Preface

This Local Planning Guidance on Distant Tsunami Response was developed by the Distant Tsunami Working Group in 2011-12. This effort brought together stakeholders from local, state, and federal agencies to better prepare Oregon for a distant tsunami event.

Acknowledgements

We wish to thank the many people who helped to develop this set of guidelines. A project like this could not happen without the work, guidance, and input from many people.

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Section 1 – Introduction

On average, Oregon receives about one distant tsunami warning, advisory, or watch per year. This *Guidance Document for Distant Tsunami Response* is intended to ensure that there is a standardized response in order to protect life and property. Response to a distant tsunami is significantly different than that of response to a local tsunami. Because tsunami are not very common, response personnel may not have experience in dealing with them. Public confidence in emergency management and first responders can be eroded by a conflicting and confused response. This can cause inappropriate actions by an under-informed population. In this document, local emergency management personnel and first responders will find a road map that can be adopted into current response structures. It was developed through the collaboration of many local, county, and state agencies.

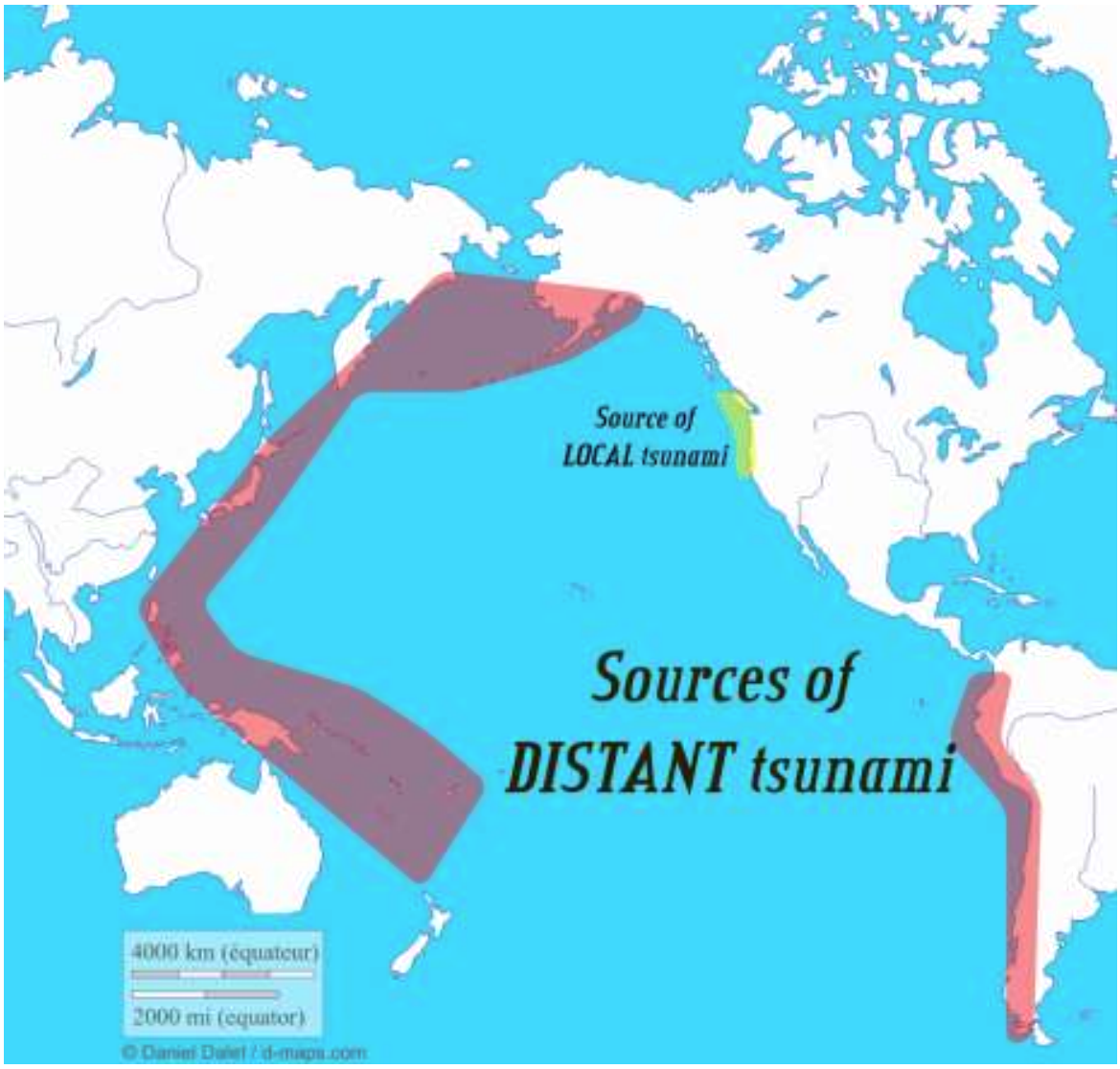
The first part of the *Guidance Document for Distant Tsunami Response* is an in-depth assessment of distant tsunami response in Oregon. The second part is a number of appendices that you should find useful.

- The Appendix One is a list of the juried Best Practices that should provide a core of distant tsunami response plans.
- Appendix Two is a decision matrix that should be able to provide a blueprint for local decision-making during and after a distant tsunami event.
- The remaining Appendices provide samples of tsunami bulletins, public services announcements and a variety of other useful tools.

Distant vs. Local Tsunami Response

Knowing when to do nothing is just as important as knowing what to do in the case of a distant tsunami event. It is important to understand the difference in both scale of event and response requirements for a local and a distant tsunami event.

- **Local Tsunami** - caused by an earthquake in the Cascadia Subduction Zone.
- **Distant Tsunami** - caused by an earthquake on a subduction zone elsewhere in the Pacific Ocean.



Why is it important to have a standardized distant tsunami response?

The local tsunami and originating earthquake will cause wide-spread damage in the region. However the distant tsunami's main impact is limited to the immediate coast and marine environment and is caused by how the public responds to the event. The purpose of this guidance document is to provide a starting point for local jurisdictions to develop a standardized response to distant events. This will enable the public to be educated on the proper response as the vast majority of Oregon's population will not be impacted by a distant tsunami.

The following table shows the differences in impact between a distant and local tsunami.

Differences between a local and a distant tsunami	
Local	**Distant**
Generated by a nearby subduction zone earthquake	Generated by a faraway subduction zone earthquake. Closest distant source is in the Gulf of Alaska.
Wave run-up can exceed 100 feet	Wave run-up can be up to ~30 feet
First surge arrival time in minutes after the earthquake	First surge arrival time in 4 or more hours after the earthquake
Widespread damage from both earthquake and tsunami	Damage limited to coastal areas in inundation zone
NOAA warning is ineffective; only effective warning is the earthquake	NOAA warning is effective, if implemented by media and local responders.
Entire population of Oregon impacted to some extent with great threat to life safety in and near the inundation zone; severe disruption of maritime operations	Impacted population generally limited to inundation zone and maritime community; long warning time greatly reduces threat to life safety.

Section 2 - Hazard Assessment

Oregon tsunami hazards come from both local and distant sources. This Guidance document will address response to a distant event. The impact of a distant tsunami is far less than that of a local tsunami generated by the Cascadia Subduction Zone.

SIDEBAR: A distant tsunami will only physically impact the coastal inundation zone. Public perception of the hazard can be distorted by the real-time images and video available through media outlets. Managing public expectation of impacts will be vital to your response planning.

Tsunamis are generated when geologic events cause large, rapid movements in the sea floor that displace the water column above. These destructive waves can be caused by coastal or submarine landslides or volcanism, but they are most commonly caused by large submarine earthquakes. The Oregon Coast is at risk both from locally- and distantly- generated tsunamis.

A tsunami:

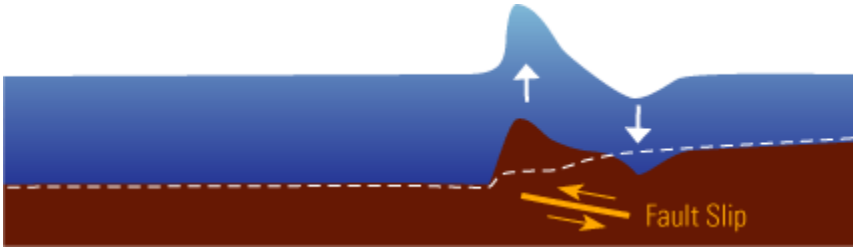
- Is a series of waves caused by a sudden, large displacement of water most often caused by earthquakes, but also by landslides; volcanic eruptions; and comet or meteorite impacts in the ocean
- Is like a fast rising flood tide, storm surge or an advancing wall of water and strikes with devastating force.
- May also be first manifested as a recession of water.
- Currents may pre sent a larger danger than the wave amplitude.
- Moves faster than you can run.
- The first wave is often not the largest or the most dangerous, and surges may arrive 10 hours or more after the initial wave.
- In the open ocean, tsunami waves have a long wavelength (distance from the crest of one wave to the crest of the succeeding wave) normally over 100 miles, and a very low amplitude (height from crest to trough). As these waves approach shallow water, their speed is decreased from a deep-water speed of over 600 miles per hour to less than 30 miles per hour. The wave energy is transferred from wave speed to wave height many times that of height in the open ocean.

Tsunamis are a unique hazard because the arrival time of a wave generated far out to sea can be predicted fairly accurately. The intensity of the wave when it reaches shore is more difficult to predict, particularly in real time during an event. Tsunamis are sometimes preceded by a trough or recession of ocean water that can attract people to the shore to examine what

appears to be a very low tide. These recessions can also cause problems for moored boats that are grounded when the water returns.

Tsunami Generation

Tsunamis are generated when geologic events cause large, rapid movements in the sea floor that displace the water column above. This swift change creates a series of high energy waves that radiate outward from the source. Locations nearest to the source, such as a large earthquake, will be impacted within minutes. Locations farther away may not see impacts for hours. All coasts can be impacted by tsunamis. Some areas are at a much greater risk than others due to the proximity to tsunami sources and sea floor configurations. Tsunami size varies from site to site depending on a location's bathymetry and topography.



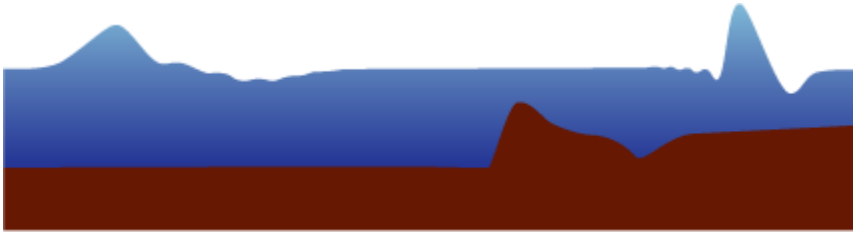
Panel 1—Initiation: Earthquakes are commonly associated with ground shaking that is a result of elastic waves traveling through the solid earth.

However, near the source of submarine earthquakes, the seafloor is "permanently" uplifted and down-dropped, pushing the entire water column up and down. The potential energy that results from pushing water above mean sea level is then transferred to horizontal propagation of the tsunami wave (kinetic energy). For the case shown above, the earthquake rupture occurred at the base of the continental slope in relatively deep water. Situations can also arise where the earthquake rupture occurs beneath the continental shelf in much shallower water.

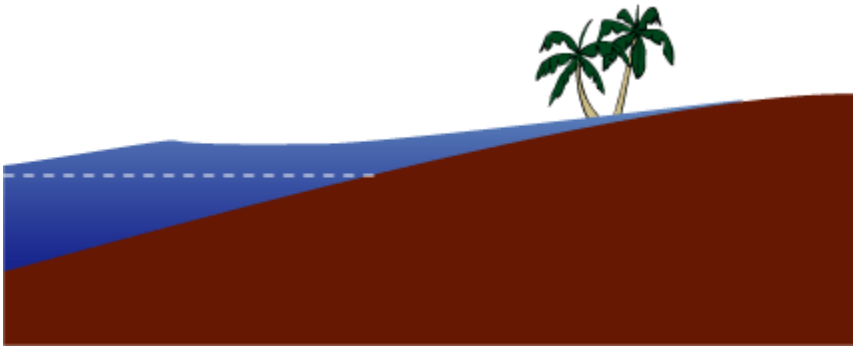
Note: In the figure, the waves are greatly exaggerated compared to water depth. In the open ocean, the waves are at most several meters high spread over many tens to hundreds of kilometers in length.

