude quake with aftershocks continuing at least through April 8.

Canby-Molalla Fault Zone

The Canby-Molalla Fault Zone is a series of NE-trending fault that vertically displace the Columbia River Basalt with discontinuous aeromagnetic anomalies that represent significant offset of Eocene basement

⁶ The Cascadia Region Earthquake Workgroup, 2005. Cascadia Subduction Zone Earthquakes: A magnitude 9.0 earthquake scenario. <http://www.crew.org/PDFs/CREWSubductionZoneSmall.pdf>

and volcanic rocks. The fault zone extends for 31 miles from the vicinity of Tigard south through the towns of Canby and Sandy in northern Oregon.

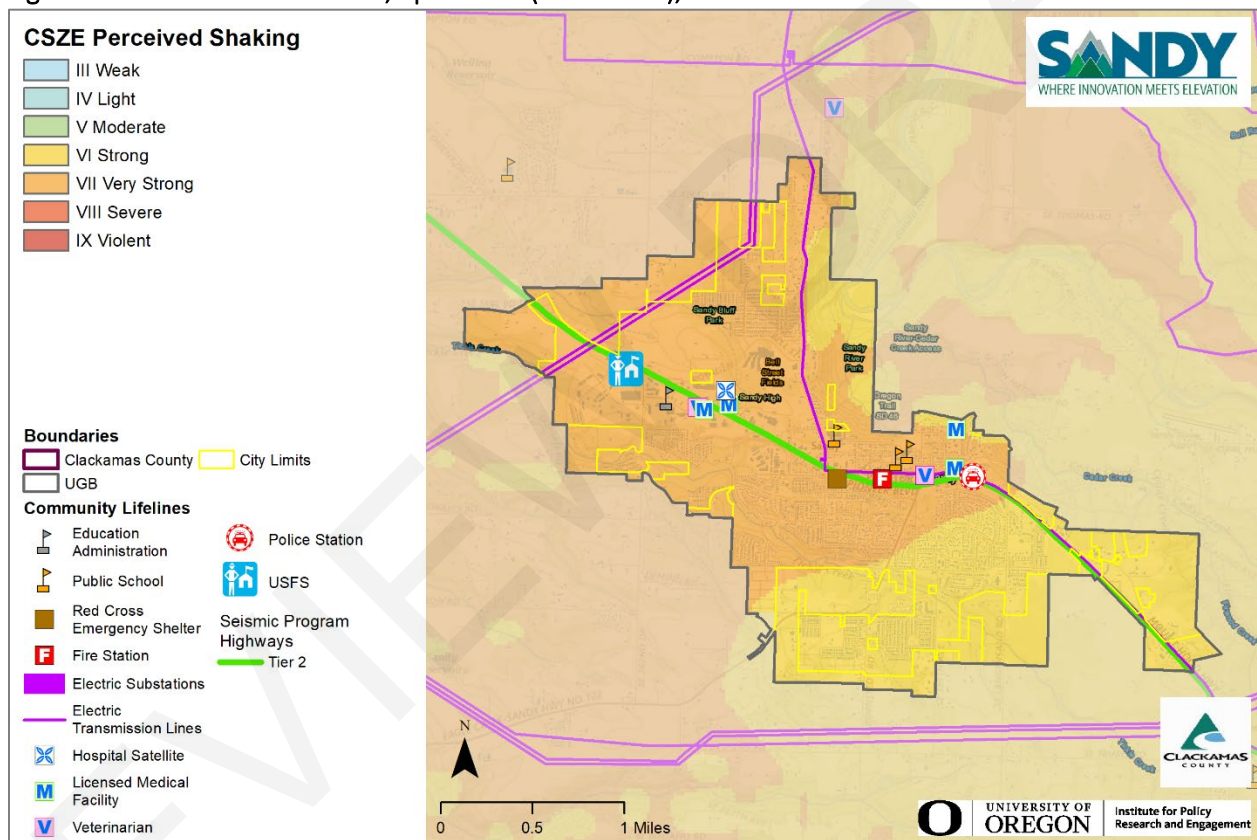
Portland Hills Fault Zone

The Portland Hills Fault Zone is a series of NW-trending faults that vertically displace the Columbia River Basalt by 1,130 feet and appear to control thickness changes in late Pleistocene (approx. 780,000 years ago) sediment. The fault zone extends along the eastern margin of the Portland Hills for 25 miles and lies about 11 miles northwest of Sandy.

Mount Hood Fault Zone

The Mount Hood Fault Zone is a series of four north-trending faults that extend approximately 34 miles north from Clear Lake to the Columbia River, its major segments include the Blue Ridge and the Twin Lakes faults.⁷

Figure SA-3 Active Crustal Faults, Epicenters (1971-2008), and Soft Soils



Source: Map created by Oregon Partnership for Disaster Resilience.

Data: Oregon Department of Geology and Mineral Industries. Preparedness Framework Implementation Team (IRIS v3).

Note: To view hazard detail click this [link](#) to access Oregon HazVu

⁷ Madin, I. P., Streig, A. R., Burns, W. J., and Ma, L., 2017, The Mount Hood Fault Zone – Late Quaternary and Holocene fault features newly mapped with high-resolution lidar Imagery, in Scott, W. E., and Gardner, C. A. (eds.), Field-trip guide to Mount Hood, Oregon, highlighting eruptive history and hazards: U.S. Geological Survey Scientific Investigations Report 2017-5022-G, p. 100-109. <https://pubs.usgs.gov/sir/2017/5022/g/sir20175022g.pdf>

Vulnerability Assessment

In 2018 the Department of Geology and Mineral Industries (DOGAMI) completed a regional impact analysis for earthquakes originating from the Cascadia Subduction Zone and Portland Hills faults ([O-18-02](#)). Findings from that report are provided at the end of the crustal earthquakes hazard section.

Seismic building codes were implemented in Oregon in the 1970s; however, stricter standards did not take effect until 1991 and early 2000s. As noted in the community profile, approximately 36% of residential buildings were built prior to 1990, which increases the City’s vulnerability to the earthquake hazard. Information on specific public buildings’ (schools and public safety) estimated seismic resistance, determined by DOGAMI in 2007, is shown in Table SA-5; each “X” represents one building within that ranking category. Of the facilities evaluated by DOGAMI using their Rapid Visual Survey (RVS), zero (0) have a very high (100% chance) collapse potential and zero (0) have a high (greater than 10% chance) collapse potential.

For a list of facilities and infrastructure vulnerable to this hazard, see the Community Assets Section and Table SA-4.

Table SA-5 Rapid Visual Survey Scores

Facility	Site ID*	Level of Collapse Potential			
		Low (<1%)	Moderate (>1%)	High (>10%)	Very High (100%)
Schools					
Aquatic and Community Center (former Cedar Ridge Middle) (17225 Smith Ave)	Clac_sch38	X			
Sandy Grade (38955 Pleasant St)	Clac_sch36	X			
Fire Facilities					
Sandy Fire 72 – Main Station (17460 Bruns Ave) see Mitigation Successes	Clac_fir37	X			
Other Facilities					
Sandy Public Library (former Police Department) (38970 Proctor Blvd)	Clac_pol07	X			

Source: [DOGAMI 2007. Open File Report 0-07-02. Statewide Seismic Needs Assessment Using Rapid Visual Assessment.](#)

“*” – Site ID is referenced on the [RVS Clackamas County Map](#)

Note 1: The Former Sandy High (Frazier) (RVS ID Clac_sch6) was demolished in and rebuilt via a 2008 bond. It now houses Cedar Ridge Middle School. New High School is located at 37400 Bell St.

Note 2: The Sandy Public Library was formerly the Police Department. There has been an extensive renovation of the building.

In addition to building damages, utility (electric power, water, wastewater, natural gas) and transportation systems (bridges, pipelines) are also likely to experience significant damage. There is a low probability that a major earthquake will result in failure of upstream dams.

Utility systems will be significantly damaged, including damaged buildings and damage to utility infrastructure, including water treatment plants and equipment at high voltage substations (especially 230 kV or higher which are more vulnerable than lower voltage substations). Buried pipe systems will

suffer extensive damage with approximately one break per mile in soft soil areas. There would be a much lower rate of pipe breaks in other areas. Restoration of utility services will require substantial mutual aid from utilities outside of the affected area.

