

City of Waldport, Oregon



Tsunami Evacuation Facilities Improvement Plan (TEFIP)

September 2019

Plan Development

This plan was developed by the City of Waldport and the Oregon Department of Land Conservation and Development. Input was received from: Oregon Department of Land Conservation and Development, Waldport City Council, Waldport Planning Commission, Waldport city staff, and Central Coast Fire & Rescue District.

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Waldport Tsunami Evacuation Facilities Improvement Plan (TEFIP)

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List of Acronyms and Abbreviations

BTW	Beat the Wave
CERT	Community Emergency Response Team
City	City of Waldport
County	Lincoln County
CSZ	Cascadia Subduction Zone
DLCD	Oregon Department of Land Conservation and Development
DOGAMI	Oregon Department of Geology and Mineral Industries
FEMA	Federal Emergency Management Agency
fps	feet per second
HMA	Hazard Mitigation Assistance
mph	miles per hour
NTHMP	National Tsunami Hazard Mitigation Program
RV	recreational vehicle
TEFIP	Tsunami Evacuation Facilities Improvement Plan
TIM	Tsunami Inundation Map

1. Introduction

1.1 General Introduction

The City of Waldport (the City) is vulnerable to the effects of a Cascadia Subduction Zone (CSZ) earthquake and tsunami event. In addition to the potentially catastrophic damage caused by the earthquake event itself, the resultant tsunami could inundate portions of the community, and a risk-based and community-specific approach to evacuation will be critical to saving lives. This Tsunami Evacuation Facilities Improvement Plan (TEFIP) is a comprehensive look at existing and potential evacuation routes and needed improvements for this community, and includes identified facility and infrastructure improvement projects and potential financing strategies. This TEFIP is essential to the implementation of evacuation route development and improvement in conjunction with the land use review and approval process.

The Oregon Department of Geology and Mineral Industries (DOGAMI) has identified and mapped the tsunami inundation hazard along the Oregon coast since 1994. DOGAMI developed a series of Tsunami Inundation Maps (TIMs) in 2013 to assist residents and visitors along the coast to prepare for the next CSZ earthquake and tsunami. The TIMs display five scenarios, labeled as “T-shirt sizes” (i.e., S, M, L, XL, and XXL), showing the impact of a CSZ tsunami that reflects the full range of possible inundation. The geologic record shows that the amount of time that has passed since the last great CSZ earthquake (January 26, 1700) is not a reliable indicator of the size of the next one, so the size ranges are intended to be inclusive of the range of scenarios that a community might expect during a CSZ event.

1.2 Limitations and Constraints

The purpose of this TEFIP is to provide guidance and recommendations for methods so that all areas within the XXL scenario can be effectively evacuated to protect life safety. This local tsunami is generated by a high magnitude earthquake just off the Oregon Coast and, thus, the inundation area is much larger than for a distant tsunami event. In addition, unlike a distant tsunami that can be predicted several hours prior to its arrival (4 or more hours), this local CSZ tsunami can arrive at coastal beaches within 15 to 25 minutes after the start of earthquake shaking.

For the purposes of this plan, tsunami evacuation means the immediate movement of people from the tsunami inundation zone to high ground or safety following a local CSZ earthquake. Comprehensive disaster planning for a CSZ earthquake and tsunami event requires a phased and scalable approach to planning and coordination; immediate evacuation for the purposes of life safety is only one phase (albeit a very important one). While this TEFIP does not include planning for earthquake shaking damage mitigation or post-event disaster response and recovery, it is important to note that ground shaking will have an immediate impact on the ability to evacuate due to debris on roadways and sidewalks and damage to critical infrastructure. Other entities at the local, state, and federal level continue to prepare for these additional phases.

1.3 Definitions

Horizontal evacuation is the preferred response for tsunami evacuation, which is the movement of people to high ground and/or inland away from tsunami waters. In some locations, high ground may not exist, or tsunamis triggered by a local event may not allow sufficient time for communities to evacuate low-lying areas. Where horizontal evacuation out of the tsunami inundation zone is neither possible nor

practical, a potential solution is **vertical evacuation**¹ into the upper levels of structures designed to resist the effects of an earthquake as well as a tsunami. A **vertical evacuation structure** is a building or earthen mound that has sufficient height to elevate evacuees above the level of tsunami inundation, and is designed and constructed with the strength and resiliency needed to resist the expected earthquake shaking and the loading due to tsunami waves.

This TEFIP identifies and discusses **tsunami evacuation facilities**, which are defined as places, amenities, infrastructure, or equipment that can be used to assist in tsunami evacuation (horizontally or vertically). Tsunami evacuation facilities generally include (but are not limited to) roads, trails, wayfinding elements (signs, kiosks, trail markers), supply caches, assembly areas, bridges, and vertical evacuation structures. Evacuation improvements for a community may also include education and outreach activities.

1.4 Coordination with the Tsunami Hazard Overlay Zone (Chapter 16.66)

Waldport has adopted land use regulations addressing tsunami risk for certain types of new development and substantial improvements. These regulations are implemented through the Tsunami Hazard Overlay Zone, Chapter 16.66 of the Waldport Zoning Ordinance. Except single family dwellings on existing lots and parcels, all new development, substantial improvements and land divisions in the Tsunami Hazard Overlay Zone (everything within the XXL tsunami scenario) are required to incorporate evacuation measures and improvements which are consistent with and conform to this adopted Tsunami Evacuation Facilities Improvement Plan.

For purposes of compliance with this TEFIP and the THOZ, applicants should review the entire plan, particularly the following sections as they relate to the proposed development and related evacuation improvements:

- **Section 3: Evacuation Facility Assessments and Recommendations** – this section is organized into discrete geographic areas, as well as citywide recommendations. Review the subsection applicable to the proposed project location for evacuation routes and identified improvement projects.
- **Section 4: Implementation Resources for Evacuation Projects** – this section describes resources related to different types of evacuation improvements. In particular, the *Oregon Tsunami Evacuation Wayfinding Guidance (Version 05-13-2019)* developed by the Oregon Office of Emergency Management and the Department of Geology and Mineral Industries should be reviewed for compliance with evacuation signage standards.
- **Section 5: Education, Outreach, and Training** – this section describes resources related to education, outreach, and training materials and activities for tsunami evacuation. If an applicant is proposing evacuation improvements related to this topic, this section should be consulted for consistency.
- **Appendices as needed**

¹ Applied Technology Council. 2012. *FEMA Guidelines for Design of Structures for Vertical Evacuation from Tsunamis*, Second Edition. Prepared for the Federal Emergency Management Agency, National Oceanic and Atmospheric Administration. FEMA P-646. April 2012.

1.5 Whole Community

Every person who lives in, works in, or visits the City shares responsibility for minimizing tsunami risks and vulnerability. These individual responsibilities include tsunami awareness, knowledge of appropriate protective actions, and preparations for personal and family safety. Knowledgeable residents and visitors who are prepared to take care of themselves and their families, and to assist neighbors in the early phases of a tsunami flooding event can make a significant contribution towards survival and community resiliency.

The development of this TEFIP involved a range of stakeholders, including the public, scientific community, local government, and community-based organizations.

Summary of Community Involvement

The Waldport Planning Commission acted as the Project Advisory Committee (PAC) throughout this project. The PAC was used to audit current zoning and comprehensive plan language, review tsunami hazard maps and data, and provide input to shape the overall outcome of the project.

A workshop was held on August 6, 2019 with planning commission members and others as identified (such as emergency personnel in the city and county) to discuss evacuation facility improvements in Waldport. After a brief presentation, Committee members and meeting attendees participated in a mapping activity and discussion to identify shortcomings in existing evacuation facilities and recommend potential improvements. This group also reviewed and provided feedback on the finalized TEFIP.

2. Tsunami Risk and Vulnerability

2.1 Hazard Identification

The hazard being addressed by this TEFIP is a tsunami event that results in the need for community evacuation. A tsunami affecting the City would be the result of an earthquake from one of two categories:

- **Local Tsunami:** Generated by an earthquake immediately offshore of the Oregon Coast (e.g., a CSZ earthquake) and would result in a tsunami coming onshore within 15 to 25 minutes following the earthquake.
- **Distant Tsunami:** Generated by a distant earthquake (e.g., large event occurring off a distant coastline, such as Japan) and would result in a tsunami coming onshore 4 hours or more following an earthquake on another subduction zone.

A local earthquake resulting in a tsunami is likely to generate additional hazards that may further hinder an individual's ability to evacuate and may increase the time needed to evacuate. Such examples include:

- **Damage to buildings:** Severe shaking, especially in areas of poor soils, will damage buildings, making it difficult to evacuate. Homes built before 1974 may not be tied to foundations and can shift off foundations. Unreinforced masonry buildings and under-reinforced concrete buildings will be severely damaged or collapsed. Furnishings and equipment not securely fastened can cause injuries. Mobile homes may be heavily damaged.²
- **Damage to infrastructure:** Severe shaking and areas of poor soils will result in infrastructure failures. Infrastructure systems that may cause barriers to evacuation are water, wastewater, and stormwater facilities; liquid fuel and natural gas tanks and lines; electrical systems; bridges; and embankments and roads. Shaking damage may result in fallen electrical lines, damaged gas lines, tank and pipeline failures and leaks, and bridge failures, as well as physical interruptions in the surface transportation system due to slope failures and ground failures.
- **Landslides:** Landslides and ground movement may present added barriers to evacuation resulting in blocked roads, bridges, and walking trails.
- **Fires:** Fires from damaged electrical lines or propane may result in injuries that hinder an individual's ability to evacuate.
- **Liquefaction:** Similar to landslides, liquefied soils may result in damaged and unstable roads, bridges, and walking trails that present added barriers to an individual's ability to evacuate, especially those who experience access and functional needs.
- **Vehicular accidents and traffic jams:** Individuals may attempt to evacuate in personal vehicles en masse and push their vehicles to cover unusual terrain either due to damaged infrastructure or in an attempt to bypass typical infrastructure to save time. This may result in accidents and traffic jams that prevent individuals from reaching higher ground. Vehicular evacuation is not recommended and likely will not be possible following a local earthquake and tsunami event.

² US Department of Housing and Urban Development, Office of Policy Development and Research. Minimizing damage and repair costs to manufactured homes during an earthquake. 1995.

<https://www.huduser.gov/publications/pdf/pdrbrch.pdf>

2.2 Mapping

Mapping produced by DOGAMI is the primary source of information for the identification of areas subject to tsunami inundation, evacuation routes, and impacts of the earthquake that may affect tsunami evacuation. DOGAMI produced a number of products depicting tsunami inundation for the City, including the TIMs, Tsunami Evacuation Brochures, and, more recently, the “Beat the Wave” (BTW) maps. Throughout this plan, these products are referenced, and they identify areas within the City that are subject to potential life safety risk and that need to be evacuated during a local CSZ tsunami event.