Panel 2—Split: Within a few minutes of the earthquake, the initial tsunami (Panel 1) is split into a tsunami that travels out to the deep ocean (distant tsunami) and another tsunami that travels

towards the nearby coast (local tsunami). The height above mean sea level of the two oppositely traveling tsunamis is approximately half that of the original tsunami (Panel 1). (This is somewhat modified in three dimensions, but the same idea holds.) The speed at which both tsunamis travel varies as the square root of the water depth. Therefore, the deep-ocean tsunami travels faster than the local tsunami near shore.



Panel 3—Amplification: Several things happen as the local tsunami travels over the continental slope. Most obvious is that the amplitude and current increases. In addition, the wavelength decreases. This results in steepening of the leading wave--an important control of wave run-up at the coast (next panel). Note that the first part of the wave reaching the local shore in the example above is a trough, which will appear as the sea receding far from shore. This is a common natural warning sign for tsunamis, but an initial surge of water is also possible for local tsunamis. Note also that the deep ocean tsunami has traveled much farther than the local tsunami because of the higher propagation speed. As the deep ocean tsunami approaches a distant shore, amplification and shortening of the wave will occur, just as with the local tsunami shown above. Destructive tsunami currents occur when the tsunami reaches near the shore or penetrates bays and estuaries.



Panel 4—Run-up: Tsunami run-up occurs when a peak in the tsunami wave travels from the near-shore region onto shore. Run-up is a measurement of the height of the water onshore observed above a reference sea level. (USGS)

Except for the largest tsunamis, such as the 2011 Japan and the 2004 Indian Ocean events, most tsunamis do not result in giant breaking waves (like normal surf waves at the beach that curl over as they approach shore). Rather, they come in much like very strong and fast-moving

tides (i.e., strong surges and rapid changes in sea level). Much of the damage inflicted by tsunamis is caused by strong currents and floating debris. The small number of tsunamis that do break often form vertical walls of turbulent water called bores. Tsunamis can travel much farther inland than normal waves.

After run-up, part of the tsunami energy is reflected back to the open ocean and scattered by sharp variations in the coastline. In addition, a tsunami can generate a particular type of coastal trapped wave called edge waves that travel back-and forth, parallel to shore, sometimes colliding with one another to produce large tsunamis hours after the earthquake. These effects result in many arrivals of the tsunami at a particular point on the coast rather than a single wave as suggested by Panel 3. Because of the complicated behavior of tsunami waves near the coast, the first run-up of a tsunami is often not the largest; emphasizing the importance of not returning to a beach many hours after the first tsunami wave arrives.

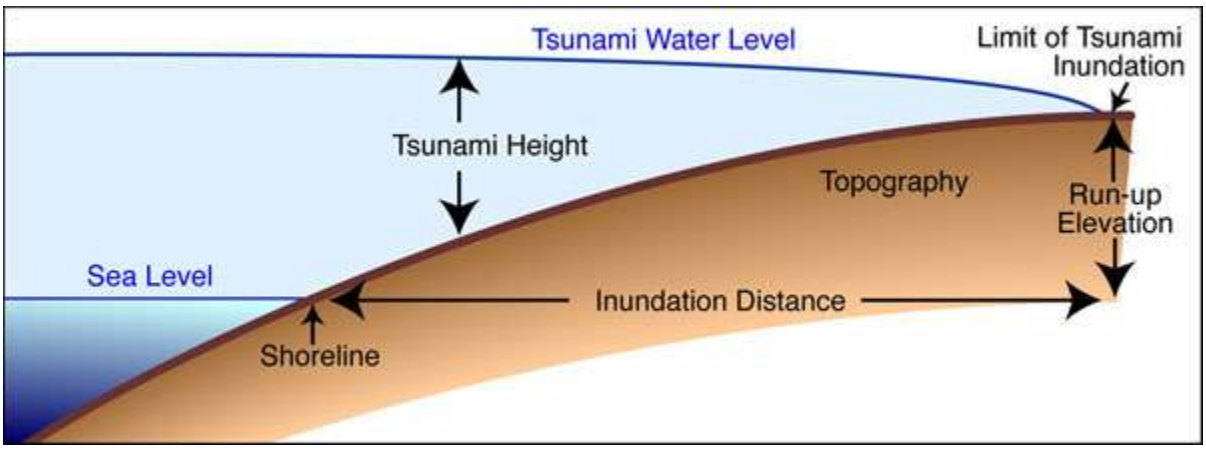


Figure 1. Illustration by Bruce Jaffe

Tsunami Detection and Observation

SIDEBAR: For a locally generated tsunami, the earthquake is your only warning. The Tsunami Warning System is designed to predict and advise on distant tsunami events only.

NOAA's Tsunami Warning Centers monitor the earth 24 hours a day, 365 days a year, through a tsunami detection system consisting of seismic, coastal sea-level, and Deep Ocean Assessment and Reporting of Tsunamis (DART) networks.

Seismic Networks –

Most damaging tsunamis are caused by earthquakes. Seismic data are collected at hundreds of seismic sensors, called seismometers, around the world. The scientists at the Tsunami Warning Centers use seismic data to determine the location and magnitude of earthquakes. The location and magnitude of an earthquake determine whether or not scientists will issue a tsunami warning, advisory, or watch.

Coastal Sea-Level Networks –

These networks consist of coastal sea-level gauges that measure the ocean height at specific coastal locations. When a tsunami arrives at a gauge, the water level will vary from its normal tide cycle. The scientists use data from these gauges to both detect a tsunami and estimate its impact at the coast.

DART Network –

DART stations sense water level changes in the deep ocean resulting from the formation and propagation of tsunamis. A DART station consists of a pressure sensor, located on the sea floor, and a data transmission buoy, located on the surface. As a tsunami passes, the depth of the water changes as does the pressure on the sensor. This pressure change is transmitted acoustically to the surface buoy and then via satellite to the Tsunami Warning Centers.

Tsunami Warning Centers –

Once an earthquake or tsunami is detected and the information is received at the Tsunami Warning Center, an earthquake and tsunami investigation begins:

- Locate and size the earthquake (automated);
- Analyze the earthquake or tsunami data;
- Analyze historical data for the same epicentral area and similar magnitudes;
- Analyze the sea-level data to verify the existence of a tsunami and to calibrate models;
- Send the appropriate warning, advisory, watch, or information messages. Typically more than a single message for a tsunami warning will be issued. It is a series of messages culminating in a cancellation, which itself can proceed slowly from breakpoint to breakpoint until final cancellation.

If the source of the earthquake is under or near the ocean, not too deep within the earth, and if the magnitude is sufficiently large, then a tsunami may have been generated. On the basis of this seismic evidence, the appropriate Tsunami Warning Center issues a tsunami warning, advisory, or watch to threatened areas near the epicenter. This is important for EMs because

there can be misunderstandings due to message streams from the two TWCs. The warning, advisory, or watch may be extended to areas located further from the epicenter if the magnitude of the earthquake is so large there is a possibility of a long-range destructive tsunami. All remaining areas will be notified that an event has occurred.

Tsunami bulletins are initially issued based solely on earthquake parameters – magnitude, location, and depth. Initial messages are issued as soon as this information has been determined.

After the initial message has been issued, the Tsunami Warning Center monitors the nearest tide gauges and DARTs to confirm the existence or nonexistence of a tsunami and its degree of severity, and issues supplementary information or cancels the initial message. Tsunami history, forecast models, and observed tsunami amplitudes are taken into account when determining the extent of danger for the area of responsibility.

The time it takes for a Center to issue an alert is dependent on the seismic network density and distribution around the epicenter. In regions of high seismic network density, Centers can provide alerts within 5 minutes. In areas of lower seismic network density, response time increases to 10-15 minutes. Initial, automated estimates of earthquake size are often smaller than the actual size, so they can be misleading in the short time frame for response to a local tsunami. Estimates both earthquake and tsunami size are constantly refined and become more and more accurate as the tsunami travels across the ocean.

If a potentially destructive, long-range tsunami is detected, the Tsunami Warning Center will issue an ocean-wide tsunami warning to advise designated national authorities. Such a warning alerts all warning system participants to the approach of a potentially destructive tsunami and provides estimated tsunami arrival times for key locations. Tsunami forecasts or estimated wave heights may be included if there is enough data and the model results are judged by Tsunami Warning Center staff to be reasonable.

Typically, during a tsunami, bulletins containing updated information are issued at least hourly, until the tsunami has crossed the entire ocean or additional data is received to indicate there is no further threat. Tsunami warnings are canceled when the Tsunami Warning Center judges that the tsunami is no longer dangerous. However, even when the warning is canceled, that does not mean it is safe for the public to return to any evacuated coastline areas. Due to structural damage, debris, and other safety concerns, the “cautionary re-entry” may not be issued by the local authorities for hours or even days after the event. In the case of the Tohoku event, there were distinct and dangerous wave packet arrivals many hours later. Probably due to reflections from distant coastlines (although not yet fully explained for this event!)

When an earthquake that might generate a tsunami for the U.S. coast is detected, the West Coast/Alaska Tsunami Warning Center and Pacific Tsunami Warning Center calculate the danger for coastal locations within their respective areas of responsibility.

Areas of Responsibility

The West Coast/Alaska Tsunami Warning Center in Palmer, Alaska is responsible for providing tsunami warnings, advisories, watches, and information statements for Alaska, the U.S. West, East, and Gulf of Mexico coasts, Puerto Rico, the U.S. Virgin Islands, and Canada.

The Pacific Tsunami Warning Center in Ewa Beach, Hawaii is responsible for providing tsunami warnings, advisories, watches, and information statements for Hawaii, U.S. Pacific Territories, Pacific Ocean, Indian Ocean, and Caribbean Sea nations.

Figure 2. Areas of Responsibility for Tsunami Warning Centers

Levels of Tsunami Alert

Tsunami Product		
Information Statement	Minor waves at most or event in another ocean basin	No action suggested
Watch	Danger level not yet known	Stay alert for more info
Advisory	Strong currents likely	Stay away from the shore
Warning	Inundating wave possible	Full evacuation suggested

Warning: (WEAK51/TSUAK1): When earthquakes occur within the WC/ATWC's area of responsibility (AOR), Tsunami Warnings are issued under the following circumstances:

- If the initial magnitudes are greater than 7.0, but less than or equal to 7.5, WC/ATWC issues a tsunami warning if the tsunami is within two-hour's wave travel time from the coast. Warnings or Advisories called between breakpoints at or just beyond 250 km from epicenter for the Pacific AOR. No watch.
- If the initial magnitudes greater than 7.5, WC/ATWC issues a tsunami warning if the tsunami is within three-hour's wave travel time from the coast. Warnings are updated half-hourly until cancellation or until a Final Supplemental Bulletin is issued.
- For Mw 7.6 - 7.8, warning called between BPs within 500 km and advisory between BPs at 500 to 1000 km from epicenter. No Watch.
- A tsunami warning is issued 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 the arrival of the initial wave. Appropriate actions to be taken by local officials may include the evacuation of low-lying areas. People in the warned areas need to move to higher ground or inland and stay in a safe area until local officials give the ‘cautionary re-entry.” A “Warning” is the most urgent announcement of an imminent tsunami and advises coastal locations in the warned area to prepare for flooding.