Earthquake Regional Impact Analysis

In 2018 DOGAMI completed a regional impact analysis for earthquakes originating from the Cascadia Subduction Zone and Portland Hills faults (O-18-02). Their study focused on damage to buildings, and the people that occupy them, and on two key infrastructure sectors: electric power transmission and emergency transportation routes. Each earthquake was studied with wet and dry soil conditions and for events that occur during the daytime (2 PM) and nighttime (2 AM). Impacts to buildings and people were tabulated at the county, jurisdictional (city), and neighborhood unit level. Estimated damage varied widely across the study area depending on local geology, soil moisture conditions, type of building, and distance from the studied faults. In general, damage from the Cascadia Subduction Zone scenario was greater in the western portion of the study area, however, damage could still be significant in some areas east of the Willamette River. The report found that damage to high-value commercial and industrial buildings was high since many of these facilities are in areas of high to very high liquefaction hazard. Casualties were higher during the daytime scenario (generally double) since more people would be at work and occupying non-wood structures that fare worse in an earthquake.

The Portland Hills fault scenario created greater damages than the Cascade Subduction Zone scenario due primarily to its placement relative to population centers and regional assets; however, at distances 15 or more miles from the Portland Hills fault the damages from the Cascadia Subduction Zone scenario generally were higher. In both the Cascadia Subduction Zone and Portland Hills Fault scenarios it is forecasted that emergency transportation routes will be fragmented, affecting the distribution of goods and services, conditions are worse under the Portland Hills Fault scenario. Portions of the electric distribution system are also expected to be impacted under both scenarios; however, the impact is considerably less than it is to the transportation routes. Additional capacity or redundancy within the electric distribution network may be beneficial in select areas that are likely to have greater impacts.

Table SA-6 shows the permanent resident population that are vulnerable to injury or death (casualty) and the buildings in the City that are susceptible to liquefaction and landslides, it does not predict that damage will occur in specific areas due to either liquefaction or landslide. More population and property are exposed to higher degrees of expected damage or casualty under the Portland Hills Fault “wet” scenario than in any other scenario.

Cascadia Subduction Zone Scenario

The City of Sandy is expected to have a 1% building loss ratio with a repair cost of \$11 million under the CSZ “dry” scenario, and a 1% building loss ratio with a repair cost of \$12 million under the CSZ “wet” scenario.⁸ The city is expected to have around 5 daytime or 2 nighttime casualties during the CSZ “dry” scenario and 5 daytime or 2 nighttime casualties during the CSZ “wet” scenario. It is expected that there will be a long-term displaced population of around 4 for the CSZ “dry” scenario and 6 for the CSZ “wet” scenario.⁹

Portland Hills Fault Scenario

The City of Sandy is expected to have a 2% building loss ratio with a repair cost of \$20 million under the CSZ “dry” scenario, and a 2% building loss ratio with a repair cost of \$21 million under the CSZ “wet”

⁸ DOGAMI, Earthquake regional impact analysis for Clackamas, Multnomah, and Washington Counties, Oregon (2018, O-18-02), Tables 12-8 and 12-9.

⁹ Ibid, Tables 12-8 and 12-9.

scenario.¹⁰ The long-term displaced population and casualties are slightly increased for all the Portland Hills Fault scenarios. The city is expected to have around 8 daytime or 3 nighttime casualties during the Portland Hills Fault “dry” scenario and 9 daytime or 4 nighttime casualties during the Portland Hills Fault “wet” scenario. It is expected that there will be a long-term displaced population of around 4 for the Portland Hills Fault “dry” scenario and 16 for the Portland Hills Fault “wet” scenario.¹¹

Recommendations from the report included topics within Planning, Recovery, Resiliency: Buildings, Resiliency: Infrastructure Improvements, Resiliency: Essential and Critical Facilities, Enhanced Emergency Management Tools, Database Improvements, Public Awareness, and Future Reports. The recommendations of this study are largely incorporated within this NHMPs mitigation strategies (Table SA-1 and Volume I, Section 3). For more detailed information on the report, the damage estimates, and the recommendations see: *Earthquake regional impact analysis for Clackamas, Multnomah, and Washington Counties, Oregon* (2018, [O-18-02](#)).

Table SA-6 Expected damages and casualties for the CSZ fault and Portland Hills fault: earthquake, soil moisture, and event time scenarios

	Cascadia Subduction Zone (M9.0)		Portland Hills Fault (M6.8)	
	"Dry" Soil	"Wet" Saturated Soil	"Dry" Soil	"Wet" Saturated Soil
Number of Buildings	3,734	3,734	3,734	3,734
Building Value (\$ Million)	1,077	1,077	1,077	1,077
Building Repair Cost (\$ Million)	11	12	20	21
Building Loss Ratio	1%	1%	2%	2%
Debris (Thousands of Tons)	5	5	8	8
Long-Term Displaced Population	4	6	4	16
Total Casualties (Daytime)	5	5	8	9
Level 4 (Killed)	0	0	0	0
Total Casualties (Nighttime)	2	2	3	4
Level 4 (Killed)	0	0	0	0

Source: DOGAMI, Earthquake regional impact analysis for Clackamas, Multnomah, and Washington Counties, Oregon (2018, O-18-02), Tables 12-8, 12-9, 12-10, and 12-11.

Natural Hazard Risk Reports

DOGAMI has developed two **Risk Reports** that provide hazard analysis summary tables that identify populations and property within the Lower Columbia-Sandy River Watershed ([O-20-06](#)) and countywide ([O-24-XX](#)) that are vulnerable to the earthquake hazard.

Note: The differences between the two Risk Reports are due to the watershed based study area of O-20-06. This study was only for the Lower Columbia-Sandy watershed, which meant that communities along the edge of the watershed like Sandy, Troutdale, and Gresham were only partially included in the study. As such, the O-20-06 report under-represented the potential impacts to the City of Sandy from this hazard.

¹⁰ Ibid, Tables 12-10 and 12-11

¹¹ Ibid, Tables 12-10 and 12-11.

2024 DOGAMI Risk Report (O-24-xx)¹²

Cascadia Subduction Zone Scenario: In the City of Sandy, 16 buildings and 1 critical facility are expected to be damaged for a total potential loss of \$17.3 million (a loss ratio of 1.2%). Only a few residents may potentially be displaced.

Canby-Molalla Fault Scenario: Six (6) buildings are expected to be damaged, 0 critical facilities, for a total potential loss of \$5.6 million (a loss ratio of less than 1%). Very few residents, if any, may potentially be displaced.

2020 DOGAMI Risk Report (O-20-06)¹³

Mount Hood Fault Scenario: One (1) building is expected to be damaged for a total potential loss of \$1,402,000 (a loss ratio of < 1%). No residents are expected to be displaced.

Note: The Cascadia Subduction Zone Scenario was also profiled but is superseded by data in O-24-xx.

Future Projections

Future development (residential, commercial, or industrial) within Clackamas County will be at risk to earthquake impacts, although this risk can be mitigated by the adoption and enforcement of high development and building standards. Reducing risks to vulnerable populations should be considered during the redevelopment of existing properties.

Flood

The HMAC determined that the City's probability of flooding is **high** and that their vulnerability to flooding is **moderate**. *The probability rating increased and the vulnerability rating did not change since the previous version of this NHMP.*

