

City of North Bend

*Tsunami Evacuation Route Improvement Plan
Appendix of the Transportation System Plan*

1. [Community Profile and Wave Arrival Maps](#)
2. [Wayfinding Guidance](#)
3. [Identified Evacuation Facility Improvement Projects](#)
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1. Community Profile and Wave Arrival Maps

This section is meant to summarize the primary details and conclusions of a pedestrian evacuation analysis completed by DOGAMI for the City of North Bend, in order to inform the city's evacuation routes and identify projects to improve overall pedestrian evacuation for a local tsunami event. Evacuation routes and improvements are described in subsequent sections.

Data source: [Open-File Report O-19-07](#), Tsunami evacuation analysis of communities surrounding the Coos Bay Estuary: Building community resilience on the Oregon coast, by Laura L. S. Gabel, Fletcher E. O'Brien, John M. Bauer, and Jonathan C. Allan.

Overall, results for this area are positive due to the steep hills that back nearly every neighborhood. North Bend can escape a maximum-considered Cascadia tsunami by walking at a minimum speed of 4 fps (walk). The Virginia Avenue, Vermont Avenue, and Broadway Avenue bridges over Pony Creek are not expected to survive the earthquake and are therefore not to be used during evacuation.

Wave arrival: The tsunami reaches the airport ~25 minutes after the start of earthquake shaking, Pony Slough is expected to be inundated after ~30–40 minutes, and the east side by ~40–45 minutes (Figure 1 and Figure 2). Minimum walking speed for pedestrian evacuation for all North Bend is slow walk (2 fps or 1.4 mph). Liquefaction is very likely and may be a challenge during evacuation. More information is needed to further understand the risk and impacts of liquefaction on evacuation.

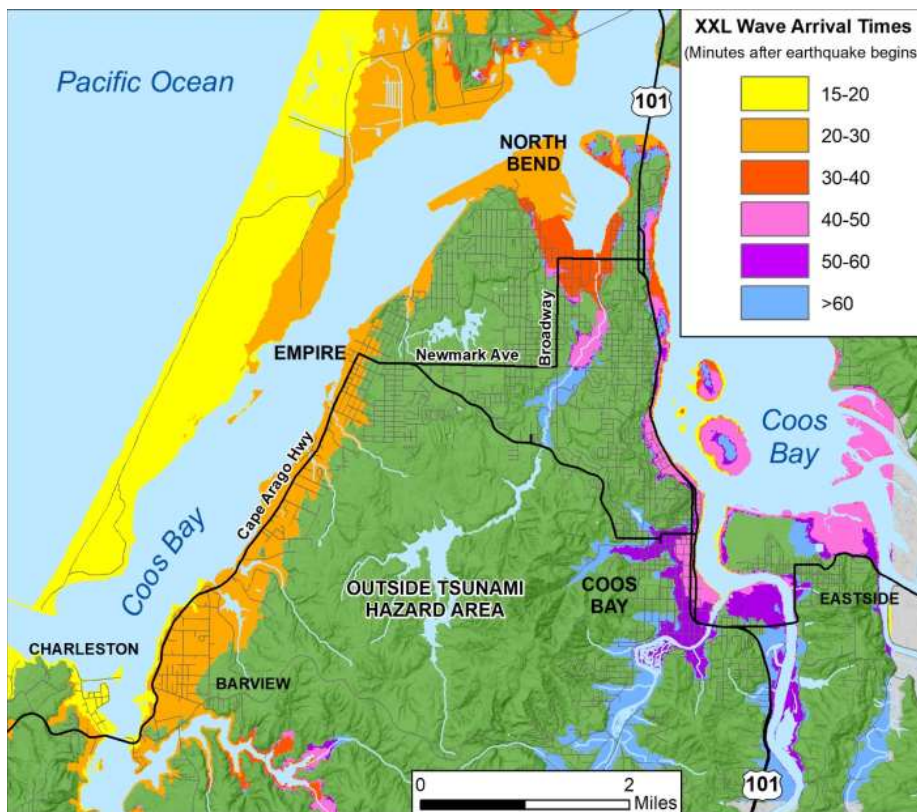


Figure 1: Tsunami wave arrival times for the Coos Bay estuary. Time in minutes from the start of earthquake shaking.