Advisory: (TIBWCA, WEPA43):

When earthquakes occur with initial magnitudes greater than 7.5, and the epicenter is more than six-hour's travel time away from any part of the WC/ATWC's AOR, the WC/ATWC will issue a Tsunami Advisory Bulletin. The intent of the Advisory Bulletin is to inform participants within the WC/ATWC AOR that a significant earthquake has occurred, but there is not a threat of a tsunami for the west coast of the United States. The Tsunami Advisory states the Pacific Tsunami Warning Center (PTWC) at Honolulu has issued a tsunami warning for parts of the Pacific Ocean, however, the warning is not for the Pacific coast, from Alaska to southern California.

A Tsunami Advisory can be updated by the WC/ATWC hourly until:

- A Tsunami Warning or Watch becomes necessary within the WC/ATWC AOR,
- All Tsunami Warnings and Watches issued by PTWC are cancelled, or
- A Final Supplemental Bulletin is issued.

A Tsunami Advisory can be issued when the earthquake's magnitude is greater than 7.5 and the tsunami is within six-hour's travel time to the WC/ATWC AOR, but there is no danger of the tsunami causing damage within the WC/ATWC area of responsibility.

A tsunami advisory is issued due to the threat of a potential tsunami that may produce strong currents or waves dangerous to those in or near the water. The threat may continue for several hours after the arrival of the initial wave, but significant widespread inundation is not expected for areas under the advisory. Appropriate actions to be taken by local officials may include the closing of beaches and the evacuation of harbors and marinas. People in the advisory area should heed local official's instructions to leave affected areas until given the "cautionary re-entry".

Watch: (TSUWCA, WEPA41):

When earthquakes occur within WC/ATWC's AOR, Tsunami Watches are issued under the following circumstances:

- If the initial magnitudes are greater than 7.0 but less than or equal to 7.5, WC/ATWC issues a tsunami watch if the tsunami is between two-hour's and three hour's wave travel time from the coast.
- If the initial magnitudes are greater than 7.5, WC/ATWC issues a tsunami watch if the tsunami is between three-hour's and six-hour's wave travel time from the coast. Tsunami Watches may be included in a Tsunami Warning bulletin. Watches are updated half-hourly until cancellation or until a Final Supplemental Bulletin is issued.

- A tsunami watch is issued when a potentially dangerous, distant seismic event has occurred which may later impact the watch area with a tsunami. Be ready to take action if a tsunami warning or advisory is later issued. A "Watch" is an alert issued to areas outside the areas issued a Warning and is essentially a notification to monitor the situation.

Information Statement: (WEAK53/TIBAK1):

When earthquakes occur within the WC/ATWC AOR, and the initial magnitudes are from 6.5 to 7.0, WC/ATWC will issue a Tsunami Information Bulletin. The bulletin will state that a sizable earthquake has occurred, but a tsunami was not generated. The WC/ATWC will also issue a Tsunami information bulletin for earthquakes occurring outside its AOR with initially determined magnitudes of 6.5 to 7.5.

WEPA43: This is the so-called "high level TIS". There is also the SEUS71 product, which is for lower magnitudes (Ml 4 to M 6.4) that are considered to be non-tsunamigenic.

A tsunami information statement is issued when an earthquake has occurred or a tsunami warning, advisory, or watch has been issued for another part of the ocean. In most cases, tsunami information statements are issued to indicate there is not threat of a destructive tsunami for the area. "Information Bulletins or Messages" are issued when the earthquake is less than 6.5 in Magnitude and not likely to trigger a tsunami that would result in significant impacts.

How Tsunami impacts are forecast

Tsunami Warning Centers utilize Tsunami Forecast Models to provide wave height, arrival time, and inundation forecasts for coastal areas potentially impacted by the tsunami. These models utilize the seismic and sea-level data provided by detection networks to forecast impacts at specific locations throughout the ocean basin.

These forecasts help scientists at the Tsunami Warning Centers determine the level of alert (warning, advisory, information statement, or watch) to issue for specific areas of the coast. The forecasts assist local emergency management to determine whether or not to issue evacuation orders during an event.

This determination is critical as emergency managers not only want to ensure that communities who will experience destruction during a tsunami are evacuated, but also to ensure that communities that are not threatened during a tsunami event do not have to undergo needless evacuation.

Who is at Risk?

All U.S. coasts can be impacted by tsunamis, though based on proximity to tsunami sources and sea floor configurations, some areas are at much greater risk than others. Within the last 150

years, destructive and deadly tsunamis have struck Hawaii, Alaska, California, Oregon, Washington, American Samoa, Puerto Rico, and the U.S. Virgin Islands.

World-wide, tsunamis have been recorded over 100 feet high in coastal zones near the source earthquake; however history of the Oregon coast has recorded few significant damaging incidents from distant events. The most damaging distant tsunami observed so far was from the magnitude 9.2 Prince William Sound Earthquake in 1964. Runup at the open coast reached up to ~20 feet and 10-15 feet in estuaries and bays. Other distant tsunamis have been documented as causing lesser damage to docks, boats and near shore structures. Again, it needs to be stressed that a local tsunami is a far more damaging, and deadly, event, up to 5 times larger than the largest distant tsunamis.

Damage from a tsunami could range from minor to major property loss and death. Damage to roadways, communication systems, public services and infrastructure, along with emergency response and medical service can be expected.

Consequential damage could include electrical equipment such as well pumps near coastal areas being flooded, in turn resulting in a shock hazard:, streams, river crossings and bridges may be washed out:, sewage systems could be flooded resulting in possible overflow conditions and a disruption of normal water supplies to the public.

Potential damage from a significant tsunami is not confined to the immediate shoreline. Tsunamis have traveled up to two miles upstream from the shoreline with resulting life loss, injury and damage. Low lying areas along streams and rivers that empty into the ocean or bays are at risk of high water surge and inundation.

The areas most at risk from tsunami impact are those coastal communities, recreation and developed areas below 50 to 100 feet above mean sea level. Areas not protected by bluffs, wide beaches, dunes, large manmade structures, distance or other barriers to the tsunami surge and rising water levels are most at risk.

No detailed study of distant tsunami vulnerability is available, but vulnerability to a tsunami averaging ~25-35 feet at the open coast (similar to a worst-case distant tsunami) is 90,772 in Oregon (unpublished USGS estimate in 2012 by Nathan Wood based on update of USGS Scientific Investigations Report 2007-5283 with census data from 2000). This figure includes 53,714 average daily State park visitors.

Section 3 – Planning Basis

Guidance

Guidance applied in the development of this plan is based on a variety of experiences and emergency management concepts. These include the County Emergency Operations Plan (EOP) and Emergency Response Plans, state guidelines for the development of emergency plans, and the Federal Emergency Management Agency's (FEMA) Guide for the Development of State and Local Emergency Operations Plans. This plan is consistent and compatible with the plans of other jurisdictions within the County Operational Area, State Emergency Plan, Standardized Emergency Management System (SEMS) and the National Incident Management System (NIMS).

Centralized Coordination

This plan is based on centralized coordination of emergency operations. Local control of response components in effect within the Operational Area (OA) should be maintained through a centralized system, even as the response effort escalates to a multi-jurisdictional level. Centralized control will be coordinated from the County Emergency Operations Center (EOC) and/or related County Department Operations Centers, coordinating with jurisdictions and agencies throughout the OA. To assist with centralized coordination, the County EOC is equipped for staffing by private and quasi-private entities in addition to appropriate public agency staff.

This plan does not provide specific response actions for field response. Agencies and jurisdictions that may have a role in the event of a tsunami should develop standard operating procedures for their roles and responsibilities.

Communications

Emergency Public Information

There will be a need for a multifaceted approach to public information that may include emergency information for the public and information for emergency workers. The public will need and want information about the extent of the emergency and the need for evacuation, as well as instructions on proper survival and/or response actions. The local media will perform an essential role in providing emergency instructions and status information to the public.

During the 2011 Tohoku earthquake and tsunami, the media repeatedly showed video of the extremely high inundating waves. In Japan, the tsunami was a local event. The media did not adequately relay the information that the distant tsunami waves would not be as large when they reached the Oregon coast line. This caused the public to respond incorrectly and to evacuate when it was not necessary. This also caused problems when the public thought that the tsunami initial arrival time would be more dramatic and then discounted advice to remain off of the beaches for 24 hours.

The goal of this plan, in conjunction with the overall County Emergency Operations Plan, and EOC SOPs, is to provide a system of rapid dissemination of accurate instructions and information to the public, primarily through the use of the local Emergency Alert System (EAS). The establishment of a Media Center near the Emergency Operations Center (EOC) would facilitate management of the emergency public information system, and may be established if needed.

It should be noted that in a sudden local tsunami, there will not be sufficient time to activate the EAS prior to areas being impacted with fast moving water. The earthquake is your only warning for a local tsunami.

There are initial, pre-scripted EAS messages located in attachments to this plan that could be broadcast, if needed. Follow up EAS and emergency Public Information Office (PIO) functions would be established using standard County EOC response procedures that are contained in documents separate from this plan.

Section 4 - Emergency Management

While earthquakes give no warning, in the case of a distant tsunami, you will have time to activate your normal emergency management procedures.

National Incident Management System (NIMS)

On February 28, 2003, President Bush issued Homeland Security Presidential Directive 5 (HSPD 5). HSPD 5 directed the Secretary of Homeland Security to develop and administer a National Incident Management System (NIMS). NIMS provides for a consistent nationwide template to enable all government, private sector, and nongovernmental organizations to work together during domestic incidents.

NIMS provides for a comprehensive, national approach to incident management that is applicable at all jurisdictional levels and across functional disciplines. The intent of NIMS is to:

- Be applicable across a full spectrum of potential incidents and hazard scenarios, regardless of size or complexity;
- Improve coordination and cooperation between public and private entities in a variety of incident management activities;
- HSPD-5 requires Federal departments and agencies to make the adoption of NIMS by state and local organizations a condition for Federal preparedness assistance (grants, contracts, and other activities).

NIMS standard incident management structures are based on three key organizational systems:

1. The Incident Command System (ICS) defines the operating characteristics, management components, and structure of incident management organizations throughout the life cycle of an incident;
2. The Multiagency Coordination System, which defines the operating characteristics, management components, and organizational structure of supporting entities;
3. The Public Information System, which includes the processes, procedures, and systems for communicating timely and accurate information to the public during emergency situations.

Standardized Emergency Management System (SEMS)

The Standardized Emergency Management System (SEMS) is a state-wide system police officers, firefighters and other disaster responders use in disaster events. The primary goal of SEMS is to aid in communication and response by providing a common management system and language.

Primary Components of SEMS

There are five primary components that make up SEMS and are used as part of the emergency management structure for responding to problems related to a tsunami. They are:

1. The Incident Command System (ICS), which is a specific emergency management system used primarily at the field level;

2. Interagency Coordination (IAC), which includes communicating and coordinating with various agencies and jurisdictions during an emergency, primarily at the EOC level;

3. The Master Mutual Aid Agreement, which is the master agreement and authority that allow jurisdictions to provide each other with mutual assistance during emergencies;

4. Operational Areas (OA), which consist of all local jurisdictions within a county geographical area working together for emergency management and disaster response issues;

5. Operational Area Satellite Information System (OASIS) which includes a satellite communications system in the County EOC and is also a resource ordering system for ordering and coordinating resource response between the OA and the State.

ICS Training

Agencies that have institutionalized ICS into their training programs and operational response procedures demonstrate a high degree of effectiveness in their response operations and their capability to communicate / interoperate with other agencies similarly trained.

The Incident Command System (ICS) is a standardized, organizational structure proven to be effective in emergency response and disaster management. ICS prevents communication problems by providing a common language and operating picture for all personnel - regardless of jurisdiction or discipline - involved in emergency response.

Exercises

Well prepared agencies exercise on some regular, periodic basis both internally and externally with other disciplines. This provides an opportunity to build relationships and test assumptions about interoperating with other agencies, particularly with regard to roles, responsibilities, and available resources.

Community Preparedness

Prepared communities respond appropriately to the threat. For distant events, community members need to understand that there is a lot of time for people to assess whether they need to go anywhere—most don't.

