Planning grant funding provided by:

Federal Emergency Management Agency (FEMA)
Pre-Disaster Mitigation Program
Grant: EMS-2017-PC-0005
Sub-grant Application Reference: PDMC-PL-10-OR-2016-001, and

Additional Support Provided by:

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June 18, 2019

The Honorable Jim Bernard  
Chair, Clackamas County Commissioners  
2020 Kaen Road Suite A  
Oregon City, Oregon 97045

Dear Chairman Bernard:

On April 12, 2019, the United States Department of Homeland Security’s Federal Emergency Management Agency (FEMA) Region 10 approved the Clackamas County Multi-Jurisdictional Hazard Mitigation Plan as a multi-jurisdictional local plan as outlined in Code of Federal Regulations Title 44 Part 201. This approval provides the below jurisdictions eligibility to apply for the Robert T. Stafford Disaster Relief and Emergency Assistance Act’s, Hazard Mitigation Assistance (HMA) grants through April 11, 2024, through your state.

| Clackamas County | City of Estacada | City of Lake Oswego |

The updated list of approved jurisdictions includes the cities of Estacada and Lake Oswego which recently adopted the Clackamas County Multi-Jurisdictional Hazard Mitigation Plan. To continue eligibility, jurisdictions must review, revise as appropriate, and resubmit the plan within five years of the original approval date.

If you have questions regarding your plan’s approval or FEMA’s mitigation grant programs, please contact Joseph Murray, State Hazard Mitigation Planner with Oregon Military Department, Office of Emergency Management, at 503-378-3929, who coordinates and administers these efforts for local entities.

Sincerely,

Mark Carey, Director  
Mitigation Division

Enclosure

JG:vl
RESOLUTION 19-34

A RESOLUTION ADOPTING THE CITY OF LAKE OSWEGO ADDENDUM TO THE CLACKAMAS COUNTY MULTI-JURISDICTIONAL NATURAL HAZARDS MITIGATION PLAN

Whereas, the City of Lake Oswego recognizes the threat that natural hazards pose to people, property and infrastructure within our community; and

Whereas, undertaking hazard mitigation actions will reduce the potential for harm to people, property and infrastructure from future hazard occurrences; and

Whereas, an adopted City of Lake Oswego Addendum to the Natural Hazards Mitigation Plan is required as a condition of future funding for mitigation projects under multiple FEMA pre- and post-disaster mitigation grant programs; and

Whereas, the City of Lake Oswego has fully participated in the FEMA prescribed mitigation planning process to prepare the Clackamas County, Multi-Jurisdictional Natural Hazard Mitigation Plan, which has established a comprehensive, coordinated planning process to eliminate or minimize these vulnerabilities; and

Whereas, the City of Lake Oswego has identified natural hazard risks and prioritized a number of proposed actions and programs needed to mitigate the vulnerabilities of the City of Lake Oswego to the impacts of future disasters within the Clackamas County, Multi-Jurisdictional Natural Hazard Mitigation Plan; and

Whereas, these proposed projects and programs have been incorporated into the Clackamas County, Multi-Jurisdictional Natural Hazard Mitigation Plan that has been prepared and promulgated for consideration and implementation by the cities of Clackamas County; and

Whereas, the Oregon Office of Emergency Management and Federal Emergency Management Agency, Region X officials have reviewed the City of Lake Oswego addendum to the Clackamas County Multi-Jurisdictional Natural Hazard Mitigation Plan and pre-approved it (dated, April 25, 2019) contingent upon this official adoption of the participating governments and entities;

Whereas, the Natural Hazard Mitigation Plan is comprised of three volumes: Volume I: Basic Plan, Volume II: Jurisdictional Addenda, and Volume III: Appendices, collectively referred to herein as the NHMP; and

Whereas, the Natural Hazard Mitigation Plan is in an on-going cycle of development and revision to improve its effectiveness; and

Whereas, City of Lake Oswego adopts addendums to the Natural Hazard Mitigation Plan and directs the City Manager to develop, approve, and implement the mitigation strategies and any administrative changes to the Natural Hazard Mitigation Plan.

Resolution 19-34
Page 1 of 2
NOW, THEREFORE, BE IT RESOLVED by the City Council of the City of Lake Oswego that:

Section 1. The City of Lake Oswego adopts the Lake Oswego addendum to the Clackamas County Multi-Jurisdictional Natural Hazards Mitigation Plan as an official plan; and

Section 2. The City Council directs that this Adoption Resolution be submitted to the Oregon Office of Emergency Management and Federal Emergency Management Agency, Region X officials to enable final approval of the Clackamas County Multi-Jurisdictional Natural Hazards Mitigation Plan.

Section 3. Effective Date. This Resolution shall take effect upon passage.

Considered and adopted at the regular meeting of the City Council of the City of Lake Oswego on the 21st day of May, 2019.

AYES: Mayor Studebaker, Manz, O’Neill, LaMotte, Nguyen, Wendland, Kohlhoff

NOES: None

EXCUSED: None

ABSTAIN: None

[Signature]
Kent Studebaker, Mayor

ATTEST:

[Signature]
Anne-Marie Simpson, City Recorder

APPROVED AS TO FORM:

[Signature]
David D. Powell, City Attorney
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Purpose

This is an update of the Lake Oswego 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 Lake Oswego’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.

Lake Oswego adopted their addendum to the Clackamas County Multi-jurisdictional NHMP on May 21, 2019. FEMA Region X approved the Clackamas County NHMP on April 12, 2019 and the City’s addendum on June 18, 2019. 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 April 11, 2024.

Mitigation Plan Mission

The NHMP mission states the purpose and defines the primary functions of the 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 City concurs with the mission statement developed during the Clackamas County planning process (Volume I, Section 3):

Promote sound public policy designed to protect citizens, critical facilities, infrastructure, private property, and the environment from natural hazards.

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 Clackamas County citizens, and public, and private partners can take while working to reduce the City’s risk from natural hazards. These statements of direction form a bridge between the broad mission statement, and serve as checkpoints, as agencies, and organizations begin implementing mitigation action items.

The City concurs with the goals developed during the Clackamas County planning process (Volume I, Section 3). All 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.
Below is a list of the NHMP goals:

GOAL #1: PROTECT LIFE AND PROPERTY
- Implement activities that assist in protecting lives by making homes, businesses, infrastructure, critical facilities, and other property more resistant to natural hazards.
- Reduce losses and repetitive damages for chronic hazard events while promoting insurance coverage for catastrophic hazards.
- Improve hazard assessment information to make recommendations for discouraging new development and encouraging preventative measures for existing development in areas vulnerable to natural hazards.

GOAL #2: ENHANCE NATURAL SYSTEMS
- Balance watershed planning, natural resource management, and land use planning with natural hazards mitigation to protect life, property, and the environment.
- Preserve, rehabilitate, and enhance natural systems to serve natural hazard mitigation functions.

GOAL #3: AUGMENT EMERGENCY SERVICES
- Establish policy to ensure mitigation projects for critical facilities, services, and infrastructure.
- Strengthen emergency operations by increasing collaboration and coordination among public agencies, non-profit organizations, and business, and industry.
- Coordinate and integrate natural hazards mitigation activities, where appropriate, with emergency operations plans and procedures.

GOAL #4: ENCOURAGE PARTNERSHIPS FOR IMPLEMENTATION
- Strengthen communication and coordinate participation among and within public agencies, citizens, non-profit organizations, business, and industry to gain a vested interest in implementation.
- Encourage leadership within public and private sector organizations to prioritize and implement local, county, and regional hazard mitigation activities.

GOAL #5: PROMOTE PUBLIC AWARENESS
- Develop and implement education and outreach programs to increase public awareness of the risks associated with natural hazards.
- Provide information on tools, partnership opportunities, and funding resources to assist in implementing mitigation activities.
NHMP Process and Participation

This section of the NHMP addendum addresses 44 CFR 201.6(a)(3), Participation.

Lake Oswego first developed an addendum to Clackamas County’s Natural Hazards Mitigation Plan in 2004. This plan was updated in 2009, 2012, and in 2018. The last update of the Lake Oswego addendum to the Clackamas County NHMP was approved by FEMA on April 8, 2013.

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 Lake Oswego to update their NHMP. This project is funded through the Federal Emergency Management Agency’s (FEMA) Fiscal-Year 2016 (FY16) Pre-Disaster Mitigation (PDM) Competitive Grant Program EMS-2017-PC-0005 (PDMC-PL-10-OR-2016-001). Members of the Lake Oswego NHMP Hazard Mitigation Advisory Committee also participated in the County NHMP update process (Volume III, Appendix B).

The Clackamas County NHMP, and Lake Oswego addendum, are the result of a collaborative effort between citizens, public agencies, non-profit organizations, the private sector, and regional organizations. The Lake Oswego Hazard Mitigation Advisory Committee (HMAC) guided the process of developing the NHMP.

Convener and Committee

The Lake Oswego Citizen Information Specialist 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 Lake Oswego 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 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, action items, and community profile.

The Lake Oswego HMAC was comprised of the following representatives:

- Bonnie Hirshberger, Citizen Information Coordinator, Convener
- Rob D. Amsberry, Engineering Department
- Jim Bateman, Public Works – Water Superintendent
Public Participation

Public participation was achieved, in part, with the establishment of the HMAC, which was comprised of City officials representing different departments, and sectors, and members of the public. The HMAC served as the local review body for the NHMP’s development. Community members were provided an opportunity for comment via the NHMP review process and through a survey administered by Clackamas County (Volume III, Appendix G). During the City public review period (Attachment B) there were no comments provided.

NHMP Implementation, and Maintenance

The City Council will be responsible for adopting the Lake Oswego addendum to the Clackamas County NHMP. This addendum designates the 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 Lake Oswego 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 Citizen Information Specialist will serve as the convener 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; and
- Documenting successes, and lessons learned during the year.

The convener will also remain active in the County’s implementation, and maintenance process (Volume I, Section 4).

The City will utilize the same action item prioritization process as the County (Volume I, Section 4).

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, Lake Oswego 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.

Future development without proper planning may result in worsening problems associated with natural hazards. Metro, the regional government for Clackamas, Multnomah, and Washington counties, determines many land use laws for the tri-county region and sets the urban growth boundary. The entire Portland Metro area is subject to tremendous growth pressures due to its desirable location and the restrictions on urban sprawl placed by urban growth boundary requirements.

Lake Oswego’s acknowledged comprehensive plan is the City of Lake Oswego Comprehensive Plan (1979, updated March 2014). The Oregon Land Conservation and Development Commission first acknowledged the plan in 1984. The City implements the plan through the Community Development Code.

Lake Oswego currently has the following plans that relate to natural hazard mitigation. For a complete list visit the City’s [website](#):

- **Comprehensive Plan** (1979, amended 2014)
- **Lake Oswego Community Development Code, and City Code (revised August 2018)**
  - Section 50.05.010 Sensitive Lands Overlay Districts
  - Section 50.05.011 Flood Management Area
  - Section 50.06.006 Geologic Hazards, and Stormwater Management
  - Article 38.25 Stormwater Management Code
- **Capital Improvement Plan** (2019, update underway)
- **Clean Streams Plan** (2009)
- **Emergency Operations Plan** (updated June 2017)
- **2034 Transportation System Plan** (2014, amended 2017)
  - [Portland Metro 2014 Regional Transportation Plan](#)

Other plans:

- **Clackamas County Community Wildfire Protection Plan** (2018)
  - Lake Oswego Fire Department

**Government Structure**

The Lake Oswego City Charter establishes a Council-Manager form of government, which vests policy authority in a volunteer City Council, and administrative authority for day-to-day operations in an appointed, professional City Manager. The Lake Oswego City Council consists of a Mayor and six Councilors who serve four-year terms. At least three Council positions are up for election every two years. Councilors are elected at-large. The three
candidates who receive the highest number of votes are elected to the vacant seats. The Council meets regularly on the first and third Tuesdays of each month at City Hall. The agenda of each meeting includes time for citizen comment.

The City of Lake Oswego currently has the following departments which have a role in natural hazard mitigation:

**Building** is responsible for plan review and inspections on commercial, industrial and residential developments, as well as fire life and safety plan review.

**Engineering** manages the design and construction of the City’s infrastructure, including surface water, water, wastewater collection, and transportation. In addition, the Engineering Division provides technical support for the Willamette Shore Trolley, oversees the Water Treatment Plant, and provides GIS mapping services.

**Fire** provides emergency response to more than 50,000 citizens within the City of Lake Oswego and three adjoining contract districts. Emergency services include fire suppression, emergency medical response, hospital ambulance transportation, water and dive rescue operations, hazardous materials incidents, and disaster response. Non-emergency services include fire prevention and inspection services, code enforcement, public safety education services/CPR training, fire extinguisher use, residential safety surveys, home fire escape planning, emergency and disaster preparedness planning and training for citizens (CERT), and fire and life safety education in Lake Oswego schools.

**Public Works Operations** provides many of the basic urban services to the citizens of Lake Oswego, including water sanitary sewer and storm drainage systems, and their maintenance and repair. The Department is also responsible for streets.

**Planning** is responsible for all long range and current planning for new development, as well as the City’s natural resource, geologic hazard and floodplain overlay zones. It is also responsible for implementation of the Comprehensive Plan.

**Police** is a full-service law enforcement organization dedicated to the citizens of the City of Lake Oswego. The Department is made up sworn officers and non-sworn personnel.

### Continued Public Participation

An open public involvement process is essential to the development of an effective NHMP. To develop a comprehensive approach to reducing the effects of natural disasters, the planning process shall include opportunities for the public, neighboring communities, local, and regional agencies, as well as, private, and non-profit entities to comment on the NHMP during review.\(^1\) Keeping the public informed of efforts to reduce its risk to future natural hazard events is important for successful NHMP implementation, and maintenance. As such, the City is committed to involving the public in the NHMP review and update process (Volume I, Section 4). The City posted the plan update for public comment before FEMA approval, and after approval will maintain the plan on the City’s website: [https://www.ci.oswego.or.us/maps/natural-hazards-mitigation-plan](https://www.ci.oswego.or.us/maps/natural-hazards-mitigation-plan).

---

\(^1\) Code of Federal Regulations, Chapter 44. Section 201.6, subsection (b). 2015
**NHMP Maintenance**

The Clackamas County NHMP, and City addendum will be updated every five years in accordance with the update schedule outlined in the Disaster Mitigation Act of 2000. During the County NHMP update process, the City will also review, and update its addendum (Volume I, Section 4). The convener will be responsible for convening the HMAC to address the questions outlined below.

- Are there new partners that should be brought to the table?
- Are there new local, regional, state or federal policies influencing natural hazards that should be addressed?
- Has the community successfully implemented any mitigation activities since the NHMP was last updated?
- Have new issues or problems related to hazards been identified in the community?
- Are the actions still appropriate given current resources?
- Have there been any changes in development patterns that could influence the effects of hazards?
- Have there been any significant changes in the community’s demographics that could influence the effects of hazards?
- Are there new studies or data available that would enhance the risk assessment?
- Has the community been affected by any disasters? Did the NHMP accurately address the impacts of this event?

These questions will help the HMAC determine what components of the mitigation plan need updating. The HMAC will be responsible for updating any deficiencies found in the NHMP.

**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) were first developed during the 2004 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 2018 update process the City re-evaluated their mitigation strategy (action items). During this process action items were updated, noting what accomplishments had been made, and whether the actions were still relevant; any new action items were identified at this time (see Volume III, Appendix B for more information on changes to action items).