Tsunami Inundation Maps

The TIM series depicts the projected tsunami inundation zone from five different magnitude seismic events. These events are categorized as small, medium, large, extra-large, and extra extra-large (S, M, L, XL, XXL) tsunami inundation events. These different modeled events reflect the full range of earthquake and tsunami events experienced in the past and what will be encountered in the future. The amount of time that has passed since the last great Cascadia earthquake (January 26, 1700) is not a reliable indicator of the size of the next one, so the size ranges are intended to fully bracket what might happen next.

See <http://www.oregongeology.org/tsuclearinghouse/pubs-inumaps.htm> for more information.

Tsunami Evacuation Brochures

The Tsunami Evacuation Brochures are public products designed to direct visitors and residents away from low-lying areas in the event of a tsunami. They depict three color zones: orange for the largest expected distant tsunami, yellow for the largest expected local tsunami, and green for safety (or high ground).

See <http://nvs.nanoos.org/TsunamiEvac> and www.oregontsunami.org for more information.

Beat the Wave Maps

DOGAMI has also recently completed (in 2018) BTW tsunami evacuation modeling for the City, which provides additional detail on estimated pedestrian evacuation clearance times and evacuation needs. The results of this mapping have been used in this plan to identify evacuation deficiencies, as well as potential evacuation improvements. These maps will be discussed in greater detail in Section 3.

The focus of this TEFIP is primarily an XXL tsunami event. See DOGAMI's [Tsunami Evacuation Analysis of Unincorporated Lincoln County](#), OFR O-19-06, for more information.

Earthquake Damage Maps

Studies completed by DOGAMI provide detailed risk assessments for natural hazards affecting Lincoln County (the County), including a CSZ earthquake and tsunami. Results include estimates of building damage and loss as well as population impacts (i.e., displacement of permanent residents) due to earthquake shaking, earthquake liquefaction, and tsunami inundation.

See DOGAMI's [Natural Hazard Risk Report for Lincoln County, Oregon](#), for more information.

2.3 Populations at Risk

The purpose of this section is to determine the overall numbers of people and assets within the tsunami inundation zone. The goal is estimate how many people will need to be evacuated and sheltered, and to

identify the characteristics and locations of populations that may have specific additional needs or requirements for evacuation.

Overall, the City has moderate vulnerability to tsunami risk. Some of the City’s critical facilities are located within the inundation zone, while many have been relocated to outside of the tsunami zone (such as the schools and public works). Most areas of the City can be evacuated to high ground at a walk (2-4fps) or slower. However, the landslide potential of a few key evacuation roads and high numbers of manufactured housing in the inundation zone may create evacuation difficulties for the Old Town area³. There is a sharp change of elevation in the landscape from the most exposed inundation areas (Old Town) to high ground, which may cause evacuation difficulties, especially for mobility-challenged populations.

Critical/Essential Facilities

Critical Facilities, or facilities that present a high life safety risk or are necessary for response and recovery post-disaster, are considered to be at risk if they are located within the potential tsunami inundation zone. Some critical facilities in Waldport are within the XXL tsunami inundation zone. There are ~700 total buildings in the XXL tsunami inundation zone.

There are also some important public facilities outside of the tsunami zone that may still be functioning after a CSZ event. These facilities include the Waldport School Campus (high school, middle school, and elementary school), the Oregon Coast Community College, the Waldport Public Works Department, the Waldport Water Treatment Plant, and others. These facilities could be used for emergency sheltering for displaced residents and tourists, locating supply caches, and providing equipment for use after an event. These areas could also be used to receive air drops of supplies from outside aid groups.

Table 1 – Critical Facilities in the XXL Tsunami Inundation Zone

Category	Locations	Within Inundation Zone?
Public Facilities and Infrastructure	City Hall	Yes
	Central Oregon Coast Fire & Rescue station 7200	Yes
	Airport	Yes
	Public Library	Yes
	Community Center	Yes

Demographics

According to the US Census, 2,200 people lived in the City of Waldport in 2018⁴. There is expected to be a slight increase in the average annual growth rates (0.9%) for the City through 2035⁵.

³ Gabel, LLS, O’Brien, FE, Bauer, JM, and Allan, JC. *Tsunami Evacuation Analysis of Unincorporated Lincoln County: Building Community Resilience on the Oregon Coast*. State of Oregon, Oregon Department of Geology and Mineral Industries. Open-File Report O-19-06. <https://www.oregongeology.org/pubs/>

⁴ US Census Bureau. American Community Survey 2013-2017 (5-year estimates). Waldport, Oregon.

⁵ Portland State University, College of Urban & Public Affairs: Population Research Center. 2017. *Coordinated Population Forecast 2017 through 2067, Lincoln County*. https://www.pdx.edu/prc/sites/www.pdx.edu/prc/files/Lincoln_Report_2017_Final.pdf

The following demographic characteristics of Waldport may have implications for tsunami evacuation improvements in the community.⁶

Mobility Challenges

Certain members of the community, including young children, older adults, and people with disabilities, may have difficulty reaching or maintaining the speeds required for tsunami evacuation, and may have a harder time navigating steep or unimproved roads and trails.

- Percent 65 and older: 31% of permanent residents in the XXL inundation area (27% coast-wide)⁷
- Persons with a reported disability (hearing, vision, cognitive, ambulatory): 33%

Economic Indicators

Renters, people experiencing poverty, and those who are unemployed may face difficulties in ensuring their preparedness. It may be financially out of reach for people with lower incomes to purchase and maintain the recommended two-week supply of food and water for use post-disaster. Additionally, renters may be left out of outreach and education that is targeted towards homeowners or property owners with regard to preparedness and evacuation plans.

- Poverty rate: 13.8% (State 16.2%)
- Unemployment rate: 4.7% (State 4.2%)
- Rate of homeownership: 63% (State 61.7%)

Note – Demographic analysis only includes the population within Waldport City limits. Census data only includes people who indicate that their primary residence is in Waldport, therefore this analysis does not reflect second home owners, vacationers, part-time residents, etc.

Population Estimates

Tsunami evacuation is of greatest concern to populations residing or working within the inundation zone. Less than half of the permanent resident population of Waldport lives within the hazard area, with ~680 (30%) permanent residents within the urban growth boundary living within the XXL inundation zone.⁸ Another 27% of employers and 28% of employees work in the XXL tsunami zone.

Access and Functional Needs Populations

Access and functional needs populations (also referred to as vulnerable populations and special needs populations) are members of the community who experience physical, mental, or medical care needs and who may require assistance before, during, and after an emergency incident after exhausting their usual resources and support network. In the case of evacuations, examples of individuals who have access and functional needs that may make evacuation challenging include, but are not limited to:

- Individuals who experience mobility challenges (e.g. those with physical disabilities, older adults, children)
- Individuals who are blind or have low vision
- Individuals with limited-English proficiency

⁶ US Census Bureau. American Community Survey 2013-2017 (5-year estimates). Waldport, Oregon.

⁷ DOGAMI Socioeconomic Analysis of the Oregon coast.

⁸ DOGAMI

- Individuals who are deaf or hard of hearing
- Individuals who have been injured during the earthquake

Tsunami evacuation requires the ability to move from the inundation zone to high ground (or safety) in a timely matter. Due to this short onset time, individuals who experience access and functional needs may lack the resources to travel such distances. There are access and functional needs facilities in Waldport that are located within the inundation zone. However, the location of these facilities can only serve as a proxy for the presence of access and functional needs populations.

Using Key Locations as a Proxy

Specific information about where or how many access and functional needs individuals would need assistance in an evacuation is not available; however, by identifying key locations that can be used as a proxy for access and functional needs populations, we can extrapolate where those individuals may be in a CSZ event (see Table 2).

Table 2 – Access and Functional Needs Populations Locations within the XXL Tsunami Hazard Zone

Category	Proxy For	Facilities in XXL Tsunami Zone
Schools, Youth Organizations, and Childcare Facilities	Children	
Hospitals and Medical Centers	Medically-fragile individuals	
Senior Facilities	Elderly	Sa Da Munn Apartments Vandehaven by the Bay Apartments
Impoverished/Homelessness Facilities	Individuals who experience poverty or homelessness	
Hotels, Second Homes, and Vacation Lodging	Out of area visitors and tourists	The Waldport Inn Numerous Vacation Rentals Bayview Mobile Home Park McKinley’s Marina & RV Park
Damaged Buildings (projected)	Individuals injured during the earthquake	

Housing

According to the US Census Bureau, 55% of the occupied housing stock in Waldport were built before seismic standards were put into place in Oregon.⁹ This could have implications both for difficulty of evacuation in damaged structures within the inundation zone, and for sheltering needs after a CSZ earthquake and tsunami event. More people could be displaced following an event beyond those in the tsunami inundation zone due to extensive earthquake damage in the communities. There are 758 buildings (all types) within the XXL tsunami zone in Waldport, which is about 45% of the total buildings within the City.

⁹ Williams, M.C. and Appleby, C.A. 2018. Natural Hazard Risk Report for Lincoln County, Oregon. DOGAMI. Not yet published, but available by request.

The relatively large number of manufactured homes in Waldport could also present evacuation difficulties, as these homes are more likely to sustain damage in an earthquake. Older manufactured homes can slide from their foundations during an earthquake event and provide challenges for egress.

Another challenge for successful evacuation in Waldport is the large number of second homes, vacation homes, and short-term rentals in the community. A large percent of the population of the city at any given time is made up of people who are not residents and may be unfamiliar with tsunami risks and evacuation procedures.

Community Sheltering

Permanent and temporary residents who successfully evacuate out of the tsunami zone will very likely require short- to medium-term shelter, given that their residences are presumed destroyed or rendered uninhabitable. Temporary residents will likely not be able to return to their permanent homes for at least several weeks, given the anticipated disruption to the regional transportation network and fuel supply and that their personal vehicles were likely destroyed or damaged in the tsunami. It is important to note that those displaced and in need of sheltering includes both those displaced from the tsunami and those displaced from earthquake damage.

2.4 Conclusions

Vulnerability related to loss of life to a tsunami in Waldport is moderate. Much of the city's commercial area is within the hazard area, though most of those that occupy the zone will likely have enough time to reach high ground before the first tsunami wave. Landslides and steep terrain may make evacuation challenging, especially for the high populations of older adults and people with disabilities. It will be important to address these concerns to the extent practical.

Some of Waldport's critical and public facilities have been relocated to high ground (schools, public works). City Hall and police/fire departments remain in the inundation zone, but there are plans to move forward with a relocation strategy for those facilities as well. The Port of Alsea, as well as a few other important public facilities are inside the inundation zone. There are also several bridges connecting the community to other areas that will likely fail or be destroyed by the tsunami.

The City experiences high numbers of visitors and tourists, who are unfamiliar with the landscape and tsunami hazards and may need additional assistance in evacuating effectively. Successful evacuations will be challenging because visitors and tourists need to understand the threat, recognize signs of imminent waves, and take self-protective action. Evacuees will also need to overcome sudden obstacles that arise as a result of the earthquake (e.g., fallen trees or buildings, liquefaction, landslides).

