



Sonoma County Operational Area Emergency Operations Plan Annex:

Tsunami Response Plan

DEPARTMENT OF EMERGENCY MANAGEMENT



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As an Annex to the Sonoma County Emergency Operations Plan, this document is subject to revision at any time.

Comments and suggestions should be directed to:

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DEPARTMENT OF
**EMERGENCY
MANAGEMENT**
SONOMA COUNTY

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I. INTRODUCTION

1.1 Purpose

This Tsunami Response Plan is one of several hazard-specific response plans that serve as an Annex to the Operational Area (OA) Emergency Operations Plan (EOP). The main purpose of this Annex is to provide an overview of a tsunami threat and the existing plans, procedures and response protocols within the OA that would be implemented in the event of a tsunami hazard impacting Sonoma County, specifically along the Sonoma Coast.

It also provides clarity on who are the key OA stakeholders involved in response operations and how a coordinated planning and response approach would take place in the event.

1.2 Scope

The planning and response procedures mentioned in this Annex are based on historical tsunami occurrences, modern risk assessments, and lessons learned from local response operations that have required similar coordinated protocols to follow. It is intended for tsunami risk areas of the unincorporated county coastline. The plan is not meant to override existing tsunami response plans from individual cities, California State Parks, and/or neighboring jurisdictions that may also be affected by the same event.

Further, this Annex has been developed in accordance with the County's EOP, California Emergency Services Act, Standardized Emergency Management System (SEMS), and National Incident Management System (NIMS).

1.3 Support Plans

This response plan alone may not be sufficient to address all the elements that may arise outside the existing tsunami response protocols. Planning and response operations for a tsunami event should be supported by the following plans and guidelines:

- Sonoma County Evacuation Annex
- Sonoma County Alert & Warning Annex
- Sonoma County Mass Care and Shelter Annex
- Sonoma County Animals in Disaster Annex
- Sonoma County Coastal Incidents Response Plan

1.4 Situation Overview

Tsunami: A natural phenomenon

A tsunami is a series of ocean waves caused by any large and sudden disturbance of the sea surface. Landslides, volcanic eruptions, or even meteorite impacts in the ocean can generate tsunamis. However, tsunamis are most often caused by an earthquake where there is a sudden displacement of the ocean floor.¹

When the waves enter shallow depths near a coastline, they may rise to several feet or, in rare cases, tens of feet. It is imperative for people and communities along a beach or in low coastal areas to be aware that a tsunami could arrive within minutes after a severe earthquake. A tsunami's danger period can continue for many hours after a major earthquake. They can also occur during any season of the year and at any time of the day.

Two general types of tsunamis could affect coastal areas:

- **Local tsunami** (near-source): when a large earthquake or undersea landslide occurs at or near the coast and the first waves may reach coastal communities within minutes. There may be little or no time for authorities to issue a warning.
- **Distant tsunami** (distant-source): when very large earthquakes in other areas of the Pacific Rim occur and the first waves reach the coastline hours after the earthquake occurred.

Damaging effects of a tsunami

The local threat of a tsunami is confined to low-lying coastal areas less than 50 feet above mean sea level. If the gradient is shallow, tsunami waves can also travel upstream into river channels. The primary effects of a tsunami can be widespread destruction and damage to low-lying coastal communities.

The effects of a tsunami can range from essentially no damage to heavy damage with fatalities. A moderate to heavily damaging tsunami may generate significant problems that include:

- Mass injuries and fatalities
- Emergency medical services disruptions, including hospitals
- School disruptions
- Hazardous material releases
- Fires
- Need for short-term evacuations
- Utility disruptions (gas, electric, water, sanitation)
- Transportation system disruptions
- Traffic management problems
- Communication disruptions
- Loss of commerce and government resources

¹ <https://oceantoday.noaa.gov/tsunamiawareness/>

Threat to California and the Sonoma Coast

Tsunami occurrences impacting the California coast have been historically low compared to other coastal areas worldwide. However, this does not clear California from sustaining related damages nor from any future risk stemmed from a distant or local-source tsunami.

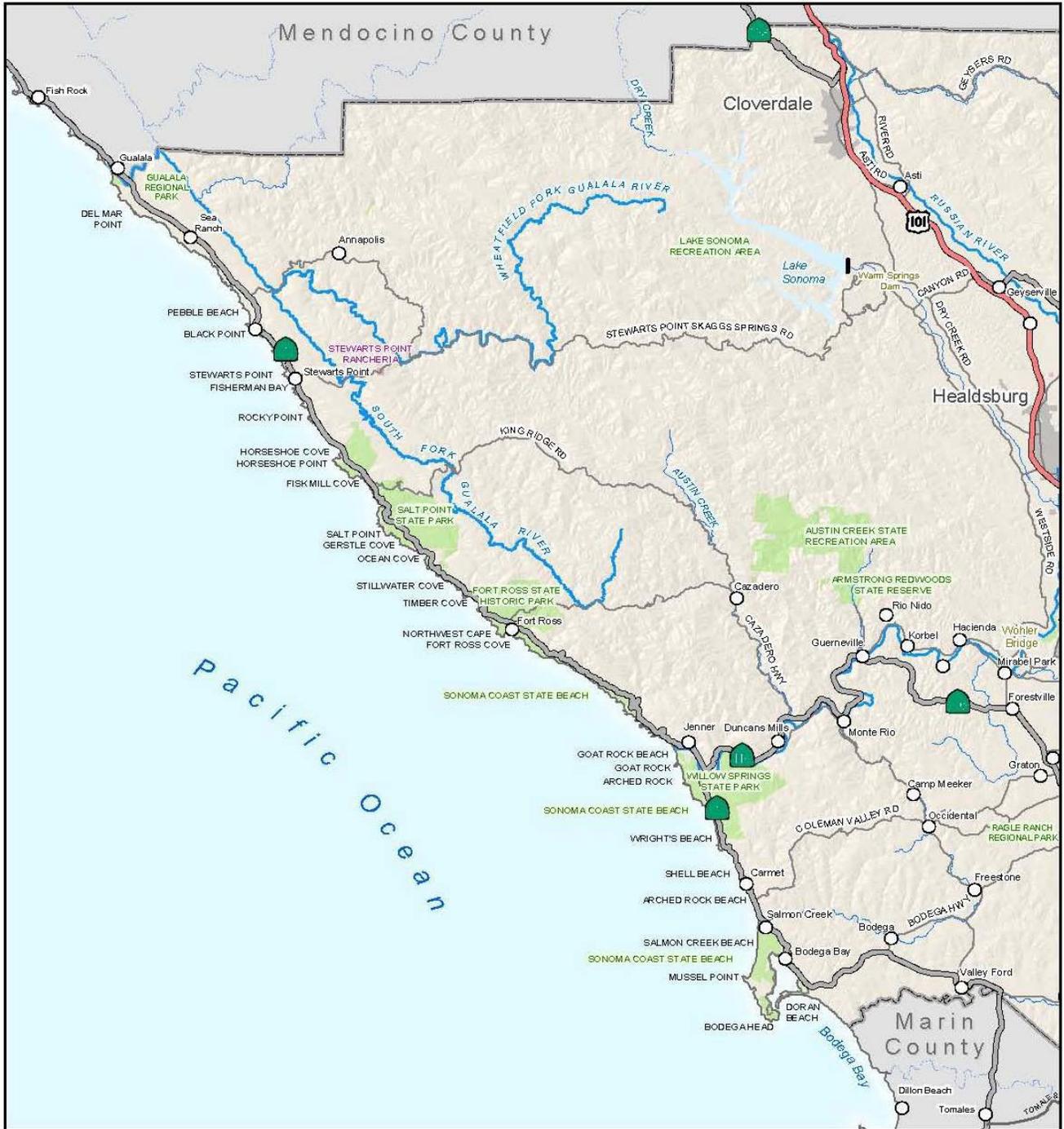
Since 1812, the California coast has had 14 tsunamis. The worst tsunami resulted from the 1964 Alaskan earthquake, which caused 12 deaths and significant damage in the coastal community of Crescent City in northern California. In recent years, the 2011 Tohoku Earthquake generated a tsunami that reached the California coast ten hours after impacting Japan. As a result, one person died and all docks in Crescent City and Santa Cruz harbors were damaged or destroyed by several strong tsunami surges that arrived over the next 24+ hours.

With 55 miles of coastline, Sonoma County has a mix of rugged coastal terrain comprised of bluffs, cliffs and low-lying terrain and beaches. The degree of potential damage to these areas would depend on the local sea bottom, coastal topographic characteristics as well as the incoming direction and height of the tsunami. Although there are no known deaths or significant damage documented as a result from a tsunami in Sonoma County, there were small tsunami impacts in 1946 and 1960.

The tsunami threat in Sonoma County is directed on certain areas in low-lying communities, which include:

- Jenner
- Carmet
- Salmon Creek
- Bodega Bay
- Fort Ross
- Sea Ranch
- Port Sonoma

Sonoma County Coastline Map



1.4 Planning Assumptions

This Tsunami Response Plan is based on the following planning and response assumptions:

- The tsunami threat in Sonoma County is primarily due to earthquakes far from California, especially originating in the Alaska-Aleutian Subduction Zone.
- After the arrival of the first wave, waves may continue to arrive at intervals for several hours. Risk areas can be reopened for public safety access two hours after the last observed wave, or two hours after the Expected Time of Arrival (ETA) has passed without a wave coming ashore.
- The first wave may not be the largest. The largest usually occurs within the first ten waves.
- For most events, at least four to nine hours warning time will be available to warn the public, evacuate sensitive facilities, establish temporary shelters, and secure the coast area. However, a local or regional tsunami could result in little or no warning. Impact reports from areas closer to the epicenter may or may not be available – this may influence the decision-making process and response effort.
- For most events, the Tsunami Warning Center may take more than 15 minutes to develop and deliver a warning message via the CalOES Warning Center and ultimately reach the Sonoma County Duty Officer and/or Sheriff's Dispatch.
- It may take more than 30 minutes for local public safety agencies to initiate response upon receipt of the warning.
- Only departments that have a response role or a role closely supporting the response to a tsunami event will be included in this plan. The departmental roles listed are limited to those applicable to the event.
- In any disaster, primary consideration is given to the preservation of life, then incident stabilization, and then to property preservation. Additionally, time and effort must be given to providing critical life-sustaining needs.
- In a catastrophic incident, damage control and disaster relief will be required from the State and Federal government, other local governments, and private organizations.
- The OA Emergency Operations Center (EOC) may or may not be activated in support of an event. EOC activation will be determined based on the scope and scale of the event.
- Many residential, commercial, and institutional structures could be damaged, requiring a substantial Search & Rescue/Heavy Rescue or Ocean/Swift Water Rescue mobilization.
- Residents and visitors could be displaced, requiring shelter and social service needs. Sheltering activities could be short term or long-term depending on the severity of the incident.