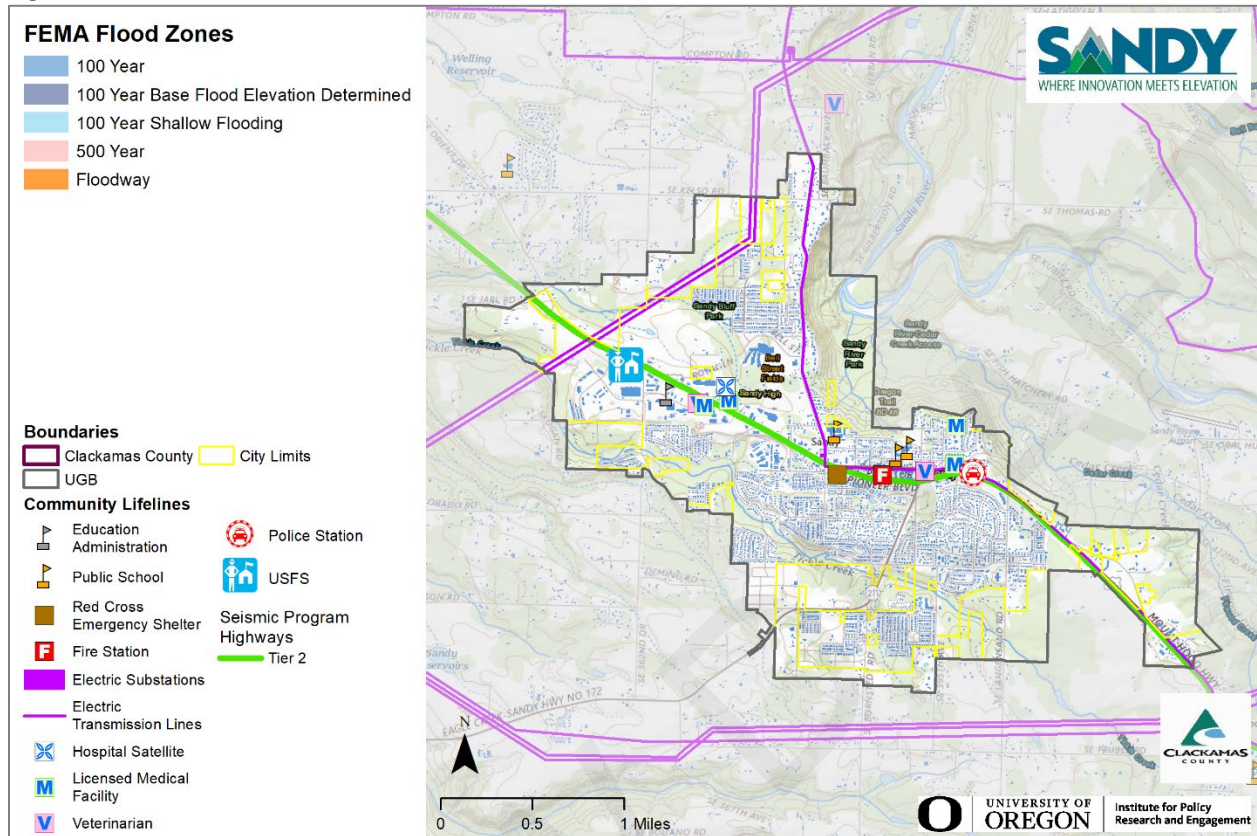
Volume I, Section 2 describes the characteristics of flood hazards, history, as well as the location, extent, and probability of a potential event. Figure SA-4 illustrates the flood hazard area for Sandy.

The main sources of flooding in Sandy are Tickle Creek, No Name Creek, and numerous drainage ways. Regionally, the Sandy River is a flooding source as well, but not for Sandy as the river is located at a much lower elevation than the city. The largest flooding event affecting Sandy was in January 2009. From January 1-2, 2009, a winter storm event led to flooding throughout many of the smaller tributaries and drainage ways. Some rural homeowners rerouted the culverts and drainage ways near their homes to protect their property, but this resulted in more damage and flooding to neighbors downstream.. Some rural residents outside Sandy depend on small bridges to access their homes. A few of these structures were washed out, damaging the bridges, and essentially cutting residents off from their homes. Two trailers were lost, and many homes had crawl space flooding.

¹² DOGAMI, *Multi-Hazard Risk Report for Clackamas County, Oregon (O-24-xx, September 2023 Draft)*, Table A-23.

¹³ DOGAMI, *Lower Columbia-Sandy Watershed Natural Hazard Risk Report (March 2018 Draft)*, Table 9-11.

Figure SA-4 FEMA Flood Zones



Source: Map created by Oregon Partnership for Disaster Resilience.

Data: Oregon Department of Geology and Mineral Industries. Preparedness Framework Implementation Team (IRIS v3).

Note: To view hazard detail click this [link](#) to access Oregon HazVu

Vulnerability Assessment

The Oregon Department of Geology and Mineral Industries (DOGAMI) conducted a multi-hazard risk assessment (Risk Report) for the Lower Columbia-Sandy Watershed including the City of Sandy. The Risk Report provides a quantitative risk assessment for the flood (including channel migration) hazard along the Sandy River.

Floods can have a devastating impact on almost every aspect of the community, including private property damage, public infrastructure damage, and economic loss from business interruption. It is important for the City to be aware of flooding impacts and assess its level of risk.

The economic losses due to business closures often total more than the initial property losses that result from flood events. Business owners, and their employees are significantly impacted by flood events. Direct damages from flooding are the most common impacts, but indirect damages, such as diminished clientele, can be just as debilitating to a business.

The only mapped floodplain hazard within city limits is in the area surrounding Tickle Creek, which bisects the southern side of the city. A few homes are located within this mapped floodplain (Figure SA-4). A steep bluff protects the northern areas of the city from the Sandy River. For mitigation planning purposes, it is important to recognize that flood risk for a community is not limited only to areas of mapped floodplains. Other portions of Sandy outside of the mapped floodplains, such as the majority of No Name Creek, may also be at relatively high risk from over bank flooding. Small creek tributaries and

drainageways area often not mapped by FEMA. It is also important to verify that culverts are not blocked and are approximately sized to accommodate rainfall increases during storm events.

The HMAC identified Sandy's wastewater treatment plant as a potential vulnerability in severe flooding situations. Portions of the road that lead to the plant are in the floodplain; as such, access to the sewage treatment plant could be isolated in a flooding event. Additionally, any transportation closures within the region will be difficult for Sandy's residents. The city is largely a bedroom community, and residents rely upon regional transportation routes for work.

Natural Hazard Risk Reports

DOGAMI has developed two **Risk Reports** that provide hazard analysis summary tables that identify populations and property within the Lower Columbia-Sandy River Watershed ([O-20-06](#)) and countywide ([O-24-XX](#)) that are vulnerable to the flood and channel migration hazards.

Note: The differences between the two Risk Reports are due to the watershed based study area of O-20-06. This study was only for the Lower Columbia-Sandy watershed, which meant that communities along the edge of the watershed like Sandy, Troutdale, and Gresham were only partially included in the study. As such, the O-20-06 report under-represented the potential impacts to the City of Sandy from this hazard.

2024 DOGAMI Risk Report ([O-24-xx](#))¹⁴

According to the 2024 Risk Report there is minimal risk to buildings and population within the city from the channel migration or flooding of the Sandy River. One (1) building could be damaged for a total potential loss of \$2,000 (a building loss ratio of < 1%). About 6 residents may be displaced by flood (a population displacement ratio of less than 1%).

2020 DOGAMI Risk Report ([O-20-06](#))¹⁵

According to the 2020 Risk Report there is minimal risk to buildings and population within the city from the channel migration or flooding of the Sandy River (note: The Risk Report did not assess flood risk from the Tickle Creek).

National Flood Insurance Program (NFIP)

FEMA's Flood Insurance Study (FIS), and Flood Insurance Rate Maps (FIRMs) are effective as of June 17, 2008. The City complies with the NFIP through enforcement of their flood damage prevention ordinance, which was updated in 2019, and their floodplain management program. The last Community Assistance Visit (CAV) for Sandy was on April 28, 1994. Sandy does not participate in the Community Rating System (CRS). The Community Repetitive Loss record does not identify any Repetitive Loss Properties¹⁶ or Severe Repetitive Loss Properties¹⁷.

¹⁴ DOGAMI, *Multi-Hazard Risk Report for Clackamas County, Oregon* ([O-24-XX](#), [September 2023 Draft](#)), Table A-23.

¹⁵ DOGAMI, *Lower Columbia-Sandy Watershed Natural Hazard Risk Report* (March 2018 Draft), Table 9-11.

¹⁶ A Repetitive Loss (RL) property is any insurable building for which two or more claims of more than \$1,000 were paid by the National Flood Insurance Program (NFIP) within any rolling ten-year period, since 1978. A RL property may or may not be currently insured by the NFIP.

¹⁷ A Severe Repetitive Loss (SRL) property is a single family property (consisting of 1 to 4 residences) that is covered under flood insurance by the NFIP and has incurred flood-related damage for which 4 or more separate claims payments have been paid under flood insurance coverage, with the amount of each claim payment exceeding \$5,000 and with cumulative amount of such claims payments exceeding \$20,000; or for which at least 2 separate claims payments have been made with the cumulative amount of such claims exceeding the reported value of the property.

Future Projections

According to the Oregon Climate Change Research Institute “Future Climate Projections, Clackamas County,”¹⁸ winter flood risk at mid- to low elevations in Clackamas County, where temperatures are near freezing during winter and precipitation is a mix of rain and snow, is projected to increase as winter temperatures increase. The temperature increase will lead to an increase in the percentage of precipitation falling as rain rather than snow. The projected increases in total precipitation, and in rain relative to snow, likely will increase flood magnitudes in the region. Vulnerable populations adjacent to floodways (including the unhoused, manufactured home communities, and campground occupants) will be more at risk as the winter flood risk increases.