Employment: Within many Oregon coastal communities, the Accommodation and Food Services sector¹ is the largest employer by sector within the tsunami zone. Such is the City of North Bend (32% of the jobs in the tsunami zone). The Accommodation and Food Services sector comprises establishments providing customers with lodging and/or preparing meals, snacks, and beverages for immediate consumption. North Bend has a disproportionately large percentage of jobs inside the inundation zone compared to the other communities nearby (36% of all employers and 47% of all employees).

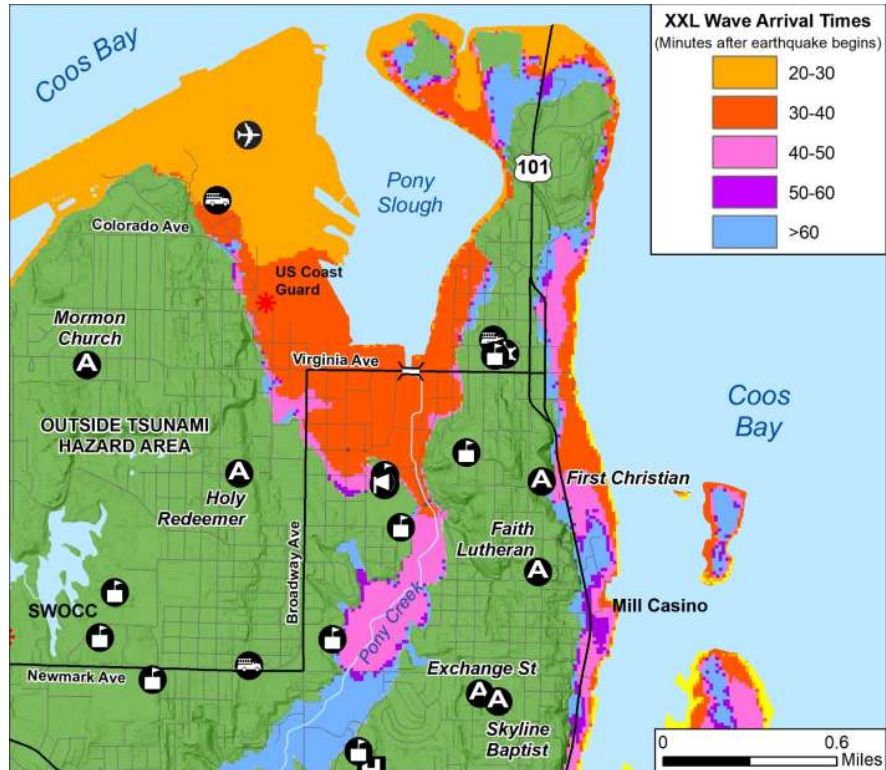


Figure 2: Tsunami wave arrival times for the City of North Bend. Time in minutes from the start of earthquake shaking.

Population: About 1,186 permanent residents of the city (out of 9,815 total)² live within the XXL tsunami inundation zone. Of those, 211 are 65 years or older. In addition, approximately 19% of the permanent population has a reported disability and 3% are Spanish speaking which have implications for successful evacuation and educational and awareness activities to promote successful evacuation.

¹ North American Industry Classification System Sector 72, <https://www.census.gov/eos/www/naics/>

² [Open-File Report O-19-07](#), Tsunami evacuation analysis of communities surrounding the Coos Bay Estuary: Building community resilience on the Oregon coast, by Laura L. S. Gabel, Fletcher E. O'Brien, John M. Bauer, and Jonathan C. Allan.

2. Wayfinding Guidance

Definitions:

It is important to understand that at the time of the earthquake, the objective of every person is to immediately head to their nearest safety destination (or escape point) on high ground, and not necessarily to a designated Assembly Area. The reason is that Assembly Areas may not necessarily be the closest safety destination for many residents and tourists. As a result, when educating the public and designating an evacuation route with signage, it is important to emphasize that the first objective is to survive the tsunami. This can be achieved by evacuating to the nearest high ground escape point.

