

Broadcasters Tsunami Emergency Guidebook



**Washington
Military
Department**

**Emergency
Management
Division**

ISSUE DATE: APRIL 2006

Introduction

The Pacific Coast of Washington is at risk from tsunamis. These destructive waves can be caused by coastal or submarine landslides or volcanism, but they are most commonly caused by large submarine earthquakes.

Tsunamis are generated when these geologic events cause large, rapid movements in the sea floor that displace the water column above. That swift change creates a series of high-energy waves that radiate outward like pond ripples. Local offshore tsunamis would strike the adjacent shorelines within minutes. The Pacific Coast is at risk both from locally and distantly generated tsunamis.

Tsunami waves can continue for hours. The first wave can be followed by others a few minutes or a few hours later, and the later waves are commonly larger.

Warnings

When an earthquake that might generate a Pacific Coast tsunami is detected, the West Coast/Alaska Tsunami Warning Center calculates the danger to the northeast Pacific Coast and notifies the communities at risk. If the earthquake occurs off our coast, however, there may be no time to send out hazard warnings and may make alert and notification systems inoperable. The first waves

could arrive within 30 minutes of the earthquake. The only tsunami warning might be the earthquake itself.

Broadcasters

This guidebook provides a concise overview of the notification process used to send tsunami alerts to public information broadcasters, local jurisdictions and the public. It includes a Tsunami Warning Flow Chart that shows how information is sent to broadcasters, a contact list of tsunami experts who can provide credible tsunami information during a tsunami event, and Washington coastal community maps of regions most susceptible to tsunamis.

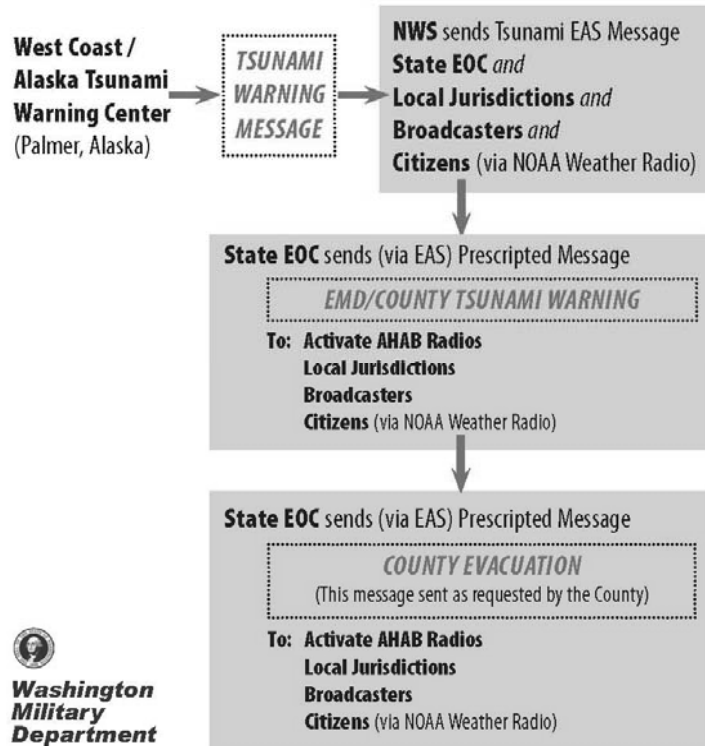
Two DVDs accompany this guidebook (located in the binder sleeve): *Tsunamis in Washington* (running time: 4:31:26); and *U.S. National Tsunami Hazard Mitigation Program Selected Interviews*.

Coastal Tsunami Inundation Maps

Washington coast maps appear in geographic order. Each map includes a symbol key that pinpoints tsunami hazard zones, evacuation routes, and safer assembly areas for people.

Tsunami Warning Flow Chart

HOW THE TSUNAMI WARNING SYSTEM WORKS



WC/ATWC: West Coast/Alaska Tsunami Warning Center (Palmer, Alaska)
 State EOC: State Emergency Operation Center
 NWS: National Weather Service Coastal Offices
 AHAB: All Hazards Alert Broadcast
 EAS: Emergency Alert System

Local Subject Matter Expert Contacts

TSUNAMI NUMERICAL MODELING

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TSUNAMIS GENERAL

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INUNDATION MAPPING

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EARTHQUAKE/TSUNAMI GEOLOGIST

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(Continued next page)

Local Subject Matter Expert Contacts

TSUNAMI WARNING CENTER

West Coast/Alaska Tsunami Warning Center

PALMER, ALASKA

Tel: (907) 745-4212
(Warning Center)

ANCHORAGE, ALASKA

Tel: (907) 271-4767
(NWS Alaska Region PIO)

EMERGENCY ALERT SYSTEM (EAS)

National Weather Service

SEATTLE

Tel: (206) 526-6857
(unlisted media line)

PORTLAND

Tel: (503) 261-9248
(unlisted media line)

Washington Emergency Management Division

DON MILLER

Tel: (253) 512-7035

Tsunami Bulletin (Example)

From West Coast/Alaska Tsunami Warning Center

BULLETIN

PUBLIC TSUNAMI MESSAGE NUMBER 1

NWS WEST COAST/ALASKA TSUNAMI WARNING CENTER PALMER AK
1241 PM PST SAT DEC 17 2005

... THIS MESSAGE IS FOR TEST PURPOSES TO SHOW AN EXAMPLE
WEAK51 MESSAGE...

... A TEST TSUNAMI WARNING IS IN EFFECT WHICH INCLUDES THE
CALIFORNIA – OREGON – WASHINGTON – BRITISH COLUMBIA AND
ALASKA COASTAL AREAS FROM POINT ARENA CALIFORNIA TO SITKA
ALASKA...

... A TEST TSUNAMI WATCH IS IN EFFECT FOR THE CALIFORNIA COASTAL
AREAS FROM POINT CONCEPTION CALIFORNIA TO POINT ARENA
CALIFORNIA AND FOR THE ALASKA COASTAL AREAS FROM SITKA
ALASKA TO YAKUTAT ALASKA...