Landslide

The HMAC determined that the City’s probability for landslide is **high** and that their vulnerability to landslide is **moderate**. *The probability and vulnerability ratings increased since the previous version of this NHMP.*

Volume I, Section 2 describes the characteristics of landslide hazards, history, as well as the location, extent, and probability of a potential event within the region. Rural areas outside Sandy that have experienced landslides in the past include Ten Eyck Road, Barlow Trail, Laughing Water Road, Coalman Road, and Salmon River Road. In 1982, a landslide on Ten Eyck Road closed the road for 3-4 months. This was one of the biggest impacts that rural Sandy has experienced because of sliding activity. More recently landslides occurred on January 1 and 2, 2009. On the night of January 1st, a large mudslide to the east of city limits closed Highway 26 at milepost 35. At about 1:00am on January 2nd, an embankment above the Mount Hood Industrial Park east of Ruben Lane on the south side of Highway 26 gave way and destroyed a building. The slide also damaged a water line, a fiber optic cable and took out 9-1-1 service for part of the early morning.

Most of Sandy demonstrates a low to moderate landslide susceptibility exposure. Outside the city approximately 18% of the area has very high or high, and inside the city approximately 30% has a moderate, landslide susceptibility exposure.¹⁹

Note that even if a jurisdiction has a high percentage of area in a high or very high landslide exposure susceptibility zone, this does not mean there is a high risk, because risk is the intersection of hazard, and assets.

Vulnerability Assessment

DOGAMI completed a statewide landslide susceptibility assessment in 2016 ([O-16-02](#)), general findings from that report are provided.

Potential landslide-related impacts are adequately described within Volume I, Section 2, and include infrastructure damages, economic impacts (due to isolation, and/or arterial road closures), property damages, and obstruction to evacuation routes. Rain-induced landslides, and debris flows can potentially occur during any winter, and thoroughfares beyond City limits are susceptible to obstruction as well. For a list of facilities and infrastructure vulnerable to this hazard see the Community Assets Section and Table SA-4.

The most common type of landslides are slides caused by erosion. Slides move in contact with the underlying surface, are generally slow moving, and can be deep. Rainfall-initiated landslides tend to be

¹⁸ Oregon Climate Change Research Institute, *Future Climate Projections, Clackamas County, Oregon*. February 2023.

¹⁹ DOGAMI. [Open-File Report, O-16-02, Landslide Susceptibility Overview Map of Oregon](#) (2016)

smaller; while earthquake induced landslides may be quite large. All soil types can be affected by natural landslide triggering conditions.

The property at 39641 Scenic St, Cedar Ridge Middle School, and the adjacent Verizon Wireless Tower, Advance Auto, and Pacific Pride Fuel are located above or below steep slopes. The local slump and earthflow hazards are located at the hill on Tupper Road between Sandy Heights Road and Strawbridge Parkway, and another hazard is on the slope between Nettie Connett Drive and the entrance to Hood Chalet Mobile Estates. The Hood Chalet Mobile Villa is located at the base of the hill and a slide in this area could devastate a large portion of the mobile home park. The mudflow and debris flow hazard is located on the slope near Dubarko Road, at Melissa Ave, and Solso Court.

Past landslide-incurred damages are proof that landslides can cause adverse effects upon residents, transportation systems, and local businesses. In the future, the HMAC expects that a slide could pollute the city water supply if sediment enters streams and rivers.

Sandy's residents are very dependent on Highway 26 for travelling to and from work, and Sandy's stores are similarly dependent on Highway 26 for inventory. If a large slide impacted this arterial Sandy could be cut off from neighboring communities.

There is evidence of earth movement affecting several multi-family dwellings on the west end of Park St. near Beers Ave. Some of the foundations show evidence of cracking and concrete buttresses have been built to support the foundation walls on the downhill side of these structures. In addition, the piping connecting a private sewage lift station serving these dwellings has been affected by movement of the surrounding soils and structures. It is unknown whether the soil instability is a result of earth movement or poor construction practices when these dwellings were built (ca. 1977). While this area has not been impacted in the past, it could be the location of a future landslide, especially because unstable soils could be subject to liquefaction in an earthquake event.

The raw water intake for the Alder Creek Water Treatment Plant is accessible only by foot or helicopter. A slide in the watershed above could bring trees and debris down the stream channel and plug the diversion intake. It would be difficult to bring equipment to the area within a reasonable amount of time because the intake is so remote.

Approximately 40 homes are located on the 'cliff' side of Bluff. A landslide could impact some or all of these dwellings. The water transmission line connecting Sandy to the Portland Water Bureau's system is also located in the northbound lane of Bluff Road. A mass earth movement affecting the roadway prism could damage the transmission main. Lastly, tourism surrounding Mount Hood has a great impact on Sandy's economy. If roads leading to Mt. Hood are altered by a landslide, tourism would be severely impaired. In addition to skiing, Sandy is home to a large mountain biking and hiking community. A landslide could block access to these activities or create an unsightly environment and reduce tourism in the area.

Natural Hazard Risk Reports

DOGAMI has developed two **Risk Reports** that provide hazard analysis summary tables that identify populations and property within the Lower Columbia-Sandy River Watershed (O-20-06) and countywide (O-24-XX) that are vulnerable to the landslide hazard.

Note: The differences between the two Risk Reports are due to the watershed based study area of O-20-06. This study was only for the Lower Columbia-Sandy watershed, which meant that communities along the edge of the watershed like Sandy, Troutdale, and Gresham were only partially included in the study. As such, the O-20-06 report under-represented the potential impacts to the City of Sandy from this hazard.

2024 DOGAMI Risk Report (O-24-xx)²⁰

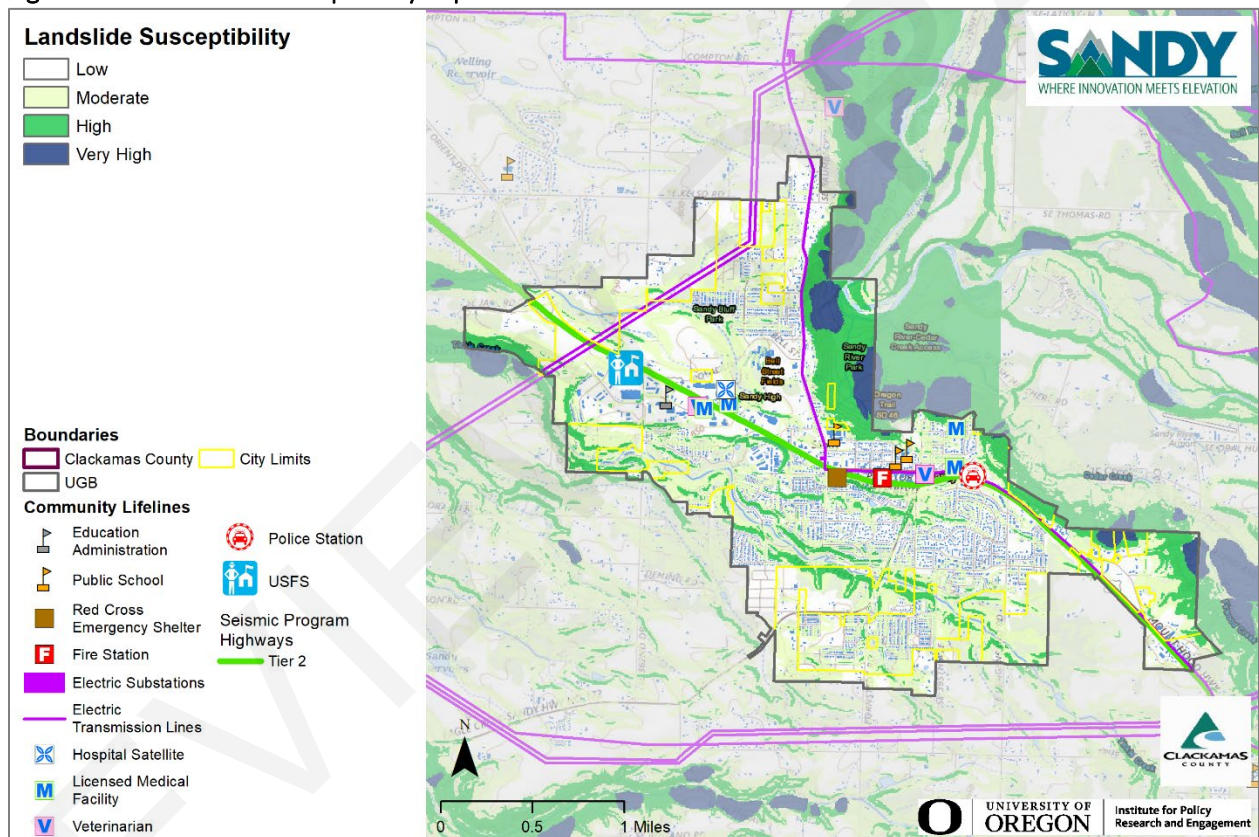
According to the most recent Risk Report, 127 buildings are exposed to the *high and very high landslide susceptibility* hazard for a total exposure of \$41.3 million (a building exposure ratio of < 3%). About 492 residents may be displaced by landslides (a population exposure ratio of 4%).

