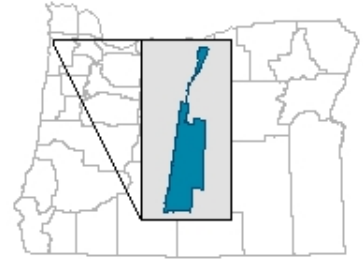




Rockaway Beach, OR

The Department of Geology and Mineral Industries (DOGAMI) has completed a tsunami damage assessment for a local Cascadia Subduction Zone earthquake and tsunami event in Rockaway Beach, OR. The major results are presented below along with suggested action items to increase resilience in the community. This study was designed so that public decisions might be made with the best science available.

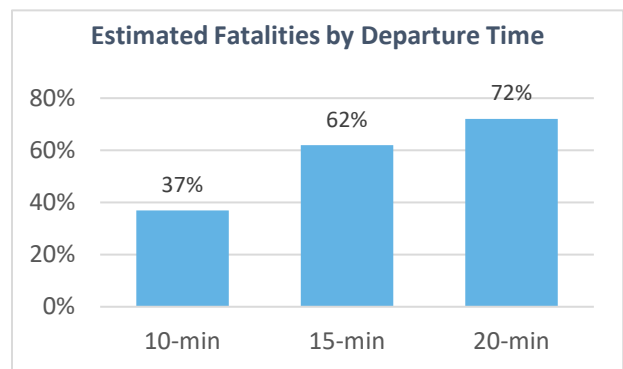


Casualty Estimates (Injuries + Fatalities)

The first tsunami wave arrives in Rockaway Beach **27 minutes** from the start of earthquake shaking. The wave arrival time is important for assessing a community's ability to quickly evacuate, which directly affects the potential for fatalities.

The results presented here are for a summer weekend at 2 AM, which represents a peak number (all possible beds occupied). The summer population can increase by ~6 times in the XXL tsunami zone. Results also include the City's Urban Growth Boundary, which includes the neighborhoods of Nedonna Beach and Twin Rocks.

Assuming a 10-minute departure time and average walking speed of 3 miles per hour, 63% of the Rockaway Beach summer population located within the XXL tsunami zone (temporary + permanent) is expected to survive. Departure time is the length of earthquake shaking (3-5 min.) plus milling time before someone starts evacuating. Evacuation delays could increase the number of fatalities significantly, as shown in the graph.



Longer evacuation delays can significantly increase the percent of the population that could be killed by a tsunami.

Population & Assets in the Tsunami Zone

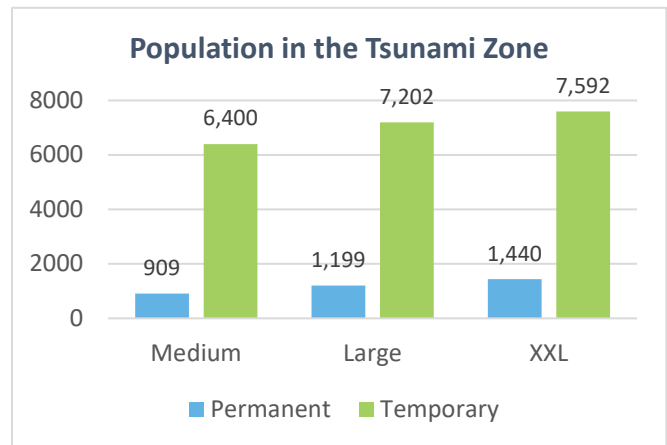
Almost the entire community of Rockaway Beach is directly impacted by the XXL tsunami; a few discrete areas located in the eastern hills are outside of the tsunami inundation zone.

People located within the tsunami zone will have to quickly evacuate to safety following an earthquake. Effective evacuation can become more difficult when additional risk factors are involved, such as visitors, older or younger individuals, or those with mobility challenges.

- 79% of Rockaway Beach's permanent residents live in the tsunami zone; 35% are aged 65 years or older.
- Nearly all businesses and jobs in the Rockaway Beach UGB are located within the tsunami zone.
- Temporary residents could increase the local population within the tsunami zone by ~6 times in the summer.
- Most of the permanent population within the tsunami zone occupies single-family (80%) or manufactured homes (28%). Foundations of manufactured homes may fail in an earthquake, hindering timely evacuation.
- About 80% of the temporary visitor population occupies single-family homes, manufactured homes, and multi-family homes. A major challenge of such a dispersed temporary population is ensuring every vacation home contains site-specific earthquake and tsunami information.

- Visitors tend to be located closer to the ocean, and thus farther away from high ground. Permanent residents are on average about 1,000 ft. closer to high ground than visitors.
- Key bridges (12th Street bridge over Lake Lytle and Highway 101 bridge) could fail during the earthquake, blocking or limiting more efficient routes to safety.

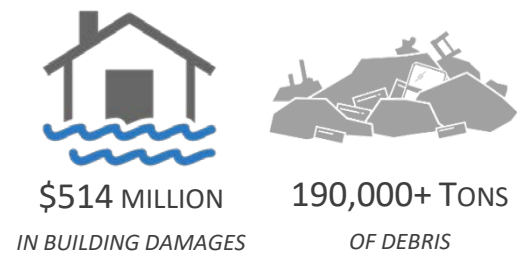
The topography, coastal lakes, older infrastructure, and human settlement patterns in Rockaway Beach have created challenges for timely evacuation from a tsunami. Distance to safety is longest in areas to the immediate west of Lake Lytle, along the Manhattan Beach shoreline, and in buildings close to the ocean in the Twin Rocks area. Other areas of concern include Nedonna Beach in the far north, and at the Rockaway Beach RV Park on S Beacon St.



