Tsunami Hazard Map of the Seaside-Gearhart Area, Clatsop County, Oregon

1998

STATE OF OREGON
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IMS-3

Tsunami Hazard Map of the Seaside-Gearhart Area, Clatsop County, Oregon

By G. R. Priest and others

- Low to negligible risk zone for tsunami flooding (300-600 year events)
- Moderate risk for tsunami flooding (300-600 year events)[1]
- High risk for tsunami flooding (300-600 year events)[2]
- Extreme risk for tsunami flooding (300-600 year events)[3]
- Inundation limit of the 1964 Alaskan Tsunami (distant tsunami)[4]

- ★ Site flooded by the 1964 Alaska tsunami[5]
- ◆ Core site with buried soils capped with one or more Cascadia tsunami sand layers[5]
- ■ Core site with one or more tsunami sand layers of uncertain age[5]
- ▲ Core site with liquefaction sand dikes or sills[5]

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[1]Elevations within and below this zone would be flooded by a Cascadia subduction zone tsunami from a magnitude ~9. 1 earthquake with doubling of the fault slip immediately offshore. See Priest and others (1997), Model 1A Asperity for a complete explanation of this model earthquake and tsunami.
[2]Elevations within and below this zone would be flooded by a Cascadia subduction zone tsunami from a magnitude ~9.1 earthquake. See Priest and others (1997), Model 1A, for a complete explanation of this model earthquake and tsunami.
[3]Elevations within and below this zone would be flooded by a Cascadia subduction zone tsunami from a magnitude ~8.6 earthquake. See Priest and others (1997), Model 2Cn , for a complete explanation of this model earthquake and tsunami.
[4] Inundation mapped by Thomas S. Horning, geologic consultant, Seaside, Oregon, from historical data. This event probably approximates a worst case for flooding by a large tsunami from a distant area (distant tsunami).
[5] All core data is from Fiedorowicz (1997). Some sites shown flooded by the 1964 Alaskan tsunami lie outside the main zone of mapped inundation for this event. These sites generally had marginal evidence such as foam or minor wetting in street gutters.

Map prepared by: George R. Priest, Oregon Department of Geology and Mineral Industries, from numerical simulations of Edward Myers, Antonio Baptista, Oregon Graduate Institute of Science & Technology, and Robert A. Kamphaus, Center for the Tsunami Inundation Mapping Efforts, National Oceanic and Atmospheric Administration, and from mapping of historic and prehistoric tsunami inundation by Brooke K. Fiedorowicz and Curt D. Peterson of Portland State University and Thomas S. Horning, geologic consultant, Seaside, Oregon. All of these individuals are co-authors on this map and should be listed in order indicated for bibliographic citations.

How to Use the Map: Mapped boundaries may be viewed as guides for evacuation planning in the event of an earthquake and tsunami. *If an earthquake occurs with 20 seconds or more of shaking that is strong enough to make standing difficult, plan on going immediately to the lowest risk site available. A tsunami could arrive within a few minutes of the earthquake.* Such nearby earthquakes and associated tsunamis only occur on the order of 300-600 years. Distant tsunamis occur more often, are generally smaller than tsunamis from nearby earthquakes, and arrive hours after a distant earthquake. The inundation boundary for the 1964 Alaska tsunami approximates a worst case for distant tsunamis. The Alaska Tsunami Warning Center issues warnings for all distant tsunamis affecting the west coast of the United States.

The following figures illustrate current velocities and timing of waves as they arrive after a large earthquake on the nearby Cascadia subduction zone fault system. They utilize the scenario tsunami from a magnitude ~9.1 subduction zone earthquake (see Priest and others (1997), Model 1A, for a complete explanation of this model earthquake and tsunami). Figure 1 shows the pattern of maximum current velocities for 4 hours of wave activity. Figure 2 shows the progress of the flooding throughout the map area during the first 72 minutes after the earthquake. Note that the initial wave arrives about 30 minutes after the earthquake. Figure 3 illustrates the sequence of wave arrivals (time history) at observation stations at the open coast and at the Necanicum River.

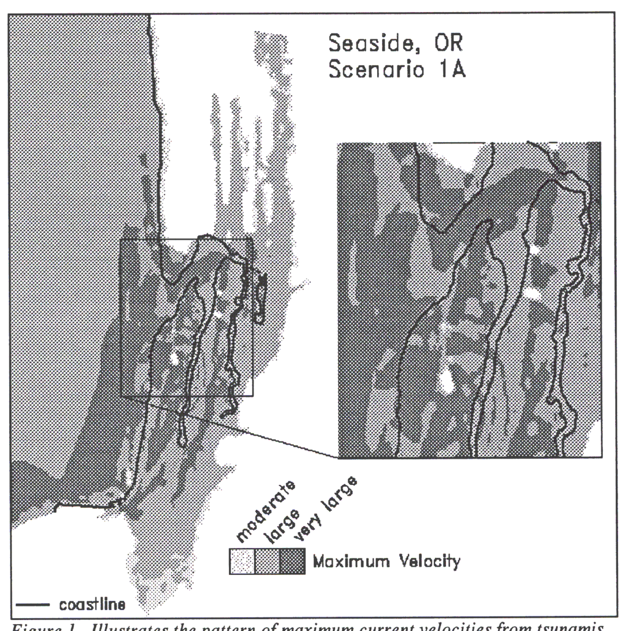

Figure 1. Illustrates the pattern of maximum current velocities from tsunamis generated by a magnitude ~9.1 earthquake on the nearby Cascadia subduction zone fault system. (Model 1A of Priest and others (1997)) is illustrated. Figure should only be used as a qualitative tool to compare velocity from area to area; not as a quantitative predictor of absolute velocity.