Local News Media

Establishing a relationship with local media through regular guest appearances and interviews during non-emergency times helps build trust and cooperation when a joint effort is needed to keep the public informed of the developing situation.

Additionally radio stations and other media should be reminded on a regular basis that pre-recorded Public Service Announcements and a Tsunami Media Guidebook published by Oregon Emergency Management are available and can be used to facilitate communications during the next event. Developing a press release for immediate distribution to media outlets allows you to frame the essential messages the way you want to frame them. Reporters often don't write it the way you meant it. A press release for the basics ensures quick delivery of an accurate message. Key message is to educate folks that most people don't need to go anywhere!

Public Education & Outreach

Well-planned and conducted tsunami education and outreach events help individuals and organizations understand the reaches of the inundation zone, what to do when a tsunami warning is issued and where to go.

Agencies with effective public education and outreach programs understand the different audiences in their community; actively schedule, promote and conduct outreach events and maintain a presence in the media with their message. An informed public contributes to an orderly evacuation and self manages better than those unaware of the tsunami risk in their community.

Long term developmental engagement with key stakeholders is going to be very effective in the long term, e.g. hospitals, schools, businesses, public works, etc. Bringing these key stakeholder groups into any education and outreach program will greatly enhance your efforts. Outreach to these groups will be far more targeted in their role in response and recovery after a distant tsunami.

Section 5 - Concept of Operations

Decision making process

For more information, please see Appendix # 2, the Decision Tree.

The recommendations in this Guidebook can be activated by the appropriate first responder agency and/or county emergency management upon receipt of notification of a tsunami warning, advisory, or watch with the potential of an actual tsunami impacting the Oregon coastline. These recommendations may also be used as guidance for potential or actual seiches in local bays, estuaries, lakes, dams, or other confined bodies of water.

In the event of a Tsunami Advisory or Warning involving a potential significant impact, a pre-designated core group of decision makers (e.g., police chief, fire chief, etc.,) can convene to discuss the impacts of the surge arrival time, the expected duration of the surge, tidal times, and any other pertinent information indicating potential impacts. An appropriately equipped meeting place should be identified and communicated ahead of time. Depending on the initial assessment, others may be called into assist.

The decision makers should use the most appropriate method to convene in an expedited fashion, which could be a meeting in person, by telephone, by internet meeting (i.e. “go to meeting”) or other means of communication which would allow for full participation and information exchange among the parties

If a severe earthquake (over 7.0 Mw) has occurred on a distant subduction zone and a Tsunami Warning has been received, activation of the community’s emergency notification system (reverse 911 / robo-caller) may be authorized along with activation of alternate means to warn the public to evacuate the inundation zones.

The local Emergency Operations Center can be automatically activated and contact with other EOCs and the state Warning Point should be established as early as practicable. Early discussions should include, but not be limited to, step-down and deactivation criteria and procedures.

Notification & Verification

Public Officials

National Warning System (NAWAS)

The NAWAS is a dedicated nationwide continuous private line telephone system established for dissemination of emergency information and instructions about natural and technological emergencies including attack and fallout warnings.

NAWAS is a notification system designed to alert local governments about an impending emergency or disaster.

The Oregon State Warning System relies primarily on that portion of the NAWAS that lies within the state. NAWAS terminal or "drops" have been provided at designated Warning Points to provide state and local governments with the capability to receive warning information and instructions.

The National Weather Service (NWS) offices will likely use the National Warning System (NAWAS) to issue a tsunami watch or warning. A Tsunami Watch is issued when an earthquake has occurred of sufficient magnitude and in such a location that a tsunami may be generated. A Tsunami Warning is issued based on positive evidence that a tsunami exists.

The Oregon State Warning Point receives and disseminates information over NAWAS to counties. The Primary State Warning Point is located within the Oregon Emergency Response System (OERS) function in Salem.

NAWAS broadcasts are typically accompanied by a Law Enforcement Data System (LEDS) teletype and, if necessary, a telephone call to specific individuals.

County Warning Points

All Oregon coastal counties (Clatsop, Tillamook, Lincoln, Lane, Douglas, Coos and Curry) are considered County Warning Points and each has a NAWAS drop located in a Public Service Answering Point (a public safety 911 or dispatch center). When a NAWAS emergency broadcast message is received the County and local emergency managers are to be notified immediately.

Upon receipt of a NAWAS message, County and local emergency managers are to disseminate the information to their own public officials according to agency policy.

Emergency Alert System (EAS)

The Emergency Alert System (EAS) is a national warning system jointly coordinated by FEMA, the Federal Communications Commission (FCC), and the National Weather Service (NWS) and media outlets. The EAS is a system designed to notify the general public of an impending emergency or disaster.

The EAS broadcasts over AM, FM and Land Mobile Radio Service, as well as VHF, UHF and cable television including low-power stations. Digital television and cable providers, along with Sirius XM satellite radio, IBOC, DAB and digital radio broadcasters as well as DirecTV, Dish Network and all other DBS providers are also required to participate.

EAS does not utilize the telephone system for broadcasting messages.

Some Oregon counties have the necessary equipment to launch a local EAS message. The local EAS operates through cooperation of the county's public safety communications center, local public safety agencies, local radio and TV broadcasters and cable operators.

As an example, the Lane County Sheriff's Office Communications Center is the hub for the Lane County Operational Area. All five of the public safety communication centers in Lane County have a special phone dedicated to EAS to connect to the Lane County Sheriff's Office Communications Center so that an authorized official can record and broadcast an EAS message if necessary.

The EAS system is tested monthly by all participating agencies. In the event of an emergency, authorized officials of city and county agencies may activate the EAS on a 24-hour basis to notify or warn the public of impending hazardous events such as a tsunami warning.

Oftentimes EAS activations are generated by higher levels of government such as the National Weather Service (NWS). When a higher level of government activates the EAS it is usually accompanied by a Law Enforcement Data Systems (LEDS) teletype message that goes out to all public safety communication centers.

Immediate notification that an alert has been issued will depend upon whether LEDS messages are being received into the local communications centers and whether staff are diligent in reviewing the messages.

Regardless of the source of EAS activation (County, State or Federal government) further dissemination of the alert within a jurisdiction (i.e., notification of police, fire, public works, etc.) must be facilitated by local staff according to agency policy.

Notification Lists and Protocols

The ongoing maintenance of notification lists and protocols is crucial to an expedient notification process. Agencies that have someone assigned to the regular, periodic review of emergency notification lists and protocols have more successful notifications than agencies with outdated information.

Agencies who neglect this important task invariably encounter problems during the notification process and miss notifying key personnel.

Government Emergency Telephone System (GETS)

The Government Emergency Telephone System (GETS) provides subscribers with a calling card for emergency access and priority processing in the local and long distance segments of the Public Switched Telephone Network. It is intended to be used in an emergency or crisis situation when the probability of completing a call over normal or other alternate telecommunication means has significantly decreased (e.g., all lines are busy / jammed).

GETS uses local networks provided by Local Exchange Carriers (LECs) and wireless providers, such as cellular carriers and personal communications services (PCS), as well as the major long-distance networks provided by Interexchange Carriers (IXCs) such as, AT&T, Verizon Business and Sprint, including their international services.

Agencies can obtain any number of calling cards for distribution to key personnel. A GETS Card provides instructions on how to make a GETS call and provides a special code for accessing the system. It is carried with you like a credit card.

Additional GETS information is available online at: http://gets.ncs.gov/. You may also call them directly at 1-800-818-GETS (4387) for assistance.

Rapid Notification Systems

In addition to first responders, most agencies have a long list of key personnel such as department directors, elected officials, and volunteers who need to be alerted about an impending emergency or disaster. There are several web-based commercial products on the market that are easy-to-use for mass notification via telephone, fax, email, and SMS text messaging. Using one of these systems significantly improves early notification rates and drastically reduces the amount time that would otherwise be required from manual calling methods.

Additional Notification Tools

Early notification is advantageous in emergency response because it allows more time to notify and mobilize key staff for ensuring a safe and effective operation. Public officials with several means of personal notification are assured maximum advance notice and respond more quickly than those who have limited means for personal notification.

Public Warning

Having several different warning and notification systems in place within a community is the surest way to achieve maximum notification to the public. In most cases, warning systems activated in a real event will have some level of malfunction or failure despite rigorous pre-event testing.

Depending on the level of the incident and the potential danger to the public, immediate notification of people in the affected area may be needed. This may be accomplished by methods such as using coastal warning sirens, emergency vehicle public address systems, door-to-door contacts and, if necessary, by activating the Emergency Alert System (EAS). The Watch Commander or County Office of Emergency Services staff accesses the coastal warning sirens and the EAS stations through the EOC.

If the EAS and/or tone alert system is to be activated, the incident PIO should prepare accurate, clear and timely Emergency Alert System/tone alert messages and provide them to the County

EOC for broadcast. All messages must be approved by the ESD unless public safety and/or emergency worker safety dictate otherwise. To avoid confusion and conflicting information, all public warning information for all participating agencies should be coordinated and disseminated through one primary Information Officer.

NOAA Weather Radios

A NOAA radio can be programmed to automatically turn on when a warning is issued. This feature is particularly useful at times when a cell phone is silenced, turned off, or disabled from a dead battery. It can also be a faster notification than a telephone call from the agency's dispatch or communications center.

It is highly recommended that all schools, hospitals, public venues and lodging facilities have NOAA radios.

Earthquake Notification Service (ENS)

The USGS' Earthquake Notification Service (ENS) is a free service that can send text notifications to your cell phone. Registering for this service can be an expedient form of alert in the absence of other notification systems.

Short format messages are abbreviated (messages are less than 90 characters in length). Due to the message length limitations, only the message type, earthquake parameter information, and a very concise evaluation will be provided.

You will need to contact your cell phone provider to determine the proper email address to forward these short messages to your cell phone.

To register go to: https://sslearthquake.usgs.gov/ens

E-mail Alerts

The National Weather Service offers an email service to an audience limited to Emergency Managers and Public Safety Officials. This service provides immediate notification of Advisories, Watches, and Warnings for a variety of weather related hazards. To see if you are eligible to receive these email notifications, contact the Portland Office of the National Weather Service.

Sirens

Tsunami warning sirens have a very limited usefulness in a warning system. They are most useful when there is a concentrated population within the sound-range of the siren or where there is no other means of notifications, such as beach locations. Frequently, they cannot be heard by people who are indoors. Limited and targeted use of tsunami warning sirens can be a

part of your warning system, but the public should be educated to have redundant message receiving capability.

Ground Patrols

Despite all of the warning systems a community has in place, the potential always exists for some segment of the population to remain uninformed. When time permits, ground patrols of neighborhoods, beaches, parks and campgrounds are a critical part of the public warning process.

Situation Reporting

The first priority upon activation of this plan is situation status reporting, which is the process of getting a complete and comprehensive summary of overall information on the Earthquake and/or Tsunami and the potential damages. An initial report on the nature of a tsunami or earthquake is needed in order to develop an effective immediate response.

Ongoing situation reporting is critically important for determining effects from tsunami, such as location of ocean water recession, rapidly rising coastal waters, amount of flooding occurring, special rescue efforts that may be needed, structural or transportation route damage and related response needs.

Situation reporting is generally divided into two components: overall situation assessment at the EOC and situation reporting from the field. Personnel such as dam tenders, public works crews, police and firefighters accomplish field situation reporting, reporting information back to their specific agencies. An important aspect of situation assessment is interagency coordination between the various agencies in order to develop an overall status of the incident, which allows for effective overall response coordination at the EOC level.

It is recommended that you institute a policy for how field reports are gathered and analyzed. It will be important to be able to relay this information up to the State EOC during the scheduled teleconferences.

Periodic Briefings

During an emergency, periodic briefings can help keep public officials informed of facts and information and help minimize rumor control. Briefings can prevent a void of information from developing and pre-empt the human tendency to fill information gaps with one's own imagination. A well-structured briefing may be as simple as an update on an issue, communicating a set of instructions to perform a task or as complex as conveying intelligence to a community about an event.