A TSUNAMI WARNING MEANS... ALL COASTAL RESIDENTS IN THE WARNING
AREA WHO ARE NEAR THE BEACH OR IN LOW-LYING REGIONS SHOULD MOVE
IMMEDIATELY INLAND TO HIGHER GROUND AND AWAY FROM ALL HARBORS
AND INLETS INCLUDING THOSE SHELTERED DIRECTLY FROM THE SEA.
THOSE FEELING THE EARTH SHAKE... SEEING UNUSUAL WAVE ACTION... OR
THE WATER LEVEL RISING OR RECEDING MAY HAVE ONLY A FEW MINUTES
BEFORE THE TSUNAMI ARRIVAL AND SHOULD EVACUATE IMMEDIATELY.
HOMES AND SMALL BUILDINGS ARE NOT DESIGNED TO WITHSTAND
TSUNAMI IMPACTS. DO NOT STAY IN THESE STRUCTURES.

ALL RESIDENTS WITHIN THE WARNED AREA SHOULD BE ALERT FOR
INSTRUCTIONS BROADCAST FROM THEIR LOCAL CIVIL AUTHORITIES. THIS
TSUNAMI WARNING IS BASED SOLELY ON EARTHQUAKE INFORMATION —
THE TSUNAMI HAS NOT YET BEEN CONFIRMED.

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A TSUNAMI WATCH MEANS... ALL COASTAL RESIDENTS IN THE WATCH
AREA SHOULD PREPARE FOR POSSIBLE EVACUATION. A TSUNAMI WATCH
IS ISSUED TO AN AREA WHICH WILL NOT BE IMPACTED BY THE TSUNAMI
FOR AT LEAST TWO HOURS. WATCH AREAS WILL EITHER BE UPGRADED TO
WARNING STATUS OR CANCELED.

AT 1230 PM PACIFIC STANDARD TIME ON DECEMBER 17 AN EARTHQUAKE
WITH PRELIMINARY MAGNITUDE 7.3 OCCURRED 40 MILES SOUTHEAST OF
PORT ALICE BRITISH COLUMBIA.

THIS EARTHQUAKE MAY HAVE GENERATED A TSUNAMI. IF A TSUNAMI
HAS BEEN GENERATED THE WAVES WILL FIRST REACH TOFINO BRITISH
COLUMBIA AT 127 PM PST ON DECEMBER 17. ESTIMATED TSUNAMI ARRIVAL
TIMES AND MAPS ALONG WITH SAFETY RULES AND OTHER INFORMATION
CAN BE FOUND ON THE WEB SITE WCATWC.ARH.NOAA.GOV.

TSUNAMIS CAN BE DANGEROUS WAVES THAT ARE NOT SURVIVABLE. WAVE
HEIGHTS ARE AMPLIFIED BY IRREGULAR SHORELINE AND ARE DIFFICULT
TO PREDICT. TSUNAMIS OFTEN APPEAR AS A STRONG SURGE AND MAY BE
PRECEDED BY A RECEDING WATER LEVEL. MARINERS IN WATER DEEPER
THAN 600 FEET SHOULD NOT BE AFFECTED BY A TSUNAMI. WAVE HEIGHTS
WILL INCREASE RAPIDLY AS WATER SHALLOWS. TSUNAMIS ARE A SERIES
OF OCEAN WAVES WHICH CAN BE DANGEROUS FOR SEVERAL HOURS AFTER
THE INITIAL WAVE ARRIVAL. DO NOT RETURN TO EVACUATED AREAS UNTIL
AN ALL CLEAR IS GIVEN BY LOCAL CIVIL AUTHORITIES.

THE PACIFIC TSUNAMI WARNING CENTER WILL ISSUE TSUNAMI BULLETINS
FOR HAWAII AND OTHER AREAS OF THE PACIFIC OUTSIDE CALIFORNIA /
OREGON / WASHINGTON / BRITISH COLUMBIA AND ALASKA.

ADDITIONAL BULLETINS WILL BE ISSUED HALF-HOURLY OR SOONER IF
CONDITIONS WARRANT. THE TSUNAMI WARNING AND WATCH WILL REMAIN
IN EFFECT UNTIL FURTHER NOTICE. FOR FURTHER INFORMATION STAY TUNED
TO NOAA WEATHER RADIO... YOUR LOCAL TV OR RADIO STATIONS... OR SEE
THE WEB SITE WATC.ARH.NOAA.GOV.

THIS IS A TEST MESSAGE. DO NOT TAKE ACTION BASED ON THIS TEST
MESSAGE.

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Tsunami Bulletin (Example)

From Washington State Emergency Operation Center

"THIS IS NOT A TEST. A TSUNAMI WARNING HAS BEEN ISSUED FOR THE COASTAL AREAS OF WASHINGTON. A TSUNAMI CAN CAUSE DANGEROUS FLOODING. IF YOU ARE IN A LOW COASTAL AREA YOU ARE AT RISK AND MUST MOVE TO HIGHER GROUND OR INLAND NOW. DO NOT RETURN UNTIL DIRECTED TO DO SO. CLOSELY MONITOR LOCAL RADIO STATIONS FOR ADDITIONAL INFORMATION. THIS IS NOT A TEST. A TSUNAMI WARNING HAS BEEN ISSUED FOR THE COASTAL AREAS OF WASHINGTON. MOVE TO HIGHER GROUND OR INLAND NOW."

Know the terms used by West Coast / Alaska Tsunami Warning Center

A Tsunami Warning

The highest level of tsunami alert.

A Tsunami Warning is issued by the Tsunami Warning Centers when a potential tsunami with significant widespread inundation is imminent or expected. Warnings alert the public that widespread, dangerous coastal flooding accompanied by powerful currents is possible and may continue for several hours after arrival of the initial wave. Warnings also alert emergency management officials to take action for the entire tsunami hazard zone. Appropriate actions to be taken by local officials may include the evacuation of low-lying coastal areas, and the repositioning of ships to deep waters when there is time to safely do so. Warnings may be updated, adjusted geographically, downgraded, or canceled. To provide the earliest possible alert, initial warnings are normally based only on seismic information.

A Tsunami Watch

The second highest level of tsunami alert.

A Tsunami Watch is issued by the Tsunami Warning Centers to alert emergency management officials and the public of an event that may later impact the Watch area. The Watch area may be upgraded to a Warning or Advisory (or canceled) based on updated information and analysis. Therefore, emergency management officials and the public should prepare to take action. Watches are normally issued based on seismic information without confirmation that a destructive tsunami is underway.