**Priority Action Items**

Table LA-1 presents a list of mitigation actions. 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 in **bold** text with grey 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 detailed information for each action. Full text of the plan goals referenced in Table LA-1 is located on page LA-2.
<table>
<thead>
<tr>
<th>Natural Hazard Action ID</th>
<th>Action Item</th>
<th>Coordinating Organization (Lead)</th>
<th>Internal Partners</th>
<th>Timing</th>
<th>Plan Goals Addressed</th>
</tr>
</thead>
<tbody>
<tr>
<td>MH#1</td>
<td>Develop, enhance, and implement education programs designed to reduce the losses from natural hazards.</td>
<td>Fire &amp; Public Affairs</td>
<td>Public Works; Engineering</td>
<td>Ongoing</td>
<td>✓ ✓ ✓ ✓ ✓</td>
</tr>
<tr>
<td>MH#2</td>
<td>Integrate the goals and action items from the Lake Oswego Natural Hazards Mitigation Plan into existing regulatory documents and programs, where appropriate.</td>
<td>Planning and Engineering</td>
<td>Administration</td>
<td>Ongoing</td>
<td>✓ ✓ ✓ ✓ ✓</td>
</tr>
<tr>
<td>MH#3</td>
<td>Address wireless communication deficiencies locally and regionally.</td>
<td>Lake Oswego 9-1-1 Communications (LOCOM)</td>
<td>Lake Oswego Communications (LOCOM)</td>
<td>Short Term</td>
<td>✓ ✓ ✓ ✓</td>
</tr>
<tr>
<td>MH#4</td>
<td>Improve vegetation management throughout the city.</td>
<td>Planning and Parks</td>
<td>Watershed Councils</td>
<td>Short Term</td>
<td>✓ ✓ ✓ ✓</td>
</tr>
<tr>
<td>MH#5</td>
<td>Upgrade Lake Oswego wastewater system.</td>
<td>Engineering</td>
<td>Public Works</td>
<td>Long Term</td>
<td>✓ ✓ ✓</td>
</tr>
<tr>
<td>EQ#1</td>
<td>Conduct seismic evaluations on identified critical/essential facilities and infrastructure for implementing appropriate structural and non-structural mitigation strategies.</td>
<td>City Manager’s Office</td>
<td>Emergency Management; Administration</td>
<td>Long Term</td>
<td>✓ ✓ ✓</td>
</tr>
<tr>
<td>FL#1</td>
<td>Ensure continued compliance in the National Flood Insurance Program (NFIP) through enforcement of local floodplain management ordinances.</td>
<td>Planning and Engineering</td>
<td>Emergency Management; HMAC</td>
<td>Ongoing</td>
<td>✓ ✓ ✓</td>
</tr>
<tr>
<td>Natural Hazard Action ID</td>
<td>Action Item</td>
<td>Coordinating Organization (Lead)</td>
<td>Internal Partners</td>
<td>Timing</td>
<td>Plan Goals Addressed</td>
</tr>
<tr>
<td>-------------------------</td>
<td>------------------------------------------------------------------------------</td>
<td>---------------------------------</td>
<td>-------------------</td>
<td>-------------</td>
<td>---------------------</td>
</tr>
<tr>
<td>LS#1</td>
<td>Improve knowledge of landslide hazard areas and understanding of vulnerability and risk to life and property in hazard-prone areas.</td>
<td>Engineering &amp; Planning</td>
<td>HMAC</td>
<td>Ongoing</td>
<td>✓ ✓</td>
</tr>
<tr>
<td>SW#1</td>
<td>Reduce frequency and duration of power outages from the severe wind and winter storm hazards where possible.</td>
<td>Engineering and Planning</td>
<td>Public Works</td>
<td>Ongoing</td>
<td>✓ ✓ ✓ ✓ ✓</td>
</tr>
<tr>
<td>WF#1</td>
<td>Promote fire-resistant strategies and the use of non-combustible roofing materials by evaluating and making recommendations to current code to encourage noncombustible roofing standards in high fire-hazard areas.</td>
<td>Fire &amp; Planning</td>
<td>Fire Co-op</td>
<td>Long Term</td>
<td>✓ ✓ ✓ ✓ ✓</td>
</tr>
<tr>
<td>WF#2</td>
<td>Develop and implement an Urban Forest Fire Management Plan.</td>
<td>Fire</td>
<td>Planning</td>
<td>Long Term</td>
<td>✓</td>
</tr>
<tr>
<td>WF#3</td>
<td>Coordinate wildfire mitigation action items through the Clackamas County Community Wildfire Protection Plan.</td>
<td>Fire</td>
<td>Planning, Emergency Management</td>
<td>Ongoing</td>
<td>✓ ✓ ✓ ✓ ✓</td>
</tr>
</tbody>
</table>

Source: City of Lake Oswego HMAC, 2018.
Note: Full text of the plan goals referenced in this table is located on page LA-2.
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 2, and Volume III, Appendix C. The risk assessment process is graphically depicted in Figure LA-1. Ultimately, the goal of hazard mitigation is to reduce the area of risk, where hazards overlap vulnerable systems.

**Figure LA-1 Understanding Risk**

![Understanding Risk Diagram](source)

**Hazard Analysis**

The Lake Oswego 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 Lake Oswego, which are discussed throughout this addendum.
Table LA-2 shows the HVA matrix for Lake Oswego 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 sense of hazard priorities but does not predict the occurrence of a hazard.

Two catastrophic hazards (Cascadia Subduction Zone earthquake, and a crustal earthquake event such as from the Portland Fault), and two chronic hazards (winter storm, and wildfire) rank as the top hazard threats to the City (Top Tier). The windstorm, drought, flood, and landslide hazards comprise the next highest ranked hazards (Middle Tier), while the volcanic eruption, and extreme heat hazards comprise the lowest ranked hazards (Bottom Tier).

### Table LA-2 Hazard Analysis Matrix

<table>
<thead>
<tr>
<th>Hazard</th>
<th>History</th>
<th>Vulnerability</th>
<th>Maximum Threat</th>
<th>Probability</th>
<th>Total Threat Score</th>
<th>Hazard Rank</th>
<th>Hazard Tiers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Earthquake - Cascadia</td>
<td>4</td>
<td>45</td>
<td>100</td>
<td>49</td>
<td>198</td>
<td>#1</td>
<td>Top Tier</td>
</tr>
<tr>
<td>Earthquake - Crustal</td>
<td>6</td>
<td>50</td>
<td>100</td>
<td>21</td>
<td>177</td>
<td>#2</td>
<td>Top Tier</td>
</tr>
<tr>
<td>Winter Storm</td>
<td>10</td>
<td>30</td>
<td>70</td>
<td>56</td>
<td>166</td>
<td>#3</td>
<td>Middle Tier</td>
</tr>
<tr>
<td>Wildfire</td>
<td>6</td>
<td>25</td>
<td>70</td>
<td>49</td>
<td>150</td>
<td>#4</td>
<td>Middle Tier</td>
</tr>
<tr>
<td>Windstorm</td>
<td>20</td>
<td>20</td>
<td>50</td>
<td>49</td>
<td>139</td>
<td>#5</td>
<td>Bottom Tier</td>
</tr>
<tr>
<td>Drought</td>
<td>10</td>
<td>20</td>
<td>50</td>
<td>56</td>
<td>136</td>
<td>#6</td>
<td>Bottom Tier</td>
</tr>
<tr>
<td>Flood</td>
<td>16</td>
<td>20</td>
<td>30</td>
<td>56</td>
<td>122</td>
<td>#7</td>
<td>Bottom Tier</td>
</tr>
<tr>
<td>Landslide</td>
<td>14</td>
<td>15</td>
<td>20</td>
<td>63</td>
<td>112</td>
<td>#8</td>
<td>Bottom Tier</td>
</tr>
<tr>
<td>Volcanic Eruption</td>
<td>2</td>
<td>35</td>
<td>50</td>
<td>14</td>
<td>101</td>
<td>#9</td>
<td>Bottom Tier</td>
</tr>
<tr>
<td>Extreme Heat</td>
<td>2</td>
<td>20</td>
<td>40</td>
<td>14</td>
<td>76</td>
<td>#10</td>
<td>Bottom Tier</td>
</tr>
</tbody>
</table>

Source: Lake Oswego HMAC, 2018.

Table LA-3 categorizes the probability, and vulnerability scores from the hazard analysis for the City and compares the results to the assessment completed by the Clackamas County HMAC. Variations between the City, and County are noted in **bold** text within the city ratings.

### Table LA-3 Probability and Vulnerability Comparison

<table>
<thead>
<tr>
<th>Hazard</th>
<th>Lake Oswego</th>
<th></th>
<th>Clackamas County</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Probability</td>
<td>Vulnerability</td>
<td>Probability</td>
<td>Vulnerability</td>
</tr>
<tr>
<td>Drought</td>
<td>High</td>
<td>Moderate</td>
<td>High</td>
<td>Low</td>
</tr>
<tr>
<td>Earthquake - Cascadia</td>
<td>Moderate</td>
<td>High</td>
<td>Moderate</td>
<td>High</td>
</tr>
<tr>
<td>Earthquake - Crustal</td>
<td>Low</td>
<td>High</td>
<td>Low</td>
<td>High</td>
</tr>
<tr>
<td>Extreme Heat</td>
<td>Low</td>
<td>Moderate</td>
<td>Low</td>
<td>High</td>
</tr>
<tr>
<td>Flood</td>
<td>High</td>
<td>Moderate</td>
<td>High</td>
<td>Moderate</td>
</tr>
<tr>
<td>Landslide</td>
<td>High</td>
<td>Low</td>
<td>High</td>
<td>Low</td>
</tr>
<tr>
<td>Volcanic Eruption</td>
<td>Low</td>
<td>Moderate</td>
<td>Low</td>
<td>Moderate</td>
</tr>
<tr>
<td>Wildfire</td>
<td><strong>Moderate</strong></td>
<td>Moderate</td>
<td>High</td>
<td>Moderate</td>
</tr>
<tr>
<td>Windstorm</td>
<td>Moderate</td>
<td><strong>Moderate</strong></td>
<td>Moderate</td>
<td>Low</td>
</tr>
<tr>
<td>Winter Storm</td>
<td><strong>High</strong></td>
<td>Moderate</td>
<td>Moderate</td>
<td>Moderate</td>
</tr>
</tbody>
</table>

Source: Lake Oswego and Clackamas County HMAC, 2018.
Community Characteristics

Table LA-4 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. Between 2010 and 2016 the City grew by 1,595 people (4%; as of 2018 the population was 3,8,215) while median household income increased by 1%.² Between 2018 and 2040 the population is forecast to grow by 5% to 40,311.³ New development has complied with the standards of the Oregon Building Code, and the city’s development code including their floodplain ordinance.

Transportation/Infrastructure

In the City of Lake Oswego, the town is surrounded by hills on the north, and the south, the Willamette River to the east, and I-5 to the west. Highway 43, a State highway, runs through the eastside of town with Oswego Lake in the center of the City. The current freight railroad system is the Portland, and Western Railroad, which serves local, and regional industry. Lake Oswego’s commercial areas developed along primary routes, and residential development followed nearby.

Today, mobility plays an important role in Lake Oswego, and the daily experience of its residents, and businesses. Motor vehicles represent the dominant mode of travel through, and within Lake Oswego. Tri-Met provides local, and regional bus service, to serve the high number of commuters within the Tri-Met region. There are also free or donation-based shuttle services for residents going to the Adult Community Center, medical escorts for doctor appointments, wheelchair, and/or special transportation needs, and services provided by the Tri-Met Lift program.⁴

Economy

Lake Oswego is an inner-urban suburb of the Portland metropolitan region, and has easy access to downtown Portland, and surrounding communities. There is significant economic activity happening within the City of Lake Oswego, making it a desirable place to live, work, and visit. The Kruse Way Corridor, from I-5 to Boones Ferry Road, is a significant economic engine within the City of Lake Oswego, with over 2,700 on-site jobs, and an annual regional economic output of $1.4 billion (2013).⁵ Lake Oswego residents are mostly employed in professional, and related occupations, with most in management, business, and financial operations occupations.⁶ In 2016, the city’s per capita income is $59,953, and median household income is $89,979.⁷

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³ Metro, 2040 Distributed Forecast (2016).
⁴ Transportation Services. City of Lake Oswego website. Visited 10/9/2018: https://www.ci.oswego.or.us/acc/transportation-services
⁵ City of Lake Oswego. (2013). City of Lake Oswego Draft Economic Opportunities Analysis. Exhibit 5 Ordinance 2640. https://tinyurl.com/ycql504f
⁶ Social Explorer, Table T1, U.S. Census Bureau, 2012-2016 American Community Survey Estimates.
⁷ Ibid.
Lake Oswego is in the northwestern corner of Clackamas County, located in the Tualatin Valley, and within the Metro Portland UGB. There are three major drainage basins: Oswego Lake, the Tualatin River, and the Willamette River. Lake Oswego has a complex geography with many steep, wooded hillsides, and streams that flow from the higher areas to the drainage basins. Oswego Lake is the largest physical feature, and its geographic center.

Lake Oswego’s temperatures range from a monthly average low of 35°F in the winter months to a high of 82°F in the summer months. The coldest month is January, and the hottest month is August. The average annual precipitation is about 37 inches.¹

The City has an educated population with 67% of residents 25 years and older holding a bachelor’s degree or higher.⁹ The Lake Oswego School District has a 92% graduation rate as of 2016-17.¹⁰ Lake Oswego includes commercial development, and light manufacturing but is zoned primarily residential.

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⁹ Social Explorer, Table T1, U.S. Census Bureau, 2012-2016 American Community Survey Estimates.

¹⁰ Holley, Claire. “Lake Oswego SD grad rate among state’s highest at 92.45%”. Pamplin Media Group. 01/25/18.
Community Assets

This section outlines the resources, facilities, and infrastructure that, if damaged, could significantly impact the public safety, economic conditions, and environmental integrity of Lake Oswego. It is important to note that the facilities identified as “critical” and “essential” are characterized differently than the structural code that identifies buildings as “essential” and “non-essential.” The structural code uses different language and criteria and therefore have completely different meanings than the buildings identified in this addendum.

Critical Facilities

Facilities that are critical 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 LA-5 Critical Facilities in Lake Oswego

<table>
<thead>
<tr>
<th>Facility</th>
<th>Drought</th>
<th>Earthquake</th>
<th>Extreme Heat</th>
<th>Flood</th>
<th>Landslide</th>
<th>Volcanic Event</th>
<th>Wildfire</th>
<th>Windstorm</th>
<th>Winter Storm</th>
</tr>
</thead>
<tbody>
<tr>
<td>City Hall: Dispatch, Law Enforcement</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fire Stations: Main Fire Station is the EOC</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Station 210 Westlake Fire Station</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Station 211 Jean Rd Fire Station</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Station 212 South Shore Fire Station</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Station 214 Main Fire Station &amp; Admin Office</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
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</tr>
</tbody>
</table>

Other Critical Facilities

Adult Community Center (short-term shelter) X X X
Maintenance Center X X X
Water Treatment Plant X X

Hazardous Materials:

Facilities that, if damaged, could cause serious secondary impacts may also be considered “critical.” A hazardous material facility is one example of this type of critical facility. Those sites that store, manufacture, or use potentially hazardous materials include:

Table LA-6 Hazardous Materials in Lake Oswego

<table>
<thead>
<tr>
<th>Facility</th>
<th>Drought</th>
<th>Earthquake</th>
<th>Extreme Heat</th>
<th>Flood</th>
<th>Landslide</th>
<th>Volcanic Event</th>
<th>Wildfire</th>
<th>Windstorm</th>
<th>Winter Storm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biotronics</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Bus Barn School District</td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Interstate 5</td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
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: City buildings and other public facilities such as schools.