2020 DOGAMI Risk Report (O-20-06)²¹

Landslide event (High and Very High Susceptibility): 18 buildings are exposed (0 critical facilities) for a total potential loss of \$4,488,000 (an exposure ratio of 2%). In addition, 53 residents may be displaced (about 5% of the population).

Note: the exposure number is for all buildings and population exposed to the high and very high landslide susceptibility areas.

Figure SA-5 Landslide Susceptibility Exposure



Source: Map created by Oregon Partnership for Disaster Resilience.

Data: Oregon Department of Geology and Mineral Industries. Preparedness Framework Implementation Team (IRIS v3).

Note: To view hazard detail click this [link](#) to access Oregon HazVu

²⁰ DOGAMI, *Multi-Hazard Risk Report for Clackamas County, Oregon (O-24-XX, September 2023 Draft)*, Table A-23.

²¹ DOGAMI, *Lower Columbia-Sandy Watershed Natural Hazard Risk Report (March 2018 Draft)*, Table 9-11.

Future Projections

Landslides are often triggered by rainfall when the soil becomes saturated. As a surrogate measure of landslide risk, the Oregon Climate Change Research Institute report presents a threshold based on recent precipitation (cumulative precipitation over the previous 3 days) and antecedent precipitation (cumulative precipitation on the 15 days prior to the previous 3 days). By the 2050s under the higher emissions scenario, the average number of days per year in Clackamas County on which the landslide risk threshold is exceeded is not projected to change substantially. However, landslide risk depends on multiple factors, and this metric, which is based on precipitation, does not reflect all aspects of the hazard. Additional triggers, such as earthquakes, wildfires, or development, can increase risks of landslides. Future development along slopes or adjacent to riverbanks will be a greater risk of impact from this hazard.

Severe Weather

Severe weather can account for a variety of intense, and potentially damaging hazard events. These events include extreme heat, windstorms, and winter storms. The following section describes the unique probability, and vulnerability of each identified weather hazard.

Extreme Heat

The HMAC determined that the City's probability for extreme heat events is **moderate** and that their vulnerability is **moderate**. *The probability rating increased and the vulnerability rating did not change since the previous version of this NHMP.*

Volume I, Section 2 describes the characteristics of extreme heat, history, as well as the location, extent, and probability of a potential event within the region. Generally, an event that affects the County is likely to affect the City as well.

A severe heat episode or "heat wave" occurs about every two to three years, and typically lasting two to three days but can last as many as five days. A severe heat episode can be defined as consecutive days of upper 90s to around 100. Severe heat hazard in the Portland metro region can be described as the average number of days with temperatures greater than or equal to 90-degrees, or 100-degrees, Fahrenheit. On average the region experiences 13.6 days with temperatures above 90-degrees Fahrenheit, and 1.4 days above 100-degrees Fahrenheit, based on new 30-year climate averages (1981-2010) from the National Weather Service – Portland Weather Forecast Office.

The City of Sandy has not experienced any life-threatening consequences from the few historical extreme heat events, although changes in climate indicate that the area should expect to see more extreme heat events. resulting from hazards.

Future Projections

According to the Oregon Climate Change Research Institute "Future Climate Projections, Clackamas County,"²² the number, duration, and intensity of extreme heat events will increase as temperatures continue to warm. In Clackamas County, the number of extremely hot days (days on which the temperature is 90°F or higher) and the temperature on the hottest day of the year are projected to increase by the 2020s and 2050s under both the lower (RCP 4.5) and higher (RCP 8.5) emissions scenarios. The number of days per year with temperatures 90°F or higher is projected to increase by an average of 12 (range 3–21) by the 2050s, relative to the 1971–2000 historical baselines, under the higher emissions scenario. The temperature on the hottest day of the year is projected to increase by an average

²² Oregon Climate Change Research Institute, *Future Climate Projections, Clackamas County, Oregon*. February 2023.

of about 7°F (range 2–11°F) by the 2050s. Higher temperatures and longer/more extreme heat events will have negative impacts upon vulnerable populations such as those over 65+, children, those living in older or temporary housing, and field workers.

Windstorm

The HMAC determined that the City’s probability for windstorm is **moderate** and that their vulnerability to windstorm is **moderate**. *The probability rating decreased and the vulnerability rating did not change since the previous version of this NHMP.*

Volume I, Section 2 describes the characteristics of windstorm hazards, history, as well as the location, extent, and probability of a potential event within the region. Because windstorms typically occur during winter months, they are sometimes accompanied by flooding and winter storms (ice, freezing rain, and very rarely, snow). Other severe weather events that may accompany windstorms, including thunderstorms, hail, lightning strikes, and tornadoes are generally negligible for Sandy.

In September of 2022, a combination of dry conditions, windstorm and heat were the perfect blend to trigger a significant wildfire event from downed powerlines. PGE activated a Public Safety Power Alert (PSPS) in designated high fire risk zones, of which Sandy and the Mt Hood corridor were the first pre-emptive de-energization. The PSPS lasted from 2:20 am September 9, 2022, until Sunday evening September 11, 2022 once the windstorm had passed, and PGE line crews had confirmed or repaired no downed powerlines. Our prediction is that late summer and fall wind events will continue to cause PSPS on a routine basis. Power shutoff not only affects heat and cooling for dwellings, but electrical power that supplies the water and wastewater utility as well as traffic lights for safe passage.

Volume I, Section 2 describes the impacts caused by windstorms, including power outages, downed trees, heavy precipitation, building damages, and storm-related debris.

Additionally, transportation, and economic disruptions result as well. Damage from high winds generally has resulted in downed utility lines, and trees usually limited to several localized areas. Electrical power can be out anywhere from a few hours to several days. Outdoor signs have also suffered damage. If the high winds are accompanied by rain (which they often are), blowing leaves, and debris clog storm drainage grates, which in turn may cause localized urban flooding. Most electrical telephone and CATV utilities serving Sandy are still above ground and vulnerable to falling tree branches and debris. For example, the Alder Creek Water Treatment Plant suffers from power interruptions during wind events. The water plant is equipped with a standby generator to reduce the impact of power outages; however, procuring diesel or gasoline fuel for water and wastewater treatment as well as pump station generators could be difficult in an extended power outage/wind event.

Future Projections

Limited research suggests little if any change in the frequency and intensity of windstorms in the Northwest as a result of climate change. Those impacted by windstorms at present, including older residential or commercial developments with above-ground utilities, poor insulation or older construction, heavy tree canopies, or poor storm drainage, will continue to be impacted by windstorms in the future.

Winter Storm (Snow/Ice)

The HMAC determined that the City’s probability for winter storm is **moderate** and that their vulnerability to winter storm is **moderate**. *The probability rating decreased and the vulnerability rating did not change since the previous version of this NHMP.*

Volume I, Section 2 describes the characteristics of winter storm hazards, history, as well as the location, extent, and probability of a potential event within the region. Severe winter storms can consist of rain, freezing rain, ice, snow, cold temperatures, and wind. They originate from troughs of low pressure offshore that ride along the jet stream during fall, winter, and early spring months. Severe winter storms affecting the City typically originate in the Gulf of Alaska or in the central Pacific Ocean. These storms are most common from November through March.

The biggest impact of winter storms is congestion on roadways. Highway 26 bisects Sandy and is used as the main route to the Mount Hood region for residents of the Portland Metro area.

Although most winter storms typically do not cause significant damage, they are frequent, and have the potential to impact economic activity. Road and rail closures due to winter weather are an uncommon occurrence but can interrupt commuter, and commercial traffic as noted above.

Future Projections

According to the Oregon Climate Change Research Institute “Future Climate Projections, Clackamas County,”²³ cold extremes will become less frequent and intense as the climate warms. In Clackamas County, the number of cold days (maximum temperature 32°F or lower) per year is projected to decrease by an average of 6 (range -3– -8) by the 2050s, relative to the 1971–2000 historical baselines, under the higher emissions scenario. The temperature on the coldest night of the year is projected to increase by an average of 6°F (range 0– 11°F) by the 2050s.

The intensity of extreme precipitation is expected to increase as the atmosphere warms and holds more water vapor. In Clackamas County, the number of days per year with at least 0.75 inches of precipitation is not projected to change substantially. However, by the 2050s, the amount of precipitation on the wettest day and wettest consecutive five days per year is projected to increase by an average of 15% (range 0–31%) and 10% (range -1–26%), respectively, relative to the 1971–2000 historical baselines, under the higher emissions scenario.