Know the terms used by the West Coast / Alaska Tsunami Warning Center

A Tsunami Advisory

The third highest level of tsunami alert.

A Tsunami Advisory is issued by the Tsunami Warning Centers due to the threat of a potential tsunami that may produce strong currents or waves dangerous to those in or near the water.

Coastal regions historically prone to damage due to strong currents induced by tsunamis are at the greatest risk. The threat may continue for several hours after the arrival of the initial wave, but significant widespread inundation is not expected for areas under an Advisory. Appropriate actions to be taken by local officials may include closing beaches, evacuating harbors and marinas, and the repositioning of ships to deep waters when there is time to safely do so. Advisories are normally updated to continue the Advisory, expand/contract affected areas, upgrade to a Warning, or cancel the Advisory.

Information Statement

An Information Statement is issued to inform emergency management officials and the public that an earthquake has occurred. In most cases, Information Statements are issued to indicate there is no threat of a destructive tsunami affecting the issuing Tsunami Warning Center's Area of Responsibility and to prevent unnecessary evacuations as the earthquake may have been felt in coastal areas. An Information Statement may, in appropriate situations, caution about the possibility of destructive local tsunamis. Information Statements may be re-issued with additional information, though normally these messages are not updated. However, a Watch, Advisory or Warning may be issued for the area, if necessary, after analysis and/or updated information becomes available.

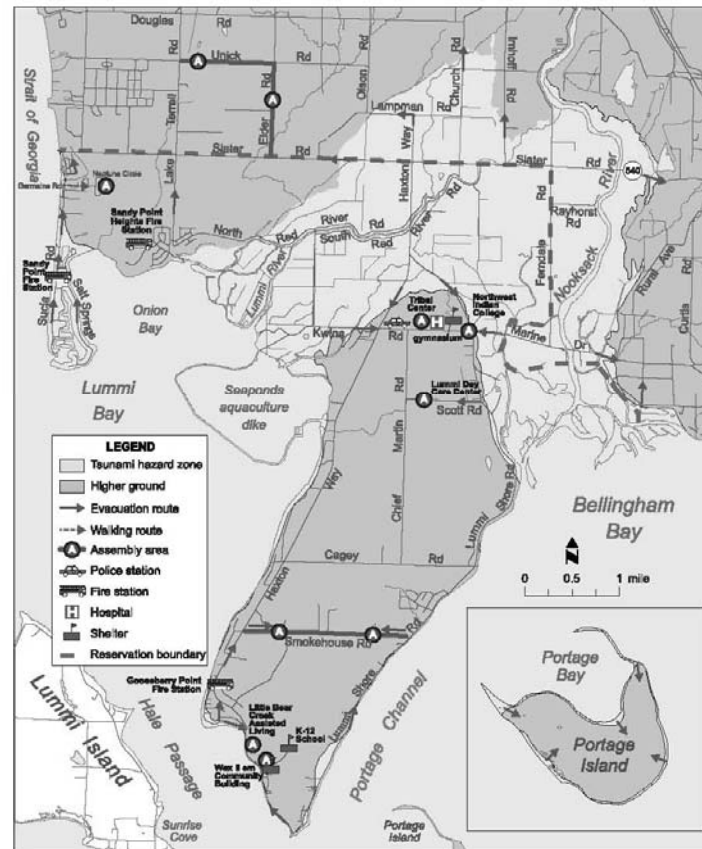
Washington Coast

Tsunami Inundation Maps appear on the following pages in geographic order beginning with Lummi Reservation