**Table LA-7 Essential Facilities in Lake Oswego**

<table>
<thead>
<tr>
<th>Facility</th>
<th>Drought</th>
<th>Earthquake</th>
<th>Extreme Heat</th>
<th>Flood</th>
<th>Landslide</th>
<th>Volcanic Event</th>
<th>Wildfire</th>
<th>Windstorm</th>
<th>Winter Storm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Churches: Shelter Sites</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Schools: Potential Shelter Sites</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Building (former Marylhurst University)</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Forest Hills Elementary</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hallinan Elementary</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lake Grove Elementary</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lake Oswego High</td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lake Oswego Junior High</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lakeridge High</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lakeridge Junior High</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oak Creek Elementary (remodeled)</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Our Lady of the Lake (remodeled)</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Palisades Elementary (remodeled)</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Park Academy (in Old Armory building)</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>River Grove Elementary</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>St Stephen’s Academy South Campus</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Uplands Elementary</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Westridge Elementary</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Facility | Drought | Earthquake | Extreme Heat | Flood | Landslide | Volcanic Event | Wildfire | Windstorm | Winter Storm
--- | --- | --- | --- | --- | --- | --- | --- | --- | ---
Lake Oswego Library: Shelter |  |  |  |  |  |  |  |  |  |
Lake Oswego Tennis Center: Shelter |  |  |  |  |  |  |  |  |  |
Lake Oswego Municipal Golf Course |  |  |  |  |  |  |  |  |  |

### Critical Infrastructure:

Infrastructure that provides necessary services for emergency response include:

**Table LA-8 Critical Infrastructure in Lake Oswego**

| Facility | Drought | Earthquake | Extreme Heat | Flood | Landslide | Volcanic Event | Wildfire | Windstorm | Winter Storm |
--- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
Communications towers | X | X | X | X | X | X |  |  |  |
Fiber optic lines | X | X | X |  |  |  |  |  |  |
Highway 43 (State St.), McVey Ave, Stafford Rd.: Regional Emergency Transportation Route | X | X | X | X |  |  |  |  |  |
NW Natural gas pipelines and gas substations | X | X |  |  |  |  |  |  |  |
Oswego Lake dam and headgate | X | X |  |  |  |  |  |  |  |
Oswego Lake sanitary sewer interceptor | X | X |  |  |  |  |  |  |  |
Portland & Western Railroad | X | X |  |  |  |  |  |  |  |
Portland General Electric substations | X | X | X |  |  |  |  |  |  |
Transportation networks, including all major roads and all bridges including Country Club Rd., Boones Ferry Rd., and Kruse Way | X | X |  |  |  |  |  |  |  |
Tryon Creek Wastewater Treatment Plant, lift stations, and main lines | X | X | X |  |  |  |  |  |  |
Water treatment plant, water pumping stations, major water lines, reservoirs, water intake on Clackamas River | X | X | X |  |  |  |  |  |  |

### Economic Assets/Population Centers:

Economic assets include businesses that employ large numbers of people and provide an economic resource to the city of Lake Oswego. 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 include:
### Table LA-9 Economic Assets/Population Centers in Lake Oswego

<table>
<thead>
<tr>
<th>Facility</th>
<th>Drought</th>
<th>Earthquake</th>
<th>Extreme Heat</th>
<th>Flood</th>
<th>Landslide</th>
<th>Volcanic Event</th>
<th>Wildfire</th>
<th>Windstorm</th>
<th>Winter Storm</th>
</tr>
</thead>
<tbody>
<tr>
<td>City Hall</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Meadows Rd. and Center Pointe Complex</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>School District</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SW Employment Area - Industrial Zone</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Environmental Assets:**

Environmental assets are those parks, green spaces, wetlands, and rivers that provide an aesthetic, and functional ecosystem services for the community include:

### Table LA-10 Environmental Assets in Lake Oswego

<table>
<thead>
<tr>
<th>Facility</th>
<th>Drought</th>
<th>Earthquake</th>
<th>Extreme Heat</th>
<th>Flood</th>
<th>Landslide</th>
<th>Volcanic Event</th>
<th>Wildfire</th>
<th>Windstorm</th>
<th>Winter Storm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bryant Woods Park</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Canal Acres Natural Area</td>
<td></td>
<td>X</td>
<td>X</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cook’s Butte Park</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Foothills Park</td>
<td></td>
<td>X</td>
<td>X</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Freepons Park</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>George Roger Park</td>
<td></td>
<td>X</td>
<td>X</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Glenmorrie Park</td>
<td></td>
<td>X</td>
<td>X</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hallinan Natural Area</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Iron Mountain Park</td>
<td></td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lake Grove Swim Park</td>
<td></td>
<td>X</td>
<td>X</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lake Oswego Hunt Club</td>
<td></td>
<td>X</td>
<td>X</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lake Oswego Swim Park</td>
<td></td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Luscher Farm</td>
<td></td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Millennium Plaza Park</td>
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**Facility**

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<th>Flood</th>
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### Environmental Assets

Vulnerable Populations:

Vulnerable populations, including seniors, disabled citizens, women, and children, as well as 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:

**Child Care Facilities**

- Bethlehem Church Pre-School
- Buildings (formerly Touchstone School)
- Children’s Hour Academy
- Christ Church Episcopal Preschool
- Community Arts Pre-School
- Exploration Learning School
- International Leadership Academy
- Kiddie Care Child Care
- Kings Kids
- Lake Oswego Kindercare
- Mayam’s Preschool
- Mountain Park Kindercare
- Mountain Park Playschool
- Oswego Play School
- Park Academy
- R D & S Daycare
- Rockinghorse Day School
- Sonshine Express Preschool
- Vermont Hills Family Life Center
- Village Montessori
- West Hills Montessori

**Adult Care Facilities**

- Abby's Adult Foster Care
- Always Caring
- Autumn Health Care II
- Best Family Care
- Cherry Crest Adult Care Home
- Daniel's Adult Care Home
- Eva & Gabriel Adult Care Home
- Felicia's Adult Care Home
- Green Ridge Estates
- Greentree Adult Care Home
- Health for Life
- Hillside Home Adult Care
- Hope's Sweet Home
- Indian Springs Adult Care Home
- Lake Oswego Care Home
- Lake Oswego Comfort Living
- Loving Care Adult Care Home
- Lucky’s Home
- Mary's Woods
- Oswego Care Home LTD.
- Oswego Place Assisted Living
- Oswego Pointe Adult Care Home
- Rosewood Inn Adult Foster Care
- Sunshine Adult Foster Care
- The Pearl at Kruse Way
- The Stafford
- The Springs at Carman Oaks
- The Springs Living at Lake Oswego
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 residents alike, it is the unique places, stories, and annual events that make Lake Oswego 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. The following historic resources can be found in the City of Lake Oswego:

- Allen House I and II
- Angler’s Club
- Aquinas Hall
- Bickner Building
- Black House
- Brown-Vose House
- Bryant Home
- Marker
- Carl House
- Carman House
- Carter House
- Christie School
- Clara Weinstein House
- Cleary House
- Collard House
- Conway House
- Davidson House
- Didzun House
- Eastman House
- Education Hall
- Erickson House
- F. Davidson House
- Flavia Hall
- Harris House
- Headrick-Carothers House
- Hofer House
- Iron Furnace
- Chimney
- Jantzen Estate
- Johnson Barn
- Klose House
- Laidlaw House
- Lake Grove Fire Station
- Lake Oswego Country Club
- Lake Oswego Hunt Club
- Lakewood School
- Larson House
- Log Hoist
- Lueg House
- Marylhurst Administration Building
- Marylhurst Cemetery/Alter
- McCall House
- McWaters House
- Methodist
- Episcopal Church
- Mulder House
- Murphy Company Building
- Noel Dew House
- Odd Fellows Hall
- Old Mine Trail
- Parelis House
- Parron House
- Peg Tree
- Pioneer Cemetery
- Rogers Building I and II
- Rogers House
- Rosentreter House
- Sacred Heart School
- Shepard House
- Smith House
- St. Catherine’s Dormitory
- Sundeleaf House
- Trueblood House
- Tualatin-Oswego Canal
- Tug Masters House
- Twinings House
- Van Houten House
- Vose House
- Waldorf House
- Warren House
- White House
- Worker’s Cottage
- Worthington House
Hazard Characteristics

Drought

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

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.

Lake Oswego draws its main water supply from the Clackamas River intake facility in Gladstone, which is then treated at the Water Treatment Plant in West Linn. The West Linn Water Treatment Plant was originally built in unincorporated Clackamas County for the City of Lake Oswego in the 1960s, it now serves multiple jurisdictions— including Tigard, and Lake Oswego. There was recently a project completed in October 2017 to increase the treated water capacity (to 38 million gallons per day) for residents of Lake Oswego, and Tigard. The treatment plant has two different utility substations on the property for back up electricity, and has agreements with other treatment plants around the region for water use that creates redundancies within the water supply system for residents, and businesses. For more information on the future of Lake Oswego’s water supply visit their website: https://www.ci.oswego.or.us/publicworks/water.

Vulnerability Assessment

Due to insufficient data and resources, Lake Oswego 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 Tables LA-5 through LA-10.

Mitigation Activities

The existing drought hazard mitigation activities are conducted at the county, regional, state, and federal levels and are described in the Clackamas County NHMP.

Please review Volume I, Section 2 for additional information on this hazard.

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. The probability rating decreased, and the vulnerability rating did not change since the previous version of this NHMP addendum. Previously, the earthquake hazard profile was a single risk assessment, which is now divided into two separate earthquake hazards: Cascadia Subduction Zone (CSZ) earthquake, and Crustal earthquake.

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 Lake Oswego as well. The causes, and characteristics of an earthquake event are appropriately described within the 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 Lake Oswego as well.

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, Portland Hills Fault Zone, and Gales Creek-Newberg-Mt. Angel Structural 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.13

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 high-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 Clackamas County 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.

Figure LA-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 (orange) shaking, while areas near rivers and streams will experience severe (light red) to violent (dark red) shaking in a CSZ event.

Vulnerability Assessment

Due to insufficient data and resources, Lake Oswego is currently unable to perform a quantitative risk assessment for this hazard. However, the City of Lake Oswego GIS Department completed an analysis, using the best available data, as a component of the vulnerability assessment in 2013 and reviewed and updated it, as appropriate, in 2018. This analysis looked at identified hazard areas in conjunction with available data on property exposed to the hazard. Exposure of community assets to natural hazards was determined by manually comparing critical and essential facilities and infrastructure with each hazard and identifying where assets and hazards intersected. Additionally, 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.
City Hall, the Main Fire Station, and the Adult Community Center are critical facilities exposed to relative earthquake hazard Zone A, the highest hazard zone. City Hall, which contains the City’s law enforcement and emergency dispatch facilities are not built to current seismic standards. Seismic design standards range by category from Seismic Zone 1 to Seismic Zone 4. Occupancy Category IV is the highest design standard achievable. The Main Fire Station, and the main building of the new Maintenance Center, which houses the Emergency Operations Center (EOC), were built to Occupancy Category IV standards, a step above the required standard for Seismic Zone 3. The Maintenance Center’s vehicle barn/motor pool was built to Occupancy Category III standards. The Adult Community Center, which would serve as an emergency short-term shelter, has not had any seismic upgrades and does not meet modern seismic standards.

Several Essential Facilities are in the high earthquake hazard zone. These facilities include the former Marylhurst University building, Westridge Elementary (proposed to be demolished in rebuilt in 2021, voter approval required), Lake Grove Elementary (proposed to be demolished in rebuilt in 2025, voter approval required), Our Lady of the Lake School, and several churches, which could potentially serve as Red Cross shelter sites.

Operation of and access to exposed infrastructure including the Oswego Lake headgate, City water pumping stations, a PGE substation and the communications towers located at City Hall, could potentially be impacted during an earthquake. Other exposed infrastructure including wastewater main lines, major water lines, natural gas pipeline and fiber optic lines are buried, however they are also vulnerable to damage from earthquake hazards, potentially limiting or delaying access for the purposes of operation or repair. The fiber optic lines located along Highway 43/State Street, McVey Avenue and Stafford Road is a significant communication link for the entire region.

The City’s fresh drinking water supply comes from the water treatment plant in West Linn and is in earthquake hazard Zone A (highest hazard), while the water intake located on the Clackamas River in Gladstone is in Zone C. The water line from the West Linn water treatment plant enters Lake Oswego along Highway 43, which crosses through earthquake Zone A. The water treatment plant and the intake have been upgraded to earthquake Zone 4 standards. There are 16 reservoirs serving Lake Oswego.

The three newest reservoirs, Touchstone II, McNary II, and Palisades II were constructed to earthquake Zone 4 standards.

The regional Emergency Transportation Route follows State Highway 43 from the northern City limits, and continues south on State Street to McVey Avenue, and then southwest to and along Stafford Road. The Emergency Transportation Route passes through earthquake hazard Zone A at the northern City limits along State Street, possibly impacting access to and from the City.

Additionally, several the City’s environmental assets are exposed to the high earthquake hazard. These include Iron Mountain Park, Canal Acres Natural Area, River Run Park, Glenmorrie Park, Foothills Park, Roehr Park, Rossman Park, and Tryon Creek State Natural Area.

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 characteristics section (Table LA-4), approximately 72% 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 LA-11; each “X” represents one building within that ranking category. Of the facilities evaluated by DOGAMI using their Rapid Visual Survey (RVS), none have a very high (100% chance) collapse potential, however, seven (7) schools 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 Tables LA-5 through LA-10. 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.

**Mitigation Activities**

Earthquake mitigation activities listed here include current mitigation programs and activities that are being implemented by Lake Oswego agencies or organizations.

A primary mitigation objective is to construct or upgrade critical and essential facilities and infrastructure to withstand future earthquake events. The Main Fire Station, a critical facility which serves as the City’s Emergency Operations Center (EOC), was constructed to Seismic Zone 4 standards. The South Shore Fire Station recently underwent seismic upgrades, and upgrades have been completed at the West Lake and Jean Road Fire Stations to harden the apparatus bays. Seismic upgrades have also been made to the City’s water treatment plant to ensure it remains operational after a magnitude seven earthquake. Additionally, school remodels must now include seismic upgrades and the installation of sprinkler systems. Seismic studies were completed for City Hall and the police station building, City maintenance facilities, and the sewer interceptor system and as a result, the wastewater (sewer) interceptor system was completely rebuilt and seismically upgraded with the LOIS Project, including the overhead mains into the treatment plant.
# Table LA-11 Rapid Visual Survey Scores

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<th>Facility</th>
<th>Site ID*</th>
<th>Level of Collapse Potential</th>
<th>Notes</th>
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<td><strong>Low (&lt;1%)</strong></td>
<td>Moderate (&gt;1%)</td>
<td>High (&gt;10%)</td>
<td>Very High (100%)</td>
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<td>Clac_sch04</td>
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<td>Hallinan Elementary (16800 Hawthorne Dr)</td>
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<td>Seismic retrofit of entire building via 2017 bond.</td>
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<td>Clac_sch06</td>
<td>(X)</td>
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<td>Lake Oswego Junior High^ (2500 Country Club Rd)</td>
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<td>Rivergrove Elementary^ (5850 McEwan Rd)</td>
<td>Clac_sch07</td>
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<td>Seismic retrofit of gym/covered play structure via 2017 bond.</td>
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<td>Clac_pol02</td>
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Note 1: Schools listed in bold have proposed remodels that may reduce seismic collapse potential.

Note 2: Collapse potential ratings indicated in parentheses (x) provided in 2008 by Froelich Consulting Engineers.

Note 3: * building being used for students of Lakeridge Junior High

Note 4: ^ Phase 2 (2021) proposes to demolish and rebuild this school (voter approval required)

Note 5: ^^ Phase 3 (2025) proposes to demolish and rebuild this school (voter approval required)

Note 6: # Lake Oswego Police Department/City Hall was determined to have a high collapse potential by the City of Lake Oswego. The City Hall/Police building is scheduled to be rebuilt and is currently in design phase.
City of Lake Oswego Codes Pertaining to Earthquakes

The following Lake Oswego plans, policies, and codes pertain to earthquakes:

1. Lake Oswego Comprehensive Plan, Goal 7 - Areas Subject to Natural Disasters and Hazards, Section 2 Earthquake Hazards. The Goal of Section 2, Earthquake Hazards states: “The City shall protect life and property from earthquake hazards.”