3. Evacuation Facility Assessments and Recommendations

The process of evaluating existing evacuation facilities and identifying prioritized improvement recommendations involved three phases:

1. **Existing facility assessments:** The project team engaged in discussions with the PAC, emergency management personnel, and City staff to discuss existing evacuation facilities and potential improvements.
2. **Identification of needed improvements:** DOGAMI’s Beat the Wave results for the City, as well as the local knowledge of city stakeholders served to assess gaps in existing facilities to determine locations requiring improvements.
3. **Prioritization of needed improvements:** Following the identification of needed improvements, the planning team reviewed the list of proposed projects and prioritized them (high, medium, low) based upon the project’s perceived effectiveness and feasibility (measured by capacity, administrative control, and political considerations). This resulted in the prioritized project alternatives identified in the rest of this section.

Considering Co-Benefits

The most cost-effective and successful projects generate benefits outside of their intended purpose. For example, a tsunami evacuation route sign provides lifesaving guidance following an earthquake, but it also increases overall hazard awareness and personal preparedness. Sections 3.1 to 3.4 below highlight recommended evacuation improvement projects throughout the City. Identifying co-benefits created through the implementation of each project may support the identification of additional partners and funding opportunities. Some of the co-benefits relevant to this plan are as follows:

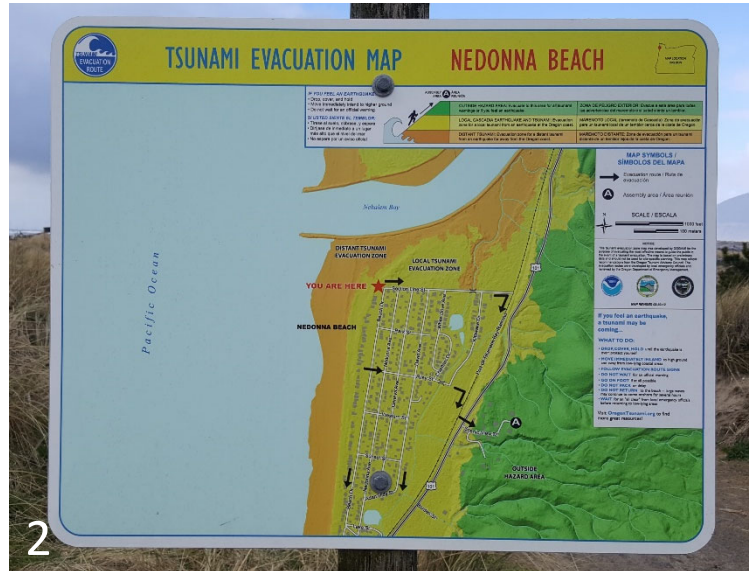
- Hazard Awareness and Education
- Personal Preparedness
- Health and Wellness
- Transportation Effectiveness
- Asset Protection
- Economic Development
- Environmental Protection

More information on potential project partners and potential funding sources can be found in Appendix 3. For maps of recommended project locations, see Appendix 2.

Figure 1 - Types of Tsunami Evacuation Wayfinding and Signage

The recommendations within the plan reference the following types of signs and wayfinding for use in the Waldport Tsunami Evacuation Facilities network:

Clockwise from top left: 1. Evacuation Route Arrow, 2. You Are Here map, 3. Assembly Area sign, 4. Blue Line, 5. High Ground Safety Area sign, 6. Entering/Leaving Hazard Zone sign



3.1 Citywide Recommendations

There are a number of steps that the City of Waldport should take in order to increase tsunami resilience in the community, beyond location-specific recommendations for wayfinding and construction projects. These citywide recommendations include administration and policies, education, and projects that deal with increasing the effectiveness of the entire network of tsunami evacuation facilities in the community.

Administration and Policy Recommendations

- W1. **Identify staff member to lead implementation.** Implementation of the recommendations within this plan will be a years-long process, requiring coordination between the City and many other stakeholders and organizations. Identifying a staff member who can lead this effort will help the city improve evacuation facilities in an efficient and timely manner. **Priority - Medium**
- W2. **Increase interdepartmental coordination.** Maintain and improve communication between the City Manager, Planning, Public Works, and Emergency Management leaders to increase efficiency and effectiveness of resilience efforts. **Priority - High**
- W3. **Integrate evacuation facilities improvements with ongoing planning efforts.** Tsunami resilience and evacuation facilities improvements should be incorporated into other ongoing planning efforts, as appropriate. Such ongoing projects may include the Natural Hazard Mitigation Plan update, Transportation System Plan update, and others. **Priority - High**
- W4. **Adopt recommended Comprehensive Plan policies.** DLCDC has created a set of model Comprehensive Plan policies that support increasing resilience through goals related to hazard planning, transportation, and urbanization. The project team has customized these model policies to meet the needs of the Waldport community. These policies should be reviewed, customized, and incorporated into the Comprehensive Plan upon its next update. For the full text of the model policies, see Appendix 2. **Priority – Medium**
- W5. **Require tsunami education and mapping in short-term rentals and hotels/motels.** Adopt a City ordinance that requires posting tsunami info in hotels/motels/STRs. Tillamook County has adopted a Short Term Rental Ordinance that requires tsunami evacuation information be posted in all short term rentals within the evacuation zone. The ordinance reads as follows:
A copy of an Oregon Department of Geology and Mineral Industries (DOGAMI) Tsunami Evacuation Brochure furnished by the Tillamook County Department of Community Development at the time of Short-Term Rental Permit issuance and renewal shall be posted in a visible location of a short term rental located within a DOGAMI mapped area susceptible to tsunami hazards.
Priority – Medium

Education/Outreach: See Section 5 for additional education, outreach, and training options.

- W6. **“Stay Alive. Walk. Don’t Drive!”** The planning committee recognizes that many residents of Waldport believe that they will be able to utilize their cars to evacuate in a local CSZ event. In order to remind people to evacuate by foot and not vehicle, the committee recommends using this slogan in a targeted and constant public service advisory campaign. See Section 5 for additional education, outreach, and training options. **Priority – High**
- W7. **Create a pedestrian trail evacuation map.** To emphasize the need to evacuate by foot and not by vehicle, create a trail map that identifies all the trails in Waldport that can get pedestrians to high ground from the tsunami zone and publish as an outreach and education product. As new trails are reinforced or built, they can be added to the map. **Priority – High**

Evacuation Facilities and Preparedness

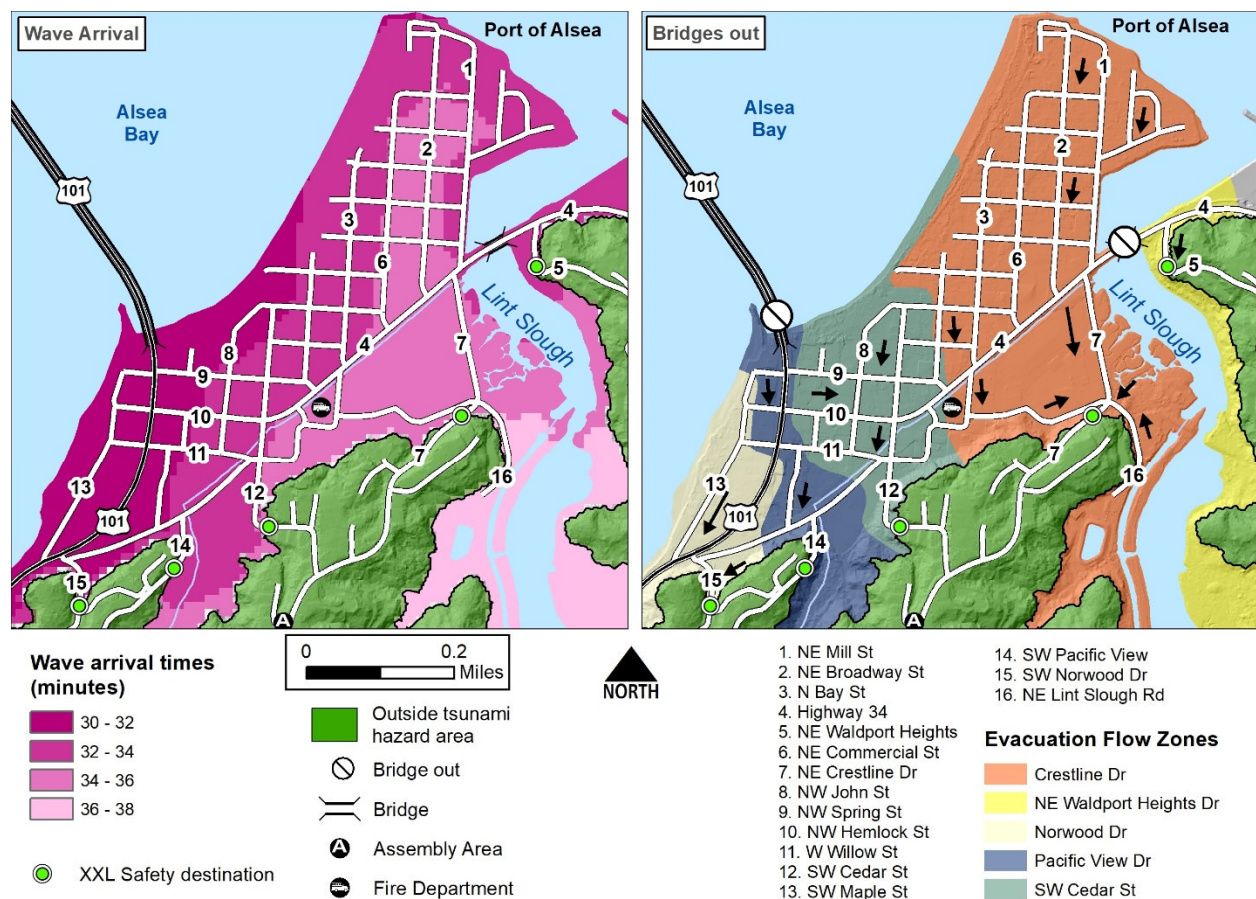
- W8. Establish supply caches and emergency shelters in strategic areas outside of the inundation zone.** The availability of supplies and shelter will be absolutely essential to survival post-disaster. Determining the best locations for supply caches and amount and types of supplies and shelter to provide will require further study. However, the following recommendations can be used as a starting point when considering where and how to establish these resources:
- The City should ask the following questions when determining the suitability of a potential site for a supply cache:
 - Who owns the land?
 - Is there good access to the site for establishing and maintaining supplies?
 - Is the site susceptible to other hazards, such as landslides?
 - How will the caches be maintained, monitored and secured?
 - Will the City purchase and maintain supplies, or will residents?
 - Consider a phased approach – create one cache in each sub area to start, then expand to all appropriate sites as resources and funding allow
 - Maintain already established supply caches
 - Coordinate with DLCD and DOGAMI as they continue to research supply cache best practices
- Priority - High***
- W9. Continue to pursue acquisition of land for relocation of critical facilities.** Currently, the fire station and city hall are within the inundation zone. The City may want to pursue re-locating these facilities or having a second fire station location outside of the inundation zone. ***Priority - High***
- W10. Create trail connectivity between high ground and assembly areas.** Post-disaster movement may be difficult in the inundation zone, due to damage and debris. Many trails already exist above the inundation zone. These trails could be mapped and connected to help evacuees move more easily from high ground safety areas to assembly areas post-tsunami. This map could be combined with the evacuation trail map identified in **W7** above. ***Priority - Medium***

3.2 Old Town

Community Overview

This area is roughly defined as the northern peninsula of the city bordered by the Alsea River on the west and north, Lint Slough on the east, and the rapid transition from low to high ground on the southern edge (Figure 2). It is comprised primarily of commercial and residential uses, the intersection of Highway 101 and Highway 34 (which includes 2 bridges), and the Port of Alsea. It is a predominantly low lying area, backed by steeply rising hills to the south.