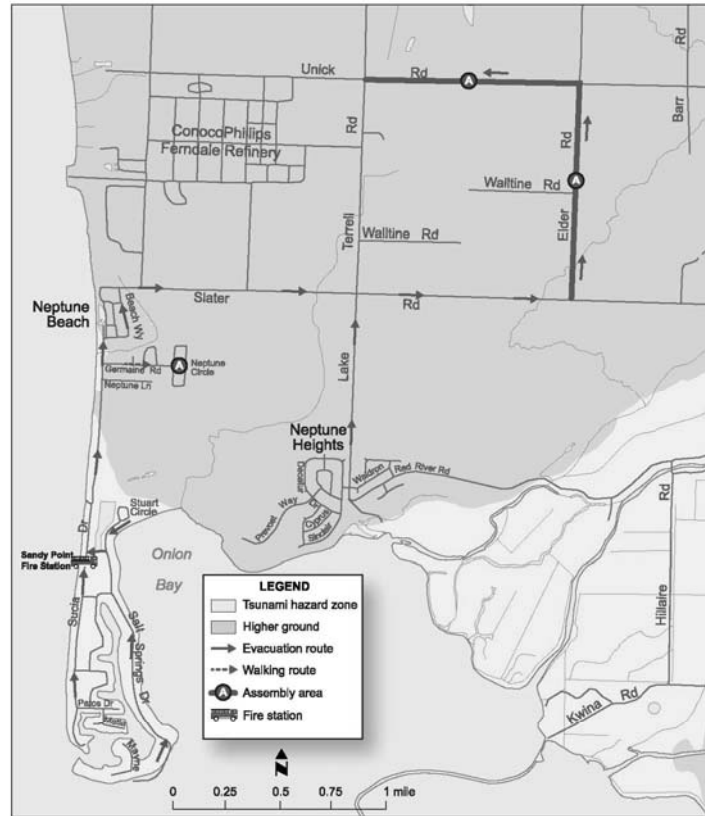
Whatcom County

Lummi Reservation



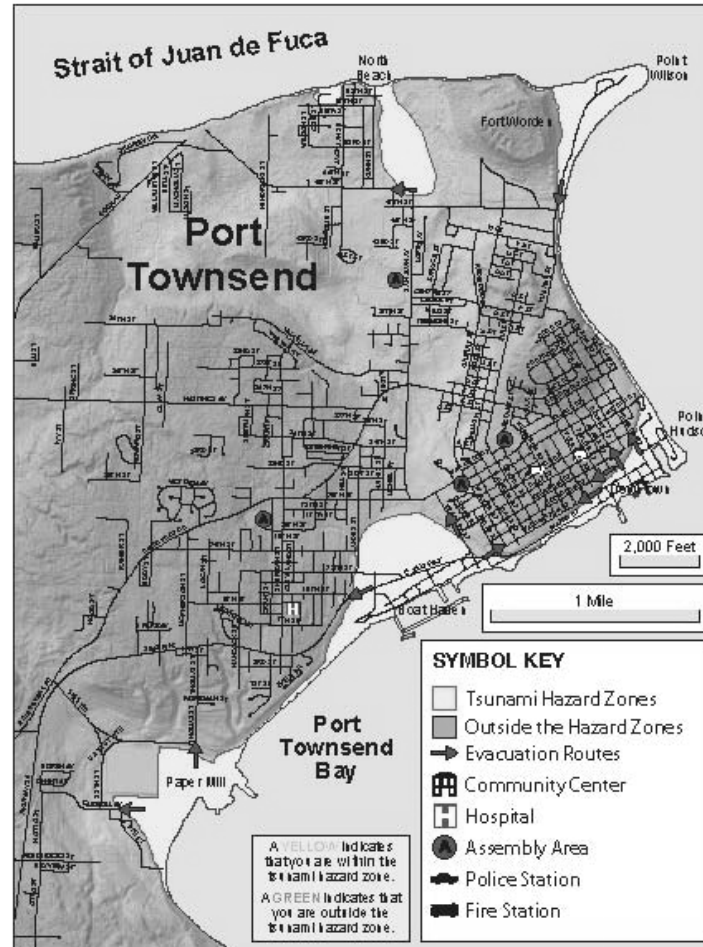
Whatcom County

Sandy Point



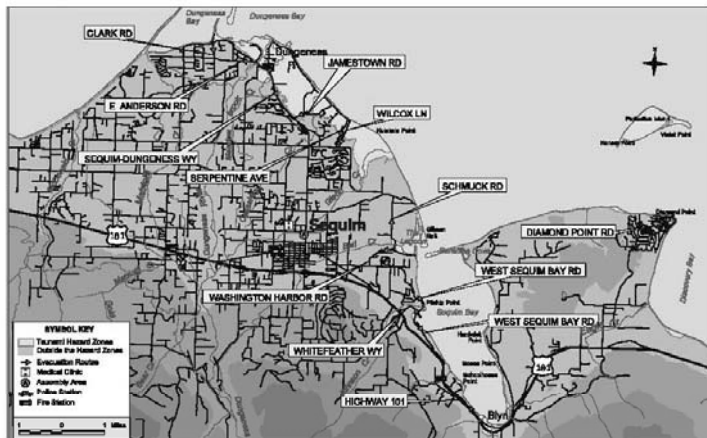
Jefferson County

Port Townsend



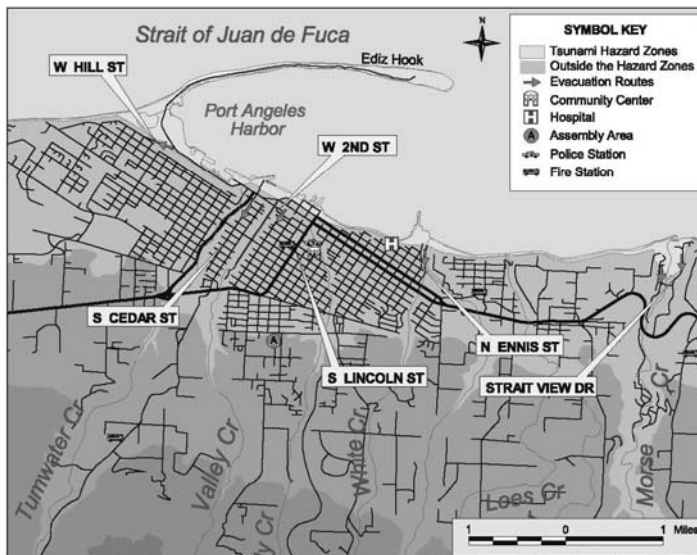