Different briefings can be scheduled for different audiences and conducted in person or over the phone.

Teleconference Briefings

Oregon Office of Emergency Management will utilize a teleconferencing system in order to give regular briefings and to allow local jurisdictions to report local conditions. The phone number and pin will be disseminated within an hour of OEM activating the State EOC. The State EOC subject matter expert will moderate these roll call teleconference briefings. This is initiated by the WCATWC. Usually occur about once every other hour – depending on information to be shared and impending decision points

This teleconference will not take the place of *OpsCenter* in the on-going management of the event. Any requests for assistance or resources must follow OEM EOC procedure.

Interagency Coordination

Interagency Coordination (IAC) is important for ensuring an effective response to an earthquake, tsunami or related problem. IAC allows for the exchange of information between the County EOC (acting in the role of Operational Area Coordinator) and affected jurisdictions. It is important for agencies to interact with the County EOC in order for an effective overall management of the incident, which in turn provides for the safety of the affected public and emergency workers.

In the case of activation of this plan, IAC includes the County EOC and related Department Operations Centers (DOC) communicating with each affected jurisdiction in order to provide information on what is happening, what the threat is, what the county is doing, and determining what additional resources each jurisdiction may need. In turn, it is important for the jurisdictions to provide the County EOC and related DOCs information on their actions and make resource requests through the EOC or DOC so an overall response effort can be coordinated. This IAC allows the County to know if additional resources from unaffected areas of the county can be requested for mutual aid assistance in numbers sufficient to meet the need of all jurisdictions if mutual aid must be requested from outside the county.

Appoint EOC Liaisons

Agencies who appoint EOC liaisons are more likely to have better situational awareness and are less likely to have communication breakdowns than those who work in isolation. Further, by keeping all activated EOC's apprised of what one another is doing, multiple jurisdictions can engage in a single regional strategy where appropriate and keep all EOC's advised of resources available along the entire coast.

Given the reality of limited resources, having a liaison physically present in another EOC may not be possible. In such cases, calling into another jurisdiction's EOC and announcing the liaison appointee and the periodic briefing (i.e., every half hour, every hour, etc.,) for which updates will be requested and information shared can also work.

Suggested EOC liaisons include, but are not limited to, city to county within the same county, county to county and, county to state.

Cautionary re-entry

The National Weather Service will not issue an "All Clear", that is the responsibility of local authorities. The National Weather Service will only downgrade or cancel a warning. As such, coastal county EOC managers should attempt to convene via teleconference to coordinate the winding down of the warning.

If the warning is still in effect but there appears to be no immediate threat to the public then a step-down message should be considered that advises people to stay off beaches and out of the water. This should be announced at evacuation centers, assembly areas, and through local media. Road signage and any other means of public notification should also be changed to reflect this new status.

Recommendations:

- Do not use "Cautionary re-entry"
- Use phrase "Cautionary re-entry". Give a definition in the guidance document. Give reason why we don't use "cautionary re-entry".
- For planning purposes, the time that beaches and public access to marine facilities are closed should be a minimum of 12 hours or up to a full tidal cycle after cancellation of the Warning or Advisory Bulletin by the National Weather Service's West Coast and Alaska Tsunami Warning Center.
- Develop a template for PIO for public consumption messaging, put a "why" Waves could be dangerous for a period of up to 24 hours after the cancellation.
- Add terms to glossary

Managing Public Information

Public Information Coordination

In addition to emergency information, the public information function will be necessary to keep the public updated on the incident. Emergency incidents arouse public attention, and attract the media. The media will respond to the area of a large incident, and will regularly call for updated information. If the media cannot find an official spokesperson to talk to they may talk to anybody near or affiliated with the incident.

The Public Information Officer (PIO) and his/her assistants will be responsible for developing current and accurate information, providing a central source of information, relieving the ESD and others from media pressure, and tracking down and dispelling rumors.

Having several different warning and notification systems in place within a community is the surest way to achieve maximum notification to the public. In most cases, warning systems activated in a real event will have some level of malfunction or failure despite rigorous pre-event testing.

For all public information functions, it is very important that all agencies and personnel involved in disseminating information provide consistent factual information. It is for this reason that upon activation and/or use of a public information section/person, that communications channels be established between everyone that will be releasing information.

All public information/instructions and EAS information being released from the EOC should be cleared through the ESD if possible. The only exception to this is if the immediate health and safety of the public or emergency responders would be adversely affected.

Designated Public Information Officer

Pursuant to the Incident Command System, an individual should be assigned responsibility for developing and releasing information about the incident to the news media and to other appropriate agencies and organizations. This person is known as the Public Information Officer (PIO).

Agencies that have already worked through this assignment of responsibility and obtained the relevant training ahead of time - including how to activate, staff and run a Joint Information Center - are more capable of handling the overwhelming demand for communicating with the public during an incident than those who try to handle it on-the-fly.

Other Authorized Spokespersons

There are times when the media might request information that can easily be provided by another authorized spokesperson before the role of Public Information Officer has been formally activated. This works best when those authorized to speak to the media have been pre-designated and conversely, those who are not authorized to speak to the media are advised accordingly. In any case, transition to the formal activation of the role of Public Information Officer should happen as early in the incident as deemed necessary and reasonably possible.

Phone Banks for Overflow Calls

All public safety agencies should expect an influx of calls during an emergency or disaster. Having a back-up phone line, bank of phones and list of personnel who can staff the phones in place ahead of time can expedite phone bank activation during a crisis.

Evacuation

Evacuations may become necessary if tsunami warning or related information is received or the occurrence of an actual tsunami endangers or potentially endangers life or property. Individuals located within an area designated for evacuation will most likely be recommended to evacuate a to a pre-designated evacuation area. All individuals on beaches, at ocean vista points or traveling next to the coast in low lying areas will be recommended to go to high ground. Depending upon warning time, additional evacuation route information may be provided through the news media.

As inundation maps are developed and made available by the State of Oregon, this plan will evolve and information and changes developed through cooperative efforts such as the Oregon Distant Tsunami Advisory Committee and/or related organizations will be implemented as appropriate. This may include cooperative efforts such as statewide development of standardized evacuation signs and common emergency planning procedures. County Emergency Management will continue to be involved with and monitor statewide improvements related to tsunami readiness and recommend implementation of any new protective or preparedness measures that may benefit the citizens and visitors of coastal Oregon communities.

Upon an evacuation decision, evacuated populations will be encouraged to report to local Reception and Care Centers, which will be identified during emergency broadcasts to the media. The American Red Cross can then register those individuals and affect a locator service. The Red Cross can provide information on the location of relatives and friends. Fewer people evacuating unnecessarily will require less evacuation infrastructure and support. The new DOGAMI maps indicate the Distant Tsunami evacuation zones. It is THESE ORANGE AREAS (NOT THE YELLOW ARES) that people need to avoid. Let's use distant event evacuations as a method for teaching people the right thing to do, not enable them to over react.

Local stakeholders and residents should be enlisted in the development of any evacuation and sheltering plans. Businesses will need to be educated on the need for the inundation zones to remain closed for the duration of the Warning/Advisory/Watch. Proactive outreach is necessary to ensure compliance to evacuation orders.

Reception and Care Centers

If evacuations are necessary, a significant number of displaced citizens can be anticipated as a result of a tsunami or related problem. A considerable number of these will likely stay with friends, family, etc.

Others may require public sheltering as provided by the American Red Cross. Significant logistical support will also be required, which is coordinated through the Shelter and Welfare function of the Incident Command System (ICS) when activated in the County/OA EOC.

Locations of shelters will depend on the extent of the emergency, and such factors as areas actually affected, and how many people were, or are being evacuated. The locations of shelters will be passed on to the public through emergency alert messages.

It is recommended that a system for managing evacuated populations be put into place. If the public evacuates to a location with no cover or restroom facilities, there is a risk that they will return to their homes or businesses in the hazard zone before the Cautionary re-entry is sounded. This would be population at risk needlessly. The public needs to be educated to know that facilities may not be posh, nor refreshments provided, but some sort of plan needs to be made before a distant tsunami event.

Traffic Disruption

There could be problems with traffic management and flow as a result of tsunami flooding; such problems might include:

- Difficulty in getting out of the area due to debris and damaged roadways/streets.
- Difficulty getting rescuers and other vital personnel into areas of extensive damage.
- Difficulty keeping sightseers out of damaged areas during the early hours and days after an emergency.
- Inappropriate actions by the public, such as evacuating by foot or automobile when not necessary.

The means of coping with these impediments include; beginning debris removal, rerouting of traffic by law enforcement officials and public works assigned to areas by the Traffic Control Group of the ICS team, and limiting access to affected areas.

Should evacuation of any area after a tsunami or damaging earthquake be necessary, the Logistics Section, in coordination through the County/OA EOC will be responsible for coordinating the use of resources that may be needed to evacuate these people and others without transportation. These procedures may include arranging for bus or similar transportation modes to meet evacuees at strategic locations that can be reached by those forced to evacuate on foot.

Recovery and Reentry

Recovery involves many aspects: reentry into affected areas including homes and businesses, demobilization of emergency response resources, cleanup and restoration, and long-term disaster assistance. During transition into the recovery phase, damaged structures may need to be inspected to determine if they are safe for public reentry or if they should be condemned until repaired or demolished. This task may require using qualified inspection personnel from

other jurisdictions and private companies. These personnel can be obtained through the OEM mutual aid system and the related building official's mutual aid program.

The Emergency Services Director and the EOC command group must determine when it would be safe to allow public reentry to any area that has been evacuated due to a tsunami. Based on joint concurrence of the appropriate officials, reentry will be authorized after such threats have subsided and an EAS message to that effect will be issued.

Demobilization

When response agencies are nearing completion of the last remaining life safety and property safety missions, and when the ESD has determined that the disaster has entered into a recovery phase, the EOC command group should develop a formal demobilization plan. Consideration should be given to releasing mutual aid resources no longer needed. Consideration should also be given to assigning appropriate agencies to conduct short-term recovery operations, such as debris removal, restoration of critical facilities and utilities/communications, and tending to the needs of the displaced.

The County EOC should be downgraded or shut down as soon as emergency operations cease. The EAS should be deactivated with a termination EAS message giving the public a contact point for follow up assistance. It is desirable to attempt to restore agencies to their normal working routine and environment as soon as possible. Both short term and long-term recovery operations can best be managed through the normal structure of government.

Final Report and Documentation

All department heads from County agencies involved in the tsunami or related earthquake response will be required to complete a narrative report and a master activity log. The narrative report briefly describes the primary responsibility, the duties performed, and the total number of staff hours incurred by the agency during the emergency phase of the incident. The master activity log documents the names and times of agency personnel involved in a particular assignment, equipment and supplies used, and any contracts with private vendors to support emergency operations. Much of this information can be obtained from activity logs used by team leaders during the emergency. A copy of this narrative report and master activity log will become part of the County's official record of the tsunami.

After Action Report

The after action report shall, at a minimum, be a review of response actions taken, application of SEMS, suggested modifications to SEMS, necessary modifications to plans and procedures, identified training needs, and recovery actions to date.

APPENDIX # 1 - Recommended Best Practices

Crisis Communication and notification methods for local communities

- Incorporate layers of redundancy into any system of notification of public officials and first responders. Local jurisdictions can tailor the information to their needs and should be updated at least annually.
  - Use mass notification technologies (email, text, and/or voice) to provide notification in as many channels as possible.
  - Have a pre-designated email distribution list for various groups and make list easily editable.
    - Media
    - Visitor services
      - Motels
      - RV parks
    - Vulnerable populations groups
    - Public safety agencies
    - Elected officials
  - Have a pre-designated call-down telephone list prepared and updated regularly. Make sure to get primary and secondary numbers.
    - Example
      - EOC staff
      - Utility companies
      - Public safety agencies
      - Elected officials
      - Support organizations
        - Bus companies
        - Schools
        - American Red Cross, etc.