- The number of displaced persons could vary significantly depending on the time of year and day the event occurs. There will likely be more visitors along the coast in the high summer season.
- Vital infrastructure such as potable water supplies, electrical power, natural gas, and sewer services could be compromised. Re-establishment of these vital resources will be critical.
- Transportation infrastructure could be damaged and in limited operation. Vital vehicle and rail corridors could be damaged and impassible. Re-establishment of transportation infrastructure will be critical.
- Communications infrastructure could be damaged causing disruption in landline telephone, cellular telephone, radio, microwave, computer, and other communication services. Re-establishment of communications infrastructure will be critical.
- Hazardous materials incidents could be widespread in the inundation areas.
- Bridges could be unusable, creating an area of isolation.
- Media interest will be significant for any Tsunami Warning, Advisory, or Watch. Media coverage and SoCo Alert/Emergency Alert System (EAS) messages may cause the public to call 9-1-1 or other emergency numbers for more information.
- Tsunami Advisory or Warning may attract sightseers to the beaches.
- Heavy use of telephones by the public after a tsunami may impact the ability of public safety agencies to communicate and effectively warn the public.

1.5 Preparing and Responding with the Whole Community Strategy

The County of Sonoma strives to incorporate a "Whole Community" perspective in its emergency planning. The Whole Community approach to emergency management calls for the involvement of everyone- not just the government- in preparedness efforts². A key part of the Whole Community approach is incorporating those with access and functional needs into the emergency planning and response early and often. By planning with the Whole Community, the County of Sonoma planning strategy incorporates the complexities in Sonoma County's diversity.

The State of California defines those with Access and/or Functional Needs (AFN)³ as:

individuals who have developmental or intellectual disabilities, physical disabilities, chronic conditions, injuries, limited English proficiency or who are non-English speaking, older adults, children, people living in institutionalized settings, or those who are low income, homeless, or transportation disadvantaged, including, but not limited to, those who are dependent on public transit or those who are pregnant.

² FEMA Glossary <https://www.fema.gov/glossary/whole-community>

³ California Statute § 8593.3

Sonoma County's definition of disabilities and access and functional needs is as follows:

Populations whose members may have additional needs before, during, and after an incident in functional areas, including but not limited to: maintaining independence and the ability to perform the activities of daily living, communication, transportation, supervision, and medical care. Individuals in need of additional response assistance may include those who have disabilities; who live in congregate care settings; are elderly; are children; are from diverse cultures; have limited English proficiency or are non-English speaking; or who are transportation disadvantaged. ⁴

The County and OA are committed to maximizing compliance with the Americans with Disabilities Act (ADA) and providing the best service to Sonoma County residents and visitors. As such, the County adheres to the guidelines outlined below:

- Disability will not prevent access to services or facilities provided by the County.
- The County will not exclude or deny benefits of any sort based on a disability, access, or functional need.
- The County will accommodate people with disabilities and those with access and/or functional needs in the most integrated setting possible.
- During all phases of disaster response, the County will make reasonable modifications to policies, practices, and procedures, if necessary, to ensure programmatic and architectural access to all.

More information on Whole Community planning in Sonoma County can be found in the *Sonoma County Operational Area Emergency Operations Plan*.

1.6 Equity Considerations

Traditional emergency management structures create a clear decision-making hierarchy and standardized procedures, which provides clarity and efficiency in rapidly changing emergencies. However, it has also often left little room for a collaborative, community-centered approach.

Sonoma County is in the process of establishing equity practices within its emergency management structures, including embedded equity position(s) within the local Incident Command System Structure (ICS), the Joint Information Center (JIC), and in the Management section of the Emergency Operations Center (EOC).

These positions help ensure that there is a demographic assessment of the community impacted by the evacuation (for example by GIS mapping the evacuation area(s) and pulling the most recent Census or American Community Service data for evaluating race/ethnicity, income, language, etc.) to support the provision of culturally responsive emergency notification and sheltering operations. They also coordinate with community-

⁴ Sonoma County Emergency Operations Plan

based organizations and trusted partners to provide input during the design, planning, and execution phases of the response. This information is also relevant in longer term recovery planning and service delivery efforts.

Culturally responsive notification efforts can be achieved, for example, by ensuring notifications are developed and shared in relevant languages in all notification formats, as well as in emergency communications with the media. Culturally responsive sheltering efforts can be achieved by providing familiar foods, emphasizing that immigration status has no bearing on the receipt of services, and staffing shelters with bi- or multi-lingual employees and volunteers.

II. CONCEPT OF OPERATIONS

This Annex builds on the basic concepts and authorities outlined in the Sonoma County Operational Area Emergency Operations Plan (EOP), outlines general roles and responsibilities, and describes when and how resources will be activated and coordinated to support tsunami response activities.

The Concept of Operations addresses the potential issues associated with tsunamis occurring in or affecting the County and OA. The Concept of Operations outlines the roles and responsibilities of the County and OA in order to reduce loss of life. The document outlines actions and notifications associated with “triggers.” These “triggers” are based on the categories of tsunami messages issued by the National Tsunami Warning Center (NTWC), National Oceanic and Atmospheric Administration (NOAA), and The National Weather Service (NWS): tsunami information statement, watch, advisory, or warning.

The goal is to ensure a coordinated response to tsunami related emergencies in Sonoma County and provide support to jurisdictions of the Operational Area, using interagency coordination in accordance with the OA Emergency Operations Plan, the California Emergency Services Act, SEMS and NIMS.

2.1 Direction, Control and Coordination

A tsunami event will require multi-agency and multi-discipline coordination at all levels, including first responders. A unified command will be established from the various agencies with responsibility for the incident. The unified command will facilitate coordination among agencies and disciplines.

2.1.1 Objectives

- Protection of life, property, and the environment
- Alerting and warning the public including people with disabilities and those with access and functional needs

- Evacuation of the public and people with access and functional needs
- Care and shelter of large numbers of people
- Search and rescue operations including water rescues
- Environmental and public health concerns
- Debris removal
- Animal care issues, including care, shelter, and possible public health concerns
- Restoration of critical infrastructure for response activities

2.2 Notifications

Time sensitive and accurate alerts and notifications are critical in the event of a tsunami. In order to get the emergency message out in as timely a manner as possible there are multiple communications systems available to government agencies.

2.2.1 National Oceanic and Atmospheric Administration (NOAA)

The tsunami warning system for the United States is a function of NOAA National Weather Service (NWS). NOAA has two warning centers that cover the Pacific Ocean:

- National Tsunami Warning Center (NTWC) in Palmer, Alaska
*** This is the only center that issues information for the California Coast.*
- Pacific Tsunami Warning Center (PTWC) in Ewa Beach, Hawaii, this center issues information for the Pacific Ocean, Hawaii, Caribbean, and the Indian Ocean.

To accomplish its mission of providing accurate and timely tsunami bulletins to its area of responsibility which includes the Canadian coastal regions and ocean coasts of all U.S. States except Hawaii, the NTWC detects, locates, sizes, and analyzes earthquakes throughout the Pacific, Atlantic and Arctic basins.

Tsunami bulletins are issued to state departments of emergency services, federal disaster preparedness agencies, National Weather Service offices, Canada's Atlantic Storm Prediction Center, Federal Aviation Administration offices, the U.S. Coast Guard, military bases, local emergency managers, United States Geological Survey offices and many other recipients located in the U.S and Canada. Earthquakes large enough to be felt near the coast, but below the tsunami warning threshold size, prompt informational statements to the same recipients to help prevent needless evacuations.