Clallam County

Sequim



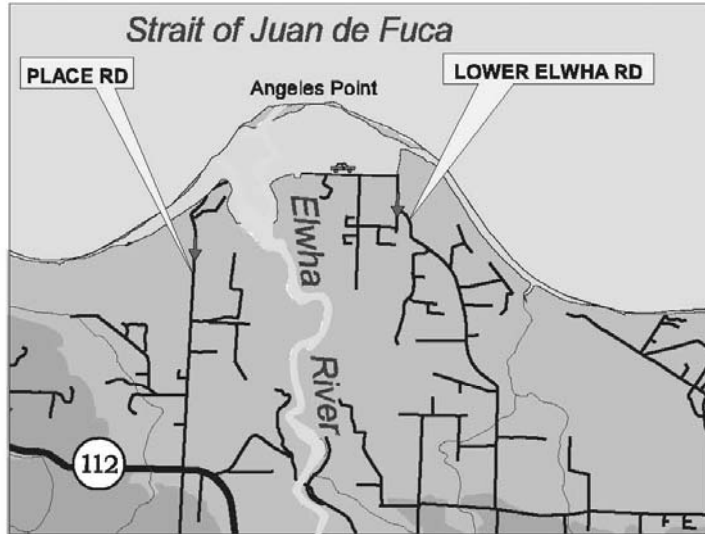
Clallam County

Port Angeles



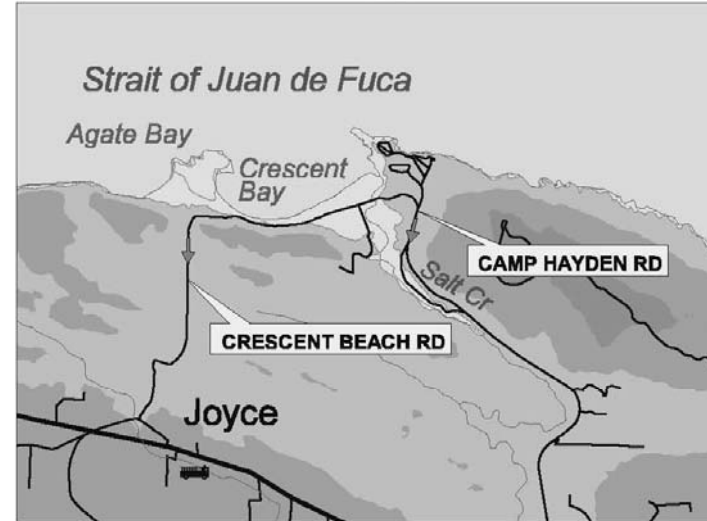
Clallam County

Angeles Point



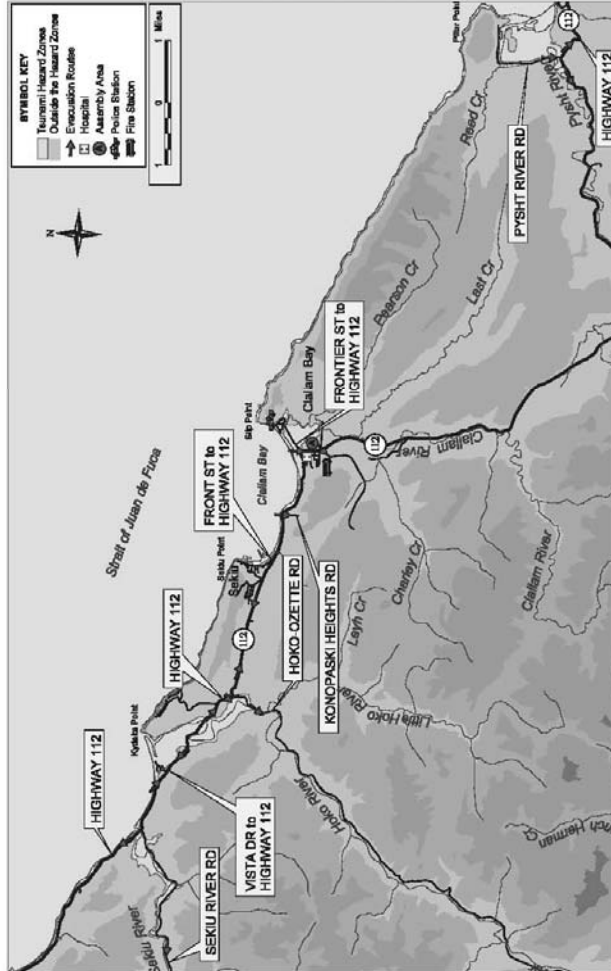
Clallam County

Agate Bay / Crescent Bay (Crescent Beach)