- Create a description of procedures in case of system breakdown and you are unable to reach specific individuals, such as elected officials or other key decision makers.
  - This can include physically dispatching law enforcement personnel to individuals residences.
- Oregon Emergency Management (OEM) will establish a schedule of teleconference calls as early as possible to relay information to locals. OEM Conference calls are to be used to gather impact information and tsunami observations and to disseminate information to county emergency operations.
  - OEM should develop specific teleconference instructions to be sent out just prior to the first teleconference conversation on how the call will be managed.
    - Dissemination will be through email, phone call, or text
- The sit-rep from OEM should be distributed, via email, to:
  - the West Coast and Alaska Tsunami Warning Center.

    - County emergency operations centers.
    - PSAPs serving coastal counties

EOC Activation/ Stand down / Cautionary re-entry

- Do not use "Cautionary re-entry"
- Use phrase "Cautionary re-entry".
- For planning purposes, the time that beaches and public access to marine facilities are closed should be a minimum of 12 hours or up to a full tidal cycle after cancellation of the Warning or Advisory Bulletin by the National Weather Service's West Coast and Alaska Tsunami Warning9 Center.
    - NOAA recommends that public beaches and public access to marine facilities remain closed for 24 hours after the canceling of the Warning or Advisory by the West Coast and Alaska Tsunami Warning Center.
- Develop a template for PIO for public consumption messaging, put a "why" Waves could be dangerous for a period of up to 24 hours after the cancellation.
- Add terms to glossary

Public information & dissemination

- Using the school closure system as a model, county emergency managers, in coordination with local emergency operations, will collect and distribute information on when/where evacuations are called for and when they are to be completed by and provide to local media and community contacts.
- Local jurisdictions will create and distribute a skeleton pre-scripted message that can be tailored to the specific emergency situation. Once it is tailored with relevant local information, it should be disseminated as widely as possible using many different channels.
    - Call-in telephone line for the public
    - Post on local community and media websites
    - Mass public communication systems
- Local jurisdictions should establish citizen information lines that offer pre-recorded messages to the public.
    - Establish public information call-in numbers in advance.
    - Establish phone bank to manage calls with sufficient phone lines and operators, and where possible, provide non-English information.
    - Post call-in numbers on appropriate electronic sites and printed materials.
    - Use the 211 service, where available.
    - Use call-in line to disseminate locations of Tsunami Evacuation and Information Centers.
- Where possible, communities who use mass notification technologies should adopt processes so that those within the distant tsunami inundation zone are contacted pursuant to information provided by the NOAA warning statement and under the direction of the presiding local public safety official(s).

- Communities educate the public that tsunami sirens should not be their only means of notification of a distant tsunami event.
- Communities should adopt the Uniform Tsunami Warning Signal. (http://www.oregon.gov/OMD/OEM/plans_train/Tsunami/oar_10_15_09.pdf?ga=t)
    - The timing of when to set off sirens should remain a local decision based on the readiness of the local public safety agency to assist the public and answer questions / phone calls.
    - Possible schedule:
        - 4 Hours before
        - 3 hours before
        - 2 hours before
        - 30 minutes before
        - 15 minutes before
        - At estimated arrival times
        - Once an hour for the duration of the Tsunami Warning
- If using the tsunami siren for a cautionary re-entry signal (which is **NOT** recommended), **do not** use the same as the tsunami alert signal (per OAR).

Public Information Officer responsibilities

- Local PIOs should meet regularly with the media to build relationships before the event occurs.
- Offer regular periodic briefings, which could be for command staff or media.
    - Establish schedule and location early in the event.
- Include OEM, adjacent counties, and communities 911 Call Centers & PIO/JIC in any media distribution lists.
- Create a pre-recorded message that is available to the media for download from your website.

Initiating evacuation

- Decision to initiate an evacuation should stay with local Unified Command or other designated entity.
    - Community needs to identify how long it takes to fully evacuate the population in advance of emergency event.
    - At a minimum, 4 hours should be allowed to evacuate the affected population.
    - Evacuation needs to be completed by 1 hour before estimated arrival of initial wave. The last hour is for all emergency personnel to clear the area.
    - If time permits, coordination should be conducted between neighboring counties and communities on public messaging to explain differing evacuation notification times.
- To control evacuated areas, reasonable effort should be taken to keep beaches cleared once the one-hour window is reached.

Control of evacuated areas

- Keep emergency and public safety personnel out of harm's way.
- Install lockable gates at beach access points, where possible and appropriate.
- Develop a suite of portable tools that can be deployed rapidly, that can be pre-printed and kept in vehicles that provide information on what public should do.
    - Portable sign – Tsunami Evacuation in Process
    - Plastic tape - Tsunami Evacuation in Process

Tsunami time of arrival/ Understanding the bulletins

- Refer to the decision tree
    - Warning causes XXX response
    - Advisory causes XXX response
- Each community should examine their historical record and event-specific projected models to aid in making decisions.

Tsunami Warning and Advisory cancellation process

- NOAA will issue a cancellation of a warning or advisory. They will not issue an "cautionary re-entry".
- The timing of when to issue a cautionary re-entry is a local decision and may or may not coincide with the cancellation of a Warning or Advisory for the community.
- Public safety personnel use this time to assess damage and identify and correct safety hazards.

Marine/Harbor/Port issues

- Have someone from each individual USCG stations and/or Port (if no USGS representation) in County EOC as part of incident command team.
    - Ensure information gets pushed out to communities.
- Don't make blanket statement that boats should go to sea.
    - Need to provide information so that boaters can make their own decisions.
- Educate the marine community so boaters know that if they go out during tsunami event, they need to be prepared to stay out to sea for an extended period of time, or to find an alternative port of refuge.

Tsunami evacuation and Information centers

- Assembly Area
    - Requires these types of resources
- Red Cross Shelters
    - Requires these types of resources

	Assembly Areas	Tsunami Evac Info Center	Red Cross Shelter
What (Facilities)			
When (Activated)			
Who authorizes - staffs			
Liability and Resources			

- Encourage local volunteer groups, such as CERT, faith-based organizations, and civic groups to be trained in Red Cross shelter operations and management. This will increase the number of Red Cross Volunteers available to open and run a shelter.
- If you don't have enough Red Cross volunteers, you can open up Tsunami Evacuation and Information Centers with other volunteers. (There are, however, liability issues with this option.)
    - This requires pre-planning and training.
    - Consider discussion with Red Cross
- There is a difference between an evacuation site and assembly area. See Guidance Document.
- The Tsunami Evacuation and Information Centers could be co-located with assembly areas or a Red Cross Shelter.

APPENDIX # 2 – Distant Tsunami Decision Tree

Trigger Event - A Tsunami Product is issued by the West Coast and Alaska Tsunami Warning Center

- Information Statement - No community action required
- Tsunami Watch - Recommend monitoring situation
- Tsunami Advisory - Action required to protect life and property.
- Tsunami Warning - Action required to protect life and property.

Page One: Critical Information

Critical information for initial decision making

- Is the earthquake over 7.0 Mw?
- Is the tsunami travel time less than 4 hours away?
- What are the tidal conditions?
- What are the weather conditions?

Page Two: Information Statement

Information Statement is issued by West Coast and Alaska Tsunami Warning Center (WCATWC)

OBJECTIVES: Assess whether the seismic event can lead to a response activation.

QUESTION: Is it over 7.0 Mw?

- NO- **NO** ACTION REQUIRED
- Yes - ACTION **IS** REQUIRED
    - Under-ocean earthquakes that are over 7.0 Mw can be tsunami-genic.
    - Monitor for upgrading to Watch/Advisory/Warning.
    - Review distant tsunami response plans
    - Make initial contacts with point of contact for response support agencies
        - List of recommended agencies in Appendix

QUESTION: Are you activating?

- NO- **NO** ACTION REQUIRED
- YES - ACTION **IS** REQUIRED
    - Choose the level and protocols you will use to activate
    - Identify how you plan to disseminate information, actual procedures

QUESTION: Does the WCATWC upgrade the bulletin to a Watch?

- NO- **NO** ACTION REQUIRED
- YES - ACTION **IS** REQUIRED
    - See Page # X

QUESTION: Does the WCATWC upgrade the bulletin to an Advisory?

- NO- **NO** ACTION REQUIRED
- YES - ACTION **IS** REQUIRED
    - See Page # X

QUESTION: Does the WCATWC upgrade the bulletin to a Warning?

- NO- **NO** ACTION REQUIRED
- YES - ACTION **IS** REQUIRED
    - See Page # X

Page Three: Tsunami Watch

Tsunami Watch is issued by West Coast and Alaska Tsunami Warning Center

OBJECTIVES:

- Assess whether the seismic event can lead to a response activation.
- Pre-staging for response

QUESTION: Is this an update on a previous Tsunami Information Statement?

- NO- ACTION **IS** REQUIRED
  - Under-ocean earthquakes that are over 7.0 Mw can be tsunami-genic.
  - Monitor for upgrading to Advisory/Warning.
  - Review distant tsunami response plans
  - Make initial contacts with point of contact for response support agencies
    - List of recommended agencies in Appendix
- YES - ACTION **IS** REQUIRED
  - Inform point of contact for response support agencies that the Tsunami Watch has been issued.
  - Consider increasing activation level.

QUESTION: Are you activating an emergency operations center (EOC)?

- NO- **NO** ACTION REQUIRED
- YES - ACTION **IS** REQUIRED
  - Choose the level and protocols you will use to activate
  - Identify how you plan to disseminate information, actual procedures
    - Begin notification of Public Safety agencies
    - Begin to notify personnel that event may occur
    - Define staffing patterns early to ensure continuity for duration of event

QUESTION: Do you need additional staff?

- NO- **NO** ACTION REQUIRED
- YES - ACTION **IS** REQUIRED
  - Increase EOC level

QUESTION: Is there an increase in public request for information about the tsunami event?

- NO- **NO** ACTION REQUIRED
- YES - ACTION **IS** REQUIRED
  - Develop public information statement about the tsunami event
  - Disseminate through your public information channels
    - EAS
    - Public Warning
    - Rapid notification systems

QUESTION: Does the WCATWC upgrade the bulletin to an Advisory?

- NO- **NO** ACTION REQUIRED
- YES - ACTION **IS** REQUIRED
    - See Page # X

QUESTION: Does the WCATWC upgrade the bulletin to a Warning?

- NO- **NO** ACTION REQUIRED
- YES - ACTION **IS** REQUIRED
    - See Page # X

Page Four: Tsunami Advisory

Tsunami Advisory is issued by West Coast and Alaska Tsunami Warning Center

QUESTION: Is this an update on a previous Tsunami Bulletin?

- NO- ACTION **IS** REQUIRED
  - Under-ocean earthquakes that are over 7.0 Mw can be tsunami-genic.
  - Monitor for upgrading to Warning.
  - Review distant tsunami response plans
  - Make initial contacts with point of contact for response support agencies
    - List of recommended agencies in Appendix
- YES - ACTION **IS** REQUIRED
  - Inform point of contact for response support agencies that the Tsunami Advisory has been issued.
  - Consider increasing activation level.

QUESTION: Are you activating an emergency operations center (EOC)?

- NO- **NO** ACTION REQUIRED
- YES - ACTION **IS** REQUIRED
  - Choose the level and protocols you will use to activate
  - Identify how you plan to disseminate information, actual procedures
    - Begin notification of Public Safety agencies
    - Begin to notify personnel that event may occur
    - Define staffing patterns early to ensure continuity for duration of event

QUESTION: Do you need additional staff?

- NO- **NO** ACTION REQUIRED
- YES - ACTION **IS** REQUIRED
  - Increase EOC level

QUESTION: Is there an increase in public request for information about the tsunami event?

- NO- **NO** ACTION REQUIRED
- YES - ACTION **IS** REQUIRED
  - Develop public information statement about the tsunami event
  - Disseminate through your public information channels
    - EAS
    - Public Warning
    - Rapid notification systems

QUESTION: Is the Tsunami Advisory Cancelled by the WCATWC?