2.2.2 California State Warning Center

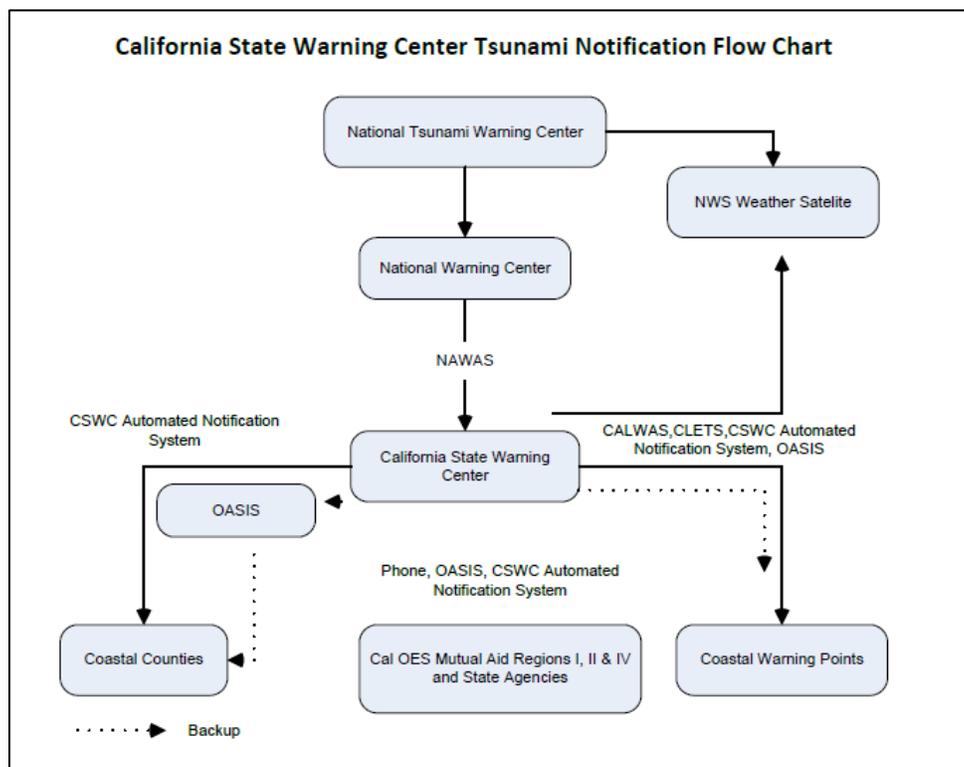
The California State Warning Center (CSWC) is responsible for informing, communicating, alerting, and notifying local governments, Operational Areas, state officials and the Federal Government of natural or human caused emergencies. The CSWC is equipped with a number of telephone, data, and radio systems, including the California Warning System, California Law Enforcement Teletype System (CLETS), NWS Weather Wire, CSWC

message-switching computer, Emergency Digital Informational Service (EDIS) and Dialogic Automated Notification System.

California Warning System (CALWAS)

The CSWC maintains the California Warning System (CALWAS) to communicate with Cal OES Regional Offices and County Warning Points during an emergency. CALWAS is part of the National Warning System (NAWAS). Components of CALWAS include the following:

- California Law Enforcement Teletype System (CLETS).
- Operational Area Satellite Information System (OASIS).
- Dialogic Automated Notification System.

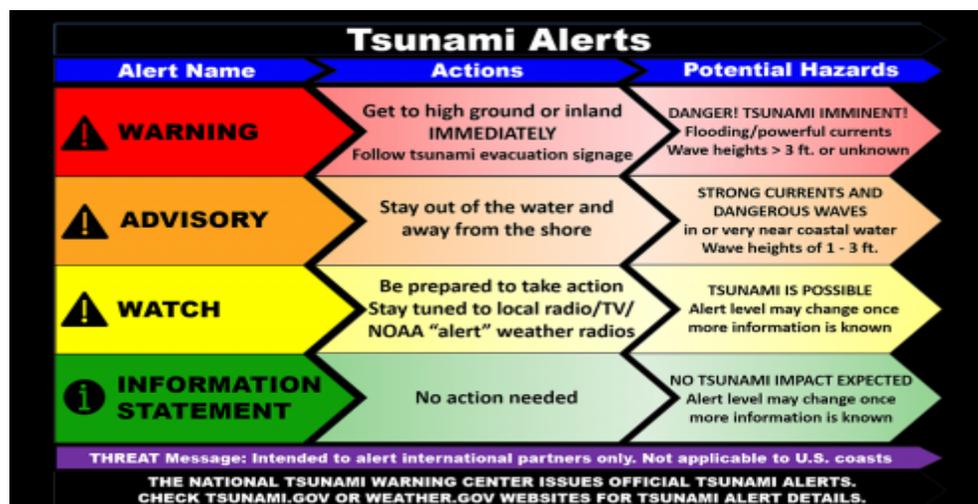


2.2.3 Tsunami Messages

NOAA issues four categories of tsunami messages:

- *Tsunami Information Statement* – A tsunami information statement is issued when an earthquake or tsunami has occurred of interest to the message recipients. In most cases, information statements are issued to indicate there is no threat of a destructive basin-wide tsunami and to prevent unnecessary evacuations. Information statements for distant events requiring evaluation may be upgraded to a warning, advisory, or watch based on updated information and analysis.

- *Tsunami Watch* –A tsunami watch is issued when a tsunami may later impact the watch area. The watch may be upgraded to a warning or advisory or canceled based on updated information and analysis. Emergency management officials and the public should prepare to take action.
- *Tsunami Advisory* – A tsunami advisory is issued when a tsunami with the potential to generate strong currents or waves dangerous to those in or very near the water is imminent, expected, or occurring. The threat may continue for several hours after initial arrival, but significant inundation is not expected for areas under an advisory. Appropriate actions to be taken by local officials may include closing beaches, evacuating harbors and marinas, and the repositioning of ships to deep waters when there is time to safely do so. Advisories may be updated, adjusted geographically, upgraded to a warning, or cancelled based on updated information and analysis.
- *Tsunami Warning* –A tsunami warning is issued when a tsunami with the potential to generate widespread inundation is imminent, expected, or occurring. Warnings alert the public that dangerous coastal flooding accompanied by powerful currents is possible and may continue for several hours after initial arrival. Warnings alert emergency management officials to take action for the entire tsunami hazard zone. Appropriate actions to be taken by local officials may include the evacuation of low-lying coastal areas, and the repositioning of ships to deep waters when there is time to safely do so. Warnings may be updated, adjusted geographically, downgraded, or canceled based on updated information and analysis. The National Weather Service will activate the Emergency Alert System (EAS) automatically in the event of a Tsunami Warning.
- A *cancellation* is issued after an evaluation of water-level data confirms that a destructive tsunami will not impact an area under a warning, advisory, or watch or that a tsunami has diminished to a level where additional damage is not expected.



2.3 Sonoma County OA Tsunami Conference Call

For a Distant Event, the California Warning Center will notify the County, Sheriff's Dispatch, and the OA Duty Officer. The Duty Officer will then analyze the Tsunami Bulletin (Watch, Advisory, Warning) received and request a conference call with specific OA partners. The conference call should take place 45-60 after written notification from the NTWC.

For a Near-Shore Earthquake Event with a magnitude greater than 6.5 the conference call will take place 1 hour after the initial earthquake due to the possibility of an imminent tsunami occurring within 15 minutes of the earthquake. Local jurisdictions should plan to immediately utilize their emergency response protocols in cases such as these.

The conference call will be used to facilitate communication, coordination, and decision-making among jurisdictions for a tsunami incident. The Duty Officer or another staff member of DEM will lead the conference call. An agenda template, call script, and list of participating agencies (Attachment B) can be found in the Attachments section.

2.4 Associated Action and Tasks

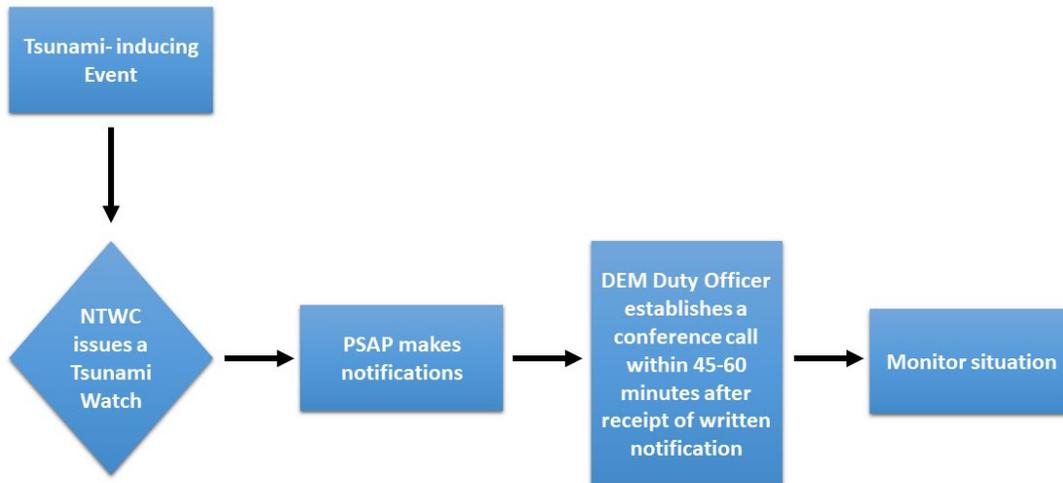
The Sonoma County Operational Emergency Operations Plan is the foundational document when speaking to systems and processes, however, during a tsunami event, the participating agencies in the Sonoma County OA Tsunami Conference Call have agreed to the following action specific tasks to this type of event.

The following sections outline and present flow charts describing what those initial actions and communications are for each tsunami hazard level. Agency specific roles and responsibilities for all levels are outlined in more detail in Section III: Roles and Responsibilities.

2.4.1 Tsunami Watch

A Tsunami Watch is issued to alert emergency managers and the public of an event that may later impact the Watch area. The Watch may be upgraded to an Advisory or Warning or cancelled based on updated information and analysis.