Temporary population = those occupying vacation rentals & second homes. Temporary population estimates are based on a peak summer weekend scenario.

Building Damage & Debris Estimates

Within the XXL tsunami zone, combined earthquake and tsunami building repair costs are estimated to be ~\$514 million (which includes ~2,360 buildings), with the bulk of the cost attributed to the destruction caused by the tsunami. The costs to repair buildings and infrastructure located outside the tsunami zone that are also damaged by the earthquake are **not** included in this estimate.

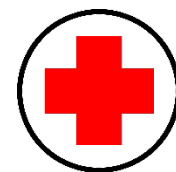


The weight of debris generated by the destruction of the buildings in the tsunami zone is estimated to be ~190,000 tons, which is a minimum estimate (excludes content in the buildings, vehicles, and other forms of debris).

Sheltering Needs

Permanent and temporary residents who successfully evacuate out of the tsunami zone will require short- to medium-term shelter. For an XXL tsunami event, the displaced population in Rockaway Beach could range from ~1,100 (mid-winter) to ~6,000 people (peak summer).

These numbers reflect only those displaced from the tsunami zone; there may be additional sheltering needs for those whose homes have been damaged or destroyed by the earthquake event outside of the tsunami zone. In addition, development exists south of the Rockaway Beach UGB (Barview). Displaced people in those locations will also temporarily need food and shelter.



1,100 – 6,000 PEOPLE
IN NEED OF SHELTER

A lesser magnitude event (i.e., Large or smaller) will produce fewer tsunami fatalities, though a significant portion of the population (permanent + temporary) will still need short-term shelter from the destruction of residential buildings within the tsunami zone.

Data Source:

Open File Report O-20-03, *Analysis of earthquake and tsunami impacts for people and structures inside the tsunami zone for five Oregon coastal communities: Gearhart, Rockaway Beach, Lincoln City, Newport, and Port Orford*, DOGAMI: www.oregongeology.org/pubs/ofr/p-O-20-03.htm.

Instill a Culture of Preparedness.

Through adaptation planning, communities can be better prepared to face natural disasters.

Action Items:

- **CONDUCT COMMUNITY EVACUATION DRILLS** – All neighborhoods in Rockaway Beach should review evacuation maps, walk evacuation routes, and conduct tsunami evacuation drills.
- **EDUCATE** – Loss of life can be minimized if individuals evacuate as soon as possible after the earthquake and travel on foot as fast as possible to safety. Tsunami evacuation map distribution, signage, and roadway paint are education tools that are highly effective if used widely.
 - Focus education and outreach to second homeowners and vacation home renters. Locally specific evacuation maps can now be generated for any location via the online tsunami evacuation portal:
<http://nvs.nanoos.org/TsunamiEvac>. Or the smartphone application: NVS Tsunami Evacuation.
- **PREPARE COMMUNITY RESOURCES**, such as disaster supply caches and mass sheltering plans. OEM and DOGAMI have a newly released community disaster cache [planning guide](#) with resources to get groups started.
- **ENCOURAGE THE PURCHASE OF FLOOD INSURANCE TO COVER TSUNAMI LOSSES** – Many of the buildings in Rockaway Beach are in the XXL tsunami zone but **not** in a designated FEMA flood zone. The voluntary purchase of flood insurance is available to all building owners through the National Flood Insurance Program, which covers building loss due to a tsunami. Standard homeowner’s insurance does not cover flood, tsunami, or earthquake damage. Find out more: www.fema.gov/flood-insurance.
- **IMPLEMENT EVACUATION IMPROVEMENTS**, focused to the challenges of the community, such as:
 - Increase the density of tsunami evacuation signage so that signs can be easily viewed and read.
 - Evaluate major engineering projects to improve resilience, such as vertical evacuation structures within the city or a seismic retrofit for the bridges at 12th Street and Highway 101.
 - A vertical evacuation structure could save thousands of lives if strategically placed but would need to be extremely tall and robust due to high flow depths and powerful tsunami forces.
- **ADVANCE LOCAL PLANNING**
 - Relocate critical and essential buildings if they are within the tsunami zone.
 - Adopt zoning restrictions or building standards for certain types of new development in the most hazardous areas in alignment with the community’s risk tolerance.
 - Develop a plan for how to manage earthquake and tsunami debris after a disaster event. Look to OEM and FEMA for resources to get started.
- **DEVELOP MUTUAL AID AGREEMENTS** with other jurisdictions or organizations to provide additional resources for the community during disaster events.
 - Coastal hospitals will need to prepare for a surge in injuries that could exceed existing capacity.
- **KNOW WHAT RESOURCES ARE AVAILABLE** – Federal and state agencies have grant funds available for risk reduction activities (e.g., FEMA’s Hazard Mitigation Grant Program, NOAA’s Coastal Management Program).