Vulnerable populations will be more likely to experience the negative impacts of winter storms in the future, particularly the unhoused and the elderly.

Vulnerability Assessment

Due to insufficient data and resources, Sandy is currently unable to perform a quantitative risk assessment, or exposure analysis, for the extreme heat, windstorm, and winter storm hazards. For a list of facilities and infrastructure vulnerable to these hazards see the Community Assets Section and Table SA-4.

Volcanic Event

The HMAC determined that the City’s probability for a volcanic event is **low** and that their vulnerability to a volcanic event is **high**. *These ratings did not change since the previous version of this NHMP.*

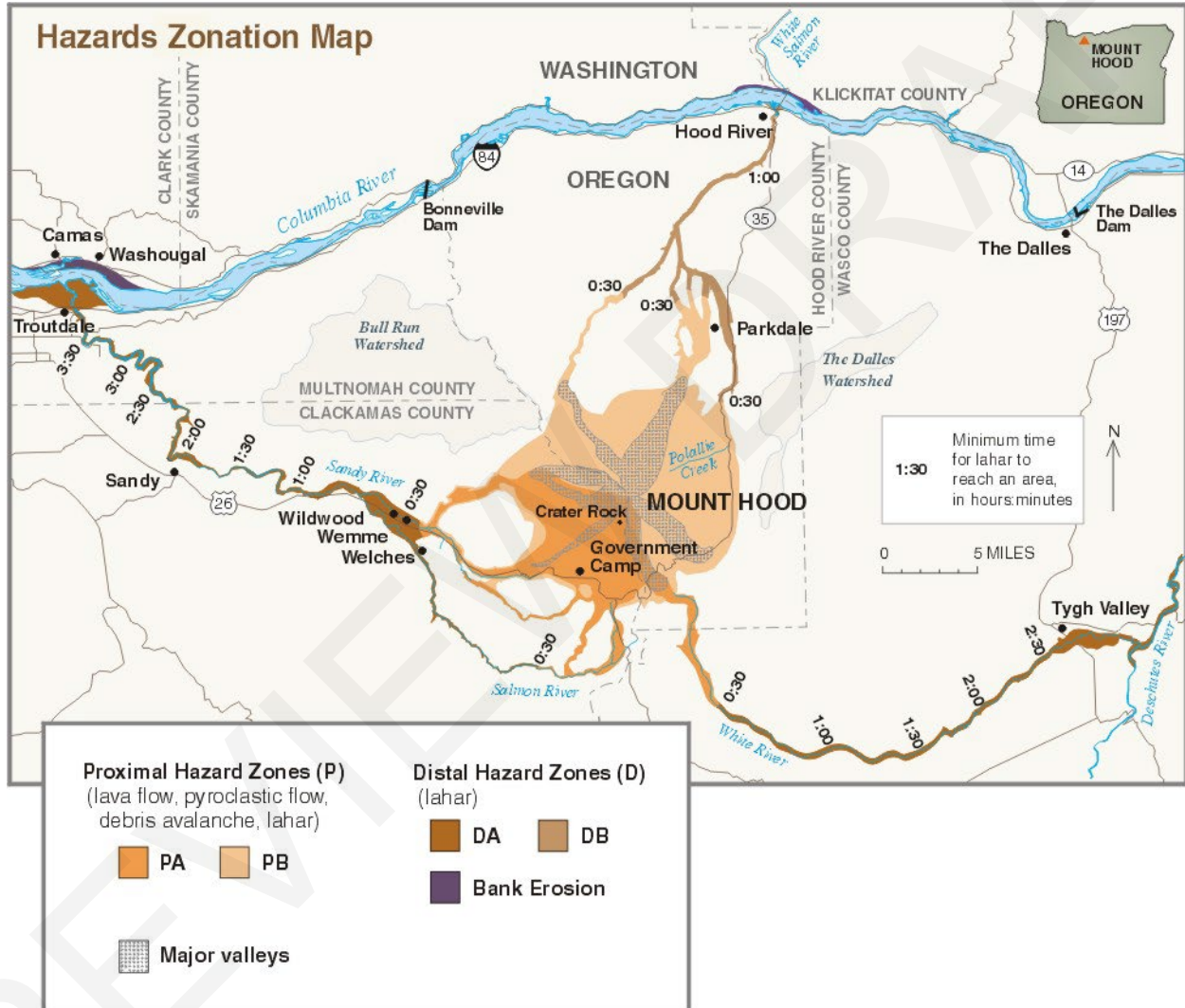
Volume I, Section 2 describes the characteristics of volcanic hazards, history, as well as the location, extent, and probability of a potential event within the region. Generally, an event that affects the western portion of the County is likely to affect Sandy as well. Volcanoes are located near Sandy, the closest of which are Mount Hood, Mount Adams, Mount Saint Helens, Mount Rainier, and the Three Sisters.

²³ Oregon Climate Change Research Institute, *Future Climate Projections, Clackamas County, Oregon*. February 2023.

Vulnerability Assessment

Due to Sandy's location near the Sandy River and proximity to Mount Hood, the city is likely to experience some of the immediate effects that eruptions have on surrounding areas. It is estimated that Sandy will have two hours before a lahar following the course of the Sandy River reaches the city (Figure SA-6 and Figure SA-7), allowing time for individuals to evacuate if needed. A lahar following the Sandy River is likely to severely damage the conduit connecting the Bull Run water source to Sandy, which provides approximately one fourth of the City's total water supply. An eruption also has the potential to severely impact Sandy's Alder Creek water source, which provides the majority of the City's total water supply.

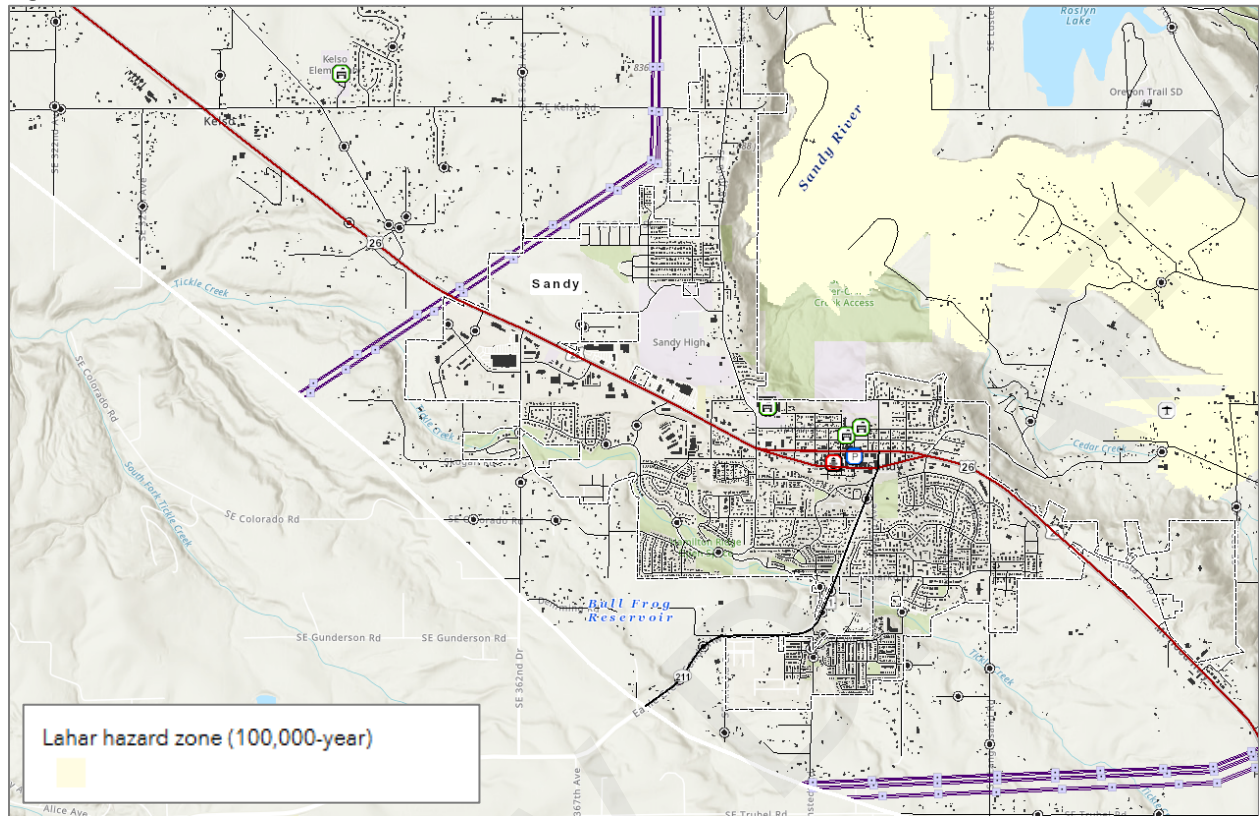
Figure SA-6 Mount Hood Hazards Map



Source: USGS Mount Hood – History and Hazards of Oregon's Most Recently Active Volcano.