[Tsunami Watch Flow Chart](#)



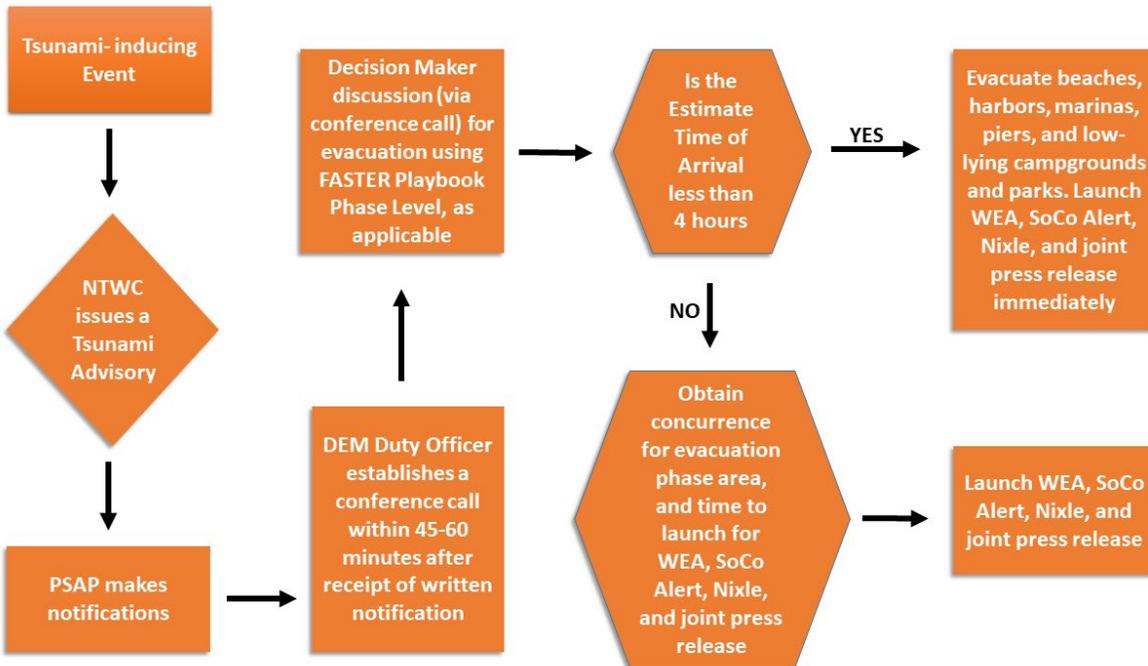
Tsunami Watch Actions and Tasks

- PSAP notifies DEM Duty Officer and Sheriff's Dispatch as per established Watch protocols.
- DEM Duty Officer will establish a conference call with jurisdictions, agencies, and NWS to discuss situation and possible changes.
- **No formal actions besides monitoring.**
- No EOC activation.
- Tsunami Watch forwarded to OA.

2.4.2 Tsunami Advisory

A Tsunami Advisory may involve the movement of people directly in contact with the ocean, as an advisory may cause strong currents and riptides. Typically called when forecasted tsunami amplitudes are between 0.3m and 1m (1ft to 3ft) above existing tidal conditions are expected. Protective action may include evacuating harbors, beaches, marinas, piers, and campgrounds.

Tsunami Advisory Flow Chart



Tsunami Advisory Actions and Tasks

- PSAP notifies DEM Duty Officer and Sheriff's Dispatch as per Advisory protocols.
- DEM Duty Officer will establish a conference call with coastal jurisdictions, agencies, and NWS to **discuss evacuations and maritime closures**.
- **If Estimate Time of Arrival of the Tsunami is less than four hours = Evacuate beaches, harbor and marina docks, piers, and low-lying campgrounds and parks.**

Or

Estimate Time of Arrival of the Tsunami is more than four hours = Use FASTER value with Elevation-Based Evacuation Playbook Plans.

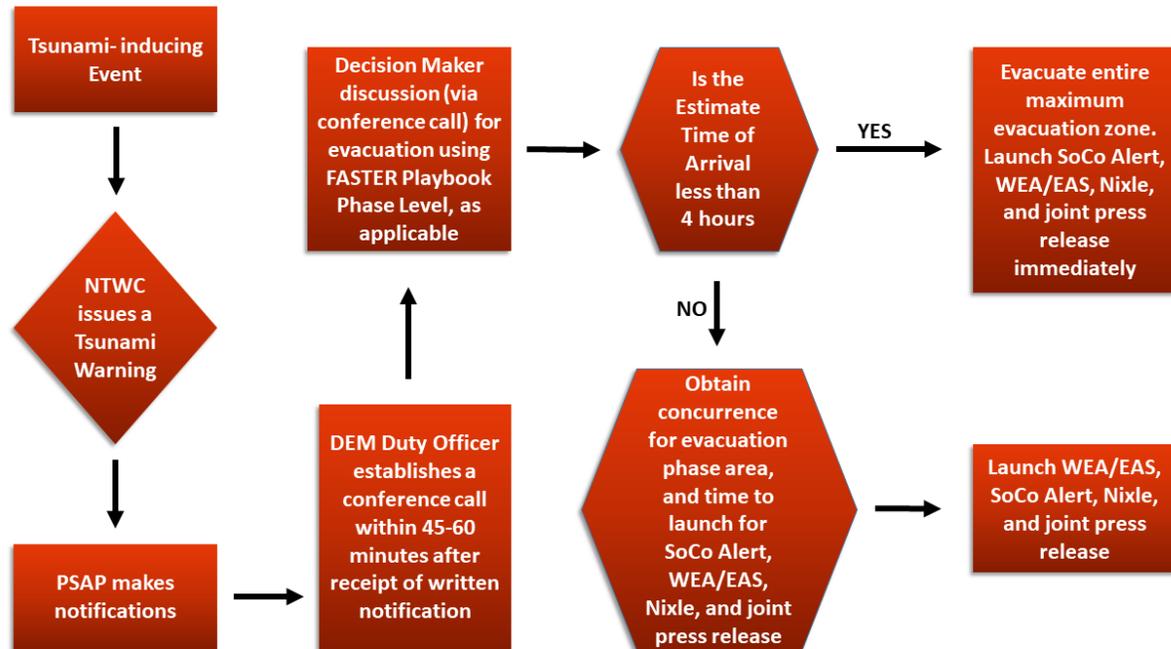
- **DEM to launch SoCo Alert and WEA to coastal region.**
- **Sherriff's Office to issue Nixle Alert.**
- **Issue joint press release.**
- OA EOC activated to Level 3 (Low Level).
- Tsunami Advisory forwarded to OA.
- Monitor and notify jurisdictions and agencies if event is updated to Tsunami Warning or there is a cancellation of the Advisory.

2.4.3 Tsunami Warning

A Tsunami Warning may involve inland inundation and evacuation of the public. Typically called when forecasted tsunami amplitudes are equal to or greater than 1m (3ft). The

impact of the inundation is depended on the location where the tsunami initiated, topography, tide, storm surge, and other factors.

Tsunami Warning Flow Chart



Tsunami Warning Actions and Tasks

- PSAP notifies DEM Duty Officer and Sheriff's Dispatch per protocols established for a Tsunami Warning.
- DEM Duty Officer will establish conference call with coastal jurisdictions, agencies, and NWS to **discuss evacuations and maritime closures using FASTER playbook.**
- **If Estimate Time of Arrival of the Tsunami is less than four hours = Evacuate maximum evacuation zone. Send alerts immediately.**

Or

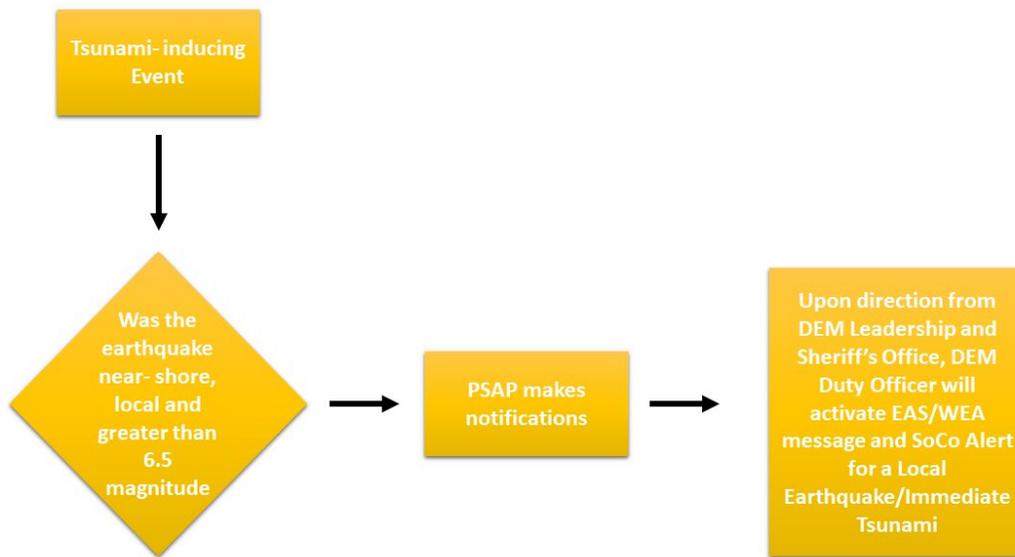
Estimate Time of Arrival of the Tsunami is more than four hours = Use FASTER value with Elevation-Based Evacuation Playbook Plans.

- **DEM to launch SoCo Alert to coastal region** (Protocol states NWS will automatically send WEAs for Tsunami Warnings, however, in the event WEAs are not issued, DEM will also launch WEA/EAS).
- **Sherriff's Office to issue Nixle Alert.**
- **Issue joint press release.**
- EOC activated to a Level 2 (Moderate Level).
- Tsunami Warning forwarded to OA.

2.4.4 Local Near-Shore Earthquake

A Local-Near Shore Earthquake (approximately 6.5 magnitude or greater) will likely cause an immediate tsunami with insufficient response time and warning.

Local Near-Shore Earthquake/Immediate Tsunami Flow Chart



Local Near-Shore Earthquake/Immediate Tsunami Actions and Tasks

- PSAP notifies DEM Duty Officer and Sheriff's Dispatch per protocols established for a Local Near-Shore Earthquake/Immediate Tsunami.
- **DEM will activate the EAS/WEA Message for Local Earthquake/Immediate Tsunami** (unless already launched by NWS).
- **DEM to launch SoCo Alert.**
- Activate EOC to Level 1.
- DEM Duty Officer will establish conference call 1 hour after initial earthquake.