Figure 2 – The image on the left shows wave arrival times for Old Town, Waldport in minutes from the start of earthquake shaking. The image on the right shows evacuation flow zones - where people in a particular area should evacuate. Green areas indicate high ground. Green dots indicate when a road reaches high ground (outside of the XXL tsunami zone).



Existing Evacuation Facilities Analysis

Tsunami Wave Arrival Time

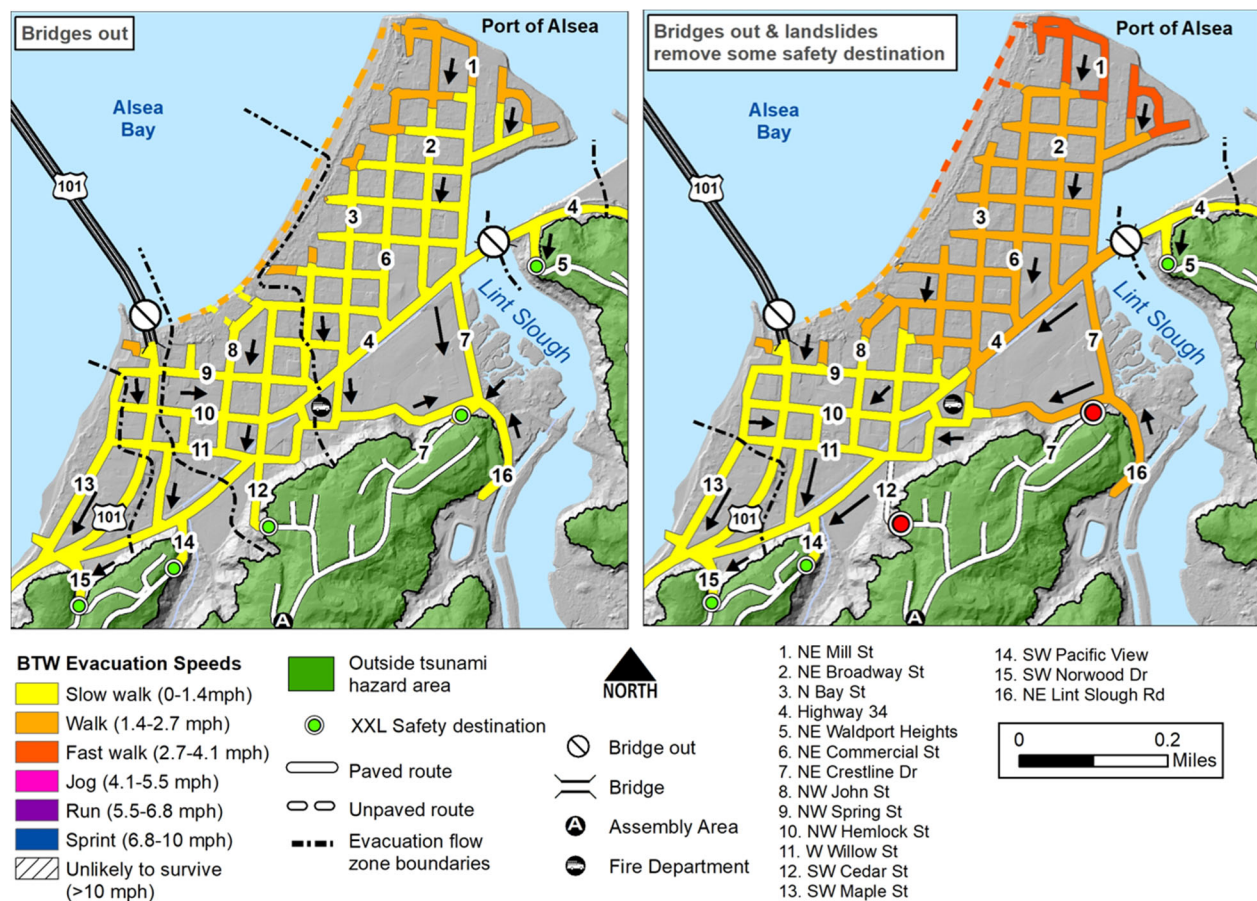
In the XXL scenario, waves will begin to arrive in this area approximately 30 minutes after the earthquake begins (Figure 2). The wave crosses the area fairly uniformly from west to east. The area is inundated within 36-38 minutes after the earthquake begins. It is important to remember that tsunami

waves will continue to arrive for 12-24 hours after the earthquake and the first wave is not always the biggest.

Existing Evacuation Routes and Signage

Generally, people in the Old Town area evacuate to the south and up the hill. There are several roads that can take evacuees to high ground: Crestline Drive, Cedar Street, Pacific View Drive, and Norwood Drive. If a landslide were to take out one of these roads, there are several others to try as alternatives. However, there is concern from the community that this whole hillside is prone to sliding and may provide challenges for evacuees in this area. If the bridge over Lint Slough were to be retrofitted, that route (over the bridge and up Waldport Heights) would become a major evacuation route alternative, instead of Crestline.

Figure 3 – Required Pedestrian Evacuation Speeds in Old Town, Waldport



Source: *DOGAMI Tsunami Evacuation Analysis Report*¹⁰

¹⁰ Gabel, LLS, O’Brien, FE, Bauer, JM, and Allan, JC. DOGAMI. Open-File Report O-19-06. <https://www.oregongeology.org/pubs/>

Evacuation Speeds

Walking speeds required to reach safety in the area range from a slow walk (0-2fps; yellow-colored roads) to a fast walk (4-6fps; dark orange-colored roads) on the northern edges of the peninsula if landslides prevent or impede evacuation in certain areas (Figure 3).

Critical Facilities

This area has two critical facilities within the XXL inundation area: City Hall and the Fire Station.

Conclusions

While walking speeds for this area are moderate, there is high concern for landslide impediments to the existing evacuation routes. Additionally, there are vulnerable populations in this zone (low-income housing areas, mobility-challenged populations, people over 65 years, tourists) and high numbers of manufactured homes (which can slide off their foundations and trap people inside during an earthquake). These populations may experience high levels of evacuation difficulty, especially with landslide potential.

Evacuation Improvement ProjectsWayfinding

- OT1. **Add signage or blue lines to indicate arrival at high ground** (not the same as assembly areas) **along major evacuation routes:** Crestline Drive, Cedar Street, Pacific View Drive, Woodland Trail, and Norwood Drive. This is to show when evacuees have reached a high ground safety area outside of the XXL inundation zone. Use the existing tsunami maps for locations along these routes. DOGAMI staff can be consulted for coordinates. **Priority – Medium**
- OT2. **Add evacuation arrow signage directing people to the Woodlands Trail (behind the baseball field).** If landslides block some roads to high ground, an alternative pedestrian route may be important for the Old Town area. Add evacuation route signs directing people to the Woodlands Trail.
- OT3. **Expand Evacuation Route Signage.** Add directional route signage on major north/south streets in Old Town (e.g. NW Cedar St, NW Alder St, N Bay St, NE Commercial St, NE Broadway St), directing people to Crestline Drive, Cedar Street, Pacific View Drive, the Woodland Trail, or Norwood Drive. Due to the number of signs required, this work may need to be accomplished in several phases. It is important to focus signage at intersections so that people know the correct direction to travel. **Priority – High**
- OT4. **Add "You Are Here" map signs at major water access points.** "You Are Here" map signs in high-traffic locations can help raise awareness and inform water users of the nearest evacuation routes. These signs should be installed at boat launches, public restrooms, and other high trafficked public locations. **Priority – Low**

Construction

- OT5. **New pedestrian evacuation trail between Crestline and Cedar.** Build a new pedestrian trail to withstand earthquake shaking in this area (behind old school site) to offset potential impacts of landslides to the existing roads and offer a more stable solution for evacuation from Old Town. **Priority – High**
- OT6. **Improvements to Woodland Trail.** There is an existing pedestrian trail behind the baseball field in Old Town. This route could be improved to withstand earthquake shaking and to allow many

people to evacuate at once. A geotechnical report for this trail could investigate alternative routes (to shorten the distance to high ground) and ways to make the trail as accessible as possible for people who experience access and functional needs. **Priority – High**

- OT7. **Improvements to trail behind the wastewater treatment facility off NE Lint Slough Road.** There is a trail that leads away from the Waldport Wastewater Plant and up into high ground. This trail could be further signed for people to know to use this route for evacuation, as well as improved to ensure its accessibility after a CSZ earthquake. **Priority – High**
- OT8. **Bury Powerlines.** In order to mitigate the potential for powerlines to fall and cause damage and electrocution to pedestrians during an evacuation, it is recommended that the powerlines be buried underground in key locations in Old Town, SW Range Drive, and Crestline Drive. **Priority – Medium**
- OT9. **Vertical Evacuation Structure.** Though there is plenty of high ground to the south of this area, the potential for landslides, steep terrain, and the presence of vulnerable populations does cause some concern for effective evacuation of the area. A vertical evacuation structure built in the downtown area is an option to reduce evacuation speeds. Such a structure could be built with co-benefits to justify its cost and potential height. This option would need much more exploration and community support in order to move forward. A location has not yet been suggested. **Priority – Low**

Planning

- OT10. **Landslide mitigation measures.** The community has determined that there is a risk of landslides in the hills to the south of Old Town in the event of a CSZ earthquake. Landslides in this area could potentially block access to high ground safety areas and assembly areas that area evacuees rely on, increasing the minimum evacuation speeds required to reach safety ahead of a tsunami. Because there are potentially several roads impacted (Crestline Drive, Cedar Street, Pacific View Drive, and Norwood Drive), a landslide evaluation analysis should be performed by a professional. This analysis could help to prioritize problem areas and suggest mitigation measures to new route improvements to ensure pedestrian evacuation success in a CSZ event. **Priority – High**