Since local tsunami waves will be catastrophic in the first 6 hours and will last at least 12 hours after the start of earthquake shaking, evacuation to the nearest designated Assembly Area site should not be attempted until a minimum of 12 hours has passed. Post-tsunami help will likely be provided at designated Assembly Area sites first.

Coordination with land use planning:

The City of North Bend 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, City Code Title 18.50. Except single family dwellings on existing lots and parcels, all new development, substantial improvements and land divisions in the Tsunami Hazard Overlay Zone are required to incorporate evacuation measures and improvements which are consistent with this Evacuation Route Improvement Plan and the Tsunami Hazard Overlay Zone.

Sign Categories

There are several categories of signs available to denote the hazard zone and evacuation routes:

- Tsunami Hazard Zone (e.g. "You Are Here" sign);
- Tsunami Evacuation Route (e.g. directional signage);
- Tsunami Assembly Site;
- Entering/Leaving Tsunami Hazard Zone.

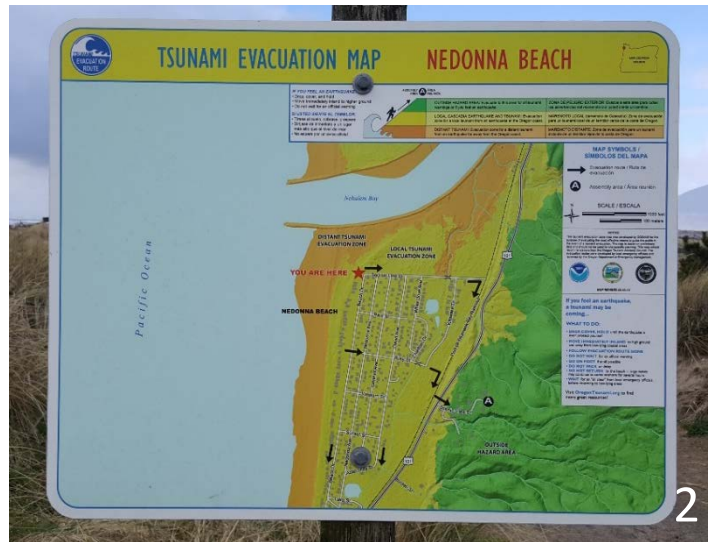
New and existing locations for each of these sign types in North Bend are identified in the Tsunami Evacuation Route and Improvement Projects Map in Section 4. New wayfinding improvements should adhere to this plan, that map, and the guidance outlined in the publication: **OEM & DOGAMI. Version 05-13-2019. Oregon Tsunami Evacuation Wayfinding Guidance.**

Additional Signage Details:

Installation of tsunami signs on state highways must be approved and coordinated with the Oregon Department of Transportation (ODOT). Government entities can order signs from the ODOT Sign Shop (503-986-2805) and contact ODOT for guidelines on sign installation (post size, attachment methods, etc.). If further assistance is needed, contact the Oregon Office of Emergency Management (503-378-2911) or the Oregon Department of Geology and Mineral Industries (541-574-6658) for sign styles and locations, and for potential funding to purchase signs.




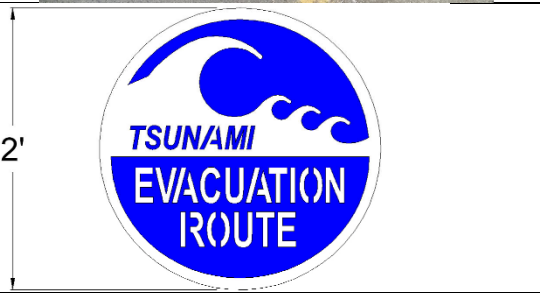
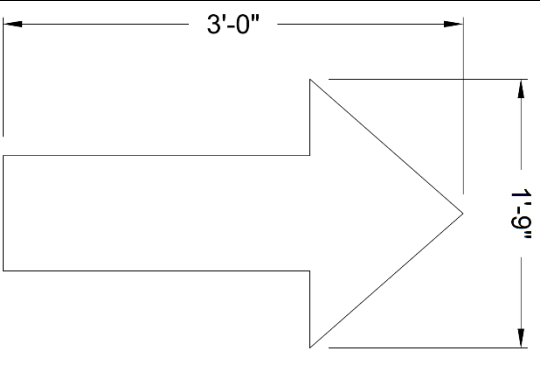
Examples of Tsunami Evacuation Wayfinding and Signage