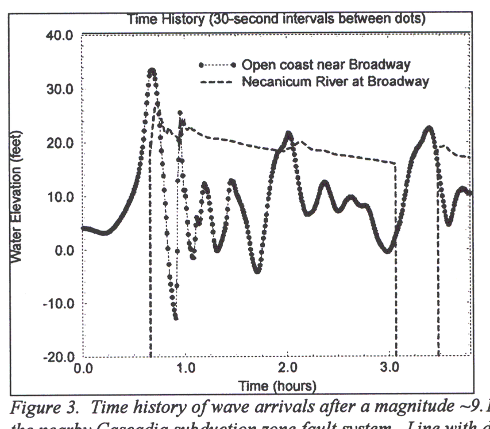

Figure 3. Time history of wave arrivals after a magnitude ~9.1 earthquake on the nearby Cascadia subduction zone fault system. Line with dots is for an observation station immediately offshore near the latitude of Broadway Avenue. The dashed line shows water levels at the same latitude in the Necanicum River. Note that there is about 30 minutes to reach areas of safety after the earthquake and that high waves continue to come in for hours. A moderately high run-up scenario (Model 1A of Priest and others (1997)) is illustrated.

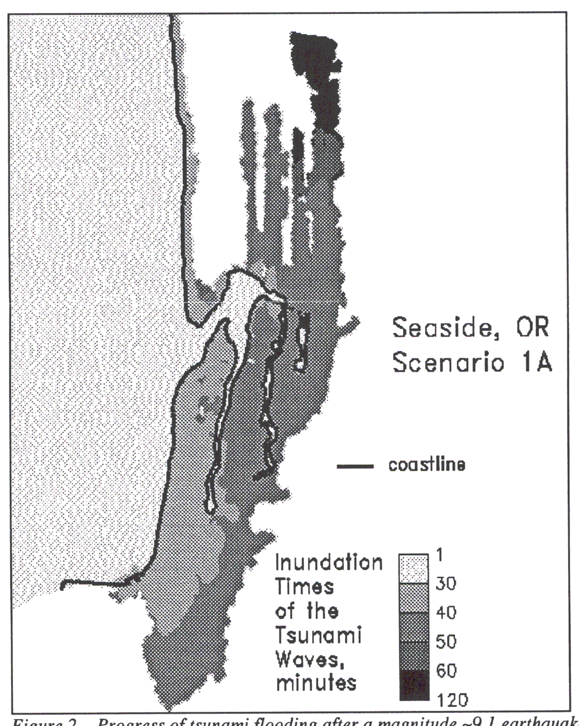

Figure 2. Progress of tsunami flooding after a magnitude ~9.1 earthquake on the nearby Cascadia subduction zone fault system (Model 1A of Priest and others (1997)) is illustrated.). Note that there is about 30 minutes before the first wave arrives to evacuate from areas near the open coast.

When planning evacuation routes and destinations check with local officials for guidance. In general one should go to the least hazardous site (non-colored area or the coolest color) on the map by the shortest route; make sure that the route is not compromised by other earthquake hazards such as liquefaction or earthquake-induced landslides. Bridges may fail in the event of an earthquake. Consult with transportation authorities about the seismic stability of bridges used for evacuation.

Additional Detailed Information: See Oregon Department of Geology and Mineral Industries Open-File Report O-97-34 (Priest and others, 1997) for a detailed explanation of the mapping techniques.

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References:

Priest, G.R., Myers, E., Baptista, A., Kamphaus R.A., Peterson, C.D., 1997, Cascadia subduction zone tsunamis: hazard mapping at Yaquina Bay, Oregon: Oregon Department of Geology and Mineral Industries, Open-File Report O-97-34, 144 p.

Fiedorowicz, B.K., 1997, Geologic evidence of historic and prehistoric tsunami inundation at Seaside, Oregon: Portland State University, Portland, Oreg., Master's thesis, 197 p.

Disclaimer: The Oregon Department of Geology and Mineral Industries is publishing this map because the subject matter is consistent with the mission of the Department. The map is not intended to be used for site specific planning. It may be used as a general guide for emergency response planning.

SCALE 1:12,000

KILOMETERS (.5 – 0 – 1 – 2)

FEET (1000 – 0 – 7000)

MILES (.5 – 0 – 1)

Contour interval: 10 feet

Base Map : 1996 orthophotograph by David C. Smith & Associates, Inc. of Portland, Oregon

Coordinate System: State Plane

Horizontal Datum: NAD 1927

Vertical Datum: NAVD 1929

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PROJECT LOCATION