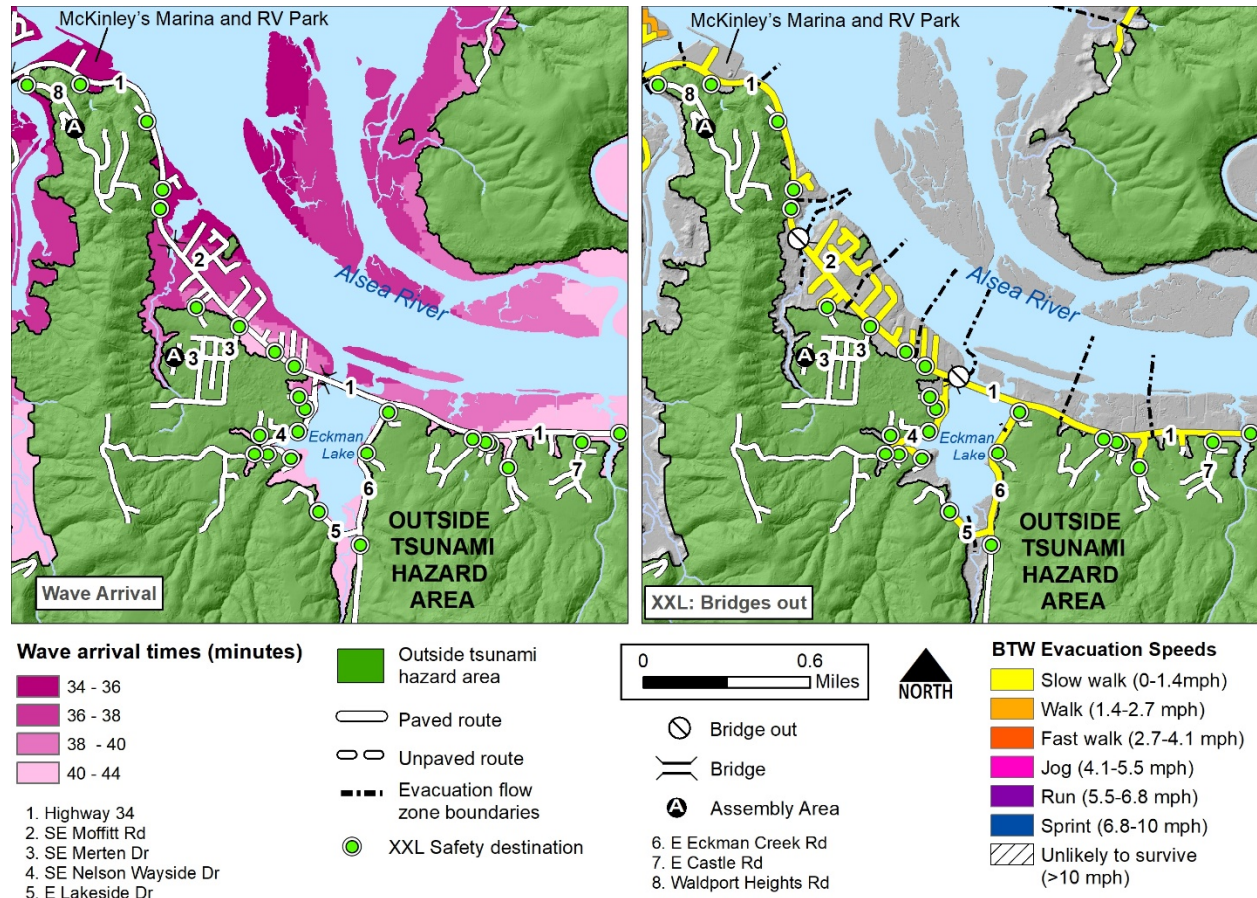
See *Appendix 2* for a map of all identified improvement projects. See also WE4 for related improvement project for this area.

3.3 Waldport East

Community Overview

This area is roughly defined as the eastern part of the city bordered by Lint Slough on the west and Alsea River to the north, out to E Castle Road on the east. Some of this area is not within the city limits. It is a predominantly a low lying area, dominated by residential uses.

Figure 4 – The image on the left shows wave arrival times for Waldport East in minutes from the start of earthquake shaking. The image on the right shows pedestrian walking speeds needed to evacuate the area. Green areas indicate high ground outside of the tsunami zone.



Source: *DOGAMI Tsunami Evacuation Analysis Report*¹¹

Existing Evacuation Facilities Analysis

Tsunami Wave Arrival Time

In the XXL scenario, waves will begin to arrive in this area approximately 34 minutes after the earthquake begins (Figure 4). The wave travels upriver along Highway 34 and gets into Eckman Lake by

¹¹ Gabel, LLS, O’Brien, FE, Bauer, JM, and Allan, JC. DOGAMI. Open-File Report O-19-06. <https://www.oregongeology.org/pubs/>

about 40 minutes. It is important to remember that tsunami waves will continue to arrive for 12-24 hours after the earthquake and the first wave is not always the biggest.

Existing Evacuation Routes and Signage

Generally, people located within the tsunami zone in Waldport East should head to the south and uphill. There are several north/south roads that can take evacuees outside of the tsunami zone: NE Waldport Heights Drive, SE Clover Lane, SE Merten Drive, SE Nelson Wayside Drive, E Lakeside Drive, E Eckman Creek Road, and E Castle Road (Figure 4). The bridge over Lint Slough is likely to fail, though there are evacuation routes on either side of the bridge.

Evacuation Speeds

Walking speeds required to reach safety in the area is a slow walk (0-2fps; yellow-colored roads) as seen in Figure 4. For the most part, there are multiple options to access high ground from the tsunami zone and if one option is blocked, another one is usually not far away.

Critical Facilities

There are no critical facilities within the inundation zone in this area.

Conclusions

Walking speeds for this area are moderate and there are many roads to high ground. There are a few mobile home and RV parks in the area that may experience evacuation difficulties. Therefore, signage and education may be of most benefit in this area.

Evacuation Improvement Projects

Wayfinding

- WE1. **Add signage or blue lines to indicate arrival at high ground** (not the same as assembly areas) **along major evacuation routes:** NE Waldport Heights Drive, SE Clover Lane, SE Merten Drive, SE Nelson Wayside Drive, E Lakeside Drive, E Eckman Creek Road, and E Castle Road. This is to show when evacuees have reached a high ground safety area outside of the XXL inundation zone. Use the existing tsunami maps for locations along these routes. DOGAMI staff can be consulted for coordinates. Prioritize routes for signage based on traffic and need. **Priority – Medium**
- WE2. **Expand Evacuation Route Signage.** Add directional route signage (arrows) at key intersections along Highway 34 to indicate evacuation routes and direction of evacuation travel. Major evacuation routes include: NE Waldport Heights Drive, SE Clover Lane, SE Merten Drive, SE Nelson Wayside Drive, E Lakeside Drive, E Eckman Creek Road, and E Castle Road. Due to the number of signs required, this work may need to be accomplished in several phases or prioritized based on need. It is important to focus signage at intersections so that people know the correct direction to travel. **Priority – Medium**
- WE3. **Add assembly area to water treatment facility.** At the end of SE Nelson Wayside Drive is a new wastewater treatment facility that will likely survive an earthquake event and is well-above the tsunami zone. This could be a good assembly area for people evacuating from the area around Eckman Lake. Add signage directing people to high ground here and an assembly area sign to the end of the road. **Priority – Medium**

Construction

WE4. **Bridge retrofit or replacement at Lint Slough (Highway 34).** This road could help people at the RV Park and other areas of Old Town to evacuate over Lint Slough and up Waldport Heights Drive as an alternative to Crestline Drive. Depending on the height of the bridge, this retrofit could have additional benefits for community connectivity post-disaster as well, if it can also withstand tsunami loads. **Priority – Medium**

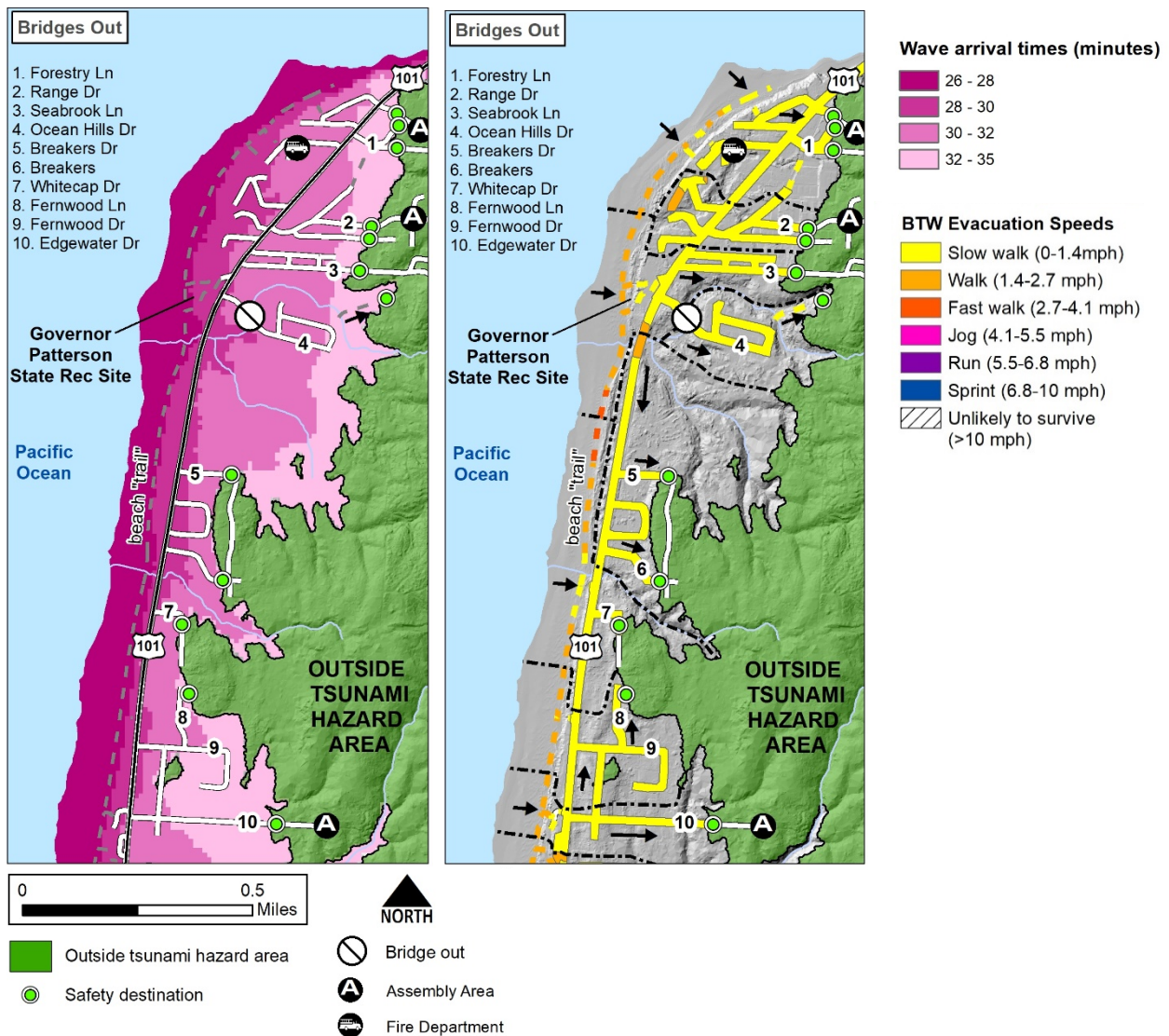
See *Appendix 2* for a map of all identified improvement projects.