Clallam County

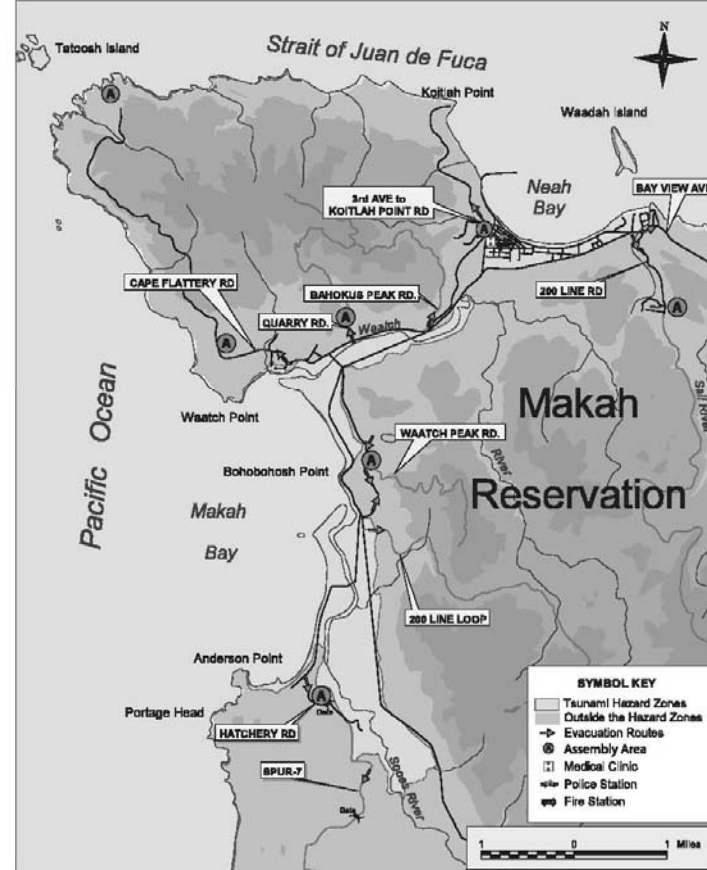
Clallam Bay / Kydaka Point



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Clallam County

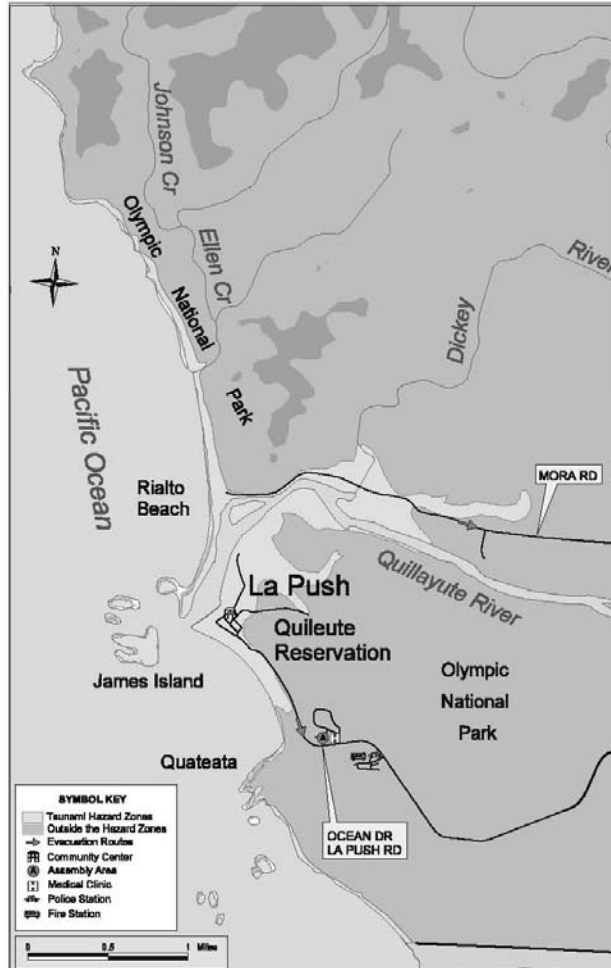
Neah Bay / Makah Bay



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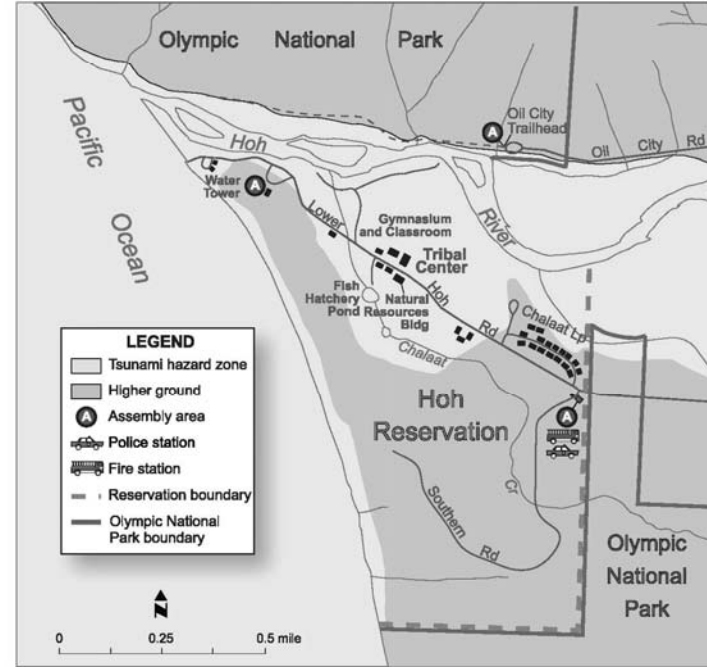
Clallam County