Due to the short time for making response decisions in this type of event, the following evacuation and response plans are recommended for all of Sonoma County by the California Tsunami Evacuation Playbooks (see Section 2.4.5 for more information):

Scenarios with short tsunami arrival times	Shortest tsunami travel time to Sonoma County after earthquake	MINIMUM Scenario Playbook Evacuation Plan
Local coastal earthquake >M6.5	10-15 minutes	Maximum evacuation zone
Cascadia subduction zone >M8.5	45 minutes to 1 hour	Phase 3 evacuation zone
Alaska or Aleutians subduction zone >M8.5	4-5 hours	Maximum evacuation zone

2.4.5 California Tsunami Evacuation Playbooks

There are two types of tsunami evacuation playbooks. The first type of playbook is for scenarios where the tsunami travel time to California is greater than 4-5 hours, and there is enough time for the Warning Center to process data and make accurate wave-height and arrival-time forecasts. This forecast information can allow coastal communities to initiate emergency response plans which might include partial or full evacuations for their communities. This 4–5-hour period is also the minimum amount of time it takes for emergency managers to implement secondary or less-than-maximum evacuations. Secondary evacuation plans can be implemented if an Advisory or small to moderate Warning level alert is issued, and evacuation of the “worst-case” inundation zones is not warranted.

The second type of playbook is for when there is less than 4 hours tsunami travel time and forecast tsunami amplitude information might not be readily available for emergency managers. In this situation, coastal communities could use existing tsunami “scenario-based playbooks” to make swift decisions on response and/or evacuation. These scenario playbooks were developed based on the state tsunami modeling work, and include tsunamis generated from three type of tsunami sources based on where they originate (local coastal earthquake, Cascadia subduction zone, Alaska or Aleutians subduction zone).

In order to recommend the evacuation phase for an incident, the playbooks utilize a FASTER Formula, which is an acronym that includes the variables for calculating the most conservative, yet accurate, localized run-up and flood elevation that the tsunami could reach at a particular part of our coastline.

FASTER is a simple analytical tool that incorporates real-time tsunami **F**orecast **A**mplitudes (wave heights), **S**torm and **T**idal conditions, potential tsunami forecast **E**rrors, and site-specific tsunami **R**un-up potential on land to determine a more exact tsunami flood height along the coast.

The FASTER formula is as follows:

FA: Forecasted Amplitude of maximum tsunami wave (in NTWC bulletin)

- + **S:** Storm **surge** or existing ocean conditions for the first five hours of the tsunami
- + **T:** Maximum **tidal** height for the first five hours of the tsunami
- + **E:** Forecast **error** potential -30% (FA x 0.3)
- + **R:** Site- amplified **run-up** potential (FA x 0.1) (add if inundation is expected)
- = **FASTER Tsunami Flood Level Number** (maximum tsunami run-up height)

FASTER Flood Values and Associated Evacuation Levels

Evacuation Level	FASTER Tsunami Flood Value (Above Mean Sea Level)
Phase 1 Evacuation	Less than 1.00 meter (3.3 feet)
Phase 2 Evacuation	1.00-1.50 meters (3.3 -5.0 feet)
Phase 3 Evacuation	1.50-2.50 meters (5.0 -8.2 feet)
Maximum Evacuation Level	Over 2.50 meters (over 8.2 feet)

Using this formula, the Playbook shows the appropriate tsunami elevation-based evacuation playbook response plan for the resulting FASTER tsunami flood level numbers. Once the FASTER value is calculated for each community, it will be used by the state to recommend a specific playbook phase plan to use. For example, if the FASTER number is 1.3m, the state will recommend as an option that the community could use the Phase 2 Evacuation Plan.

There are different playbooks for different communities and areas on the Sonoma County coastline. There are currently eight Tsunami Evacuation Playbooks for the following areas:

- Estero Americano
- Bodega Bay
- Salmon Creek
- Coastline (Salmon Creek to Jenner)
- Jenner
- Coastline (Jenner to Sea Ranch)
- Sea Ranch

- Sears Point (SF Bay)

There is also a Tsunami Maritime Playbook guidance document for Bodega, which is intended to help members of the maritime community prepare, plan, and respond to strong currents and damage from future tsunamis.

It's important to note that in a real event, the County OA or local jurisdiction may need to calculate the FASTER number locally rather than waiting on the state to provide the calculation.

How will Playbook Phase recommendations be made?

- Within 2-3 hours after the tsunami is generated, shortly after forecast data is relayed by NTWC, the FASTER calculation will be completed and used to select correct Tsunami Evacuation Playbook plan for each community along the California coast.
- The State and NWS will recommend and communicate a MINIMUM Evacuation Playbook Phase Plan for each community.
- The Playbook Phase will be directly shared with communities via redundant communication methods: emails, password-protected websites, etc.
- The State and NWS will provide further real-time support through appropriate conference calls, individual phone calls and other avenues to make sure the communities understand what this recommendation means.
- Ultimately, each community is responsible for determining and implementing tsunami evacuations and response. Each community will determine if and how to share the appropriate evacuation plan with the public.

California Maritime Tsunami Response Playbook and Mitigation Guidance

In addition to the Tsunami Evacuation Playbooks, the State of California has also developed Maritime Tsunami Response Playbooks with mitigation guidance. These playbooks are to help members of the maritime community prepare, plan, and respond to strong currents and damage from future tsunamis. Included in this Annex is a copy of a maritime tsunami response playbook for Bodega Bay and provides detailed information about potential tsunami scenarios which can be used during an event. This playbook also utilizes the FASTER approach but focuses on maritime infrastructure, mitigation measures for the maritime community, and offshore evacuation of boats.

2.5 Emergency Public Notification and Alerts

One or more of the following methods will broadcast emergency information, warnings, and protective action instructions for a tsunami event to the public:

- Emergency Alert System (EAS)
- Wireless Emergency Alert (WEA)

- Sirens
- SoCo Alert
- Nixle Alert
- Media releases

The Department of Emergency Management (DEM) will conduct initial public information alerts in agreement with the other OA partners while the Emergency Operations Center is activating. The Public Information Section at the EOC will coordinate all public information activities and will supervise field PIOs assigned to each incident. All public notifications and alerts issued by the County and OA will be coordinated with the impacted jurisdictions in accordance with the incident's public information strategy, including people with disabilities and those with access and functional needs considerations. The PIO may recommend establishing a Joint Information Center (JIC) closer to the scene of the incident and may recommend activating the Emergency Public Information Hotline.

The dissemination and timing of the alerting methods will be dependent on the tsunami hazard level and estimated time of arrival. If the hazard level is an advisory or higher and the estimated time of arrival is 4 hours or less, alerts will be issued directly after the Tsunami Coordination Conference Call (to be held 45-60min after notification of event). If the hazard level is an advisory or higher and the estimated time of arrival is more than 4 hours, a time to issue alerts will be determined on the Tsunami Coordination Conference Call. If the estimated time of arrival for the tsunami is 8 hours or more, the aim will be to alert the public between the hours of 0700 and 2000.

2.6 Coastal Area Response

The OA EOC is located at some 45 minutes from the nearest coastal communities and therefore, response coordination would be extremely challenging if done from this centralized location. For this reason, a more strategic response approach will be employed in order to provide timely response operations and ensure a localized coordination, supported by the OA EOC.

2.6.1 Geographical Approach

Given the expansion of the various coastal communities and for the purpose of coordinating emergency rescue operations, a tsunami incident in the Sonoma County coastal area may be organized into two incidents:

- North coast impact: field coordination based out of Sea Ranch and Timber Cove
- South coast impact: field coordination based out of Jenner and Bodega Bay

An Incident Command Post (ICP) will be established and will be manned by fire, law, EMS, and public works resources. Assets will stage outside the Tsunami Hazard Area until

a “Restricted Access” or the “All Clear” announcement is given. Each incident will establish Unified Command and an incident command team. Communications assets will be allocated to and coordinated within each incident prior to re-entering the Tsunami Hazard Area.

2.7 Post Inundation Response and Recovery Transition

In a major tsunami event in which significant damage occurs, it may be hours or even days before field responders or the public may safely re-enter evacuated areas. In this situation, there will likely be mounting pressure from the community to allow re-entry so that search and rescue, medical, and restoration efforts can begin. Given such pressures, it is critical to life safety and property preservation that extensive re-entry planning be done before allowing either field responders or the public to re-enter evacuated areas.

Jurisdictions and local agencies should use their Emergency Operations Plan and supporting annexes to respond to a tsunami event where inundation has occurred. For Sonoma County, the Operational Area Emergency Operations Plan and the following Annexes will be used for post inundation response and recovery operations:

- Evacuation Annex
- Mass Care and Shelter Annex

2.7.1 Evacuation Procedures

If an evacuation order is issued, Sonoma County OA response agencies shall coordinate their operations through the Sonoma County OA EOC.

The Sonoma County Sheriff's Office will lead and direct the evacuation effort. In each incident area, fire agencies, parks and recreation, and public works resources will report to the Unified Command and assist in the public warning and evacuation efforts.

Response agencies will evacuate the zones designated by Unified Command and/or the location-specific playbook phases until 30 minutes prior to the estimated first wave arrival time. The response agencies and the public will remain outside the evacuation area until the “All-Clear” is issued. The Incident Commander and/or Unified Command will determine if a “Restricted Access” announcement will be used prior to an “All Clear”.

Evacuation Routes

The following routes have been pre-determined to be used for evacuation routes. In a real-time event, efforts will be made to add these evacuation routes and directions to an online map on socopsa.org.

Road	Direction
------	-----------

Hwy 1	North- North of Coleman Valley Road South- South of Coleman Valley Road
Bay Hill Road	Easy from Hwy 1- One way traffic
Coleman Road	North- One way traffic
Hwy 116	East Bound
Will Creek Road	SEASONAL- East Bound
Lakeville Hwy	North Bound
Skaggs Springs Road	East Bound
Meters grade Road	North
Fort Ross Road	East Bound

Note: It is the intent of this plan to identify and map traffic flow routes to safe areas for all Sonoma County coastal areas. Generally, those evacuation routes will follow an easterly direction away from the coastline and will end in safe areas where there is no danger of tsunami waves.