3.4 Waldport South

Community Overview

This area is roughly defined as the intersection of Highway 101 and SW Wazyata Avenue on the north through Highway 101 and SW Edgewater Drive to the south and east to about S Crestline Drive (Figure 5). This area is a mix of residential and industrial uses. Not all of the area is within the city limits – though this plan focuses on the city limits boundary for jurisdictional purposes.

Figure 5 – The image on the left shows wave arrival times for Waldport South in minutes from the start of earthquake shaking. The image on the right shows pedestrian walking speeds. Green areas indicate high ground outside of the tsunami zone.



Source: *DOGAMI Tsunami Evacuation Analysis Report*¹²

¹² Gabel, LLS, O’Brien, FE, Bauer, JM, and Allan, JC. *DOGAMI. Open-File Report O-19-06.*
<https://www.oregongeology.org/pubs/>

Existing Evacuation Facilities Analysis

Tsunami Wave Arrival Time

In the XXL scenario, waves will begin to arrive in this area approximately 26 minutes after the earthquake begins (Figure 5). The wave inundates Highway 101 between 28 and 32 minutes. The area is inundated within 35 minutes after the earthquake begins. It is important to remember that tsunami waves will continue to arrive for 12-24 hours after the earthquake and the first wave is not always the biggest.

Existing Evacuation Routes and Signage

Generally, people located within the tsunami zone in Waldport South should head to the east and uphill. There are several east/west roads that can take evacuees to high ground: Forestry Lane, Range Drive, Seabrook Lane, Breakers Drive, Whitecap Drive, Fernwood Drive, and Edgewater Drive. There is one bridge on Sailfish Loop Drive that is likely to fail, though people in this area can instead go north and then east on Seabrook Lane. There are also several beach access points in this area that will be important for people on the beach, such as Governor Patterson Recreation Site.

Evacuation Speeds

Walking speeds required to reach safety in the area on the existing road and trail network are generally a slow walk (0-2fps; yellow-colored roads) as shown in Figure 5. Areas on the beach will need to be evacuated at a walk (2-4fps; orange) or fast walk (4-6fps; dark orange) in most areas.

Critical Facilities

The Yachats Rural Fire Protection District has a substation in this area on Corona Ct.

Conclusions

Walking speeds for this area are moderate and there are many roads to high ground. This area does have vacation rentals and beach access points, which means there is potential for tourists to be in this area. Signage and education may be of most benefit in this area.

Evacuation Improvement Projects

Wayfinding

- WS1. **Add signage or blue lines to indicate arrival at high ground** (not the same as assembly areas) **along major evacuation routes:** Forestry Lane, Range Drive, Seabrook Lane, Breakers Drive, Whitecap Drive, Fernwood Drive, and Edgewater Drive. This is to show when evacuees have reached a high ground safety area outside of the XXL inundation zone. Use the existing tsunami maps for locations along these routes. DOGAMI staff can be consulted for coordinates. Prioritize routes for signage based on traffic and need. **Priority – Medium**
- WS2. **Expand Evacuation Route Signage.** Add directional route signage at the intersection of Highway 101 and major evacuation routes, as listed above, directing people in the direction of high ground/safety. Due to the number of signs required, this work may need to be accomplished in several phases. It is important to focus signage at intersections so that people know the correct direction to travel. **Priority – High**
- WS3. **Add "You Are Here" map signs at major beach access points.** "You Are Here" map signs in high-traffic locations can help raise awareness and inform beach goers of the nearest evacuation routes. These signs should be installed at high trafficked beach access points, such as Governor

Patterson State Recreation Site. DOGAMI can create the signs for the City or other partners to install. **Priority – Low**

Construction

WS4. **Develop a post-disaster community shelter in partnership with Crestview Golf Club.** This area is a prime location for sheltering and post-disaster operations for the community after a CSZ event. Develop a partnership with the golf course to utilize this space for community caches and sheltering supplies. **Priority – High**

See *Appendix 2* for a map of all identified improvement projects.

4. Implementation Resources for Evacuation Projects

4.1 Design and Construction Standards

Below is a list of resources related to Evacuation Facility Design and Construction Standards, applicable for a variety of projects suggested in the sections above:

- Bicycle and pedestrian design:
 - Oregon Department of Transportation. 2011. Oregon Bicycle and Pedestrian Design Guide, 3rd Edition. Oregon Highway Design Manual Appendix L.
- Design requirements and ideas for wayfinding signage:
 - OEM & DOGAMI. 2019. Version 05-13-2019. Oregon Tsunami Evacuation Wayfinding Guidance.
 - Portland Urban Architecture Research Lab. 2014. "Up and Out" Oregon Tsunami Wayfinding Research Project: Final Project Report and Guidance Document.
 - Portland Urban Architecture Research Lab. 2015. "Up and Out 2" Oregon Tsunami Wayfinding Research Project: A Study in Seaside and Warrenton.
 - DOGAMI. 2003. OFR-03-06 Tsunami Sign Placement Guidelines.
- Vertical evacuation structures:
 - Applied Technology Council. 2012. [FEMA Guidelines for Design of Structures for Vertical Evacuation from Tsunamis, Second Edition](#). Prepared for the Federal Emergency Management Agency and National Oceanic and Atmospheric Administration. FEMA P-646. April 2012.
 - Chock, G. 2016. [Design for Tsunami Loads and Effects in the ASCE 7-16 Standard](#). Journal of Structural Engineering: 142 (11). (International Building Code standards)
 - Washington State Emergency Management Division. November 2018. [Manual for Tsunami Vertical Evacuation Structures](#).

4.2 Tsunami Evacuation and Wayfinding Signage

Any proposed tsunami evacuation wayfinding signage proposed for the City of Waldport should conform to the publication: **OEM & DOGAMI. Version 05-13-2019. Oregon Tsunami Evacuation Wayfinding Guidance.**

A tsunami escape wayfinding system informs people what to do and when to do it. The system is designed to make the process clear and efficient before, during, and after a tsunami. Prime elements to include in wayfinding improvements are:

- Awareness kiosks
- Tsunami hazard zone signs
- Tsunami evacuation route signs
- Zone thresholds (entering/leaving)
- Assembly areas

For different populations, such as people with disabilities and the many unprepared tourists during the spring and summer seasons, special escape sequences and patterns provide innovative wayfinding

solutions for tsunami evacuation. These populations include elderly, disabled, children, visitors in hotels, RV park visitors, etc.

Sign Type Selection

Signage can be two-dimensional, but also can include technological/sensory signals (e.g., sound, light)—an important concept when considering access and functional needs populations. When selecting a sign as a part of a signage system, the following elements should be considered:

- Basic function and visibility of signage
- Signage technology applied
- Position in space, method of fixing
- Size in relation to reading distance
- Illumination
- Requirements for impaired users
- Level of vandal resistance

4.3 Financing Strategies

Cost estimates for the tsunami evacuation improvement projects identified in this plan are general and may not reflect precise costs. Appendix A of the 2019 OEM/DOGAMI Tsunami Signage Guidance document has a list of typical tsunami evacuation route signage and their estimated costs. Resources to develop facility improvement cost estimates can be found at the following links:

- American Association of Cost Engineers – requires membership or payment (<https://web.aacei.org/resources>)
- Whole Building Design Guide – Cost Estimating (http://www.wbdg.org/design/dd_costest.php)
- American Association of State Highway and Transportation Officials - Practical Guide to Cost Estimating, requires membership or payment (https://bookstore.transportation.org/collection_detail.aspx?ID=122)
- FEMA Cost Estimating Format (<https://www.fema.gov/public-assistance-cost-estimating-format-standard-operating-procedure>)
- Disaster Recovery Reform Act (<https://www.fema.gov/news-release/2018/10/05/disaster-recovery-reform-act-2018-transforms-field-emergency-management>)

Questions to Ask

- In identifying projects to move forward with, it is important to bear in mind the following questions:
- Do citizens consider this to be an important public issue that requires a public remedy?
- Who directly benefits from the design, construction, and operation of these assets?
- Who indirectly benefits from the presence of these assets when not needed for an emergency?
- Do citizens have a preference among the various options available to finance the infrastructure investment?
- Is the scale of the need within the means of the community to finance or is outside assistance necessary?
- Should different strategies be used to elicit funding from seasonal vs. year-round residents?

- Is needed infrastructure within the jurisdiction/control of the community, or is there a need to engage other units or levels of government?
- Is there a way to fit improvements into existing programs or needs?

The following tools are most likely to succeed for enhancing a community's evacuation route system¹³:

- Using existing rights-of-way,
- Negotiating/purchasing easements, and
- Purchasing new rights-of-way.

In addition, the construction of evacuation facilities should consider the following:

- Determining the most effective location,
- Determining co-benefits to access additional funding streams, and
- Determining design and construction standards applicable to specific project.

More information on potential financing sources can be found in Appendix 3.

¹³ Oregon Department of Land Conservation and Development. 2018. *Tsunami Land Use Guide, Chapter 5, Tip*. https://www.oregon.gov/LCD/OCMP/docs/Publications/TsunamiLandUseGuide_FINAL_062718.pdf

5. Education, Outreach, and Training

In tsunami areas, it is crucial to support an ongoing sustained tsunami public education program in order to ensure effective evacuation and save lives. This section presents guidance for creating pre-disaster education and outreach activities to educate the public about appropriate actions to take when natural signs (i.e., ground shaking) indicate a tsunami is imminent or when a tsunami warning message has been issued.

Residents, homeowners, business owners, and tourists alike benefit from educational activities that increase their awareness of local hazards. These educational activities can and should be combined with other, existing hazard education programs, such as earthquake preparedness, when possible.

There are generally two messages to share with the public regarding evacuation from an impending tsunami: 1) Walk/run to the nearest high ground on foot (not in a vehicle), and 2) after the tsunami event is over (typically 12-24 hours after an earthquake), make your way to a designated assembly area or shelter.

5.1 News and Social Media

Traditional local media outlets (TV, radio, newspaper, etc.), public social media accounts, and other local websites (e.g., the Chamber of Commerce) should be utilized as appropriate to announce community training events and provide public service announcements (PSAs) regarding tsunami evacuation.