2. Lake Oswego Building Code (LOC Chapter 45). Section 45.09 of the Building Code lists the various State of Oregon Codes adopted into the City’s Building Code, including, but not limited to:
   - Oregon Structural Specialty Code;
   - UBC Grading Code;
   - Oregon One and Two-Family Dwelling Code;
   - Oregon Manufactured Dwelling Park Rules;
   - Oregon Manufactured Home Installations Rules; and
   - ICBO Uniform Code for the Abatement of Dangerous Buildings.

3. Lake Oswego Emergency Operations Plan and Related Annexes, Earthquake Annex. This plan describes how the City of Lake Oswego’s emergency operations system will operate during emergencies involving earthquake conditions within the City and contract districts. The plan is designed to meet Clackamas County, state, and federal government emergency plans.

   The plan describes the roles and responsibilities of all local responders within the City of Lake Oswego. It identifies who will be in charge of responding in the event of an incident and how the response will be handled. It provides guidelines for coordinating emergency services. It also describes how Lake Oswego will be in charge of an incident. It provides guidelines for coordinating emergency services.

4. Lake Oswego City Building Evacuation Plan. The building evacuation plan is based on the adopted state program. The plan establishes evacuation procedures, including the designation and training of evacuation coordinators.

5. Lake Oswego Bridge Inspections and Records Manual. This manual outlines the City’s bridge inspection program that was implemented to better respond in the event of a natural disaster. The intent of the program is to utilize trained City personnel to closely document bridge conditions through visual inspections, establishing baseline condition information to use for comparison to bridge conditions after a disaster. Additionally, the manual outlines a disaster response plan, including identification of disaster response team members and a bridge closure and detour plan.

Preparedness

The City of Lake Oswego has an established Community Emergency Response Team (CERT) program that has trained members since 1995 in mitigation as well as preparedness and response. The City’s Emergency Management Program works with community groups, businesses, residential facilities, and public and private schools in promoting earthquake preparedness and mitigation.
Mitigation Projects

In May 2017, Lake Oswego voters approved a $187 million bond measure that will make capital investments in all schools to improve earthquake resiliency and other improvements. Lakeridge junior high is scheduled to be demolished and rebuilt by 2020. Seismic rehabilitation of all buildings is included for Hallinan Elementary, Oak Creek Elementary, and Westridge Elementary.

Seismic rehabilitation is included for River Grove Elementary School’s gym and covered play structure and the gyms of Lake Oswego Junior High, Lake Oswego High, and Lakeridge High.

Phase 2 (2021, voter approval required) proposes to demolish and replace Lake Oswego Junior High and River Grove Elementary. Phase 3 (2025, voter approval required) proposes to demolish and replace Forest Hills Elementary and Lake Grove Elementary.

The private school Our Lady of the Lake was rebuilt under existing building code in 2012.

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. The probability rating decreased, and the vulnerability rating did not change since the previous version of this NHMP addendum. Previously, the earthquake hazard profile was a single risk assessment, which is now divided into two separate earthquake hazards: Crustal earthquake, and Cascadia Subduction Zone (CSZ) earthquake.

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 Lake Oswego 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 Lake Oswego as well.

Figure LA-3 shows a generalized geologic map of the Lake Oswego 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.

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

Source: Oregon HazVu; Statewide Geohazards Viewer (DOGAMI)
Note: To view detail click the link above to access Oregon HazVu.

There are two potential crustal faults and/or zones near the City that can generate high-magnitude earthquakes. These include the Gales Creek-Mt. Angel Structural Zone (about 15 miles southwest of the city, not pictured) and the Portland Hills Fault Zone (about 3 miles northwest of the city, not pictured). The fault pictured in the southwest is the Canby-Molalla Fault, the Bolton Fault runs through Oswego Lake, and the Oatfield Fault is pictured in the northeast. More distant is the Mt. Hood Fault in eastern Clackamas County which has potential to impact Lake Oswego. 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.

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 northeast of Wilsonville.

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.

**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 to 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 night time (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 LA-12 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 Lake Oswego is expected to have a 5% building loss ratio with a repair cost of $337 million under the CSZ “dry” scenario, and an 8% building loss ratio with a repair cost of $523 million under the “wet” scenario. The city is expected to have around 174 daytime or 50 nighttime casualties during the CSZ “dry” scenario and 258 daytime or 130 nighttime casualties during the “wet” scenario. It is expected that there will be a long-term displaced population of around 220 for the CSZ “dry” scenario and 1,207 for the “wet” scenario.

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16 Ibid, Tables 12-8 and 12-9.
Portland Hills Fault Scenario

The City of Lake Oswego is expected to have a 28% building loss ratio with a repair cost of $1.877 billion under the Portland Hills Fault “dry” scenario, and a 35% building loss ratio with a repair cost of $2.377 billion under the “wet” scenario. The long-term displaced population and casualties are greatly increased for all the Portland Hills Fault scenarios. The city is expected to have around 965 daytime or 418 nighttime casualties during the “dry” scenario and 1,194 daytime or 659 nighttime casualties during the “wet” scenario. It is expected that there will be a long-term displaced population of around 3,243 for the “dry” scenario and 6,391 for the “wet” scenario.

Table LA-12 Expected damages and casualties for the CSZ fault and Portland Hills fault: earthquake, soil moisture, and event time scenarios

<table>
<thead>
<tr>
<th></th>
<th>Cascadia Subduction Zone (M9.0)</th>
<th>Portland Hills Fault (M6.8)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>&quot;Dry&quot; Soil</td>
<td>&quot;Wet&quot; Saturated Soil</td>
</tr>
<tr>
<td>Number of Buildings</td>
<td>13,770</td>
<td>13,770</td>
</tr>
<tr>
<td>Building Value ($ Million)</td>
<td>6,805</td>
<td>6,805</td>
</tr>
<tr>
<td>Building Repair Cost ($ Million)</td>
<td>337</td>
<td>523</td>
</tr>
<tr>
<td>Building Loss Ratio</td>
<td>5%</td>
<td>8%</td>
</tr>
<tr>
<td>Debris (Thousands of Tons)</td>
<td>134</td>
<td>184</td>
</tr>
<tr>
<td>Long-Term Displaced Population</td>
<td>220</td>
<td>1,207</td>
</tr>
<tr>
<td>Total Casualties (Daytime)</td>
<td>174</td>
<td>258</td>
</tr>
<tr>
<td>Level 4 (Killed)</td>
<td>8</td>
<td>12</td>
</tr>
<tr>
<td>Total Casualties (Nighttime)</td>
<td>50</td>
<td>130</td>
</tr>
<tr>
<td>Level 4 (Killed)</td>
<td>2</td>
<td>4</td>
</tr>
</tbody>
</table>


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 LA-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).

Please review Volume I, Section 2 for additional information on this hazard.

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17 Ibid, Tables 12-10 and 12-11
18 Ibid, Tables 12-10 and 12-11.
Flood

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

Volume I, Section 2 describes the characteristics of flood hazards, history, as well as the location, extent, and probability of a potential event. Portions of Lake Oswego have areas of floodplains (special flood hazard areas, SFHA). These include areas include along Willamette River, Tualatin River, Oswego Canal, and Oswego Lake (Figure LA-4). Furthermore, other portions of Lake Oswego, outside of the mapped floodplains, are also subject to flooding from local storm water drainage.

**Oswego Lake and Canal**

Oswego Lake is three and a half miles long, with the main portion covering 385 acres, and an additional seven acres in West Bay and 28 acres in Lakewood Bay. The Lake is a reservoir and is privately owned and managed by the Lake Oswego Corporation, commonly known as The Lake Corporation. The Lake Corporation has owned and maintained the Lake since 1942. In addition to its natural resource values, Oswego Lake is a multiple-use facility that serves the community in a variety of roles. It is a hydroelectric reservoir at the center of a 7,400-acre drainage basin. The lake receives most of its water from streams, storm drain outfalls, and surface runoff. Also, there is a City sanitary sewer interceptor below the lake’s normal surface water elevation that has been constructed at an engineered grade to convey sewage to the Tryon Creek Sewage Treatment Plant. A spillover dam was completed in 1921 that raised the lake and greatly increased its size, creating Blue Heron Bay and West Bay on the west end of the lake, and Lakewood Bay on the east end.19

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 City has been proactive in mitigating flood hazards by purchasing floodplain property.

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.

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 Lake Oswego outside of the mapped floodplains may also be at relatively high risk from over bank flooding from streams too small to be mapped by FEMA or from local storm water drainage.

19 Comprehensive Plan of the City of Lake Oswego. Adopted December, 1994
The City of Lake Oswego has been impacted by floods several times since incorporating in 1910. There have been at least six events in the past fifty years which have caused widespread damage. Flooding within the City has been caused by the Willamette River, Tualatin River, Oswego Canal, and Oswego Lake. The FEMA Flood Insurance Study (June 17, 2008) has a brief history of flooding in Clackamas County, and Lake Oswego (Volume I, Section 2).

The highest recorded flood levels on the Tualatin River were recorded on February 10, 1996. The period of record on this river only extends back to 1928. As measured from the Oswego Canal Inlet gage, this record flood reached an elevation of 120.12 feet (National Geodetic Vertical Datum of 1929, NGVD) as measured at the Oswego Canal Inlet gage. Waters that normally flow from the Tualatin River into the Oswego Canal are regulated by the canal headgate structure which has a top of headgate height of 113.6 feet. Once Tualatin River levels exceed the top of headgate, the water flows unimpeded into the canal, and northward to Oswego Lake. When the river reaches a level of 117.5 feet, water begins to leave the north banks of the Tualatin near the 5400 block of Dogwood Drive, and then migrates across Sycamore Avenue eventually rejoining the main Oswego Canal near Childs Road, and Bryant Woods Park.

In 2011-2012 the Oswego Lake Corporation completed a dam spillway modification project funded by a FEMA Flood Mitigation Assistance grant via the City of Lake Oswego. The project involved the installation of new, larger, spillway gates, sized to allow the passage to
the 100-year flood flows. The project resulted in the lowering of the base flood elevation (BFE) by 3.5 feet (to 99.7 feet NGVD of 1929), which is below the top of the seawall on the main lake, Lakewood Bay, Westlake, and Blue Heron Canal. The Letter of Map Revision (LOMR) covering the entirety of Oswego Lake is effective as of August 31, 2012. Before the flood project the Lake Corporation’s ability to release water at the east end of Oswego Lake was outstripped by the flows entering the lake from the Oswego Canal, and the lake level would rise uncontrollably. Dozens of homes, businesses, and boathouses were damaged by these floodwaters. Properties along Dogwood Drive, Melissa Drive, Canal Road, Pioneer Court, Bryant Road, Cardinal Drive, Kelok Road, Sarah Hill Lane, Lake Haven Drive, Canal Circle, many homes surrounding Oswego Lake (including all bays, and canals), businesses along State Street from the railroad crossing south to North Shore Road, plus many apartments, businesses, and carports in the Oswego Pointe area all experienced severe water, and structural damage. With the completion of the dam spillway modification project flooding is no longer expected to happen to the homes surrounding Oswego Lake (including all bays, Blue Heron canal), businesses along State Street from the railroad crossing south to North Shore Road, plus many apartments, businesses, and carports in the Oswego Pointe area, with the exception that there might be some minor roadway flooding (less than a foot deep) on North Shore at North Shore Circle, Eena Road, and perhaps at South Shore Boulevard near the Gerber Pond.

Heavy rains following a severe winter storm from January 1 to 2, 2009 contributed to a sewer interceptor overflow on Cardinal Drive near Oswego Canal. Approximately 226,000 gallons of wastewater were sent out of the sewer system. Maintenance crews were able to capture about 75% of the discharge using vacuum trucks.

Record flooding is usually accompanied by low elevation snows in the Coast, and Cascade Mountain foothills. Often snow is on the ground at the 1,000’ elevation, and sometimes it is even present all the way down to sea level. Larger than normal snow depths in the middle, easily melted, elevations such as 2000’ to 3,500’ are another major source of water runoff. These depths are frequently observed at the Saddle Mountain Snowtel station located at 3,250’ in the Coast range of western Washington County. Both the 1964, and 1996 floods were preceded by a period of sub-freezing temperatures that caused the soils of the drainage basins to solidify and become relatively impervious.

Finally, there is a rainfall pattern known as the “Pineapple Express” which brings very heavy, and warm rains from the southwest. These warm rains begin their journey from parts of the Pacific near Hawaii, holding their heat, and moisture until making landfall along the Oregon coast. As an example, at 1 A.M. on the morning of February 8, 1996, the temperature had risen to 61°F with a driving rain following a period of freezing conditions. This warm rain storm preceded the flood crest on the Willamette River by 2.5 days.

Vulnerability Assessment

Due to insufficient data and resources, Lake Oswego is currently unable to perform a quantitative risk assessment for this hazard. However, the City of Lake Oswego GIS Department completed an analysis, using the best available data, as a component of the vulnerability assessment in 2013 and reviewed and updated it, as appropriate, in 2018. This analysis looked at identified hazard areas in conjunction with available data on property exposed to the hazard. Exposure of community assets to natural hazards was determined by manually comparing critical and essential facilities and infrastructure with each hazard and identifying where assets and hazards intersected.
While no essential or critical facilities are in the floodplain, several critical infrastructure and environmental assets are exposed to the flood hazard. Exposed critical infrastructure includes Tryon Creek Wastewater Treatment Plant, Oswego Lake sanitary sewer interceptor, Oswego Lake dam and headgate, Highway 43, McVey Avenue, wastewater main lines, water lines, NW Natural gas pipelines, the fiber optic line along Highway 43, several wastewater lift stations, and the Foothills power substation. Exposed environmental assets include Bryant Woods Park, Canal Acres Natural Area, Foothills Park, George Rogers Park, Iron Mountain Park, Lake Grove Swim Park, Lake Oswego Hunt Club, Lake Oswego Swim Park, Millennium Park, River Run Park, Roehr Park, and Tryon Creek State Park.

The Tryon Creek Wastewater Treatment Plant, located in the Foothills area, is located on a parcel that is affected by the Flood Management Area. In off-peak hours, the facility is remotely operated, reducing potential life safety issues from a flood hazard. However, flood conditions that result in a change in hydraulics could affect the operation of the facility.

The water transmission main from the intake on the Clackamas River in Gladstone is susceptible to flooding hazards. The transmission main is buried in the peninsula but can be exposed in a large flood, making it susceptible to damage. Additionally, prolonged periods of rain can cause the sewer interceptor system to back up and flow out of manholes and into Oswego Lake or onto streets near the lake. Such spills violate the Federal Clean Water Act.

The three wastewater main lines located in the Foothills area are elevated above ground level, potentially increasing susceptibility to flood damage. Other exposed infrastructure including wastewater main lines, natural gas pipeline and fiber optic lines are buried, decreasing their vulnerability to damage from flood hazards. However, these service lines and pipes could be exposed in large flooding events and become susceptible to damage. Hazardous flood conditions could potentially limit or delay access for the purposes of operation or repair. The fiber optic line located in Highway 43/State Street, McVey Avenue and Stafford Road is a significant communication link for the entire region.

The regional Emergency Transportation Route follows State Highway 43 from the northern City limits, and continues south on State Street to McVey Avenue, and then southwest along Stafford Road. This route crosses a bridge on McVey Road (Oswego Lake Outlet/McVey Ave. Bridge) that could be potentially affected during flood conditions. Culverts located along the Emergency Transportation Route could also be affected during hazardous conditions as flood waters could exceed the hydraulic capacity of the facility. For a list of facilities and infrastructure vulnerable to this hazard see the Community Assets section and Tables LA-5 through LA-10.