All persons in low-lying coast areas should be aware of the need to immediately evacuate to higher ground when a strong earthquake is felt. The recommendations are to evacuate to areas at least 100 feet above sea level on the open coast or at least two miles inland on low-lying ground- every foot upward or inland may make a difference.

All persons on Bodega Head who feel an earthquake should move out the of the inundation zone and shelter in place. The only route out of Bodega Head could potentially be inundated and rendered impassable. In the event of a distant source tsunami, Bodega Head will eb evacuated and a roadblock will be set up.

2.7.2 Field Responder Re-Entry

The decision on when to allow field responders to re-enter the evacuation area will be initiated by the Incident Commander or Unified Command and coordinated with the OA EOC.

Recommended tasks to be performed by field responders on re-entering the evacuation area include the following:

- Initial “windshield surveys” to assess life safety and damage in impacted land areas.

- Stabilizing ongoing hazardous conditions, such as fires, hazardous material spills, and other life-safety issues in impacted areas.
- Search and rescue operations in impacted areas.
- Clearing emergency egress and other critical transportation routes of debris.
- Providing input on the scheduling and process for lifting the evacuation order and allowing public re-entry into non-impacted areas and impacted areas.

2.7.3 Traffic Control

Local jurisdictions are responsible for providing traffic and perimeter control to prevent the public from re-entering the tsunami evacuation area until it is safe to do so. Local law enforcement is the lead agency in providing traffic control and perimeter security. Supporting agencies include Public Works, which provides barricades, signs, and other resources to assist with route closures. As time, resources, and personnel safety permit, other first responders will be deployed to traffic checkpoints outside but near the evacuation area to direct traffic out of, and to prevent traffic from returning to, the evacuation area. The Sheriff's Office will set up traffic control points at strategic locations to restrict traffic and access to evacuated areas, and to prevent "sightseers" from entering evacuation areas. Each agency will ensure contingency plans are in effect and personnel are trained for their roadblock assignments. The Sheriff's Office and the local fire department will establish an Incident Command Post to manage responders.

Unified Command or designee will ensure that personnel manning roadblocks understand that no entry by anyone is to be made back into evacuated areas until two hours after the estimated time of arrival (ETA) if no tsunami waves are detected AND after the "All Clear" message has been disseminated. If tsunami waves are detected, no entry by anyone, including first responders, into the inundation zones until the waves have ceased for two hours AND after the "Restricted Access" message has been disseminated. After the "Restricted Access" message, only first responders will be allowed back into the evacuated areas. Airborne surveillance and response operations are exempt from access restrictions. Only residents with proof of residency will be permitted to re-enter the area once public safety agencies have identified and eliminated the hazards.

All emergency response agency personnel participating in ground notification efforts will leave all tsunami inundation hazard zones 30 minutes prior to the ETA of the projected initial tsunami wave arrival time. Announcements to leave threatened areas will be made over all available official communications systems. Evacuated residents and sightseers will be prohibited from entering the Tsunami Inundation Hazard Area under the authority of California Penal Code 409.5.

Responding Agency Traffic Control Assignments

Control Point	Stop Traffic	Staffed (Y/N)
HWY 1 and Bay Hill (South of Bodega)	Prevent evacuating traffic from headed back into Bodega Bay	N
Hwy 1 and Bodega Hwy	Northbound on Hwy 1	Y
Hwy 1 and Hwy 116	Southbound on Hwy 1 and Westbound into Jenner	Y
Hwy 1 and Myers Grade Rd	Southbound on Hwy 1	N
Duncan's Mills (State Park HQ)	Westbound to Jenner	Y
Hwy 116 and Duncan's Mills	Westbound into Jenner	Y
Wright Hill Rd and Coleman Valley Rd	Prevent traffic headed towards the coast, help the flow of traffic evacuating from the coast on Wright Hill Rd and Coleman Valley Rd	Y

NOTE: Establishing and staffing traffic control points and providing security around the perimeter of the evacuation area may require a large number of law enforcement personnel for successive operational periods. Accordingly, the EOC should quickly assess the need for, and take action to:

- Request law enforcement mutual aid from inland communities.
- Request that the state provide first responders, such as California Highway Patrol or California National Guard personnel, who may augment personnel in providing perimeter control.

2.7.4 Issuing Public Evacuation “All Clear” Notice

Local government officials are responsible for determining when to issue an all-clear notice. An evacuation all-clear notice indicates that the tsunami threat has passed and that it is safe for the public to re-enter evacuated areas. The NTWC does not issue all-clear notices because local shoreline and bathymetric features can cause wide variations in tsunami wave action from location to location. In addition, other local dangers, such as the presence of debris, fires, and hazardous material spills, may make impacted areas unsafe long after the threat of inundating tsunami waves has passed.

The decision as to when to issue an all-clear notice allowing the public to re-enter the evacuation area will be by the decision makers on the Tsunami Conference Call.

Jurisdictional decision makers should consider the following guidelines to make that decision:

- If no tsunami was generated:
 - The NTWC's cancellation of a Warning, Advisory, or Watch indicates that officials may issue an all-clear notice allowing public re-entry into evacuated areas.
- If a tsunami was generated:
 - Local officials can assume the threat to land-based areas from destructive tsunami waves has passed when no waves, or only insignificant waves, occur for a *minimum of two hours after the latest wave arrival time* issued by the NTWC, unless the NTWC extends the Warning or Advisory.
 - Beaches and maritime areas (e.g., ports, marinas, and harbors) should remain closed for a minimum of 12 hours or up to a full tidal cycle after the NTWC cancels a Tsunami Warning or Advisory due to strong, unpredictable currents along shoreline areas. These currents may last for days.
 - When tsunami inundation or damage has occurred, or the extent of inundation or damage is unknown, field responders must first re-enter the evacuation area to perform an initial safety and damage assessment to determine whether and when the public may re-enter.

A phased re-entry may be needed if there are location within the evacuation area that remain unsafe for the public.

The NWTC may cancel or downgrade Tsunami Warnings and Advisories when conditions drop below dangerous thresholds for a sustained time period. For example, the NTWC will downgrade a Warning when conditions fall below 1 meter (3.28 feet) for a sustained period, or below 0.3 meters (1 foot) for an Advisory. The NTWC makes these determinations based on observations of local tide gauge data.

2.7.5 Coastal Observation Points

Coastal observation points may be established for real-time reports of tsunami wave impacts to those pre-identified viewable areas. Personnel assigned to observation locations shall have direct communications capabilities with the Incident Command Post and with any applicable local Command Post. Reports include any observable wave actions (or lack thereof), any observable wave affects including inundation limits, and damage reports (especially infrastructure such as roads and bridges). Reports of observed human life-threatening situations shall take priority.

The following observation points may be established:

<u>Potential Lookout Location</u>
Petaluma River Bridge for Hwy 37 (e/w access)

Sonoma Creek Bridge at Hwy 37 (e/w access)
Jenner – Russia River Mouth – Bridge Access and Safety
Carmet Area (Bluffs above Carmet beach/arched rock)
Goat Rock Rd
B. B. Fire Department
Bodega Harbor
Hwy 1 and Myers Grade Rd
Willing Rd (Jenner)
Goat Rock
Fort Ross

NOTE: Auxiliary Communication Service (ACS) volunteers would be a resource for this role to free up public safety personnel for other duties.

Where possible, observers will be asked to use video recording equipment to document the event.

2.7.7 Damage Assessment

The Damage Assessment Unit at the EOC will coordinate all damage assessment teams. Information will be forwarded to the EOC Plans Section for evaluation and consolidation.

Immediately following the “Restricted Access” announcement, a public safety assessment/rapid damage assessment is to be completed before an “All Clear” announcement is given.

2.7.8 Re-Entry Plan

After a large event, there may be a need to restrict re-entry to some areas and not to others. A re-entry plan will be created by the Op Area EOC to outline those areas that are not open, restricted to public safety personnel, areas restricted to residents only, and areas open to the general public. The plan will also provide a course of action to get those areas closed back open and an estimated timeline. The EOC Director will approve the plan and distribute to the ICPs.

Public information will be a big part in the re-entry plan. Items such as where to get information, how to gain access to homes, how to get utilities turned back on, and debris removal resources will be distributed.

The Sheriff's Office will coordinate long-term security and crime prevention activities if access to specific areas are to remain restricted for long periods of time.

III. ROLES AND RESPONSIBILITIES

All agencies, jurisdictions and organizations with a tsunami response role are responsible for implementing specific response procedures to support their functions as described below:

Sonoma County- Sheriff's Office - Dispatch

- Receive and relay the tsunami warning/advisory/watch as per the Tsunami Alert/Notification Procedure (Attachment A)
- Confirm receipt of warning/advisory/watch with California State Warning Center
- Confirm receipt of warning/advisory/watch by agencies/individuals as per the Tsunami Alert/Notification Protocol (Attachment A)
- Advise 9-1-1 callers if an evacuation is occurring
- Consider holding over and calling back staff
- On termination of incident, notify all agencies previously alerted

Sonoma County- Sheriff's Office – Command

- Activate Henry One to conduct flyover and aerial warning of beach areas
- Deploy staff to relocate Sheriff's Marine vessel(s)
- Consider activating Search & Rescue
- Assist in public warning and notification
- Serve as Incident Commander in Unified Command
- Establish Incident Command Post (ICP)
- Move resources out of the Tsunami Hazard Area
- Stage resources outside the Tsunami Inundation Hazard Zone until the "Restricted Access" or "All Clear"
- Coordinate, direct, and conduct evacuation efforts
- Coordinate, direct, and conduct scene security, crowd control, and traffic control
- Request law enforcement mutual aid as required
- Consider restricting or closing the air space over the tsunami inundation hazard zone
- Consider holding over and calling back staff
- Coordinate re-entry of residents and businesses into evacuated areas once threat has passed and area is deemed safe
- Participate in the OA Tsunami Conference call(s)