The recommended wayfinding improvements identified within the plan (Sections 3 & 4) reference the following types of signs and wayfinding for use in the North Bend evacuation network: *Clockwise from top left: 1. Evacuation Route Arrow, 2. 'You Are Here' map, 3. Assembly Area sign, 4. Blue Line, 5. Tsunami Hazard Zone sign, and 6. Entering/Leaving Hazard Zone sign.*


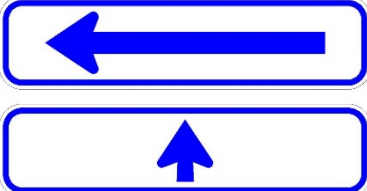
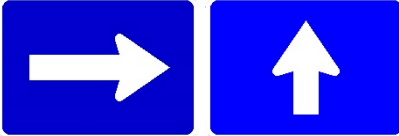





Estimated Signage Costs:

The table below shows the typical costs for the most used tsunami evacuation signage in Oregon, as of May of 2019.

| TYPE | Description | Image | Cost |
|----------------------|--|--|----------|
| Thermoplastic | Leaving tsunami zone sign |  | \$328.90 |
| Thermoplastic | "Saliendo la Zona de Tsunami" - spanish translation of "Leaving tsunami zone" imbedded as blue line strip (light color) 12" x 72" |  | \$129.00 |
| Thermoplastic | Blue line (light color) 12" x 30ft |  | \$138.80 |
| Thermoplastic | Tsunami Evacuation Route Sign (round) |  | \$72.30 |
| Thermoplastic | Tsunami Evacuation Arrow Signs |  | \$67.10 |

| | | | |
|------------------------|---|---|-----------------------------------|
| <p>Aluminum</p> | <p>Entering Tsunami Hazard Zone Sign:</p> <p>42"x48"</p> <p>24"x27" (note: this sign just has "Entering" and "Tsunami Zone")</p> |  | <p>\$147.00</p> <p>\$50.00</p> |
| <p>Aluminum</p> | <p>Leaving Tsunami Hazard Zone Sign:</p> <p>42"x48"</p> <p>24"x27" (note: this sign just has "Leaving" and "Tsunami Zone")</p> |  | <p>\$147.00</p> <p>\$50.00</p> |

| | | | |
|------------------------|--|---|-------------------------------|
| <p>Aluminum</p> | <p>Tsunami Evacuation Route Signs (24" round)</p> <p><i>Note: may now be produced using a square sign.</i></p> |  | <p>\$51.00</p> |
| <p>Aluminum</p> | <p>Tsunami Evacuation Arrow Signs:</p> <p>24"x6" long</p> |  | <p>\$10.00</p> |
| | <p>Tsunami Evacuation Arrow Signs (interstate):</p> <p>21"x15" long</p> |  | <p>\$20.00</p> |
| <p>Aluminum</p> | <p>Tsunami Assembly Area Signs:</p> <p>18"x22"</p> <p>24"x36"</p> |  | <p>\$20.00</p> <p>\$60.00</p> |

| | | | |
|------------------------|---|--|---------------------------------|
| <p>Aluminum</p> | <p>Tsunami Evacuation Site Signs size: 12"x18" <i>Note: various types out there including with/without people</i></p> |  <p>The sign is rectangular with a white background and a blue border. It features a blue silhouette of a tsunami wave. Above the wave, there are three human figures: one is running up a slope, and two others are standing together. Below the wave, the words "EVACUATION SITE" are written in blue, bold, capital letters.</p> | <p>\$20.00</p> |
| <p>Aluminum</p> | <p>Tsunami Hazard Zone Signs: 22.5"x18" 30"x24"</p> |  <p>The sign is rectangular with a blue background. At the top, a white banner contains the text "TSUNAMI HAZARD ZONE" in blue, bold, capital letters. Below this is a white silhouette of a tsunami wave with a white human figure running up a slope. At the bottom, another white banner contains the text "IN CASE OF EARTHQUAKE, GO TO HIGH GROUND OR INLAND" in blue, bold, capital letters.</p> | <p>\$30.00 \$50.00</p> |

3. Identified Tsunami Evacuation Route Improvement Projects

These lists are a starting point and can be modified, added to, or deleted based on community needs and desires into the future.