**National Flood Insurance Program (NFIP)**

FEMA’s Flood Insurance Study (FIS), and Flood Insurance Rate Maps (FIRMs) are effective as of June 17, 2008. Table LA-13 shows that as of July 2018, Lake Oswego has 222 National Flood Insurance Program (NFIP) policies in force. Of those, 122 are for properties that were constructed before the initial FIRMs. The last Community Assistance Visit (CAV) for Lake Oswego was on August 28th, 2003. Lake Oswego does not participate in the Community Rating System (CRS). The table shows that the majority of flood insurance policies are for residential structures, primarily single-family homes. There has been a total of 54 paid claims for $3,587,489. The City complies with the NFIP through enforcement of their flood damage prevention ordinance and their floodplain management program.
The Community Repetitive Loss record for Lake Oswego identifies no Repetitive Loss Properties\(^{20}\) or Severe Repetitive Loss Properties\(^{21}\).

### Table LA-13 Flood Insurance Detail

<table>
<thead>
<tr>
<th>Policies by Building Type</th>
<th>Clackamas County</th>
<th>Lake Oswego</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initial FIRM Date</td>
<td>-</td>
<td>8/4/1987</td>
</tr>
<tr>
<td>Total Policies</td>
<td>1,957</td>
<td>222</td>
</tr>
<tr>
<td>Pre-FIRM Policies</td>
<td>1,086</td>
<td>122</td>
</tr>
<tr>
<td>Single Family</td>
<td>1,761</td>
<td>174</td>
</tr>
<tr>
<td>2 to 4 Family</td>
<td>30</td>
<td>5</td>
</tr>
<tr>
<td>Other Residential</td>
<td>58</td>
<td>35</td>
</tr>
<tr>
<td>Non-Residential</td>
<td>9</td>
<td>1</td>
</tr>
<tr>
<td>Minus Rated A Zone</td>
<td>123</td>
<td>15</td>
</tr>
<tr>
<td>Insurance in Force</td>
<td>$541,833,400</td>
<td>$65,279,400</td>
</tr>
<tr>
<td>Total Paid Claims</td>
<td>590</td>
<td>54</td>
</tr>
<tr>
<td>Pre-FIRM Claims Paid</td>
<td>450</td>
<td>41</td>
</tr>
<tr>
<td>Substantial Damage Claims</td>
<td>83</td>
<td>3</td>
</tr>
<tr>
<td>Total Paid Amount</td>
<td>$20,830,662</td>
<td>$3,587,489</td>
</tr>
<tr>
<td>Repetitive Loss Structures</td>
<td>51</td>
<td>0</td>
</tr>
<tr>
<td>Severe Repetitive Loss Properties</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>CRS Class Rating</td>
<td>-</td>
<td>NP</td>
</tr>
<tr>
<td>Last Community Assistance Visit</td>
<td>-</td>
<td>8/28/2003</td>
</tr>
</tbody>
</table>


Note: The portion of the cities of Portland and Tualatin that are within Clackamas County are not included in this table.

NP = Not Participating

### Mitigation Activities

Flood mitigation activities listed here include current mitigation programs and activities that are being implemented by Lake Oswego agencies or organizations.

### Lake Oswego Codes Pertaining to Flooding

The following Lake Oswego codes, plans, and policies pertain to flooding:

1. Lake Oswego Comprehensive Plan, Goal 7 - Areas Subject to Natural Disasters and Hazards, Section 1, Flood Hazards. The Goal of Section 1, Flood Hazards states: “The City shall protect life and property from flood hazards.”

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\(^{20}\) 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.

\(^{21}\) 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.
The Federal Emergency Management Agency (FEMA) provides the City with mapped floodplain information which identifies floodplain elevations and areas subject to flooding. Lake Oswego participates in the National Flood Insurance Program, which is administered by FEMA. This program allows residents of Lake Oswego to obtain federally subsidized flood insurance. To be eligible to participate in this program, the City adopted floodplain development standards in 1988 that met FEMA standards. In June 2008, the City adopted revised floodplain management standards and adopted updated FEMA Flood Insurance Rate Maps (FIRM) as well as the updated Flood Insurance Study (FIS) in compliance with FEMA, state, and Metro standards.

2. Lake Oswego Community Development Code, Article 50.44 Flood Management Area. This portion of the Community Development Code implements the Goal 7 policies of the Comprehensive Plan and regulates development within the floodplain. The purpose of Article 50.44 is to:
   - Promote the public health, safety and general welfare;
   - Minimize public and private losses due to flood conditions in specific areas; and
   - Maintain eligibility of properties within the City to participate in the National Flood Insurance Program.

3. Lake Oswego City Code and Charter, Chapter 52 - This chapter aims to control erosion at its source as a means of maintaining and improving water quality and minimizing water pollution, downstream flooding, and wildlife habitat damage.

4. Lake Oswego Bridge Inspections and Records Manual - This manual outlines the City’s bridge inspection program that was implemented to better respond in the event of a natural disaster. The intent of the program is to utilize trained City personnel to closely document bridge conditions through visual inspections, establishing baseline condition information to use for comparison to bridge conditions after a disaster. Overall, bridges throughout the City are old and in need of upgrading. Additionally, the manual outlines a disaster response plan, including identification of disaster response team members and a bridge closure and detour plan.

Flooding Response Activities
During past flood events, the City’s response included notification of property owners of impending flooding. Generally, the City has provided 24 to 36 hour notice. Notices have been followed by evacuations of people and, to a limited extent, personal property. Since 2006 the City has used a reverse 911 emergency notification system called Public Alerts to notify citizens of emergency incidents.

Attempts at sandbagging have been only partially effective. In areas where a good initial plan is communicated to volunteers, adequate supplies are available, and waters do not exceed 2 feet in depth, sandbagging can help. City staff members sandbag critical facilities and provide access to sand and sandbags for the public.

Flood Mitigation Projects
Lake Oswego is in the final design stages of the Lake Oswego Interceptor System (LOIS), and work has already begun on the out of lake work. The LOIS system will replace the interceptor sewer line located in Oswego Lake. The existing interceptor is undersized, resulting in overflows during heavy rains, and is vulnerable during an earthquake. Replacement of the interceptor is critical to ensuring the environmental protection of
Oswego Lake and maintaining sewer service for residents. This project represents the completion of an action that was identified in Lake Oswego’s 2004 mitigation plan addendum. The LOIS project was completed in winter of 2011-2012. Additionally, the City constructed seismic upgrades to the elevated wastewater main pipes that lead into the Tryon Creek Wastewater Treatment Plant.

Lake Oswego has currently been working with a consultant to incrementally model the flood levels of the Tualatin River. The final product of this effort will be the production of a series of flood inundation area maps that will be based upon the level of the river as measured at the USGS “West Linn” gage station. The city will use these maps to provide critical information to the Emergency Operation Center and crews in the field in an effort to better manage flood response. The maps will allow for strategic allocation of resources necessary to evacuate specific areas, close threatened roads, set up detours and deploy sand bagging materials.

The Engineering Division is developing a drainage improvement plan for the First Addition Neighborhood. Currently, due to a lack of designed neighborhood-wide drainage system, rainwater does not drain properly and streets can flood in this neighborhood. The improvements include the design and construction of new storm drainage systems throughout the neighborhood. The new drainage systems will help to reduce the amount of roadway sediments and pollutants entering into the drainage system, by utilizing various methods such as pollution control manholes and catch basins, infiltration swales, and compost filters. The FAN drainage plan was completed and identifies several projects. The projects have been included in the city CIP Plan, currently listed as unfunded.

In 2003, Lake Oswego commissioned a study, “Evaluation of Flood Management Alternatives for Oswego Lake and Canal” (Pacific Water Resources, Inc., June, 2003) which detailed strategies to help alleviate flooding of Oswego Lake. In the fall of 2009, the City completed a surface water master plan called the “Clean Streams Plan,” a completed action item from the 2004 mitigation plan.

After the 1996 flood event the City of Lake Oswego commissioned a study, “Lakewood Bay Flood Protection at North Shore Road Bridge” (Pacific Water Resources, June 30, 2000), to evaluate the event of the 1996 flood and what impacts would be experienced by the main part of Oswego Lake if Lakewood Bay were isolated during a similar flood event. During a flood event, blocking the inlet of Lakewood Bay would stop flood waters from filling the bay and overtopping State Street (Highway 43), as occurred in 1996. During the 1996 flood, State Street was flooded and blocked for over a day, affecting emergency access to the eastern part of Lake Oswego. With improvements to the dam spillway in 2011-2012, the city will no longer need to consider blocking the flow path into Lakewood Bay. All flood flows (up to the 100-yr event) will spill over the dam.

During the flood event in 1996, the primary cause of the flooding in the Foothills Road area was due to two sources. Both sources have since been mitigated, as described below:

5. A low point in the levy behind (north of) the Tryon Creek Treatment Plant allowed flood waters from the Tryon Creek/Willamette River to overtop the levy and enter the Foothills Road area. The City of Portland has since made repairs and improvements to address the problem.
6. A large diameter storm drain pipe that receives runoff from an area of downtown (200+ acres) drains through the Toklat Industries parking lot and discharges into Tryon Creek. Flood waters from the Tryon Creek/Willamette River system backed up through this storm system, surcharging the manholes and catch basins, contributing to the flooding in the Foothills Road area. Subsequently, this problem has been rectified. Redundant check valves have been installed on the storm pipes to prevent back up, and two pump stations have been designed and built that will accept the runoff generated in the upstream drainage basin and “force” it into the drain pipe and through the submerged outlet.

The smaller pump station is an electric submersible pump, designed to handle runoff that accumulates at the Lakeshore Concrete site. Should power fail during a flood event, the pump is positioned so a trailer-mounted portable generator can be plugged into the control panel to provide backup power.

The other pump station is located at the north end of Toklat Industries parking lot. These are two variable speed pumps with a combined capacity of 5,000 GPM. Each pump is powered by a Ford six-cylinder engine, fueled with natural gas. In the event of a loss of supply of natural gas, the backup power source is a power take-off (PTO) drive that is mounted on the vertical drive shaft of the pumps. City Maintenance staff would then mobilize a piece of equipment that employs hydraulics (such as a back-hoe, tractor, or dump truck,) and plug in the quick-connect hoses (stored on site) into the PTO and the piece of mobile equipment.

These pumps were installed in the late 1990’s and City Maintenance staff is familiar with their operation. These systems are inspected and exercised on a regular basis.

In 2011-2012 the Oswego Lake Corporation completed a dam spillway modification project funded by a FEMA Flood Mitigation Assistance grant via the City of Lake Oswego (see above for more information).

*Please review Volume I, Section 2 for additional information on this hazard.*

**Landslide**

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

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. Landslide susceptibility exposure for Lake Oswego is shown in Figure LA-5. Most of Lake Oswego demonstrates a low to moderate landslide susceptibility exposure, with an area of high exposure around Mountain Park. Approximately 14% of Lake Oswego has very high or high, and approximately 44% moderate, landslide susceptibility exposure.\(^{22}\) The City’s wastewater main lines, major water lines, and fiber optic lines are identified as being especially vulnerable.

Figure LA-5 Landslide Susceptibility Exposure

Landsliding unlikely. Areas classified as Landslide Density = Low (less than 7%) and areas classified as Slopes Prone to Landsliding = Low.

Landsliding possible. Areas classified as Landslide Density = Low to Moderate (less than 17%) and areas classified as Slopes Prone to Landsliding = Moderate OR areas classified as Landslide Density = Moderate (7%-17%) and areas classified as Slopes Prone to Landsliding = Low.

Landsliding likely. Areas classified as Landslide Density = High (greater than 17%) and areas classified as Slopes Prone to Landsliding = Low and Moderate OR areas classified as Landslide Density = Low and Moderate (less than 17%) and areas classified as Slopes Prone to Landsliding = High.

Existing landslides Landslide Density and Slopes Prone to Landsliding data were not considered in this category. Note: the quality of landslide inventory (existing landslides) mapping varies across the state.

Source: [Oregon HazVu: Statewide Geohazards Viewer (DOGAMI)](https://www.oregon.gov/DOGAMI)
Note: To view detail click the link above to access Oregon HazVu.

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.

The City’s fresh drinking water supply comes from the West Linn Water Treatment Plant, which was originally built in unincorporated Clackamas County for the City of Lake Oswego in the 1960s. It now serves multiple jurisdictions— including Tigard, and Lake Oswego. There was recently a project completed in October 2017 to increase the treated water capacity (to
38 million gallons per day) for residents of Lake Oswego, and Tigard.\textsuperscript{23} The treatment plant has two different utility substations on the property for back up electricity, and has agreements with other treatment plants around the region for water use that creates redundancies within the water supply system for residents. The water line from the City’s water treatment plant located in West Linn enters the City along Highway 43, and runs north through George Rogers Park, an area vulnerable to landslide hazards. The fiber optic line located in Highway 43/State Street, McVey Avenue, and Stafford Road is a significant communication link for the entire region.

The last major landslide event occurred in 2009 when a large landslide originated from the slopes above Green Bluff Drive in the Marylhurst area and slid into a home on Woodhurst Place just after 1:00am. Twenty-one homes, and twenty-eight people were evacuated, while five people were transported to the hospital. The Adult Community Center was opened to accommodate families in need of shelter. A second slide down the hill from Green Bluff damaged another home, and the right of way. A third slide on Oak Street deposited earth onto the road and diverted runoff to the properties downhill. Additional landslide events occurred on February 2, 2008 in George Rogers Park, leading to the closure of the pathway between George Rogers Park and Old River Road for five months; in 2008 on Green Street; in December 2007, a rain event led to three slides on Iron Mountain Boulevard and Green Bluff; in 2007 on Eagle Crest Drive and Glenmorrie Drive.; in 2006 on Royce Way, Oak Street, and Laurel Street; and in 2004 on Kerr Parkway, Del Prado Street, and Oak Terrace.

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 Tables LA-5 through LA-10.

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

**Vulnerability Assessment**

Due to insufficient data and resources, Lake Oswego is currently unable to perform a quantitative risk assessment for this hazard. However, the City of Lake Oswego GIS Department completed an analysis, using the best available data, as a component of the vulnerability assessment in 2013 and reviewed and updated it, as appropriate, in 2018. This analysis looked at identified hazard areas in conjunction with available data on property exposed to the hazard. Exposure of community assets to natural hazards was determined by manually comparing critical and essential facilities and infrastructure with each hazard and identifying where assets and hazards intersected. Additionally, DOGAMI completed a statewide landslide susceptibility assessment in 2016 (O-16-02), general findings from that report are provided above and within Figure LA-5.

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\textsuperscript{23} Lake Oswego-Tigard Water Treatment Plant. Public Works, City of West Linn. Last visited 10/9/18: https://westlinnoregon.gov/publicworks/lake-oswego-tigard-water-treatment-plant
The Adult Community Center, a critical facility, is within a potential landslide area and is exposed to landslide hazards. However, the portion of the parcel that contains the Adult Community Center is relatively flat, while the undeveloped rear portion of the parcel is at the top of a steep slope leading down to Tryon Creek, thereby minimizing risks of the facility to the landslide hazard. The Hallanan School and Westridge Elementary are essential facilities exposed to the landslide hazard.

Exposed infrastructure including wastewater main lines, major water lines and fiber optic lines are buried, decreasing their vulnerability to damage from landslide hazards. However, hazardous landslide conditions could potentially damage the infrastructure and limit or delay access for the purposes of operation or repair. The City’s fresh drinking water supply comes from the water treatment plant in West Linn, with the water intake located on the Clackamas River in Gladstone. The water line from the City’s water treatment plant located in West Linn enters the City along Highway 43 and runs north through George Rogers Park, an area vulnerable to landslide hazards.

The fiber optic line located in Highway 43/State Street, McVey Avenue and Stafford Road is a significant communication link for the entire region. Exposed environmental assets include George Rogers Park, Iron Mountain Park, Lake Oswego Hunt Club, Lake Oswego Swim Park, and Tryon Creek State Natural Area.

The regional Emergency Transportation Route follows State Highway 43 from the north City limits, and continues south on State Street to McVey Avenue, and then southwest along Stafford Road. At the northern City limits, the Emergency Transportation Route along State Street passes through a potential landslide area, possibly impacting access to and from the City.