News Organizations

Many community members rely on local news sources for information about their community. Developing a working relationship with local newspapers and radio is an effective mode of communicating with the public.

Recommended Action

- Work with local newspapers and radio stations to announce tsunami awareness events and provide community education information and resources. Local service providers include:
 - Newport News Times

Resources

- Tsunami Emergency Guidebook for Oregon Mass Media, Oregon Emergency Management, September 2007:
http://www.oregongeology.org/tsuclearinghouse/resources/pdfs/OregonTsunamiMediaBinder_final_6_20_07.pdf

Social Media

Social media's role in emergency communication has grown over the past several years, not only as a major channel for broadcasting emergency information but also as a means of engaging and conversing with the public during all emergency mission phases (i.e. protection, preparedness, mitigation, response, and recovery).

The city has two Facebook pages – the City of Waldport and Waldport Community.

Recommended Action

- Consistently incorporate tsunami education information into social media accounts, including the graphics used on tsunami evacuation signs. Social media accounts should be monitored to manage misinformation and rumor control.
- Develop working relationships with local bloggers and businesses to utilize their social media presence to retweet or copy posts so they reach a larger audience.
- Link social media accounts to OEM, FEMA, other County and City sites so that there is continued information and feeds that help with keeping posts new and relevant.

Resources

- FEMA Social Media and Emergency Preparedness Press Release: <https://www.fema.gov/news-release/2018/04/16/social-media-and-emergency-preparedness>
- FEMA Social Media in Emergency Management Training: <https://training.fema.gov/is/courseoverview.aspx?code=IS-42>
- The Department of Homeland Security's Innovative Uses of Social Media in Emergency Management: https://www.dhs.gov/sites/default/files/publications/Social-Media-EM_0913-508_0.pdf

Sample Social Media Posts

The following sample social media posts have been developed by the National Weather Service and edited for use by the City.

Facebook

- A tsunami can strike our coast at any time throughout the year. While they don't happen very often, they pose a major threat to coastal communities like Waldport. Check out this video for things you can do to prepare: https://youtu.be/x0GX_kc7JZo #TsunamiPrep
- A tsunami can be very dangerous to life and property on the coast. It can produce strong and dangerous currents, rapidly flood the land and cause great destruction. Even small tsunamis can be dangerous. Strong currents can injure and drown swimmers and damage and destroy boats in harbors. Visit <http://www.nws.noaa.gov/om/Tsunami/about.shtml> #TsunamiPrep
- Because tsunamis are a threat in our community, you should include tsunami-specific preparations in your emergency plan. Learn the evacuation routes, identify safe places and practice evacuating. Visit <http://www.nws.noaa.gov/om/Tsunami/before.shtml> #TsunamiPrep
- Do you live, work or play on the coast? Do you know our community's tsunami risk? Our community has identified and mapped tsunami hazard and evacuation zones. Check out links to tsunami maps on this page <http://nws.weather.gov/nthmp/maps.html> or ask your local/state emergency management office or your local NWS forecast office for more info. #TsunamiPrep
- Official tsunami warnings are broadcast through local radio and TV, marine radio, wireless emergency alerts, NOAA Weather Radio, and National Oceanic and Atmospheric Administration (NOAA) websites. They may also come through outdoor sirens, local officials, text message alerts and telephone notifications. Learn about the four levels of tsunami alerts for the U.S. at: <http://www.nws.noaa.gov/om/Tsunami/alerts.shtml>. #TsunamiPrep

Twitter

- If you live, work or play on the coast, you should prepare for a #tsunami
https://youtu.be/x0GX_kc7JZo #TsunamiPrep
- A #tsunami, which may resemble a fast-rising flood, can be very dangerous to life & property
<http://www.nws.noaa.gov/om/Tsunami/about.shtml> #TsunamiPrep
- At risk from #tsunamis? Plan for and practice evacuation.
<http://www.nws.noaa.gov/om/Tsunami/before.shtml> #TsunamiPrep
- Live, work or play on the coast? Know your #tsunami risk & evacuation zones
<https://nws.weather.gov/nthmp/maps.html> #TsunamiPrep
- Tsunami alerts come from many sources like @NOAA websites & @NOAA Weather Radio
<http://www.nws.noaa.gov/om/Tsunami/alerts.shtml> #TsunamiPrep

Websites

Websites continue to play a large role in providing information and outreach activities to residents and tourists. The City of Waldport website shares information on official City events and shares information on emergency preparedness.

Recommended Actions

- Include tsunami awareness information on the City's website in a prominent location and use the website to announce tsunami-related community activities. Consider linking to relevant webpages from Lincoln County Emergency Management, DOGAMI, Oregon Department of Land Conservation and Development (DLCD), NOAA, etc., rather than recreating the information.
- Develop working relationships with local businesses and organizations to include a link back to the City's tsunami information to increase the website's reach.

5.2 Community Activities

Community activities are a vital part of public education and outreach. These activities and events not only build awareness and familiarity with tsunami preparedness and evacuation facilities, but also allow the opportunity for neighbors to build important community connections that will be vital in the event of a disaster.

Recommended Actions

- Hold at least one community-wide outreach or education activity annually.
- Provide educational and evacuation information at every State, County, and City park.
- Develop community outreach materials, such as the following, to be distributed at community events:
 - Brochures containing zone and route information
 - Refrigerator magnets with preparedness information
 - Maps to be printed in phonebooks
 - Permanent posted material for hotels, rentals, restaurants, and other businesses

Door-to-Door Education and Community-wide Evacuation Drills

The National Tsunami Hazard Mitigation Program studied which educational strategies work best for tsunami awareness in Seaside, Oregon (Connor 2005). Door-to-door outreach and evacuation drills were the most effective techniques according to polls for this study. This has been confirmed during recent events in Japan and Mexico where earthquake and evacuation drills are routinely used as a training technique.

Recommended Action

- Develop Volunteer Educators who can go door-to-door to discuss tsunami awareness and safety with residents. These volunteers would be trained by the City and given brochures to hand out to residents.
- Conduct a community-wide tsunami evacuation drill using the Oregon Office for Emergency Management Tsunami Evacuation Drill Guidebook as a reference.

Resources

- The Oregon Office for Emergency Management's Tsunami Evacuation Drill Guidebook: https://www.oregon.gov/oem/Documents/Tsunami_Evacuation_Drill_Guidebook.pdf

Run/Walk Event

Events like the Cannon Beach “Race the Wave” provided an opportunity to build awareness of tsunami routes. Participants in the 5K and 10K Race the Wave fun run/walk/roll started on the beach, followed a scenic tsunami evacuation route through the city, and reached the finish line out of the tsunami inundation zone. A preparedness fair was held near the finish line for all participants and included food, games, and giveaways.

Recommended Action

- Host a run/walk event that has participants race a tsunami evacuation route as a fun awareness event.
- Hold a preparedness fair at the end of the race. See below for additional information on preparedness fairs.



Participants in the Cannon Beach “Race the Wave” event in 2015. Source: Race the Wave Facebook page.

Resources

- <https://www.fema.gov/news-release/2015/09/08/know-your-tsunami-evacuation-routes-race-wave-cannon-beach-or-sept-13>
- Up and Out Oregon Tsunami Wayfinding Research Project Final Project Report & Guidance Document: https://www.oregon.gov/oem/Documents/Up_And_Out_Phase1.pdf

Preparedness Fairs/Booth

An emergency preparedness fair or a tsunami preparedness-focused booth at a community event can help educate community members and visitors about tsunami evacuation. A preparedness fair can feature many booths and activities. It can be held separately or combined with another event, such as a 5K run/walk, farmers market, or festival.

Recommended Action

- Work with the Emergency Preparedness leaders to ensure that they have the information and resources they need to communicate tsunami preparedness information with the public
- Identify additional community events where a preparedness booth may be appropriate, or community groups and organizations willing to host a preparedness fair.

Resources

- The American Red Cross and California Emergency Management Agency’s Disaster Preparedness Event Toolkit: https://www.redcross.org/content/dam/redcross/atg/Chapters/Division_2_-_Media/Bay_Area/Bay_Area_-_PDFs/Preparedness_Event_Toolkit.pdf

Tsunami Quests

A Tsunami Quest is an educational activity for families and children to learn about tsunamis and tsunami evacuation routes in a clue-directed hunt format. The Oregon Sea Grant is already using Tsunami Quests in Clatsop, Lincoln, and Coos Counties to help residents and visitors prepare for a major earthquake and tsunami. The “hunt” culminates in discovery of a box that holds a guest book so participants can record their achievement at completing the Quest. The goal is to encourage people to explore these routes for fun, so that they will be familiar with them in the event of a tsunami.



Tsunami Quest participants. Source: OSU Oregon Sea Grant.

Recommended Action

- Invite the Oregon Sea Grants Quest Coordinator to hold a workshop like the one highlighted in this video: <https://youtu.be/TQvgSMiby7k>.
- Develop a map and a series of educational clues that, when followed, lead the walkers to higher ground.
- Engage elementary or middle school students to develop the clues as a class exercise.
- Consider incorporating geocaches with preparedness information.

Resources

- The 2017-18 Oregon Coast Quests Book: <https://seagrant.oregonstate.edu/sgpubs/2017-18-oregon-coast-quests-book>
- A video that describes the quest concept and how quests are used to teach coastal visitors and locals what to do in the event of a tsunami: <https://youtu.be/TQvgSMiby7k>.

5.3 Schools and Childcare Facilities

Empowering children with knowledge about tsunami hazards and evacuation routes can be an excellent motivator for families to become more aware and prepared. Tsunami education efforts can be incorporated into existing emergency exercises and trainings.

Child Appropriate Trainings

Many materials are available online for teachers to use in educating children about tsunamis. The Tommy Tsunami Coloring Book from the National Tsunami Warning Center is one example.



Students from Seaside High School participate in a tsunami evacuation drill. Source: <https://www.knkn.org/post/coastal-schools-drill-tsunami-would-rather-relocate>

Recommended Action

- Work with teachers to develop tsunami curriculum that is age appropriate.
- Coordinate with Waldport School District to ensure they have the information and educational resources they need to ensure that their students and staff are prepared
- Encourage school children to get ham radio training and offer trainings through the school.

Resources

- The Washington Military Department, Emergency Management Division's booklet "How the Smart Family Survived a Tsunami" for elementary children (K-6): <https://www.mil.wa.gov/uploads/pdf/Publications/HowtheSmartFamilySurvivedaTsunami.pdf>
- The Tommy Tsunami Coloring Book from the National Tsunami Warning Center: https://www.tsunami.noaa.gov/pdfs/tommy_tsunami_coloring_book.pdf
- San Diego County used an animated short film to educate kids about tsunamis: <https://www.youtube.com/watch?v=UzR0Rt3i4kc>
- NOAA's Tsunami Education website: <https://www.tsunami.noaa.gov/education.html#kids>
- OEM's Without Warning: <https://www.oregon.gov/newsroom/pages/NewsDetail.aspx?newsid=1396>
- Lincoln County Amateur Radio Club – N7OY: http://www.n7oy.org/?page_id=133.