- NO- **NO** ACTION REQUIRED
- YES - ACTION **IS** REQUIRED
  - De-mobilize and monitor for 24 hours (or full tidal cycle…)

Page Five: Tsunami Warning

Tsunami Warning is issued by West Coast and Alaska Tsunami Warning Center

QUESTION: Is this an update on a previous Tsunami Bulletin?

- NO- ACTION **IS** REQUIRED
  - Under-ocean earthquakes that are over 7.0 Mw can be tsunami-genic.
  - Review distant tsunami response plans
  - Make initial contacts with point of contact for response support agencies
    - List of recommended agencies in Appendix
- YES - ACTION **IS** REQUIRED
  - Inform point of contact for response support agencies that the Tsunami Watch has been issued.
  - Consider increasing activation level.

QUESTION: Are you activating an emergency operations center (EOC)?

- NO- **NO** ACTION REQUIRED
- YES - ACTION **IS** REQUIRED
  - Choose the level and protocols you will use to activate
  - Identify how you plan to disseminate information, actual procedures
    - Begin notification of Public Safety agencies
    - Begin to notify personnel that event may occur
    - Define staffing patterns early to ensure continuity for duration of event

QUESTION: Do you need additional staff?

- NO- **NO** ACTION REQUIRED
- YES - ACTION **IS** REQUIRED
  - Increase EOC level

QUESTION: Is there an increase in public request for information about the tsunami event?

- NO- **NO** ACTION REQUIRED
- YES - ACTION **IS** REQUIRED
  - Develop public information statement about the tsunami event
  - Disseminate through your public information channels
    - EAS
    - Public Warning
    - Rapid notification systems

QUESTION: Is the Tsunami Warning Cancelled by the WCATWC?

- NO- **NO** ACTION REQUIRED
- YES - ACTION **IS** REQUIRED
  - De-mobilize and monitor for 24 hours (or full tidal cycle…)

Page Six: Cancellation of Tsunami Advisory/Warning after damage occurs

OBJECTIVES:

- Deem area safe for responders, then public, to re-enter
- Begin recovery process, if necessary

QUESTION: Was there damage to property or personal injury/loss of life due to tsunami?

- NO- ACTION **IS** REQUIRED
  - De-mobilize and monitor for 24 hours (or full tidal cycle…)
  - Allow Cautionary Re-entry and ensure public safety
- YES - ACTION **IS** REQUIRED

QUESTION: Was there any marked tsunami inundation?

- NO- ACTION **IS** REQUIRED
  - De-mobilize and monitor for 24 hours (or full tidal cycle…)
  - Allow Cautionary Re-entry and ensure public safety
- YES - ACTION **IS** REQUIRED
  - Assess beach/shore/bay safety
  - Allow Cautionary re-entry as you assess damage and ensure public safety
  - Conduct Initial damage assessment
  - Identify what the public needs
    - Do shelters need to continue?
      - NO- ACTION **IS** REQUIRED
        - Stand down Shelters according to response plan
      - YES - ACTION **IS** REQUIRED
        - Refer to Red Cross Long Term Shelter Plan
  - Does a disaster declaration need to be done?
    - NO- **NO** ACTION REQUIRED
    - YES - ACTION **IS** REQUIRED
      - Transition to IDA/PDA process

QUESTION: Is the call volume from the public still high?

- NO- **NO** ACTION REQUIRED
- YES - ACTION **IS** REQUIRED
  - Continue managing information
    - Phone bank
    - Call-line with pre-recorded message

APPENDIX # 3 - Tsunami Bulletin Samples

From the West Coast/Alaska Tsunami Warning Center

WEPA41 PAAQ 262305
TSUWCA

BULLETIN
TSUNAMI MESSAGE NUMBER 1
NWS WEST COAST/ALASKA TSUNAMI WARNING CENTER PALMER AK
405 PM PDT THU JUL 26 2012

CAZ042-043-040-041-087-039-034-035-270005-
/T.NEW.PAAQ.TS.W.0058.120726T2305Z-000000T0000Z/
COASTAL AREAS BETWEEN AND INCLUDING THE CALIFORNIA-MEXICO
BORDER TO RAGGED POINT CALIFORNIA/LOCATED 45 MILES NW OF
SAN LUIS OBISPO/
405 PM PDT THU JUL 26 2012

...A TSUNAMI WARNING IS NOW IN EFFECT WHICH INCLUDES THE
COASTAL AREAS OF CALIFORNIA FROM THE CALIFORNIA-MEXICO
BORDER TO RAGGED POINT CALIFORNIA/LOCATED 45 MILES NW OF
SAN LUIS OBISPO/...

IF YOU ARE LOCATED IN THIS COASTAL AREA... MOVE INLAND
TO HIGHER GROUND.

TSUNAMI WARNINGS MEAN THAT A TSUNAMI WITH SIGNIFICANT WIDESPREAD
INUNDATION IS EXPECTED OR IS ALREADY OCCURRING. TSUNAMIS ARE
A SERIES OF WAVES DANGEROUS MANY HOURS AFTER INITIAL ARRIVAL
TIME. THE FIRST WAVE MAY NOT BE THE LARGEST.

AT 402 PM PACIFIC DAYLIGHT TIME ON JULY 26 AN EARTHQUAKE WITH
PRELIMINARY MAGNITUDE 7.4 OCCURRED 30 MILES SOUTH OF
LOS ANGELES CALIFORNIA.

ESTIMATED TSUNAMI START TIMES FOR SELECTED SITES ARE...

SAN PEDRO CALIFORNIA 411 PM PDT JULY 26
LA JOLLA CALIFORNIA 430 PM PDT JULY 26
SANTA BARBARA CALIFORNIA 450 PM PDT JULY 26

THE TSUNAMI WARNING WILL REMAIN IN EFFECT UNTIL FURTHER NOTICE.
REFER TO THE INTERNET SITE WCATWC.ARH.NOAA.GOV FOR MORE INFORMATION.

$$

APPENDIX # 4 - CHECKLIST - ACTIONS IN THE EVENT OF A TSUNAMI WATCH

COUNTY EMERGENCY SERVICES COORDINATOR INITIAL RESPONSE GUIDELINES

Upon notification by Watch Commander, National Weather Service, Emergency Digital Information System (EDIS), or other valid source for a tsunami watch which includes the [...] County coastline, the Duty Emergency Services Coordinator can make additional notifications as needed and may take other actions as needed. Guidelines include:

1.0 Notification

1.1 CDF/County Fire Emergency Command Center (ECC) and request notify:

1.1.1 […] Fire Department

1.1.2 […] Fire Department

1.1.3 […] Fire Department

1.2 Notify the following agencies and, if situation warrants, request an Agency Representative respond to the EOC:

1.2.1 County OES

1.2.2 County Emergency Services Director and Board of Supervisors

1.2.3 County Public Works

1.2.4 County Parks

1.2.5 County Health Officer

1.2.6 County Fire Department

1.2.7 County Department of Social Services

1.2.7.1 Request activation of Phone Assistance Center if needed

1.2.8 County Office of Education

1.2.9 US Coast Guard Station,

1.2.10 Oregon State Parks

1.2.11 Oregon Office of Emergency Management, State Warning Center

1.3 Consider notification of any other agencies deemed appropriate based on location of watch and invite an Agency Representative respond to the EOC:

1.3.1 […]

1.3.2 […]

1.3.3 […]

1.4 Request the Watch Commander use the […] system to notify PSAPs 1.5

Request the Watch Commander Have Sheriff's Dispatch announce the watch on […].

1.6 Contact OSP [...] Area Communications to confirm they received the watch via […]

2.0 Monitor Situation

2.1 Continue monitoring the situation via any or all of the following:

2.1.1 Sheriff Watch Commander

2.1.2 Alaska and West Coast Tsunami Warning Center

2.1.3 National Weather Service, Portland

2.1.4 Oregon Office of Emergency Management

2.2 Monitor international, national, and local media for news stories in order to be prepared to address any local media needs

Note: If the event that caused the tsunami watch is of a significant magnitude that it seems possible a tsunami warning is imminent proceed with the actions outlined for tsunami warning in Attachment 2.

-

APPENDIX # 5 - CHECKLIST - ACTIONS IN THE EVENT OF A TSUNAMI WARNING

COUNTY EMERGENCY SERVICES COORDINATOR INITIAL RESPONSE GUIDELINES

Upon notification by Watch Commander, National Weather Service, Emergency Digital Information System (EDIS), or other valid source of a tsunami warning that includes the [...] County coastline, the Duty Emergency Services Coordinator can make additional notifications as needed and may take other actions as needed. Guidelines include:

1.0 Notification

1.1 Perform notifications outlined in Attachment 1.

2.0 Monitor Situation

2.1 Monitor situation as outlined in

3.0 EOC Activation

3.1 Set Up EOC as needed and confirm full/partial activation and mobilization.

3.2 Notify and request specific County Personnel to staff the following EOC positions (see

Basic Activation Guide for list of qualified personnel):

Operations Section Chief

Plans Section Chief

Logistics Section Chief

3.3 Request or confirm Phone Assistance Center activation (refer to NPP Plan, Social

Services SOP for additional information).

3.4 Confirm following Agency Representatives are en route to the EOC (if not or unconfirmed, request a representative from the agency respond to the EOC):

Sheriff's Department

OSP

County Emergency Services Director and Board of Supervisors

County Public Works

County Fire

County Parks

County Health Officer

County Department of Social Services

County Office of Education

County Communications;

Request Communications to notify and activate ARES/RACES at the EOC

Oregon State Parks

U S Coast Guard Station

3.5 Notify the following agencies and request a representative respond to the EOC:

ODOT

County Environmental Health

American Red Cross

3.6 Notify and advise the following agencies of the situation:

State OEM

3.7 Assume role of "Liaison Officer" until relieved by other Liaison qualified staff.

3.8 If time of potential Tsunami impact is 6 hours or greater, under standing orders of

Emergency Services Director (ESD) close access to county controlled beaches, request visitors be notified, and advise all impacted jurisdictions of county's actions.

3.9 If time of potential Tsunami impact is less than 6 hours, under standing orders of

Emergency Services Director evacuate county controlled beaches, and advise all impacted jurisdictions of county's actions.

3.9 Develop and release appropriate Emergency Alert System message(s) (multiple versions are available in the following attachments).

APPENDIX # 6 - Administrative Emergency Alert System (EAS) Message – System Activation

(Note: Instructions on use of EAS equipment operation are in the PIO room, near the EAS. This message is for release to media only. Do not broadcast message to schools or medical care facilities.)

Attention, broadcasters, attention: stand by to receive an EAS message from the […] County Sheriff's Department (or Emergency Operations Center) related to a tsunami warning. This is a request to activate the Emergency Alert System, repeating this is an actual request to activate the Emergency Alert System.

I repeat, stand-by for an EAS message. This is an actual request for activation of the Emergency Alert System.
End of message.
Approved By: _____
Time Approved: _____
Time Distributed: _____

APPENDIX # 7 - TSUNAMI EAS WARNING MESSAGE #1 –

"Attention, attention...this is an Emergency message for the public along the coast of […] County. The West Coast and Alaska Tsunami Warning Center has issued a Tsunami Warning. This could cause major flooding and risk to life in low lying areas along the coast. The County Office of Emergency Services is advising residents, visitors and businesses in any low lying areas along the coast to evacuate to high ground immediately. This includes areas of […].

Evacuate immediately.

SOME AREAS THAT NEED TO EVACUATE OR MOVE TO HIGHER GROUND IMMEDIATELY INCLUDE:

[Include list of locations]
[Include list of instructions]

PLEASE USE 9-1-1 ONLY FOR LIFE THREATENING EMERGENCIES.

THE COUNTY OFFICE OF EMERGENCY SERVICES WILL PROVIDE ADDITIONAL INFORMATION AS SOON AS POSSIBLE.

Approved By: _____
Time Approved: _____
Time Distributed: _____

APPENDIX # 8 - EAS Message for Tsunami Watch/Warning – No Evacuation.