The portion of Lake Oswego in Multnomah County, primarily the northern part of the Mountain Park neighborhood, contains steep slopes that are potentially susceptible to landslide hazards. Additionally, a communications tower that is used for emergency communications is in this area on Mt. Sylvania.

**Mitigation Activities**

Landslide mitigation activities listed here include current mitigation programs and activities that are being implemented by the City of Lake Oswego agencies or organizations.

**City of Lake Oswego Codes Pertaining to Landslides**

The following Lake Oswego codes, plans, and policies pertain to landslides:

1. Lake Oswego Comprehensive Plan, Goal 7 – Areas Subject to Natural Disasters and Hazards, Section 3, Landslides, Erosion and Unstable Soils. The Goal of Section 3, Landslides, Erosion and Unstable Soils states: “The City shall protect life and property from hazards associated with landslides, soil erosion, and unstable soils”.

2. The following portions of the Community Development Code and City Code implement the Goal 7, Section 3 policies of the Comprehensive Plan, regulating development on steep slopes, erosion control, and earthwork control:

   - Community Development Code, Article 50.40 Drainage Standard for Minor Development;
• Community Development Code, Article 50.41 Drainage Standard for Major Development;
• Community Development Code, Article 50.42 Weak Foundation Soils;
• Community Development Code, Article 50.43 Hillside Protection;
• Lake Oswego Code, Chapter 52 Erosion Control; and
• Lake Oswego Building Code (LOC Chapter 45), Article 45.16 Earthwork Control.

Additionally, Article 50.16 of the Community Development Code, Sensitive Lands Overlay Districts, manages the impacts of development on lands with environmental and natural resource significance in order to protect the functions and values of wetlands, stream corridors, and tree groves within the Lake Oswego City limits. Many of these significant resources are associated with hillsides, ravines, and ridge lines.

3. Lake Oswego City Code and Charter, Chapter 52 – This chapter aims to minimize the amount of sediment and other pollutants reaching the surface water management system because of construction, grading, excavating, clearing and any other activity which causes or accelerates erosion.

4. Lake Oswego Bridge Inspections and Records Manual. This manual outlines the City’s bridge inspection program that was implemented to better respond in the event of a natural disaster. The intent of the program is to utilize trained City personnel to closely document bridge conditions through visual inspections, establishing baseline condition information to use for comparison to bridge conditions after a disaster. Additionally, the manual outlines a disaster response plan, including identification of disaster response team members and a bridge closure and detour plan.

Landslide Mitigation Projects
City of Lake Oswego staff has been tracking recent research by DOGAMI and related state legislation regarding rapidly moving landslide hazards. The City now has LIDAR data and maps from DOGAMI. The City will be reviewing and evaluating the results of this mapping and modeling, and will update City codes and ordinances, if appropriate.

In 2005 the Engineering Department solicited proposals from qualified geotechnical engineering firms to provide an analysis of the slide area in Rockinghorse Lane and to make recommendations for alternatives to improve drainage in the area. The city is currently working on a Capital Project to improve the surface water drainage in the area.

After the George Rogers Park slide in 2008, private property owners above the pathway built a steel gabion retaining wall to stabilize the slope. A temporary debris catchment basin was built on Green Bluff and the City worked with the property owners to stabilize the embankment and roadway where the lower slide on Green Bluff occurred.

Please review Volume I, Section 2 for additional information on 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 **low** and that their vulnerability is **moderate**. *These ratings did not change since the previous version of this NHMP addendum.*

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 Lake Oswego 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.

*Please review Volume I, Section 2 for additional information on this hazard.*

**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 addendum.*

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 Lake Oswego.

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 drainage-ways, which in turn may cause localized urban flooding.

*Please review Volume I, Section 2 for additional information on this hazard.*

**Winter Storm (Snow/Ice)**

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

Major winter storms can, and have occurred in the Lake Oswego area, including in December 2008 with the largest winter storm in forty years. The storm led to significant power outages, eight water main breaks, and hazardous road conditions. The City contracted forces to assist in snow removal efforts. Additional recent winter storm (including wind) events occurred in December 2016/January 2017, January 2016, December 2015 (DR-4258), February 2014 (snow/ice), January 2009, December 2008, and December 2007. 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.

Vulnerability Assessment

Due to insufficient data and resources, Lake Oswego 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 Tables LA-5 through LA-10.

While severe weather data is not available to illustrate hazard areas, City staff has noted several areas in Lake Oswego that are particularly vulnerable. In the past, falling trees, downed power lines, and icy roads have caused problems in the downtown, Palisades, Mountain Park, and Lake Grove areas, and along South Shore Road. Primarily, these areas have tall trees that present problems. Additionally, in Mountain Park, the combination of steep roads and icy conditions hampered emergency response efforts.

In the event of a severe winter storm, the City uses identified sanding routes to coordinate response activity and concentrate resources during an event.

Mitigation Activities

Severe wind and winter storm mitigation activities listed here include current mitigation programs and activities that are being implemented by Lake Oswego agencies or organizations. The existing extreme heat mitigation activities are conducted at the county level and are described in the Clackamas County NHMP.

City of Lake Oswego Codes Pertaining to Severe Wind and Winter Storms

The following Lake Oswego codes, plans, and policies pertain to severe wind and winter storms:

1. Lake Oswego Emergency Operations Plan and Related Annexes, Severe Weather Emergency Annex. This plan describes how the City of Lake Oswego’s emergency operations system will operate during emergencies involving severe storm conditions within the City and contract districts. The plan is designed to meet Clackamas County, state, and federal government emergency plans.
The plan describes the roles and responsibilities of all local responders within the City of Lake Oswego. It identifies who will oversee response efforts in the event of an incident and how the response will be handled. It provides guidelines for coordinating emergency services. It also describes how Lake Oswego will coordinate with:

- Adjacent jurisdictions;
- Mutual aid in some areas;
- State agencies;
- Federal agencies; and
- Industry (snow removal).

2. Lake Oswego City Building Evacuation Plan. The building evacuation plan is based on the adopted state program. The plan establishes evacuation procedures, including the designation and training of evacuation coordinators.

3. Lake Oswego Bridge Inspections and Records Manual. This manual outlines the City’s bridge inspection program that was implemented to better respond in the event of a natural disaster. The intent of the program is to utilize trained City personnel to closely document bridge conditions through visual inspections, establishing baseline condition information to use for comparison to bridge conditions after a disaster. Additionally, the manual outlines a disaster response plan, including identification of disaster response team members and a bridge closure and detour plan.

Severe Wind and Winter Storm Mitigation Projects
Undergrounding utilities is required for all new development. The primary step taken for severe wind or winter storm events is preparedness. Lake Oswego CERT teams are trained in how to assist in severe storm events. Each year, the City of Lake Oswego Public Works Operations conducts the following activities:

- New weather stations and a webcam were installed to monitor storm systems;
- Inventories existing stockpile of sanding materials and replenishes as necessary;
- Performs routine maintenance and inspection of all sanders, plows, dump trucks, loaders, and chain saws;
- Provides training on sander/snowplow operations; and
- Provides training on:
  - Winter driving safety;
  - Chain saw safety – operation and personal protective equipment; and
  - Working around downed power lines.

Once a storm hits, Lake Oswego has designated sanding and plowing routes that give priority to arterials and emergency response routes. Local streets have the lowest priority because they serve the fewest citizens. The Public Alerts reverse 911 system can be used to inform citizens of hazard areas resulting from severe storms and encourage citizens to stay sheltered inside. The City website and public information line provide citizens with up to date information about the storm.

Please review Volume I, Section 2 for additional information on this hazard.
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 **moderate**. *The probability rating did not change, while the vulnerability increased since the previous version of this NHMP addendum.*

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 Lake Oswego as well. Several volcanoes are located near Lake Oswego, the closest of which are Mount Hood, Mount Adams, Mount Saint Helens, Mount Rainier, and the Three Sisters.

Due to Lake Oswego’s relative distance from volcanoes, the city is unlikely to experience the immediate effects that eruptions have on surrounding areas (i.e., mud and debris flows, or lahars). Although the City of Lake Oswego is unlikely to experience lahars or lava flows, tephra (sand-sized or finer particles of volcanic rock that is ejected rapidly into the air from volcanic vents) drifts downwind from the explosions and can form a blanket-like deposit of ash. 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. Tephra is a public health threat, and can damage agriculture and transportation systems (i.e., aircraft and on-the-ground vehicles). Tephra can also clog drainage systems and create major debris management problems. Within Lake Oswego, public health would be a primary concern, and keeping transportation routes open/accessible would be important as well.

Vulnerability Assessment

Due to insufficient data and resources, Lake Oswego 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 Tables LA-5 through LA-10.

Mitigation Activities

The existing volcano hazard mitigation activities are conducted at the county, regional, state, and federal levels and are described in the Clackamas County NHMP.

*Please review Volume I, Section 2 for additional information on this hazard.*
Wildfire

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

The 2017 Clackamas County Community Wildfire Protection Plan (CWPP) was completed in May 2018. The CWPP is hereby incorporated into this NHMP addendum by reference, and it will serve as the wildfire section for this addendum. The following presents a summary of key information; refer to the full CWPP for a complete description, and evaluation of the wildfire hazard: [https://www.clackamas.us/dm/CWPP.html](https://www.clackamas.us/dm/CWPP.html). Information specific to Lake Oswego is found in the following chapter: Chapter 10.8: Lake Oswego Fire Department.

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. Lake Oswego has not experienced a wildfire within City limits, but the city has abundant wooded areas that are a concern in the case of a wildfire event. Figure LA-6 shows overall wildfire risk in Lake Oswego.

**Figure LA-6 Overall Wildfire Risk**

![Overall Wildfire Risk](image)

Source: [Oregon Wildfire Risk Explorer](https://www.oregonwildfireexplorer.org/), date accessed November 9, 2018.

The forested hills within, and surrounding Lake Oswego are interface areas. High Priority Communities at Risk (CARs) include: Iron Mountain Bluff, Palisades, Cooks Butte Park, and Mountain Park. Medium priority CARs include: Tryon Creek State Park, Springbrook Park,
and Waluga Park.\textsuperscript{24} These areas are characterized by varying housing structures (often large houses on small lots, some with shake roofs), natural, and ornamental vegetation, and topography that may increase the risk for wildfire spreading.\textsuperscript{25}

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.\textsuperscript{26} However, conditions vary widely and with local topography, fuels, and local weather (including wind) conditions. Under warm, dry, windy, and 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.

The potential community impacts, and vulnerabilities described in Volume I, Section 2 are generally accurate for the City as well. Lake Oswego’s fire response is addressed within the CWPP which assesses wildfire risk, maps wildland urban interface areas, and includes actions to mitigate wildfire risk. Priority fuels reduction areas include: Iron Mountain Bluff, Springbrook Park, Waluga Park, Cooks Butte Park, and Tryon Creek. The City 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).

\textbf{Vulnerability Assessment}

Due to insufficient data and resources, Lake Oswego is currently unable to perform a quantitative risk assessment for this hazard. However, the City of Lake Oswego GIS Department completed an analysis, using the best available data, as a component of the vulnerability assessment in 2013 and reviewed and updated it, as appropriate, in 2018. This analysis looked at identified hazard areas in conjunction with available data on property exposed to the hazard. Exposure of community assets to natural hazards was determined by manually comparing critical and essential facilities and infrastructure with each hazard and identifying where assets and hazards intersected. For a list of facilities and infrastructure vulnerable to this hazard see the Community Assets section and Tables LA-5 through LA-10.

The Adult Community Center, a critical facility, is exposed to a high hazard wildfire area. The rear (northern) portion of the parcel is covered with trees, and slopes steeply down to Tyron Creek, potentially exposing the facility and limiting its availability as an emergency short-term site in the event of a wildfire. The South Shore Fire Station is another critical facility in the high wildfire hazard zone. Essential facilities exposed to high wildfire hazard include Oak Creek Elementary, Westridge Elementary, Hallinan Elementary, Uplands Elementary, Forest Hills Elementary, the area west of Lake Oswego Jr. High, portions of the former Marylhurst University campus, and several churches, which could potentially serve as Red Cross shelter sites.

\textsuperscript{24} Clackamas County Community Wildfire Protection Plan, \textit{Lake Oswego Fire Department} (2018), Table 10.8-1.
\textsuperscript{25} Ibid.
\textsuperscript{26} \textit{Oregon Wildfire Risk Explorer}, date accessed November 9, 2018.
Exposed infrastructure including wastewater main lines, major water lines, natural gas pipeline and fiber optic lines are buried, decreasing their vulnerability to damage from wildfire hazards. However, wildfire conditions could potentially limit or delay access for the purposes of operation or repair. The City’s fresh drinking water supply comes from a water treatment plant in West Linn, with the water intake located on the Clackamas River in Gladstone. The water line from the City’s water treatment plant in West Linn enters the City along Highway 43/State Street and runs north through George Rogers Park. This alignment includes areas that could be vulnerable to wildfire hazards. The fiber optic line located along Highway 43/State Street, McVey Avenue and Stafford Road is a significant communication link for the entire region. Operation of and access to other exposed infrastructure including the Oswego Lake headgate, several water pumping stations and reservoirs, a PGE substation in the Mountain Park area and communications towers used for emergency communications located on Cook’s Butte and Mt. Sylvania, could be potentially impacted during a wildfire hazard.

The regional Emergency Transportation Route follows State Highway 43 from the northern City limits, and continues south on State Street to McVey Avenue, and then southwest to and along Stafford Road. The Emergency Transportation Route passes through several high wildfire hazard areas, at the northern City limits along State Street and McVey Avenue to the south, possibly impacting access to and from the City.

Not surprising, several Lake Oswego’s parks and open spaces are considered high wildfire hazards. These include Bryant Woods Park, Canal Acres Natural Area, Cooks Butte Park, Freepons Park, George Rogers Park, Hallinan Natural Area, Iron Mountain Park, River Run Park, Roehr Park, Lake Grove Swim Park, Southwood Park, Springbrook Park, and Waluga Park (parks and open spaces denoted in bold are consider high or moderate priority CARs within the CWPP, see above for more information).

For the portion of Lake Oswego in Multnomah County, primarily the northern part of the Mountain Park neighborhood, Lake Oswego Fire Department staff has determined that due to the steep slopes and wooded character of this neighborhood, the wildfire hazard ranges from moderate to high.

Mitigation Activities
The City of Lake Oswego Fire Department works to mitigate problems regarding wildfire issues when they arise. Wildfire mitigation activities listed here include current mitigation programs and activities that are being implemented by Lake Oswego agencies or organizations.

City of Lake Oswego Codes Pertaining to Wildfires
The following Lake Oswego codes, plans, and policies pertain to wildfires:

1. The City of Lake Oswego Community Development Code (LOC Chapter 50) specifies site development standards, such as lot setback, coverage, depth, and corner vision; landscape and tree planting and removal standards; and structure height.
2. The City of Lake Oswego Building Code (LOC Chapter 45) regulates building materials and fire flow and sprinkler requirements.
3. The Uniform Fire Code and City Code regulate the removal of fuels that could be a fire hazard and regulate burning with permits and burning bans when needed due to high fire hazard.
Local Fire Prevention/Education Programs

The Lake Oswego Fire Department participated in creating the County’s Community Wildfire Protection Plan. Fire prevention staff also works with the Clackamas County Fire Prevention Co-op that includes the U.S. Forest Service and Oregon Department of Forestry as members. The Lake Oswego Fire Department fire prevention staff conducts a range of public education activities, including wildland fire education programs. Additionally, the City of Lake Oswego’s Community Emergency Response Team (CERT) program includes wildland fire prevention in its training program.