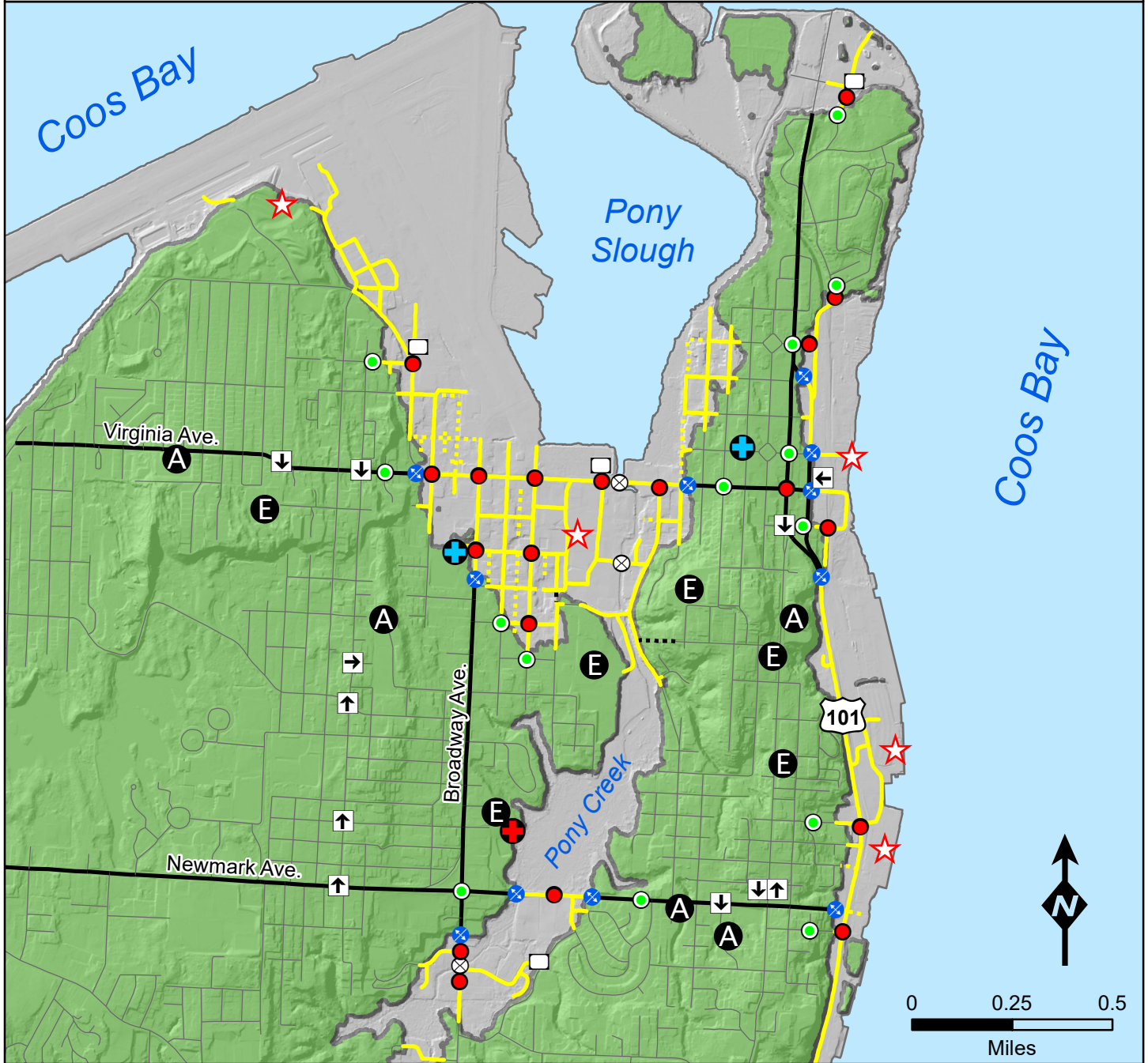
| Project Name | Priority | Potential Project Partners | Potential Funding Sources |
|---|----------|--|---|
| Administration and Policy | | | |
| Identify staff member to lead implementation. | Medium | City Administrator and city staff (planning, public works, fire, etc.) | City General Funds |
| Increase interdepartmental coordination | High | City Administrator and city/county staff (planning, public works, fire, etc.) | City General Funds |
| Integrate evacuation facilities improvements with ongoing planning efforts | High | City Administrator and city staff (planning, public works, fire, etc.), DLCD, ODOT, developers | City General Funds |
| Require tsunami education and mapping in short-term rentals and hotels/motels | Medium | Planning staff, planning commission, city council, DLCD, business/tourism representatives, operators | DLCD Technical Assistance Grants, FEMA RiskMAP CTP grants |
| Education/Outreach | | | |
| “Stay Alive. Walk. Don’t Drive!” Marketing Campaign | High | City Administrator, business community, school district | Oregon Office for Emergency Management (OEM) |
| Citywide Recommendations – Evacuation Facilities and Preparedness | | | |
| Establish supply caches and emergency shelters in strategic areas outside of the tsunami zone | High | City staff, school district, DLCD, OEM, Coos County Emergency staff, food bank, church groups, etc. | FEMA Hazard Mitigation Assistance grants |
| Pursue acquisition of land for relocation of critical facilities. | Low | City staff, city council, community stakeholder groups | FEMA Hazard Mitigation Assistance grants |
| Wayfinding | | | |
| Add signage or blue lines to indicate arrival at high ground along major evacuation routes | High | City staff, DLCD, DOGAMI, community groups | OEM & DOGAMI |