Parent/Guardian Trainings and Workshops

Children are not the only audience that can be reached through school activities—parents and guardians attend many events at schools, providing ample opportunities to reach them with the tsunami preparedness message.

Recommended Action

Encourage schools to incorporate tsunami information into their back-to-school nights or other gatherings where parents/guardians are present.

5.4 Seniors

Empowering seniors and their caregivers with knowledge about tsunami hazards and evacuation routes is important to ensure those who may have a tougher time evacuating due to physical limitations understand the importance of evacuating without delay and connecting with their neighbors for support.

Senior Workshops

Seniors and their caregivers need tsunami evacuation education and training to ensure everyone knows when and how to evacuate in the event of a local earthquake and tsunami.

Recommended Action

- Work with existing senior groups to host regular training sessions on tsunami preparedness and evacuation measures.

Resources

- Natural Disaster Awareness for Caregivers of Senior Citizens: Building Senior Resilience: <http://centennialadultcare.com/wp-content/uploads/2015/03/Natural-Disaster-Awareness-for-Caregivers-of-Senior-Citizens.pdf>
- Disaster Preparedness Guide for Seniors and Caregivers: <https://www.seniorliving.org/research/disaster-preparedness/>

5.5 Businesses

Businesses in the hazard zones may be owned, staffed, or frequented by customers who, like visitors, live outside the city limits and may not have been reached by the local outreach activities. Therefore, employers and their employees need tsunami evacuation education and training to ensure everyone knows when and how to evacuate in the event of a local earthquake and tsunami.

Recommended Action

- Work with the Chamber of Commerce to host regular training sessions for business owners, sharing information with them, so they, in turn, could return to their businesses and host in-house training.
- Develop Volunteer Educators to conduct in-house trainings at local businesses for staff.
- Encourage businesses to perform seismic upgrades.
- Recommend training for employees in the tsunami zone using DOGAMI's Tsunami Safe online training module: <https://www.oregon.gov/tsunamisafe/Pages/default.aspx>.

Resources

How to Prepare Your Business for the Next Tsunami (Hawaii specific, but useful information):
http://tsunami.org/1about/pdfs/how_to_prepare_your_business_for_the_next_tsunami.pdf.

Tsunami Quests for Businesses

Tsunami Quest activities are not just for families and children, they can be used by businesses to educate their employees about tsunami preparedness.

Recommended Action

- Encourage local businesses to utilize the Tsunami Quest activity (described above) as a “wellness event” for their employees. The activity may need to be adapted to be more appropriate for businesses.

Resources

- The 2017-18 Oregon Coast Quests Book: <https://seagrant.oregonstate.edu/sgpubs/2017-18-oregon-coast-quests-book>.
- A video that describes the quest concept and how quests are used to teach coastal visitors and locals what to do in the event of a tsunami: <https://youtu.be/TQvgSMiby7k>.
- Effective Emergency Preparedness Planning: Addressing the Needs of Employees with Disabilities: <https://www.dol.gov/odep/pubs/fact/effective.htm>.

5.6 Visitors/Recreationists

Visitors and recreationists may spend a limited amount of time in tsunami prone communities, but they are still at risk. There are many ways to provide these temporary residents with some education about the possibility of a tsunami and what to do if one happens. Being able to educate this population on the tsunami threat, preparedness, and evacuation measures will be critical to life safety in the event of a tsunami.

Education Materials

The brochures and other handouts developed for community activities can be used to educate visitors about what to do and why.

Recommended Action

- Place materials at the following locations:
 - Visitor centers
 - Information kiosks
 - Trail markers
 - Signs on beaches (particularly areas that are hard to evacuate from or in which the direction you need to evacuate to is not obvious)



Tsunami Evacuation brochures included alongside information for visitors.

If printing materials on this scale is prohibitive, consider developing a catchy phrase and website link that individuals can go to in order to download the files.

Resources

- The Disaster Response Guidebook for Hotels and Motels on Washington’s Coast, published by the Washington Military Department Emergency Management Division, includes information about a variety of disasters, including tsunamis:
https://www.mil.wa.gov/uploads/pdf/emergency-management/haz_hotelmotel_guidebook.pdf
- FEMA Website tsunami page with information about recognizing the signs:
<https://www.ready.gov/tsunamis>

Hotels, Motels, Bed and Breakfasts, and Short-Term Rentals

Visitors staying overnight for the weekend or on an extended vacation may be unfamiliar with tsunamis. The handouts used for preparedness fairs and other events hold valuable information about tsunami evacuation that can be shared with temporary residents.

Recommended Action

- Provide tsunami evacuation literature to local hospitality businesses. Request that they be permanently displayed in the lobby and hotel rooms, informing tourists of evacuation routes and general earthquake/tsunami awareness.

- Provide training and education opportunities to hotel, motel, B&B, and short-term rental owners who wish to provide preparedness supplies (such as go-bags) for their employees or guests.
- Adopt City ordinance that requires posting tsunami info in hotels/motels/STRs. Tillamook County has adopted a Short Term Rental Ordinance that requires tsunami evacuation information be posted in all short term rentals within the evacuation zone. The ordinance reads as follows:

A copy of an Oregon Department of Geology and Mineral Industries (DOGAMI) Tsunami Evacuation Brochure furnished by the Tillamook County Department of Community Development at the time of Short-Term Rental Permit issuance and renewal shall be posted in a visible location of a short term rental located within a DOGAMI mapped area susceptible to tsunami hazards.

Resources

- A glossy brochure is available in many languages from UNESCO, at: http://itic.ioc-unesco.org/index.php?option=com_content&view=article&id=1169&Itemid=2017.
- Disaster Response Guidebook for Hotels and Motels on Washington's Coast: https://www.mil.wa.gov/uploads/pdf/emergency-management/haz_hotelmotel_guidebook.pdf
- Manzanita Hotel owner stocked guest room with go-bags: https://www.dailyastorian.com/news/local/manzanita-hotel-stocks-every-room-with-go-bags/article_19c85034-315f-11e9-bc95-031bca675e7e.html.
- DOGAMI's Tsunami Safe online training module for hospitality industry: <https://www.oregon.gov/tsunamisafe/Pages/default.aspx>.

5.7 Access and Functional Needs Populations

Access and Functional Needs populations (also referred to as vulnerable populations and special needs populations) are members of the community who experience physical, mental, or medical care needs and who may require assistance before, during, and after an emergency incident. Targeted education, outreach, and training can help inform and prepare these populations to evacuate successfully in the event of a CSZ tsunami.

Mobility Challenges

Within mobility disabilities, there are several subcategories that should be considered when planning for tsunami evacuations, including: wheelchair users, ambulatory mobility disabilities, respiratory issues, and young children.

Recommended Action

- Encourage residents to get to know their neighbors and whether they will need assistance evacuating.
- Encourage hospitals, doctors, and clinics to provide tsunami evacuation materials to their patients.
- Incorporate evacuation planning into CERT training.

Resources

- To Define, Locate, and Reach Special, Vulnerable, and At-risk Populations in an Emergency: This CDC workbook is intended to provide public health and emergency preparedness planners with better ways to communicate health and emergency information to at-risk individuals with access and functional needs for all-hazards events through step-by-step instructions, resources guides and templates. https://emergency.cdc.gov/workbook/pdf/ph_workbookfinal.pdf
- This guidance from the U.S. Department of Health & Human Services Office of the Assistant Secretary for Preparedness and Response will introduce and connect you to available resources and inclusive strategies for integrating the access and functional needs of at-risk individuals into emergency preparedness, response, and recovery planning at all jurisdictional levels. <https://www.phe.gov/Preparedness/planning/abc/Pages/afn-guidance.aspx>
- Preparing for Disaster for People with Disabilities and other Special Needs <https://www.fema.gov/media-library/assets/documents/897>

Vision Impairment

Individuals who experience partial or total vision loss, including night vision challenges, rely on their sense of touch and hearing to perceive their environment. After a CSZ event, when physical obstructions such as debris, road or sidewalk damage, and liquefaction changes the lay of the land, those who experience vision impairment may find it difficult to navigate to a location outside the tsunami zone without assistance.

Recommended Action

- Incorporate lighting and reflective material on evacuation signs.
- Produce community information in larger text options.

Resources

- American Council for the Blind: <http://www.acb.org/large-print-guidelines>

- American Foundation for the Blind: <http://www.afb.org/info/reading-and-writing/making-print-more-readable/35>

Limited-English Proficiency

Key to an individual's ability to evacuate is access to information. Individuals with limited English proficiency may require additional guidance in their native language.

Recommended Action

- Incorporate communication education materials, in appropriate native languages, into community events and websites.

Resources

- The U.S. Department of Justice's 2016 Tips and Tools for Reaching Limited English Proficient Communities in Emergency Preparedness, Response, and Recovery: <https://www.justice.gov/crt/file/885391/download>
- The U.S. Department of Health & Human Services' Emergency Preparedness Resources for Persons with Limited English Proficiency (LEP): <https://www.hhs.gov/civil-rights/for-individuals/special-topics/emergency-preparedness/limited-english-proficiency/index.html>

Deaf or Hard of Hearing

Individuals who are deaf or hard of hearing may not respond to verbal direction or hear warning sirens.

Recommended Action

- Work with organizations who provide services to those who are deaf or hard of hearing to recognize the signs of a possible tsunami (i.e., ground shaking) and the necessity of evacuating immediately after the ground stops shaking.
- Encourage residents to get to know their neighbors and whether they will need non-verbal communication assistance.

Resources

- Emergency Preparedness for Individuals with Hearing Loss: A Family Guide, from the Vanderbilt Kennedy Center for Excellence in Developmental Disabilities: <https://vkc.mc.vanderbilt.edu/assets/files/tipsheets/emprephearinglosstips.pdf>
- The American Red Cross and NTID's Disaster Preparedness and the Deaf Community — For the Deaf, Hard of Hearing and Latened Deaf: http://www.cidrap.umn.edu/sites/default/files/public/php/332/332_brochure.pdf

5.8 Training and Exercises

Trainings and exercises are an excellent tool to help solidify provided educational materials into action.

Recommended Action

- Conduct yearly exercises with City staff to encourage awareness around their responsibilities during and after a tsunami event.
- Conduct community exercises.
- Offer frequent trainings to local businesses and community organizations.

5.9 Measuring Success

Learning what the community's awareness is about tsunamis through community surveys is an informative way to help guide education efforts.

Recommended Action

- Distribute questionnaires bi-annually to measure the baseline of public awareness and preparedness and subsequent changes to determine program effectiveness and to revise efforts. Consider encouraging participation by utilizing a raffle prize related to emergency preparedness.

Resources

- A sample Community Tsunami Awareness Survey is available here:
<http://kejian1.cmatc.cn/vod/comet/emgmt/community/media/documents/survey.pdf>