The City of Lake Oswego has a hydrant system that covers most of the area Lake Oswego Fire Department protects. The Fire Department continues to look for locations that will enhance wildland urban interface protection. For example, the City recently added hydrants to the Iron Mountain Bluff area after firefighters determined the need for increased protection from wildfire. Additionally, school remodels must now include the installation of sprinkler systems upgrades. Lastly, the City works to eradicate non-native plant species and manages invasive species, reducing the fuel load in the City’s open spaces.

*Please review the [2017 Clackamas County Community Wildfire Protection Plan (CWPP)](https://example.com) and Volume I, Section 2 for additional information on this hazard.*
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ATTACHMENT A:
ACTION ITEM FORMS

ACTION ITEM FORMS

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* - Priority Action Item

Note: The HMAC decided to modify the prioritization of action items in this update to reflect current conditions (risk assessment), needs, and capacity.

Summary of Action Changes

Below is a list of changes to the action items since the previous plan.

Previous NHMP Actions: Completed

Multi-Hazard Action #7 (2012): “Obtain funding for implementing recommendations for improving infrastructure outlined in the updated Clean Streams Plan” is considered complete. The Clean Streams Plan recommendations are implemented through the city’s capital improvement plan on an ongoing basis.

Multi-Hazard Action #8 (2012): “Maintain and implement the Wastewater Master Plan” is considered complete. Wastewater Master Plan actions are implemented through the city’s capital improvement plan on an ongoing basis. The plan is routinely updated and the HMAC does not consider it necessary to retain the action in the mitigation plan.

Flood Action #3 (2012): “Implement alternatives for reducing the flooding hazard for properties along Oswego Lake and canals” is considered complete. In 2011-2012 the Oswego Lake Corporation completed a dam spillway modification project funded by a FEMA Flood Mitigation Assistance grant via the City of Lake Oswego. The project involved the installation of new, larger, spillway gates, sized to allow the passage to the 100-year flood flows. The project resulted in the lowering of the base flood elevation (BFE) by 3.5 feet (to 99.7 feet NGVD of 1929), which is below the top of the seawall on the main lake, Lakewood Bay, Westlake, and Blue Heron Canal. See discussion on p. LA-33 for more information.

See 2018 status identified in each action for activities that have been completed since the previous plan.
Previous NHMP Actions: Removed

Multi-Hazard Action #4 (2012): “Continue to update and improve the hazard assessment in the Lake Oswego Natural Hazards Mitigation Plan” was removed from the list since it was determined by the steering committee that this is a function of their Implementation and Maintenance Plan and did not need to be included as an action.

Multi-Hazard Action #5 (2012): “Identify and pursue funding opportunities to develop and implement hazard mitigation activities” was removed from the list since it was determined by the steering committee that this is a function of their Implementation and Maintenance Plan and did not need to be included as an action.

Flood Action #2 (2012): “Reduce the vulnerability in the Foothills area to the flooding hazard” was removed from the list of actions. The city discussed solutions for the area but determined they will not proceed with the action until development options have been explored. As such the action is not currently applicable.

Note: 2012 Actions MH #6 and MH #9 were renumbered to 2019 Actions MH # 4 and MH #5

New NHMP Actions (2019):

- Flood Action #2
- Wildfire Action #3

See action item forms below for detail.
**Action Item Forms**

Each action item has a corresponding action item worksheet describing the activity, identifying the rationale for the project, identifying potential ideas for implementation, and assigning coordinating and partner organizations. The action item worksheets can assist the community in pre-packaging potential projects for grant funding. The worksheet components are described below.

**ALIGNMENT WITH EXISTING PLANS/POLICIES**

The Clackamas County NHMP includes a range of action items that, when implemented, will reduce loss from hazard events in the County, participating cities, and special districts. Within the plan, FEMA requires the identification of existing programs that might be used to implement these action items. The City addresses statewide planning goals and legislative requirements through its comprehensive land use plan, capital improvements plan, mandated standards and building codes. To the extent possible, the City will work to incorporate the recommended mitigation action items into existing programs and procedures. Each action item identifies related existing plans and policies.

**STATUS/RATIONALE FOR PROPOSED ACTION ITEM**

Action items should be fact-based and tied directly to issues or needs identified throughout the planning process. Action items can be developed at any time during the planning process and can come from several sources, including participants in the planning process, noted deficiencies in local capability, or issues identified through the risk assessment. The rationale for proposed action items is based on the information documented in Section 2. The worksheet provides information on the activities that have occurred since the previous plan for each action item.

**IDEAS FOR IMPLEMENTATION**

The ideas for implementation offer a transition from theory to practice and serve as a starting point for this plan. This component of the action item is dynamic, since some ideas may prove to not be feasible, and new ideas may be added during the plan maintenance process. Ideas for implementation include such things as collaboration with relevant organizations, grant programs, tax incentives, human resources, education and outreach, research, and physical manipulation of buildings and infrastructure.

**COORDINATING (LEAD) ORGANIZATION:**

The coordinating organization is the public agency with the regulatory responsibility to address natural hazards, or that is willing and able to organize resources, find appropriate funding, or oversee activity implementation, monitoring and evaluation.

**INTERNAL AND EXTERNAL PARTNERS:**

The internal and external partner organizations listed in the Action Item Worksheets are potential partners recommended by the project HMAC but not necessarily contacted during the development of the plan. The coordinating organization should contact the identified partner organizations to see if they are capable of and interested in participation. This initial contact is also to gain a commitment of time and/or resources toward completion of the action items.
Internal partner organizations are departments within the City or other participating jurisdiction that may be able to assist in the implementation of action items by providing relevant resources to the coordinating organization.

External partner organizations can assist the coordinating organization in implementing the action items in various functions and may include local, regional, state, or federal agencies, as well as local and regional public and private sector organizations.

**PLAN GOALS ADDRESSED:**

The plan goals addressed by each action item are identified as a means for monitoring and evaluating how well the mitigation plan is achieving its goals, following implementation.

**TIMELINE:**

All broad scale action items have been determined to be ongoing, as opposed to short-term (0 to 2 years) or long-term (3 or more years). This is because the action items are broad ideas, and although actions may be implemented to address the broad ideas, the efforts should be ongoing.

**POTENTIAL FUNDING SOURCE**

Where possible potential funding sources have been identified. Example funding sources may include: Federal Hazard Mitigation Assistance programs, state funding sources such as the Oregon Seismic Rehabilitation Grant Program, or local funding sources such as capital improvement or general funds. An action item may include several potential funding sources.

**ESTIMATED COST**

A rough estimate of the cost for implementing each action item is included. Costs are shown in general categories showing low, medium, or high cost. The estimated cost for each category is outlined below:

- Low - Less than $50,000
- Medium - $50,000 – $100,000
- High - More than $100,000
Multi-Hazard #1

<table>
<thead>
<tr>
<th>Proposed Action Item:</th>
<th>Alignment with Plan Goals:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Develop, enhance, and implement education programs designed to reduce the losses from natural hazards.</td>
<td>Protect Life and Property; Augment Emergency Services; Encourage Partnerships for Implementation</td>
</tr>
</tbody>
</table>

Alignment with Existing Plans/Policies:

2018 Status/Rationale for Proposed Action Item:

- Before hazard seasons articles have been written for “Hello LO,” the official City newsletter mailed monthly to all households and business within City limits, and the “LO Down,” an online newsletter published twice a month. The NHMP is posted online and the Fire Department brings a copy to events they attend. The Fire Department offers CERT classes and delivers hazard presentations to neighborhood associations. Red Cross publications are disseminated by the Fire Department. Lake Oswego partners with Clackamas County to produce the “Emergency Preparedness Calendar,” which provides information about the hazards most likely to occur each month.
- Lake Oswego continues its efforts to implement emergency preparedness and hazard mitigation educational programs, which include neighborhood association presentations, community forums, and the annual public safety fair in August.

Ideas for Implementation:

- Gather hazard related information and public information materials, and disseminate to public through local publications;
- Identify property owners in the hazard zones, and conduct a target mailing to disseminate hazard information;
- Conduct public education as hazard seasons approach;
- Target Neighborhood Associations to sponsor CERT teams;
- Include hazard information on the City website; and
- Include insurance information in public outreach and education materials.

Coordinating Organization: Fire and Public Affairs

<table>
<thead>
<tr>
<th>Internal Partners:</th>
<th>External Partners:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Public Works; Engineering</td>
<td></td>
</tr>
</tbody>
</table>

Potential Funding Sources: | Estimated cost: | Timeline:
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>General Fund</td>
<td>Low</td>
<td>☑ Short Term (0-2 years) ☐ Long Term (2-4+ years) X Ongoing</td>
</tr>
</tbody>
</table>

Form Submitted by: Existing Action Item

Priority: Medium
<table>
<thead>
<tr>
<th>Proposed Action Item</th>
<th>Alignment with Plan Goals:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Integrate the goals and action items from the Lake Oswego Natural Hazards Mitigation Plan into existing regulatory documents and programs, where appropriate.</td>
<td>Protect Life and Property; Enhance Natural Systems; Augment Emergency Services; Encourage Partnerships for Implementation; Promote Public Awareness</td>
</tr>
</tbody>
</table>

Alignment with Existing Plans/Policies:
Comprehensive Plan, Zoning Ordinance

2018 Status/Rationale for Proposed Action Item:
- The City updated areas of the development code that protect natural resources, updated the flood plain ordinance with the adoption of the new maps and FEMA studies, and is in the process of completing a new sensitive lands ordinance. The Planning and Engineering Departments were designated as the new coordinating organizations. The second “idea for implementation” now refers to development standards, not Capital Improvement Plans.
- Comprehensive plan was updated in 2013.

Ideas for Implementation:
- Use the mitigation plan to help the City’s Comprehensive Land Use Plan meet State Land Use Planning Goal 7, designed to protect life and property from natural disasters and hazards through planning strategies that restrict development in areas of known hazards;
- Educate and inform citizens on development standards and ensure development does not encroach on hazard areas without prior mitigation; and
- Partner with other organizations and agencies with similar goals to promote building codes that are more disaster resistant at the state level.

Coordinating Organization: Planning and Engineering

<table>
<thead>
<tr>
<th>Internal Partners:</th>
<th>External Partners:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Administration</td>
<td>Department of Land Conservation and Development, Department of Geology and Mineral Industries</td>
</tr>
</tbody>
</table>

Potential Funding Sources: Estimated cost: Timeline:

<table>
<thead>
<tr>
<th>General Fund</th>
<th>Low</th>
<th>□ Short Term (0-2 years)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>□ Long Term (2-4+ years)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>X Ongoing</td>
</tr>
</tbody>
</table>

Form Submitted by: Existing action item

Priority: High

* - High Priority Action Item
### Multi-Hazard #3*

<table>
<thead>
<tr>
<th>Proposed Action Item</th>
<th>Alignment with Plan Goals:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Address wireless communication deficiencies locally and regionally.</td>
<td>Protect Life and Property; Enhance Natural Systems; Encourage Partnerships for Implementation</td>
</tr>
</tbody>
</table>

#### Alignment with Existing Plans/Policies:

#### 2018 Status/Rationale for Proposed Action Item:
- The City has received grants and is pursuing additional grants to purchase, install, and maintain communications equipment and infrastructure. All radio towers have been turned on.
- The action item has been expanded to include all wireless communications, not just 800 MHz.

#### Ideas for Implementation:
- Assess current deficiencies and identify appropriate technologies to address deficiencies; and
- Obtain funding for purchasing and installing necessary equipment and infrastructure.

<table>
<thead>
<tr>
<th>Coordinating Organization:</th>
<th>Lake Oswego 9-1-1 Communications (LOCOM)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Internal Partners:</td>
<td>External Partners:</td>
</tr>
<tr>
<td>Potential Funding Sources:</td>
<td>Estimated cost:</td>
</tr>
<tr>
<td>General Fund</td>
<td>Medium</td>
</tr>
<tr>
<td>□ Long Term (2-4+ years)</td>
<td></td>
</tr>
<tr>
<td>□ Ongoing</td>
<td></td>
</tr>
<tr>
<td>Form Submitted by:</td>
<td>Existing action item</td>
</tr>
<tr>
<td>Priority:</td>
<td>High</td>
</tr>
</tbody>
</table>

* - High Priority Action Item
## Multi-Hazard #4

<table>
<thead>
<tr>
<th>Proposed Action Item:</th>
<th>Alignment with Plan Goals:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Improve vegetation management throughout the city.</td>
<td>Augment Emergency Services; Promote Public Awareness</td>
</tr>
</tbody>
</table>

### Alignment with Existing Plans/Policies:

**2018 Status/Rationale for Proposed Action Item:**
- The city’s Fire, Parks and Planning Departments are working closely together to address fuels reduction and non-native vegetation. One project being discussed involves removing invasive species (and flammable materials) and doing a demonstration project at Iron Mountain, involving more than a fire break.

### Ideas for Implementation:
- Partner with rail entities and ODOT to control vegetation along transportation corridors;
- Identify appropriate practices for eliminating English ivy and other invasive species;
- Maintain healthy urban canopy;
- Maintain vegetative coverage for slope stability; and
- Coordinate with watershed councils and others

### Coordinating Organization:
- Planning and Parks

<table>
<thead>
<tr>
<th>Internal Partners:</th>
<th>External Partners:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Watershed Councils</td>
</tr>
</tbody>
</table>

### Potential Funding Sources:
- **General Fund**
  - Estimated cost: Low
  - Timeline: X Short Term (0-2 years)
  - Long Term (2-4+ years)
  - Ongoing

<table>
<thead>
<tr>
<th>Form Submitted by:</th>
<th>Priority:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Existing action item</td>
<td>Medium</td>
</tr>
</tbody>
</table>
## Multi-Hazard #5

<table>
<thead>
<tr>
<th>Proposed Action Item:</th>
<th>Alignment with Plan Goals:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Upgrade Lake Oswego wastewater system.</td>
<td>Protect Life and Property; Enhance Natural Systems; Augment Emergency Services</td>
</tr>
</tbody>
</table>

### Alignment with Existing Plans/Policies:

### 2018 Status/Rationale for Proposed Action Item:
- The Palisades pump station now has permanent backup power. The Lake Oswego Interceptor System project is underway.

### Ideas for Implementation:
- Research and obtain more robust backup power systems to reduce the chance of pump station failures;
- Obtain adequate funding for wastewater system replacement costs;
- Acquire easements; and
- Identify and obtain funding for addressing hazard potentials

### Coordinating Organization:
- Engineering

### Internal Partners:
- Public Works

### External Partners:

### Potential Funding Sources:
<table>
<thead>
<tr>
<th>General Fund</th>
<th>Estimated cost: High</th>
<th>Timeline:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>x Long Term (2-4+ years)</td>
</tr>
</tbody>
</table>

### Form Submitted by:
- Existing action item

### Priority:
- Medium
### Earthquake #1*

<table>
<thead>
<tr>
<th>Proposed Action Item</th>
<th>Alignment with Plan Goals:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conduct seismic evaluations on identified critical/essential facilities and infrastructure for implementing appropriate structural and non-structural mitigation strategies.</td>
<td>Protect Life and Property; Enhance Natural Systems; Augment Emergency Services</td>
</tr>
</tbody>
</table>

#### Alignment with Existing Plans/Policies:

- Emergency Operations Plan

#### 2018 Status/Rationale for Proposed Action Item:

- Currently, all new facilities must comply with and meet seismic standards. If someone moves into an old building, they must upgrade to current standards.
- DOGAMI did a windshield survey of schools, fire stations, police, and city halls (2007 RVS). The focus was on action of existing buildings and information was shared with participants.

**2018 Status:**

- City Hall was evaluated. All fire stations have been evaluated and had retrofit work done to apparatus bays. The roof diaphragm of the South Shore Fire Station was tied into walls. Water tanks and communications equipment were hardened and/or secured.
- Seismic upgrades were incorporated into a new City Hall, Police Department, Maintenance Facility (formerly Public Works), and new Water Treatment Plant.
- Schools have been evaluated and a 2017 bond passed to retrofit/replace the majority of at risk school buildings within the district (see earthquake section for more information)

#### Ideas for Implementation:

- Obtain funding to perform evaluations;
- Perform FEMA 154 seismic evaluations on all buildings not included in the recent DOGAMI inventory.
- Gain funding to retrofit/replace City Hall (currently in design phase) as a model project for other critical facilities in Lake Oswego; and
- Prioritize seismic upgrades based on criticality of need and population served.