| | | | |
|---|--------|--|--------------|
| Expand Evacuation Route Signage, including directional signs, to direct people to high ground | High | City staff, DLCD, DOGAMI, community groups | OEM & DOGAMI |
| Add "You Are Here" map signs at major water access points | Medium | City staff, Airport, Oregon State Parks, DOGAMI | OEM & DOGAMI |
| Add assembly areas | Medium | Public works, DOGAMI, OEM, community/church groups | OEM & DOGAMI |

Construction

| | | | |
|--|--------|---|------------|
| Bury powerlines | Medium | Public works, DOGAMI, utility companies | ODOT, DLCD |
| Virginia Avenue bridge over Pony Creek retrofit or replacement | Medium | ODOT, public works | ODOT |
| Develop or enhance a post-disaster community cache in partnership with other community stakeholders. | High | City staff, school district, DLCD, OEM, Coos County Emergency staff, food bank, church groups, etc. | FEMA |

4. Tsunami Evacuation Route & Improvements Project Map



New Signs:

- Proposed Route (out of tsunami zone)
- ⊗ Enter/Leave Tsunami Area
- High Ground
- ★ 'You are here' Maps
- Tsunami Hazard Zone

- E Red Cross Shelter (official) (post evac. site signs)
- A City Approved Assembly Area
- + City Supplies
- + Red Cross Supplies
- ⊗ Bridge Out
- ↑ Existing Route/Arrow Signs

Beat the Wave Evacuation Speed

Slow Walk: up to 1.4 mph averaged over the entire route

- Paved roads
- Gravel roads
- Paved Paths

- Outside Tsunami Hazard Area
- Areas Subject to Chapter 18.50 NBCC

This product is for informational purposes and may not have been prepared for or be suitable for legal, engineering, or surveying purposes. Users should review or consult the primary data and information sources to ascertain the usability of the information.

Data sources:
 emergency locations: City of North Bend;
 tsunami inundation area, evacuation routes, topographic hillshading: DOGAMI;
 roads: DAS-GEO.

Projection: Oregon Lambert
 ArcMap 10.8.0, 20210126
 NBend_BTW_Evac_Signs_RD04.mxd, rd