This is the […] County Sheriff's Department (or Emergency Operations Center). At _____ (time: _____), this date, we received a tsunami watch (or warning) – repeating a tsunami watch (or warning) - from the West Coast and Alaska Tsunami Warning Center (or:).

At this time there is no evidence that a tsunami may hit the coastline of […] County. –

Repeating there is no evidence that a tsunami may hit the coastline of […] County. The County has issued no evacuation orders.

If it becomes necessary for coastal areas to evacuate the […] County Office of Emergency Services will provide information via your radio and television.

Please tune in to this or any other local radio or TV station for updated information and instructions.

Please do not call 911, the Sheriff's Department or other emergency response agencies for further information. Please use 9-1-1 only for life threatening emergency purposes.

The County Office of Emergency Services will provide additional information as soon as possible.

End of message.

Approved By: _____
Time Approved: _____
Time Distributed: _____

APPENDIX # 9 - Generic EAS Message for Tsunami Warning

This is the […] County Sheriff's Department (or Emergency Operations Center). At_____ (time: _____), this date, we received a tsunami warning – repeating a tsunami warning - from the West Coast Tsunami Warning Center (or:) advising they estimate a tsunami may hit the coastline of […]County and other Oregon counties.

Please tune in to this or any other local radio or TV station for instructions and information. It may be necessary for coastal areas to evacuate – individuals on beaches, near ocean vista points and other low lying coastal areas should prepare to move inland or to higher ground as soon as possible.

Repeating, individuals on beaches, near ocean vista points and other low lying coastal areas should prepare to move inland or to higher ground as soon as possible. Stand-by for follow-up messages with specific evacuation instructions.

Please do not call 911, the Sheriff's Department or other emergency response agencies for further information. Please use 9-1-1 only for life threatening emergency purposes.

The County Office of Emergency Services will provide additional information as soon as possible.

End of message.

Approved By: _____
Time Approved: _____
Time Distributed: _____

APPENDIX # 10 - MULTILINE UNIT MESSAGE FOR TSUNAMI WARNING

(This message may also be used for an initial EAS broadcast if necessary)

This is the […] County Emergency Operations Center. At (time) _____ on (day and date) _____ the County Sheriff's Office received a tsunami warning from _____. This means that the West Coast and Alaska Tsunami Warning Center believes our coastline will, or may be, hit by a tsunami.

This tsunami warning was issued because of an earthquake (or other reason) near _____.

If you are required to take specific protective action or evacuate, that information will be broadcast over radio and television stations via the Emergency Alert System. . Stay tuned to any local radio or TV station broadcasting emergency information should it become necessary to issue specific emergency instructions and updates on the tsunami warning.

In the meantime, the following instructions and safety precautions should be taken immediately:
1. Do not go to the beach or coastline to watch for a tsunami. Keep away. Stay at least 1 –2 miles away from the coast, or 50 feet above sea level in elevation.
2.If a tsunami occurs, even a small one, stay away from the beach or coastline until you are told it is okay to do so from emergency officials; a tsunami IS NOT a single wave, but a series of waves. Again, stay away from the beach or coastline until you hear official information from public safety personnel that it is okay to do so.
3. Remember that a small tsunami in one area may be a giant tsunami just a few miles away. Do not let the modest size of one let you lose respect for all tsunami waves.
4. Please do not call 9-1-1 for information. Use 9-1-1 only if you have a life-threatening emergency.
5. If evacuations or more specific instructions are ordered, they will be broadcast to the media.
Again, stay tuned to local radio and TV stations for updated information.
This message will be updated when additional information becomes available.
Again, please do not call 9-1-1 for information.

End of message.

Approved By: _____
Time Approved: _____

APPENDIX # 11 - PHONE NUMBERS

TABLE – EMERGENCY CONTACT INFORMATION

AGENCY PHONE

NUMBER

TIME

CONTACTED

- National Weather Service, Portland
- County Fire Emergency Command Center
- County Public Works
- County Parks (General Services)
- County Health Officer
- County Social Services
- County Communications*
- Oregon Office of Emergency Management
- U.S. Coast Guard Station
- Port Authority
- State Parks Dispatch (CENCOM)
- Sheriff's Department Watch Commander
- CHP Dispatch
- County Environmental Health
- American Red Cross
- Utility Company
- Telecommunication company

[Insert any specific contacts for your local area]

APPENDIX # 12 - Tsunami Websites

National Weather Service - http://tsunami.gov/

West Coast and Alaska Tsunami Warning Center - http://wcatwc.arh.noaa.gov/

Emergency Alert System - http://www.fcc.gov/eb/eas/

Emergency Alert System in Washington - http://www.wsab.org/eas/eas.html

All-Hazards NOAA Weather Radio - http://www.nws.noaa.gov/nwr/

Pacific Marine Environmental Laboratory - http://www.pmel.noaa.gov/ (includes tsunami and tsunami monitoring links)

Tsunami Detection Buoys - http://www.ndbc.noaa.gov/dart.shtml (located in the north Pacific Ocean)

TsunamiReady - http://wcatwc.arh.noaa.gov/tsunamiready/tready.htm

APPENDIX # 13 - Glossary of Terms

Amplitude: See Tsunami Amplitude.

Bathymetry: The measurement of the depths of the oceans, seas, and other bodies of water.

Area of Responsibility: The geographical area within which a Tsunami Warning Center has the responsibility for the dissemination of Tsunami Warnings, Watches, Advisories and Information Statements and the provision of interpretive information to emergency managers and other officials, news media, and the public.

Distant tsunami: A tsunami originating from a far away source, generally more than 1,000 km/621 miles or more than 3 hours tsunami travel time from its source to the area impacted. What may be a distant tsunami in one location, can be a local tsunami for another location. See Local Tsunami.

Earthquake Magnitude: A number that characterizes the relative size of or energy released by an earthquake. Magnitude is based on measurement of the maximum motion recorded by a seismograph. Several scales have been defined, but the most commonly used are (1) local magnitude (ML), commonly referred to as "Richter magnitude," (2) surface-wave magnitude (Ms), (3) body-wave magnitude (Mb), and (4) moment magnitude (Mw).

Epicenter: The point on the earth's surface vertically above the hypocenter (or focus) where a seismic rupture begins.

Estimated Time of Arrival (ETA): Time of first tsunami wave arrival at some fixed location. The first wave is not always the largest wave.

Evacuation Map: A drawing or representation that outlines the danger zones and designates limits beyond which people must be evacuated to avoid harm from tsunami waves. Evacuation routes and assembly areas are generally designated to ensure efficient movement of people out of the evacuation area and to areas of safety.

Hypocenter: The point within the earth where an earthquake rupture starts.

Inundation: The horizontal distance inland that a tsunami penetrates; generally measured perpendicularly to the shoreline.

Local tsunami: A tsunami generated from a nearby source, generally within 100 km/62 miles or less than 1 hour tsunami travel time from its source to the area impacted. A local tsunami is usually generated by an earthquake, but can also be caused by a landslide or pyroclastic flow from a volcanic eruption or comet or meteorite impacts in the ocean. What may be a local tsunami in one location, can be a distant tsunami for another location. See: Distant Tsunami.

Maremoto: Spanish term for tsunami.

Meteo-tsunami: A tsunami-like phenomenon generated by meteorological or atmospheric disturbances. These waves can be produced by atmospheric gravity waves, pressure changes, squalls, gales, typhoons, hurricanes, and other atmospheric sources.

Pyroclastic flow: A ground hugging avalanche of hot ash, pumice, rock fragments, and volcanic ash that rushes down the side of a volcano as fast as 100 km/62 miles per hour or more.

Regional tsunami: A tsunami capable of destruction in a particular geographic region, generally within 1,000 km/621 miles or 1 to 3 hours tsunami travel time from its source to the area impacted. Regional tsunamis generally have very limited and localized effects outside the region.

Runup: The difference between the elevation of maximum inundation line and the sea-level at the time of the tsunami. Can also refer to the elevation to which a tsunami can reach for a particular area.

Seismometer: An instrument used to detect and record seismic waves generated by earthquakes.

Subduction Zone: The place where two of the earth's plates come together, one riding over the other. Subduction zones are the primary source for some of the largest magnitude earthquakes (M8-9) and associated tsunamis.

Teletsunami: See Distant Tsunami.

Tsunami: (tsoo-NAH-me / zoo-NAH-me) A series of waves with both a long wavelength and period (time between crests), generated by a large, impulsive displacement of sea or lake water. Time between crests of the wave can vary from a few minutes to over an hour, but generally are in the range of 15 to 25 minutes. Tsunami is a Japanese word meaning harbor wave. Tsunamis are often incorrectly called tidal waves; they have no relation to the daily ocean tides.

Tsunamigenic: Capable of generating a tsunami. For example, "a tsunamigenic earthquake."

Tsunami Advisory: A Tsunami Advisory is issued due to the threat of a potential tsunami that may produce strong currents or waves dangerous to those in or near the water. The threat may continue for many hours after the arrival of the initial wave, but significant widespread inundation is not expected for areas under the advisory. Appropriate actions to be taken by local officials may include the closing of beaches and the evacuation of harbors and marinas. People in the Advisory area should heed local official's instructions to leave affected areas until given the "cautionary re-entry".

Tsunami Amplitude: The deviation of sea level, caused by the tsunami, that is above or below the normal tidal level. Tsunami amplitudes reported by Tsunami Warning Centers usually represent maximum amplitudes observed so far. Reported values may change as new data are received. Tsunami amplitude is usually measured by a sea level gauge.

Tsunami Information Bulletin: Same as a Tsunami Information Statement. The product name "Tsunami Information Bulletin" is used for international text products issued by the Pacific Tsunami Warning Center to the Pacific Tsunami Warning System and Indian Ocean Tsunami Warning System at the request of those respective user communities.

Tsunami Information Statement: A Tsunami Information Statement is issued when an earthquake has occurred or a tsunami warning, advisory, or watch has been issued for another part of the ocean. In most cases, tsunami information statements are issued to indicate there is no threat of a destructive tsunami for the area.

Tsunami Resonance: The continued reflection and interference of tsunamis in a harbor or narrow bay which can cause amplification of the wave heights, and extend the duration of wave activity from a tsunami.

Tsunami Source: Point or area of tsunami origin, usually the site of an earthquake, volcanic eruption, or landslide that caused a large scale and rapid displacement of the water resulting in a tsunami.

Tsunami Travel Time: The time required for a tsunami to propagate from its source to a specific point in the ocean or coastline.

Tsunami Warning: A Tsunami Warning is issued 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 the arrival of the initial wave. Appropriate actions to be taken by local officials may include the evacuation of low-lying areas. People in the warned areas need to move to higher ground or inland and stay in a safe area until local officials give the "cautionary re-entry."

Tsunami Warning Cancellation: A final product indicating the end of the damaging tsunami threat. A cancellation is usually issued after an evaluation of sea level data confirms that a destructive tsunami will not impact the warned area.

Tsunami Warning System: The collection of resources, processes, and functions that ensure tsunami warnings are issued, disseminated and understood. The system includes observational data (e.g. seismic, sea-level), monitoring, communications and dissemination capabilities, products and services, outreach and education, development of response plans, and the human expertise at each point in the system. Warning systems may exist at local, national,

international and global levels. Examples of Tsunami Warning Systems are the Pacific Tsunami Warning System and the Indian Ocean Tsunami Warning System.

Tsunami Watch: A Tsunami Watch is issued when a potentially dangerous, distant seismic event has occurred which may later impact the watch area with a tsunami. Be ready to take action if a tsunami warning or advisory is later issued.

Wave Crest: The highest part of a wave.

Wave Height: The vertical distance between the wave peak and adjacent trough.

Wave Period: The length of time between the arrival time of the highest wave height and the next highest wave height measured on a water level record.

Wave Length: The horizontal distance between similar points on two successive waves measured perpendicular to the crest.

Wave Trough: The lowest part of a wave.