#### Coordinating Organization:

<table>
<thead>
<tr>
<th>City Manager’s Office</th>
</tr>
</thead>
</table>

#### Internal Partners:

- Emergency Management, Administration

#### External Partners:

- Infrastructure Finance Authority, School district, colleges, utilities, water districts

#### Potential Funding Sources:

| SRGP, HMA (PDM, HMGP), General Fund | Estimated cost: Low to Moderate | Timeline: □ Short Term (0-2 years) X Long Term (2-4+ years) □ Ongoing |

#### Form Submitted by:

- Existing Action Item

#### Priority:

- High

* - *High Priority Action Item*
### Flood #1

<table>
<thead>
<tr>
<th>Proposed Action Item</th>
<th>Alignment with Plan Goals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ensure continued compliance in the National Flood Insurance Program (NFIP) through enforcement of local floodplain management ordinances.</td>
<td>Protect Life and Property; Enhance Natural Systems; Augment Emergency Services; Encourage Partnerships for Implementation; Promote Public Awareness</td>
</tr>
</tbody>
</table>

**Alignment with Existing Plans/Policies:**
- Flood Ordinance; Zoning Code

**2018 Status/Rationale for Proposed Action Item:**
- In 2011-2012 the Oswego Lake Corporation completed a dam spillway modification project funded by a FEMA Flood Mitigation Assistance grant via the City of Lake Oswego. The project involved the installation of new, larger, spillway gates, sized to allow the passage to the 100-year flood flows. The project resulted in the lowering of the base flood elevation (BFE) by 3.5 feet (to 99.7 feet NGVD of 1929), which is below the top of the seawall on the main lake, Lakewood Bay, Westlake, and Blue Heron Canal. The Letter of Map Revision (LOMR) covering the entirety of Oswego Lake is effective as of August 31, 2012. Flooding is no longer expected to happen to these areas, with the exception that there might be some minor roadway flooding (less than a foot deep) on North Shore at North Shore Circle, Eena Road, and perhaps at South Shore Boulevard near the Gerber Pond.

**Ideas for Implementation:**
- Actively participate with DLCD and FEMA during Community Assistance Visits; Community Assistance Visits (CAV) are scheduled visits to communities participating in the NFIP for: 1) conducting a comprehensive assessment of the community's floodplain management program; 2) assisting the community and its staff in understanding the NFIP and its requirements; and 3) assisting the community in implementing effective flood loss reduction measures when program deficiencies or violations are discovered.
- Assess the floodplain ordinance to ensure it reflects current flood hazards and situations, and meets NFIP requirements; and
- Coordinate with the County to ensure that floodplain ordinances and NFIP regulations are maintained and enforced.

**Coordinating Organization:** Planning and Engineering

<table>
<thead>
<tr>
<th>Internal Partners</th>
<th>External Partners</th>
</tr>
</thead>
<tbody>
<tr>
<td>Emergency Management, HMAC</td>
<td>Department of Land Conservation and Development; Association of State Floodplain Managers; Oregon Solutions</td>
</tr>
</tbody>
</table>

**Potential Funding Sources:**
- General Fund: Low

**Estimated cost:** Low

**Timeline:**
- Short Term (0-2 years)
- Long Term (2-4+ years)
- Ongoing

**Form Submitted by:** Existing Action Item (added in 2009)

**Priority:** Medium
### Landslide #1

<table>
<thead>
<tr>
<th>Proposed Action Item:</th>
<th>Alignment with Plan Goals:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Improve knowledge of landslide hazard areas and understanding of vulnerability and risk to life and property in hazard-prone areas.</td>
<td>Protect Life and Property; Encourage Partnerships for Implementation</td>
</tr>
</tbody>
</table>

#### Alignment with Existing Plans/Policies:

#### 2018 Status/Rationale for Proposed Action Item:
- In late 2013 DOGAMI completed a landslide hazard and susceptibility analysis for most of the County, (9 quadrangles covering the northwestern and central communities with most of the County's populations). These maps have not yet been adopted or integrated into the County's planning process. In 2016 the landslide hazard and susceptibility analysis and maps were updated (O-16-02).
- The City encourages citizens to look at the hazard maps and talk with geotechnical experts for new developments. In some instances, landowners are required to have a geotechnical expert inspect the property. The City also now has LIDAR information.

#### Ideas for Implementation:
- Adopt and integrate the 2016 DOGAMI landslide hazard and susceptibility maps into the county’s planning process (O-16-02).
- Develop public information to emphasize economic risk when building on potential or historical landslide areas;
- Identify funding sources to enhance site-specific geohazard mapping the Urban Growth Boundary;
- Partner with PSU to develop a descriptive landslide inventory along all Lake Oswego roadways, including appropriate mitigation strategies; and
- Identify existing mechanisms for public outreach (e.g., NRCS, watershed councils, etc.).

#### Coordinating Organization: Engineering and Planning

<table>
<thead>
<tr>
<th>Internal Partners:</th>
<th>External Partners:</th>
</tr>
</thead>
<tbody>
<tr>
<td>HMAC</td>
<td>Department of Geology and Mineral Industries, Portland State University, Watershed Councils, Natural Resources Conservation Service</td>
</tr>
</tbody>
</table>

#### Potential Funding Sources:

<table>
<thead>
<tr>
<th>Estimated cost:</th>
<th>Timeline:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low to Medium</td>
<td>□ Short Term (0-2 years)</td>
</tr>
<tr>
<td>X Ongoing</td>
<td>□ Long Term (2-4+ years)</td>
</tr>
</tbody>
</table>

### Existing Action Item

<table>
<thead>
<tr>
<th>Form Submitted by:</th>
<th>Priority:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Existing Action Item</td>
<td>Medium</td>
</tr>
</tbody>
</table>
## Severe Weather #1

<table>
<thead>
<tr>
<th>Proposed Action Item:</th>
<th>Alignment with Plan Goals:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reduce frequency and duration of power outages from the severe wind and winter storm hazards where possible.</td>
<td>Protect Life and Property; Enhance Natural Systems</td>
</tr>
</tbody>
</table>

### Alignment with Existing Plans/Policies:

### 2018 Status/Rationale for Proposed Action Item:
- Three new portable generator stations have been purchased, and all fire stations and city hall have back-up generators.
- Many lift stations have built in power generators and the remainders use portable generators.
- Undergrounding utilities is required for all new building, and
- A private business on Boones Ferry voluntarily undergrounded utilities.

### Ideas for Implementation:
- Partner with Portland General Electric, or subsequent electrical utility, to continue hazardous tree inventory and mitigation programs;
- Where possible, during redevelopment construction, promote under grounding of utilities;
- Identify strategies to establish redundant access to the utility grid to increase the reliability of critical infrastructure; and
- Identify critical facilities for backup power generation

### Coordinating Organization:
Engineering and Planning

<table>
<thead>
<tr>
<th>Internal Partners:</th>
<th>External Partners:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Public Works</td>
<td>Utilities, private landowners</td>
</tr>
</tbody>
</table>

### Potential Funding Sources:

<table>
<thead>
<tr>
<th>Estimated cost:</th>
<th>Timeline:</th>
</tr>
</thead>
</table>
| Low to High     | □ Short Term (0-2 years)  
                  □ Long Term (2-4+ years)  
                  X Ongoing |

### Form Submitted by:
Existing Action Item

### Priority:
Medium
**Wildfire #1**

<table>
<thead>
<tr>
<th>Proposed Action Item:</th>
<th>Alignment with Plan Goals:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Promote fire resistant strategies and the use of non-combustible roofing materials by evaluating and making recommendations to current code to encourage noncombustible roofing standards in high fire-hazard areas.</td>
<td>Protect Life and Property; Enhance Natural Systems; Encourage Partnerships for Implementation; Promote Public Awareness</td>
</tr>
</tbody>
</table>

Alignment with Existing Plans/Policies:

**2018 Status/Rationale for Proposed Action Item:**
- The City and Fire Department already encourage the use of non-combustible roofing materials. They also encourage neighborhood associations to stop requiring cedar shake roofs.
- Programs focus on fuel reduction and defensible space.
- This action item is not supported with code.
- The Lake Oswego Fire Marshal continues to meet regularly with neighborhood associations to discuss mitigation activities residents can take part in.

**Ideas for Implementation:**
- Encourage property owners to use noncombustible roofing materials;
- Require street design that facilitates the movement of fire fighting equipment;
- Promote use of sprinkler systems in residential construction; and
- Maintain awareness of potential City growth into the wildland urban interface.

**Coordinating Organization:** Fire and Planning

<table>
<thead>
<tr>
<th>Internal Partners:</th>
<th>External Partners:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Fire Co-op</td>
</tr>
</tbody>
</table>

**Potential Funding Sources:**

<table>
<thead>
<tr>
<th>General Fund</th>
<th>Estimated cost:</th>
<th>Timeline:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Low</td>
<td>□ Short Term (0-2 years)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>□ Long Term (2-4+ years)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>✗ Ongoing</td>
</tr>
</tbody>
</table>

**Form Submitted by:** Existing Action Item

**Priority:** Medium
## Wildfire #2

<table>
<thead>
<tr>
<th>Proposed Action Item:</th>
<th>Alignment with Plan Goals:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Develop and implement an Urban Forest Fire Management Plan.</td>
<td>Protect Life and Property; Enhance Natural Systems; Augment Emergency Services; Promote Public Awareness</td>
</tr>
</tbody>
</table>

### Alignment with Existing Plans/Policies:
Clackamas County Community Wildfire Protection Plan (2018), Comprehensive Plan

### 2018 Status/Rationale for Proposed Action Item:
- The City has an Urban Forest Annex in their Emergency Operations Plan and it is updated when the EOP is updated. The City works with the Portland Fire Bureau to plan for Trillium Creek. Work has been done to remove non-native species in City parks. Several hydrants were installed to assist in structural and wildfire fighting efforts.
- Lake Oswego is looking to add fire hydrants to Iron Mountain, as well as addressing the non-native vegetation issue. The city continues to meet with the county’s parks department to combine fuels reduction initiatives.

### Ideas for Implementation:
- Develop a vegetation inventory for areas believed to be at risk of wildfire.
- Target areas of brush and implement management strategies that are consistent with habitat protection requirements;
- Replace flammable non-native vegetation with native plants that are less flammable; and
- Enhance water storage facilities and water distribution systems (including hydrants) to serve the wild land/urban interface.

### Coordinating Organization:
Fire

<table>
<thead>
<tr>
<th>Internal Partners:</th>
<th>External Partners:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Planning</td>
<td></td>
</tr>
</tbody>
</table>

### Potential Funding Sources:

<table>
<thead>
<tr>
<th>Estimated cost:</th>
<th>Timeline:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low to Medium</td>
<td>□ Short Term (0-2 years) X Long Term (2-4+ years) □ Ongoing</td>
</tr>
</tbody>
</table>

### Form Submitted by:
Existing Action Item

### Priority:
Medium
Wildfire #3*

<table>
<thead>
<tr>
<th>Proposed Action Item:</th>
<th>Alignment with Plan Goals:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coordinate wildfire mitigation action items through the <a href="#">Clackamas County Community Wildfire Protection Plan</a>.</td>
<td>Protect Life and Property; Augment Emergency Services; Encourage Partnerships &amp; Implementation; Promote Public Awareness; Enhance Natural Systems</td>
</tr>
</tbody>
</table>

Alignment with Existing Plans/Policies:
Clackamas County Community Wildfire Protection Plan (2018)

2018 Status/Rationale for Proposed Action Item:
The wildfire mitigation action items provide direction on specific activities that organizations and residents in [Lake Oswego](#) can take to reduce wildfire hazards.

Ideas for Implementation: CWPP Identified Focus Areas and Priority Actions

**Wildfire Risk Assessment (Ch. 4):**
1. Maintain and update the Fuels Reduction (FR) and Communities at Risk (CAR) maps and databases.
2. Continue to track structure vulnerability data throughout the County through structural triage assessments.
3. Update the Overall Wildfire Risk Assessment as new data becomes available.

**Hazardous Fuels Reduction and Biomass Utilization (Ch. 5):**
1. Develop and maintain an inventory of potential and successful FR projects by meeting with parks and natural lands managers quarterly.
2. Continue securing funding to implement projects/hire seasonal ODF staff.

**Emergency Operations (Ch. 6):**
1. Develop and FDB Communications Works Group.
2. Conduct a Conflagration Exercise.

**Education and Community Outreach (Ch. 7):**
1. Develop Firewise toolkit for CAR’s.
2. Create incentives for fuels reduction.
3. Update and distribute the Burn Permitting and Fire Restrictions Brochure.
4. Continue to improve address signage throughout the County.

**Structural Ignitability Policies and Programs (Ch. 8):**
1. Identify a DTD representative for the WFEPC.
2. Improve coordination with Rural Fire Agencies.
3. Integrate WU into Plan Map and include a public outreach strategy.

Coordinating Organization: [Fire](#)

<table>
<thead>
<tr>
<th>Internal Partners:</th>
<th>External Partners:</th>
</tr>
</thead>
</table>

Potential Funding Sources: Estimated cost: Timeline:

<table>
<thead>
<tr>
<th>ODF, operating budgets</th>
<th>Low to High</th>
</tr>
</thead>
</table>

Form Submitted by: New Action Item/ Wildfire Planning Executive Committee (2018)

Priority: High *(CWPP identified priority actions listed above)*

* - High Priority Action Item
ATTACHMENT B:
PUBLIC INVOLVEMENT SUMMARY

Members of the HMAC 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 text below) was provided in the city’s newsletter HelloLO in March 2019. The opportunity to review the draft plan and to comment was left open from December 27, 2018 through January 15, 2019.

During the public review period there were no formal comments provided.

March 2019 HelloLO Article:

Natural Hazard Mitigation Plan Update

The City of Lake Oswego is in the process of updating their existing Natural Hazard Mitigation Plan (NHMP). This work is being performed in cooperation with the University of Oregon’s Institute for Policy Research and Engagement - Oregon Partnership for Disaster Resilience and the Oregon Military Department’s Office of Emergency Management utilizing funds obtained from the Federal Emergency Management Agency’s (FEMA) Pre-Disaster Mitigation Grant Program. With re-adoption of the plan, Lake Oswego will maintain its eligibility to apply for federal funding towards natural hazard mitigation projects.

A natural hazard mitigation plan provides communities with a set of goals, action items, and resources designed to reduce risk from future natural disaster events. Engaging in mitigation activities provides jurisdictions with a number of benefits, including:

• Reduced loss of life, property, essential services, critical facilities, and economic hardship.
• Reduced short-term and long-term recovery and reconstruction costs.
• Increased cooperation and communication within the community through the planning process.
• Increased potential for state and federal funding for recovery and reconstruction projects.

The updated plan, as with the current plan, will be included as an addendum to Clackamas County’s Natural Hazards Mitigation Plan

To review the updated draft Lake Oswego NHMP addendum, please visit www.ci.oswego.or.us/citymanager/emergency-management-program. As part of the update process, the City is asking residents to complete a brief survey regarding their preparedness for natural hazards. Please take the survey at: www.surveymonkey.com/r/LONHMP. The survey closes on January 15.

If you have any questions regarding the Lake Oswego NHMP addendum or the update process in general, please contact: Bonnie Hirshberger, Citizen Information Specialist, at 503-675-3992 or bhirshberger@ci.oswego.or.us; or Michael Howard, Assistant Program...
Director for the Oregon Partnership for Disaster Resilience, at 541-346-8413 or mrhoward@uoregon.edu.