La Push



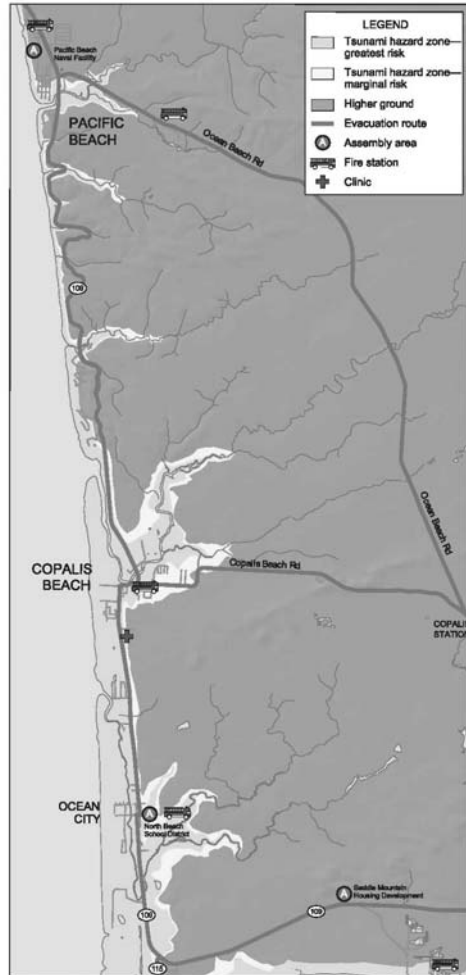
Clallam County

Hoh Reservation



Grays Harbor County

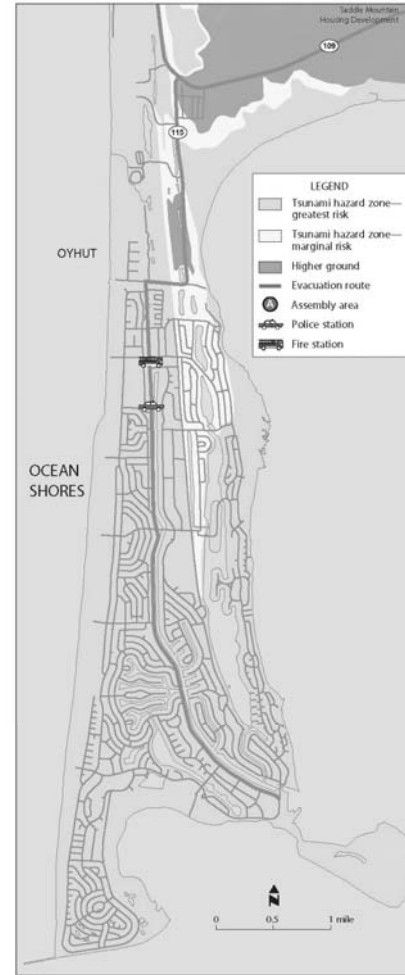
Copalis Beach / Ocean City



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Grays Harbor County

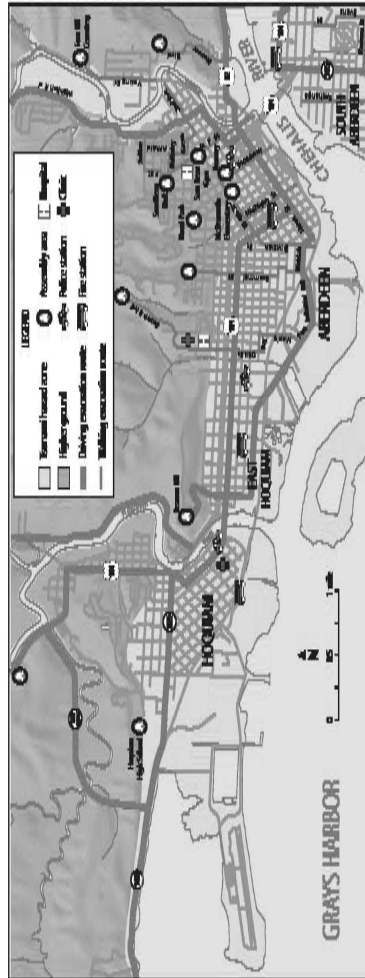
Oyuhut / Ocean Shores



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Grays Harbor County

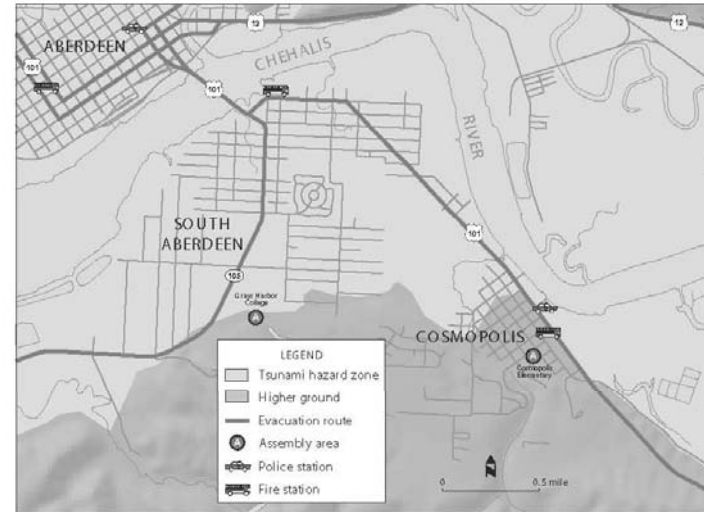
Hoquiam / Aberdeen



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Grays Harbor County

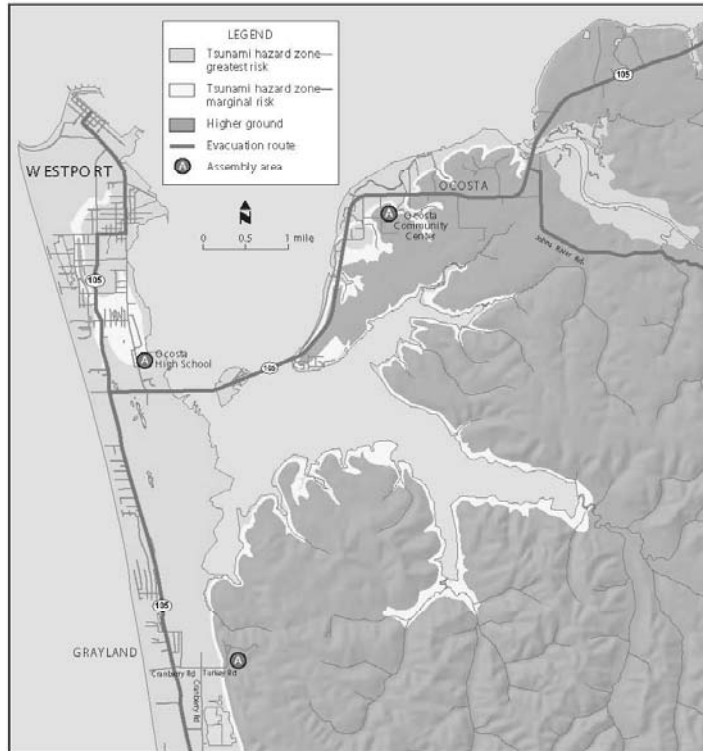
South Aberdeen / Cosmopolis



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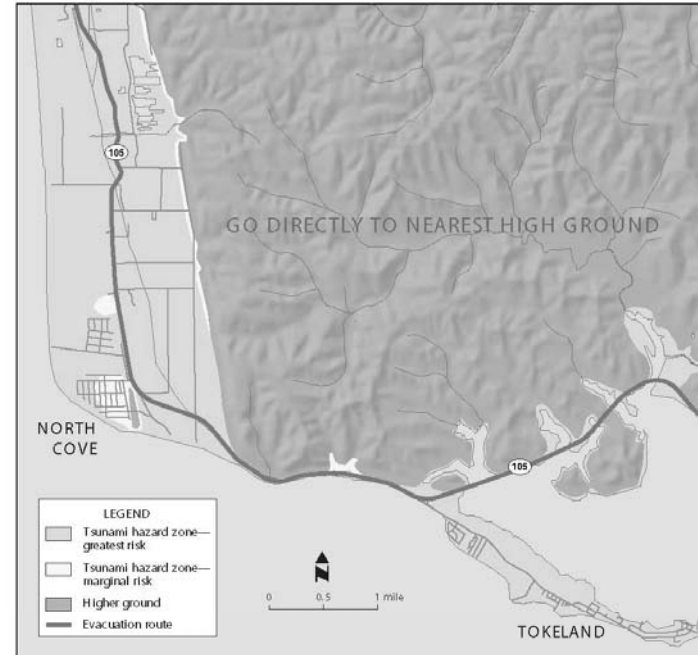
Grays Harbor County