A steep bluff shields the city from the Sandy River so a lahar should not affect assets within city limits. Additionally, depending on wind patterns and which volcano erupts, the city may experience ashfall (tephra). The eruption of Mount St. Helens in 1980, for example, coated the Willamette Valley with a fine layer of ash. If Mount Hood erupts, however, the city could experience a heavier coating of ash.

Figure SA-7 Lahar Hazard Zone and Critical Facilities



Source: [Mount Hood Hazards and Assets Viewer \(DOGAMI\)](#)

Natural Hazard Risk Reports

DOGAMI has developed two **Risk Reports** that provide hazard analysis summary tables that identify populations and property within the Lower Columbia-Sandy River Watershed (O-20-06)²⁴ and countywide (O-24-XX)²⁵ that are vulnerable to the lahar volcanic event hazard. According to the Risk Reports there is minimal risk to buildings and population within the city from the medium (1% annual chance) lahar volcanic event.

Future Projections

Although the science of volcano predictions is improving, it remains challenging to predict a potential volcanic event. Ash fall, which will be the greatest impact, will impact the entire County. Impacts will be felt hardest by property managers (ranches, farmers, etc.) and by those relying upon clean surface water (for drinking water production and irrigation).

Wildfire

The HMAC determined that the City's probability for wildfire is **high**, and that their vulnerability to wildfire is **high**. *The probability rating increased and the vulnerability rating did not change since the previous version of this NHMP.*

The [Clackamas County Community Wildfire Protection Plan \(CWPP\)](#) is hereby incorporated into this NHMP addendum by reference, and it will serve as the wildfire section for this addendum. The following

²⁴ DOGAMI, Lower Columbia-Sandy Watershed Natural Hazard Risk Report (March 2018 Draft), Table 9-11.

²⁵ DOGAMI, Multi-Hazard Risk Report for Clackamas County, Oregon (O-24-XX, September 2023 Draft), Table A-23.

presents a summary of key information; refer to the full CWPP for a complete description, and evaluation of the wildfire hazard. Information specific to Sandy is found in the following chapter: Chapter 9.11: Sandy Fire District (note Clackamas Fire District #1 provides services for the fire district).

Volume I, Section 2 describes the characteristics of wildland fire hazards, history, as well as the location, extent, and probability of a potential event within the region. The location, and extent of a wildland fire vary depending on fuel, topography, and weather conditions.

Weather and urbanization conditions are primarily at cause for the hazard level. Sandy has not experienced a wildfire within City limits, but the city has abundant forested areas within and adjacent to the city limits that are a concern in the case of a wildfire event. Figure SA-8 shows overall wildfire risk in Sandy.

Clackamas County has two major physiographic regions: the Willamette River Valley in western Clackamas County and the Cascade Range Mountains in eastern and southern Clackamas County. The Willamette River Valley, which includes Sandy, is the most heavily populated portion of the county and is characterized by flat or gently hilly topography. The Cascade Range has a relatively small population and is characterized by heavily forested slopes. Eastern Clackamas County is at higher risk to wildfire than western portions of the county due to its dense forest land. Human caused fires are responsible for most fires in Clackamas County. In eastern Clackamas County, the most common human induced wildfire source is debris burn escape.

The wildfire events experienced in the area in 2020 demonstrate the level of risk of wildfire. The City of Sandy proper experienced a level II evacuation notice during this event and a portion of the city's residents were part of the Public Safety Power Shutoff (PSPS) that is administered by Portland General Electric (PGE). The city's Police Department and other personnel were tasked with providing 24-hour public updates during the event via social media etc. Air quality in and around the area was of great concern during the event.

According to the Clackamas County Community Wildfire Protection Plan (CWPP), local forest lands have accumulated an unnatural buildup of fuel (undergrowth, brush, etc.) because of decades of timber harvest and aggressive fire suppression. Additionally, residential development near the wildland urban interface has increased the community's overall exposure to wildfire hazards. Some developments within the city have only one road in and one road out, and some areas of Sandy do not have evacuation plans. The potential for loss of life is great because of this accessibility issue. Communities at Risk (CARs) within the City include: Bluff Road (northeast). Rural areas outside the City at risk include Cedar Creek (southeast).²⁶

The Bluff Road area is also threatened by the potential of wildfire along the steep bluff above the Sandy River, and the difficulty of accessing this area with firefighting apparatus due to the extremely steep terrain. Additional future analysis may support the efficacy of road improvements in the area to facilitate emergency vehicle access down to the river.

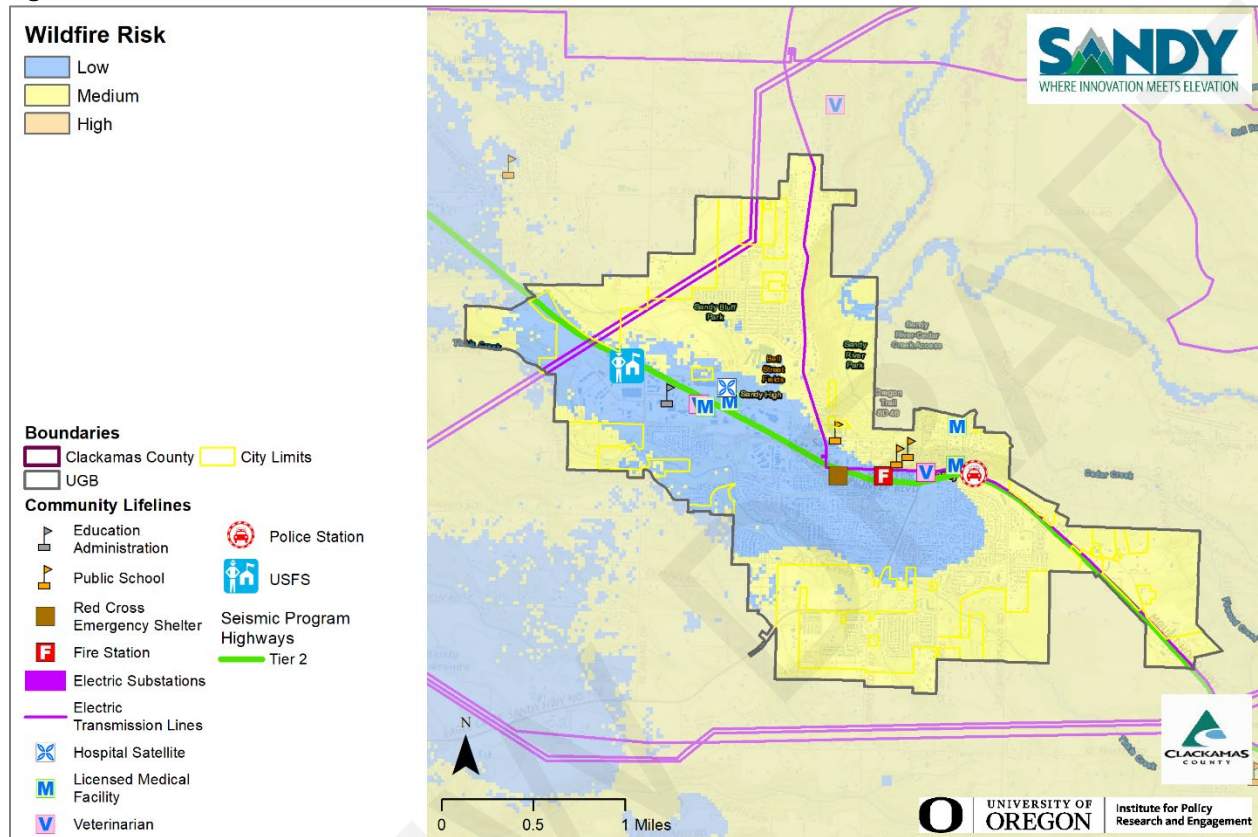
Fortunately, areas within the City are served by the water supply system and a network of fire hydrants that can more efficiently provide access to firefighting water sources than the rural areas surrounding Sandy. Most of the city has less severe (moderate or less) wildfire burn probability that includes expected flame lengths less than four feet under normal weather conditions.²⁷ However, conditions vary widely and with local topography, fuels, and local weather (including wind) conditions. Under warm, dry, windy, and

²⁶ Clackamas County Community Wildfire Protection Plan, *Sandy Rural Fire Protection District* (2018), Table 10.11-1.