Sonoma County- Sherriff's Office – Coroner

- Deploy to ICP staging area
- Supervise the removal and decontamination of the deceased
- Coordinate identification of the deceased
- Manage next-of-kin notifications and release of remains
- Investigate deaths to verify cause associated with tsunami

Sonoma County- Sheriff's Office – Search and Rescue (SAR) Team

- Stage and deploy as directed
- Locate and extricate victims as necessary
- Provide general incident support

Sonoma County- Sheriff's Office – Helicopter Henry One

- Assist with air operations coordination
- Conduct aerial warning as needed
- Monitor arrival and impact of waves
- Provide search and rescue operations
- Support damage assessment operations
- Provide medical transportation
- Provide general incident support

Sonoma County- Department of Emergency Management (DEM)

- Receive and assess the tsunami threat
- Contact and advise DEM staff, Sheriff's Watch Commander, and County Leadership/CAO
- Establish OA Tsunami Conference Call 45-60 minutes after receipt of written notification
- Activate SoCo Alert for DEM-Tsunami Conference Call Notification Group
- Facilitate OA Tsunami Conference Call (Attachment B).
- Assess and initiate emergency public warnings including SoCo Alert, WEA, EAS, and NOAA Weather Radio.
- Contact and advise local, regional, state responders and emergency management agencies if appropriate
- Contact and advise neighboring jurisdictions if appropriate
- Represent the Sonoma County Operational Area in post-warning conference calls as necessary
- Coordinate with Cal OES
- Initiate and coordinate activation of the Operational Area EOC as necessary
- Support and coordinate the issuance of the "Restricted Access" or "All Clear" as necessary

REDCOM

- Receive and relay the tsunami warning/advisory/watch as per the Tsunami Alert/Notification Procedure (Attachment A)
- Notify fire and EMS agencies
- Advise 9-1-1 callers if an evacuation is occurring
- Consider holding over and calling back staff
- Participate in the OA Tsunami Conference call(s)

Sonoma County and Coastal Fire Districts

- Assist in public warning and notification
- Serve as Incident Commander in Unified Command
- Establish Incident Command Post (ICP)
- Move resources out of the Tsunami Inundation Hazard Zone
- Establish staging area for local and incoming resources
- Stage resources outside the Tsunami Inundation Hazard Zone until the “Restricted Access” or “All Clear”
- Coordinate, direct, and conduct fire operations in inundation areas
- Provide emergency medical treatment and transport
- Request fire and medical mutual aid as required
- Consider holding over and calling back staff
- Assist in evacuation
- Coordinate, direct, conduct search and rescue operations
- Consider activation of local Community Emergency Response Teams (CERT)
- Participate in the OA Tsunami Conference call(s)

Sonoma County- Regional Parks

- Coordinate with law enforcement
- Support evacuation efforts
- Close areas of responsibility as directed including but not limited to marinas, harbors, piers, docks, parks, and campgrounds.
- Move resources out of the Tsunami Inundation Hazard Zone
- Stage resources outside the Tsunami Hazard Area until the “Restricted Access” or “All Clear”
- Support scene security, crowd control, and traffic control
- Participate in the OA Tsunami Conference call(s)

Sonoma County- Transportation and Public Works

- Coordinate, direct, and conduct response to public work operations and emergencies
- Support perimeter and traffic control efforts
- Consider holding over and calling back staff
- Request Public Works mutual aid as necessary

- Stage resources outside the Tsunami Inundation Hazard Zone until the “Restricted Access” or “All Clear”
- Coordinate utility issues including render safe, repair, and restoration
- Coordinate, direct, and conduct debris management and removal
- Request Caltrans electronic boards to provide information on road closures
- Participate in the OA Tsunami Conference call(s)
- Provide resources including changeable message signs, k-rail barricades, and road cones to support road closures
- Coordinate with all utilities including gas and electric
- Coordinate with the Sonoma Water Agency and other partner organizations to identify infrastructure concerns that may affect re-entry timelines

Sonoma County- Emergency Medical Services (EMS)

- Activate the Medical Health Operational Area Coordinator (MHOAC)
- As the Medical Health Operational Area Coordinator (MHOAC):
 - Notify Regional Disaster Medical Health Coordinator (RDMHC)
 - Obtain out-of-county EMS or other medical/health resources as necessary
 - Notify and prepare hospitals for incoming patients
 - Stage and deploy as directed
- Participate in the OA Tsunami Conference call(s)

Sonoma County - Human Services Department (HSD)

- Coordinate and manage mass care and shelter operations
- Activate temporary evacuation points (TEP)
- Participate in the OA Tsunami Conference call(s)
- Designate and alert shelter support staff. Activate Functional Assessment Service Teams (FAST)
- Coordinate transport and placement of individuals with access and functional needs

Sonoma County- Department of Health Services – Public Health

- Evaluate the direct and indirect threats to public health
- Create messaging for any protective measures necessary

Sonoma County- Department of Health Services – Environmental Health

- Stage and deploy as directed
- Evaluate the direct and indirect threats to life, safety, and the environment
- Advise the IC on exposure, facility, and environmental health issues

Sonoma County- Department of Health Services – Animal Services

- Activate REVMA (Redwood Empire Veterinary Medical Association) to shelter pets
- Coordinate animal rescue
- Coordinate animal shelter
- Remove and/or dispose of injured or dead animals
- Protect public safety, as related to animal concerns

Sonoma County- County Communications

- Coordinate public information with impacted local jurisdictions
- Evaluate the need for a JIC or JIS
- Coordinate situational updates to elected officials
- Coordinate emergency information with 2-1-1
- Provide information simultaneously in English and Spanish
- Be prepared to travel to local radio stations to initiate EAS messaging if needed
- Participate in the OA Tsunami Conference call(s)

Sonoma County- Human Resources Department

- Coordinate volunteers
- Coordinate donation management

Sonoma County- Permit Sonoma – Hazardous Materials Unit

- Coordinate, direct, and conduct Hazardous Materials response
- Deploy to staging area
- Recon the scene for possible problems and challenges
- Conduct materials field testing and analysis
- Advise Unified Command on nature of the threats
- Request Hazardous Materials mutual aid as necessary
- Participate in the OA Tsunami Conference call(s)

Sonoma County- General Services

- Participate in the OA Tsunami Conference call(s)
- Identify infrastructure concerns that may affect re-entry timelines
- Ensure facilities are safe and have retained structural integrity
- Make facilities under their jurisdiction available for Care and Shelter
- Through all phases, provide logistical support to response effort to include maintenance, procurement and supply, facilities, and telecommunications support.

United States Coast Guard - Station Bodega Bay

- Follow USCG policy and procedures
- Move resources out of the Tsunami Hazard Area

- Stage resources outside the Tsunami Hazard Area until the “Restricted Access” or “All Clear”
- Assist in directing and conducting evacuations

Auxiliary Communications Service (ACS)

- Stage and deploy as directed
- Staff Coastal Observation Points
- Notify ICP as waves are seen approaching

Sonoma Water

- Participate in the OA Tsunami Conference call(s)
- Identify infrastructure concerns that may affect re-entry timelines
- At all phases, provide technical expertise in hydrology

IV. PLAN DEVELOPMENT AND MAINTENANCE

4.1 Overview

The OA Tsunami Annex is considered a working document that will evolve in response to ever-changing threats. Ongoing maintenance, training, and exercising of this Annex will ensure new hazards and changes in communities can be accommodated. A well-developed training and exercise program is vital to ensuring overall readiness and preparedness. Training ensures personnel are prepared for their roles and responsibilities. Emergency exercises test the capabilities, resources, and working relationships of responding agencies.

4.2 Plan Maintenance

The OA Tsunami Annex will be reviewed and revised as necessary. The Department of Emergency Management will lead the responsible departments in reviewing and updating their portions of the Annex based on identified deficiencies experienced in exercises or actual occurrences. DEM is also responsible for making revisions to this Annex to enhance the conduct of evacuation operations and will prepare, coordinate, publish and distribute any necessary changes to the Annex to all entities.

4.3 Training and Exercises

County and city staff may benefit from awareness training on the policies and procedures in their respective evacuation plans. A critical element to ensuring the success of the OA Tsunami Annex is hands-on exercise experience to supplement classroom training. The Department of Emergency Management may coordinate evacuation exercises in unincorporated areas to familiarize communities with alert and warning, Tsunami Hazard Areas, evacuation routes, and TEPs.

V. REFERENCES

Federal

- National Tsunami Hazard Mitigation Program, 2018
- National Science and Technology Council's Subcommittee on Disaster Reduction – Tsunami
- NOAA's Tsunami Program
- NOAA's National Weather Service TsunamiReady
- FEMA P646A - Vertical Evacuation from Tsunamis: A guide for Community Officials, 2009
- U.S. Geological Survey, Science Application for Risk Reduction (SAFRR) – Tsunami Scenario, 2013
- U.S. Geological Survey, Community Exposure to Tsunami Hazards in California, 2013