Westport / Grayland



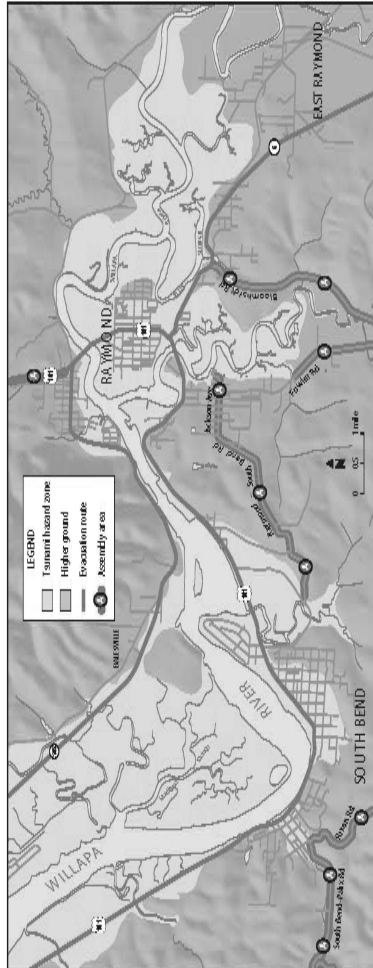
Pacific County

North Cove / Tokeland



Pacific County

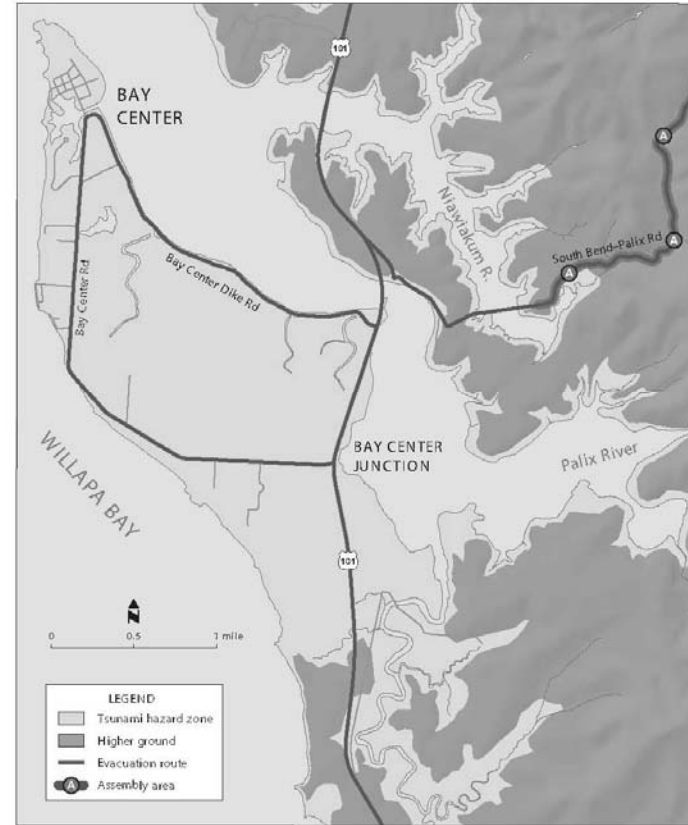
Raymond / South Bend



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Pacific County

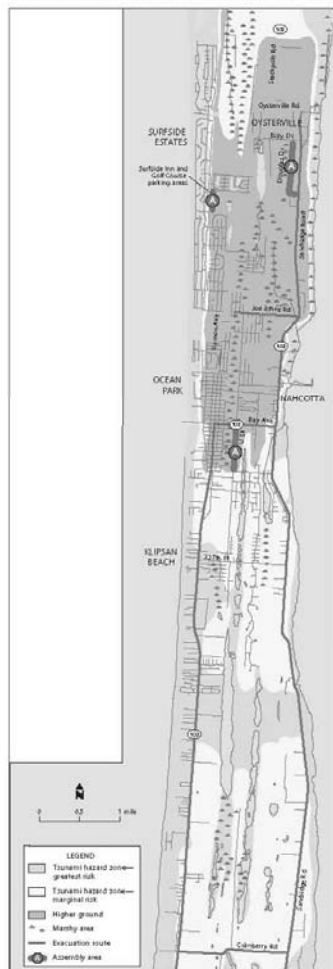
Bay Center



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Pacific County

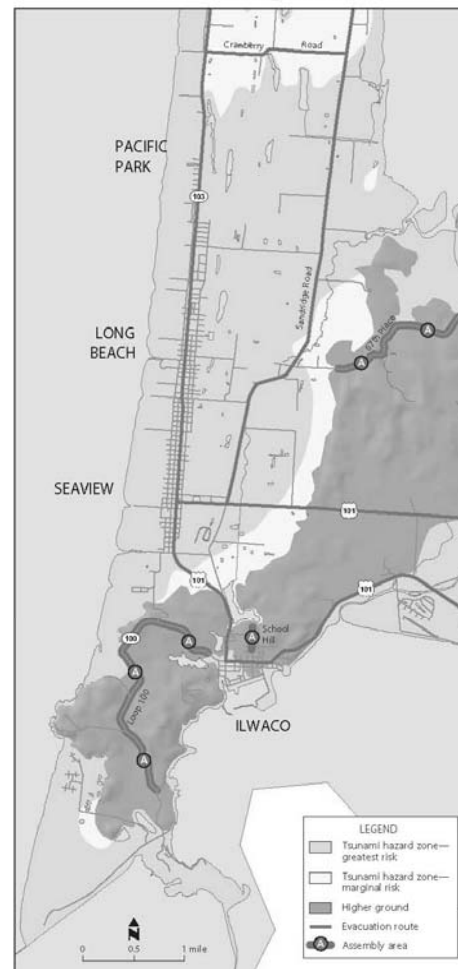
Surfside / Ocean Park / Klipsan Beach



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Pacific County

Pacific Park / Long Beach / Seaview / Ilwaco



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Tsunami Fact Sheet

What is a tsunami?

A tsunami is a series of waves typically generated by vertical displacement of the sea floor or lake bed caused by an earthquake. Tsunamis can cause significant death and destruction, with the greatest impact in areas closest to the source. The initial tsunami wave can arrive on shore within minutes of an earthquake, or up to several hours later, depending upon distance from the source.

Have we experienced a tsunami?

Yes. Tsunamis from locations across the Pacific Ocean basin and from the Cascadia Subduction Zone off the Washington coast have hit coastal communities. Tsunamis generated by sources such as an earthquake on the Seattle Fault or the eruption of Mount St. Helens struck Puget Sound and other inland waters. Tsunamis hit Washington's shorelines in the 900-930 era, 1700, the 1890's, 1944-1953 era, 1949, 1960, 1964, and 1980.

Will a tsunami strike again?

Yes. Great earthquakes in the Pacific Ocean basin generating tsunamis that could impact Washington's outer coast and Strait of Juan de Fuca occur at a rate of about six every 100 years. In the Cascadia Subduction Zone, there is a 10 to 14 percent chance of a magnitude 9 earthquake and tsunami in the next 50 years. A rate of occurrence for local earthquakes and

landslides that generate tsunamis has not been determined.

Who is at risk?

Communities along the Pacific Coast and Strait of Juan de Fuca, including a number of coastal Indian tribes, are at greatest risk. In a Cascadia Subduction Zone earthquake, the level of the coastal region could fall up to six feet, and tsunami waves could reach 30 feet, overtopping several low-lying coastal communities. At-risk population is more than 43,000 on the outer coast, excluding tourists and transient populations that could increase the number significantly.

Special note:

In its earthquake and tsunami potential, the Cascadia Subduction Zone resembles the Sunda Trench off the coast of Sumatra Island, Indonesia. The Sunda Trench produced giant earthquakes and tsunamis in December 2004 and March 2005 that killed more than 284,000 people and displaced another 1.1 million people in the Indian Ocean basin. Waves from the December 2004 tsunami reached 100 feet in places and traveled inland as far as five miles on Sumatra. The tsunami was so large it traveled around the world twice.

This information taken from draft update of Tsunami Hazard Profile, *Washington State Enhanced Hazard Mitigation Plan*, Washington Military Department, 2006.

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