²⁷ [Oregon Wildfire Risk Explorer](#)

drought conditions expect higher likelihood of fire starts, higher intensity, more ember activity, and a more difficult to control wildfire that will include more fire effects and impacts.

Figure SA-8 Wildfire Risk



Source: Map created by Oregon Partnership for Disaster Resilience.

Data: Oregon statewide wildfire risk map created by Oregon State University (unpublished). Preparedness Framework Implementation Team (IRIS v3).

Note: To view additional wildfire risk information click this [link](#) to access Oregon Explorer’s CWPP Planning Tool

Vulnerability Assessment

Due to insufficient data and resources, Sandy is currently unable to perform a quantitative risk assessment, or exposure analysis, for this hazard. For a list of facilities and infrastructure vulnerable to this hazard see the Community Assets Section and Table SA-4.

The potential community impacts, and vulnerabilities described in Volume I, Section 2 are generally accurate for the City as well. Sandy’s fire response is addressed within the CWPP which assesses wildfire risk, maps wildland urban interface areas, and includes actions to mitigate wildfire risk. The City and the Sandy Fire District will update the City’s wildfire risk assessment if the fire plan presents better data during future updates (an action item is included to participate in future updates to the CWPP).

Property can be damaged or destroyed with one fire as structures, vegetation, and other flammables easily merge to become unpredictable, and hard to manage. Other factors that affect ability to effectively respond to a wildfire include access to the location, and to water, response time from the fire station, availability of personnel, and equipment, and weather (e.g., heat, low humidity, high winds, and drought).

Natural Hazard Risk Reports

DOGAMI has developed two **Risk Reports** that provide hazard analysis summary tables that identify populations and property within the Lower Columbia-Sandy River Watershed (O-20-06) and countywide (O-24-XX) that are vulnerable to the wildfire hazard.

Note: The differences between the two Risk Reports are due to the watershed based study area of O-20-06. This study was only for the Lower Columbia-Sandy watershed, which meant that communities along the edge of the watershed like Sandy, Troutdale, and Gresham were only partially included in the study. As such, the O-20-06 report under-represented the potential impacts to the City of Sandy from this hazard.

2024 DOGAMI Risk Report (O-24-xx)²⁸

According to the most recent Risk Report, 404 buildings are exposed to the *high and (or) moderate (medium) risk wildfire* hazard for a total exposure of \$41.4 million (a building exposure ratio of < 3%). About 492 residents may be displaced by wildfires (a population exposure ratio of 4%).

2020 DOGAMI Risk Report (O-20-06)²⁹

Wildfire event (High Risk): 2 buildings are exposed (0 critical facilities) for a total potential loss of \$535,000 (an exposure ratio of < 1%). In addition, 4 residents may be displaced (< 1% of the population).

Future Projections

According to the Oregon Climate Change Research Institute “Future Climate Projections, Clackamas County,”³⁰ wildfire frequency, intensity, and area burned are projected to continue increasing in the Northwest. Wildfire risk, expressed as the average number of days per year on which fire danger is very high, is projected to increase in Clackamas County by 14 (range -6– 34) by the 2050s, relative to the historical baseline (1971–2000), under the higher emissions scenario. Similarly, the average number of days per year on which vapor pressure deficit is extreme is projected to increase by 29 (range 10–44) by the 2050s. Communities at risk to wildfire include those within the urban wildfire interface or along river or creek corridors, where fire can travel quickly. Communities will need to address growing wildfire risks if populations are not restricted from expanding further into higher risk areas.

²⁸ DOGAMI, *Multi-Hazard Risk Report for Clackamas County, Oregon (O-24-XX, September 2023 Draft)*, Table A-23.

²⁹ DOGAMI, *Lower Columbia-Sandy Watershed Natural Hazard Risk Report (March 2018 Draft)*, Table 9-11.

³⁰ Oregon Climate Change Research Institute, *Future Climate Projections, Clackamas County, Oregon*. February 2023.

Attachment A: Action Item Changes

Table SA-7 is an accounting of the status (complete or not complete) and major changes to actions since the previous NHMP. All actions were renumbered in this update to be consistent with other jurisdictions that are participating in the multi-jurisdictional NHMP. All actions marked not complete are ongoing, are still relevant, and are included in the updated action plan (Table SA-1).

Previous NHMP Actions that are Complete:

Flood #2, “Explore participation in the NFIP’s Community Rating System (CRS).” Complete. The city explored CRS and determined it to not be feasible at this time. The City will consider it as an option in the future.

Previous NHMP Actions that are Not Complete and No Longer Relevant:

Earthquake #2, “Seismically retrofit (structural and non-structural) the Sandy Community Center to exceed life safety standards in order to operate as a possible shelter.” No longer relevant, considered redundant with Action #9 which is included with this update.

Earthquake #3, “Seismically retrofit (structural and non-structural) City Hall in order to continue operations post-earthquake and to protect city and county IT infrastructure (servers).” No longer relevant, considered redundant with Action #9 which is included with this update.

Landslide #2, “Reduce the vulnerability of property owners in landslide-prone areas” No longer relevant. Existing policies are considered adequate for the risk to population.

Table SA-7 Status of All Hazard Mitigation Actions in the Previous Plan

2018 Action Item	2024 Action Item	Status	Still Relevant? (Yes/No)
Multi-Hazard #1	#1	Not Complete	Yes
Multi-Hazard #2	#2	Not Complete	Yes
Multi-Hazard #3	#3	Not Complete	Yes
Multi-Hazard #4	#4	Not Complete	Yes
-	#5	New	-
-	#6	New	-
-	#7	New	-
-	#8	New	-
Earthquake #1	#9	Not Complete	Yes
Earthquake #2	-	Not Complete	No
Earthquake #3	-	Not Complete	No

2018 Action Item	2024 Action Item	Status	Still Relevant? (Yes/No)
Flood #1	#10	Not Complete	Yes
Flood #2	-	Complete	No
-	#11	New	-
-	#12	New	-
Flood #3	#13	Not Complete	Yes
Landslide #1	#14	Not Complete	Yes
Landslide #2	-	Not Complete	No
Severe Weather #1	#15	Not Complete	Yes
Wildfire #1	#16	Not Complete, revised	Yes

Attachment B: Public Involvement Summary

Members of the steering committee provided edits and updates to the NHMP prior to the public review period as reflected in the final document.

To provide the public information regarding the draft NHMP addendum, and provide an opportunity for comment, an announcement (see below) was provided from January XX through January XX on the City's website. The plan was also posted and announced on the County's website. There were X comments provided that have been reviewed and integrated into the NHMP as applicable. Additional opportunities for stakeholders and the public to be involved in the planning process are addressed in Volume III, Appendix B.

A diverse array of agencies and organizations were provided an opportunity to provide input to inform the plan's content through a variety of mechanisms including the opportunity for comment on the draft plan. The agencies and organizations represent local and regional agencies involved in hazard mitigation activities, those that have the authority to regulate development, neighboring communities, representatives of businesses, academia, and other private organizations, and representatives of nonprofit organizations, including community-based organizations, that work directly with and/or provide support to underserved communities and socially vulnerable populations. For more information on the engagement strategy see Volume III, Appendix B.

Website Posting

To be provided

HMAC

The Hazard Mitigation Advisory Committee (HMAC) members possessed familiarity with the community and how it is affected by natural hazard events. The HMAC guided the update process through several steps including goal confirmation and prioritization, action item review and development, and information sharing, to update the NHMP and to make the NHMP as comprehensive as possible. The steering committee met formally on the following dates:

Meeting #1 and #2: March 8 and May 22, 2023

During these meetings, the HMAC:

- Reviewed the previous NHMP, and were provided updates on hazard mitigation planning, the NHMP update process, and project timeline.
- Updated recent history of hazard events in the city.
- Reviewed and confirmed the County NHMP's mission and goals.
- Reviewed and provided feedback on the draft risk assessment update including community vulnerabilities and hazard information.
- Reviewed and updated their existing mitigation strategy (actions).
- Reviewed and updated their implementation and maintenance program.
- Discussed the NHMP public outreach strategy.

Meeting #3: November 15, 2023 (via remote conference)

During this meeting, the HMAC:

- Confirmed and provided feedback on the final draft risk assessment update including community vulnerabilities and hazard information provided by DOGAMI (Risk Report).
- Reviewed and confirmed the city's capabilities assessment.
- Reviewed, confirmed, and prioritized the city's mitigation strategies.