State

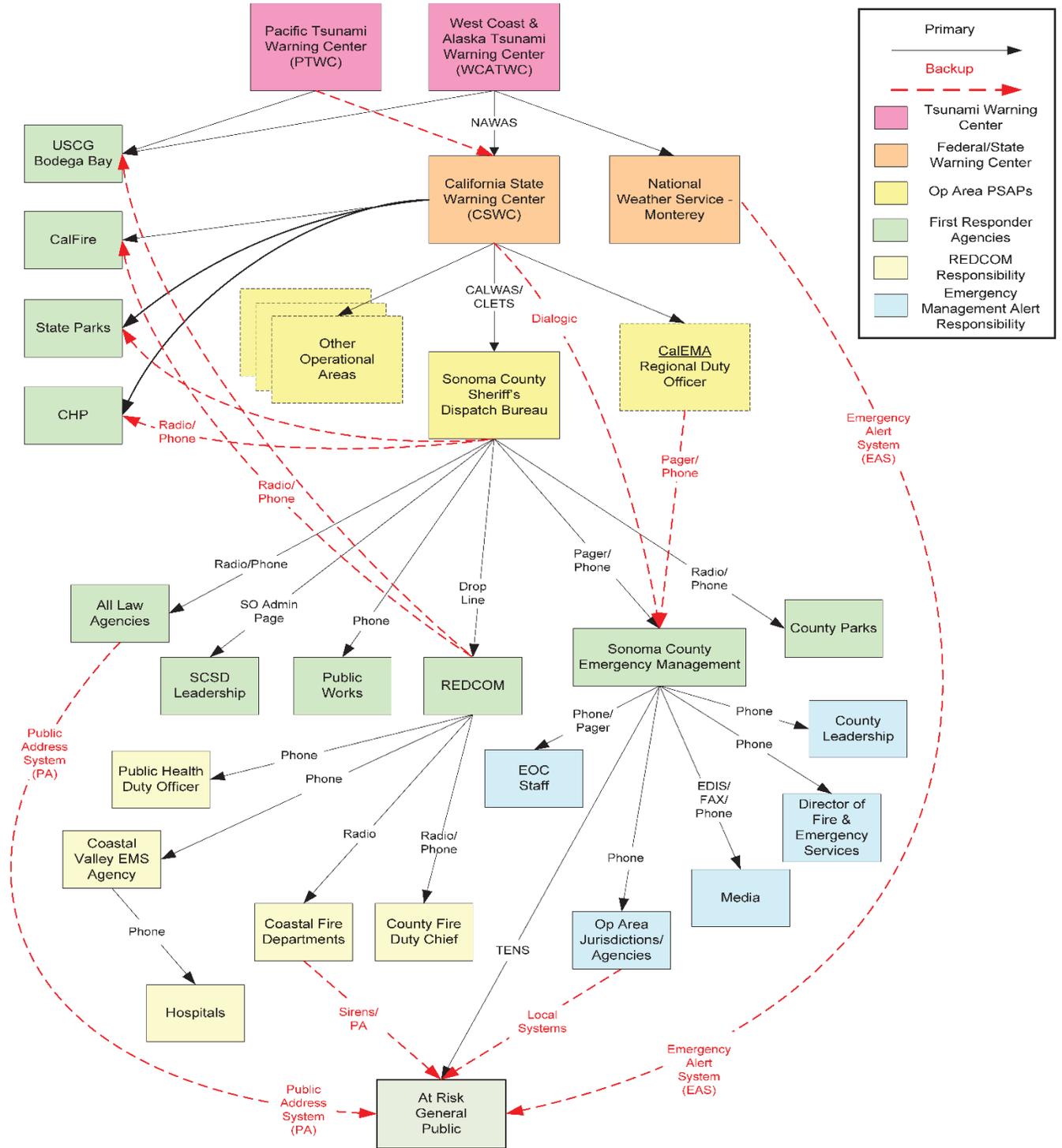
- California State Emergency Operations Plan, 2017
- California State Hazard Mitigation Plan, 2013
- State of California Seismic Safety Commission, The Tsunami Threat to California, 2005
- Tsunami Emergency Response Playbooks and FASTER Tsunami Height Calculation, 2018
- Orange County Tsunami Annex, 2020

County

- Sonoma County Emergency Operations Plan, 2022
- Sonoma County Evacuation Annex, 2021
- Sonoma County Alert & Warning Annex, 2021
- Sonoma County Mass Care and Shelter Annex, 2022
- Sonoma County Animals in Disaster Annex, 2021
- Sonoma County Coastal Incidents Response Plan, 2015
- Sonoma County Hazard Mitigation Plan, 2017

VI. ATTACHMENTS

ATTACHMENT A: Tsunami Alert/Notification Protocol



ATTACHMENT B: OA Tsunami Conference Call Script

Tsunami Conference Call Agenda for Watch, Advisory and Warning Notifications

PURPOSE

This guide is designed to facilitate communication among jurisdictions for a tsunami incident. This guide may be used under any of the following conditions:

- To establish communications among jurisdictions.
- To facilitate protective action decision-making.

INITIATING A TSUNAMI CONFERENCE CALL

The following jurisdictions/agencies should participate on tsunami call as indicated below:

Jurisdiction/Agency <i>Primary agencies and Decision Makers in bold</i>
American Red Cross
City of Petaluma
City of Santa Rosa
Kashia Band of Pomo Indians of Stewarts Point Rancheria
Monte Rio Fire Protection District
National Weather Service
Northern Sonoma Coast Fire District
REDCOMM
Sea Ranch Association (Emergency Manager & Security)
Sonoma County - County Communications/PIO
Sonoma County- Emergency Management
Sonoma County Fire District
Sonoma County - General Services
Sonoma County – Human Services Department
Sonoma County Operational Area Fire Coordinator
Sonoma County Operational Area Law Enforcement Coordinator
Sonoma County Operational Area MHOAC (Medical Health)

Sonoma County - Permit & Resource Management (PRMD – Permit Sonoma)
Sonoma County – Regional Parks, Harbor Master/Marina Manager
Sonoma County - Regional Parks, Management
Sonoma County - Regional Parks, Rangers
Sonoma County - Sheriffs Watch Command & Executive Staff (Patrol)
Sonoma County - Sheriffs Communications Shift Supervisor & Manager
Sonoma County - Transportation & Public Works
Sonoma Water
State of California - Cal OES (Sonoma County ESC or Regional Duty Officer)
State of California - Cal Trans
State of California - Highway Patrol
State of California - State Parks
U.S. Coast Guard – Station Bodega Bay

CONFERENCE CALL LINES AND BACK-UP SYSTEMS

Primary conference call line:

Conference Call: Zoom

- Set-up through SoCoOA e-mail address account.

In the event the primary conference call line fails, the Department of Emergency Management has the capabilities to provide back-up modes of communications including:

Secondary back up conference call line:

Conference Call: WebEx

- Setup through SoCoOA e-mail address account.

Type of notification from NTWC:

- Tsunami Watch
 - Tsunami Advisory
 - Tsunami Warning
-

Date:

Time:

Event Name:

County and OA EOC Facilitator:

The Sonoma County Operational Area Tsunami Conference Call is to begin 45-60 minutes after notification from Sheriffs/REDCOMM, or Cal OES, or Official Notification from NOAA PTSC.

Conference call platform: Zoom or WebEx

Time:

Link:

Meeting #:

Passcode:

LEGEND:

CF= Call Facilitator

CF= SAY IT

CF = indicates actions or items to complete

CF Ensure the following County and OA EOC Section Chiefs are in attendance, if position is activated:

- Operations Section Chief
- Planning and Intelligence Section Chief
- Logistics Section Chief
- Finance and Administration Section Chief
- PIO Section Chief

Critical Information required for the Conference Call:

CF should have the information below ready prior to initiating the conference call

Copy of the message(s) sent from the NATIONAL TSUNAMI WARNING CENTER (NTWC)		
Location and event that generated the tsunami <i>CF can obtain this information from the NTWC Bulletin</i>		
Estimated time of wave arrival <i>CF can obtain this information from the NTWC Bulletin</i>		
Projected amplitude <i>CF can obtain this information from the NTWC Bulletin</i>		
Tide levels and marine conditions predicted during event (quick information website is https://wavecast.com/forecasts/norcal/)	Low Tide Time:	Low Tide Level:
	High Tide Time:	High Tide Level:
	Marine Conditions:	
FASTER Playbook Recommended Evacuation Phases (If available). Playbook recommendations can be found in the Tsunami Annex Attachments.		
Time of Sunrise (damage assessments)		
Copy of any Press Releases or SoCo Alert messages associated with an Advisory or		

Warning in case they need to be read to the group and/or amendments made.	
Tsunami Quick Reference Chart (below)	

FASTER Reference Table for Individual Jurisdictional Playbooks

Evacuation Playbook Reference Pages	Recommended Community Action	Associated FASTER Tsunami Flood Level Number (in METERS above Mean Sea Level)	Associated FASTER Tsunami Flood Level Number (in FEET above Mean Sea Level)	Anticipated Associated NOAA Tsunami Alert Level	Tsunami height compared to other tidal reference points (see TIDAL REFERENCE FIGURE)	
					Tsunami flood level above high tide line - MHHW (flow depth above low-lying dry land)	Tsunami flood level above low tide conditions (Mean Low Low Water - MLLW)
Pages 8-9	Phase 1 Evacuation	less than 1.00m	less than 3.3ft	Advisory	none (less than 0 ft)	0 ft to 6ft
Pages 10-11	Phase 2 Evacuation	1.00m to 1.50m	3.3ft to 5.0ft	Advisory or Warning	0 ft to 1.7ft	6ft to 7.7ft
Pages 12-13	Phase 3 Evacuation	1.50m to 2.50m	5.0ft to 8.2ft	Warning	1.7ft to 5.0ft	7.7ft to 11.0ft
Pages 14-15	Maximum Evacuation Phase	more than 2.50m	more than 8.2ft	Warning	more than 5.0ft	more than 11.0ft

Tsunami Reference Chart		
Event Type	Definition	Activities/Tasks/Decisions
Tsunami Watch	Distant Tsunami Possible. Issued to alert emergency managers and the public of an event which may later impact the Watch area. May be upgraded to an Advisory or Warning -or canceled -based on updated information and analysis.	<ul style="list-style-type: none"> • PSAP notifies DEM Duty Officer and Sheriff's Dispatch as per established Watch protocols. • DEM Duty Officer will establish a conference call with jurisdictions, agencies, and NWS to discuss situation and possible changes. • No formal actions besides monitoring. • No EOC activation.

		<ul style="list-style-type: none"> • Tsunami Watch forwarded to OA.
<p>Tsunami Advisory</p>	<p>Threat of a tsunami which may produce strong currents or waves dangerous to those in or near the water; typically called when forecasted tsunami amplitudes are between 0.3m and 1m (1ft and 3ft) above existing tidal conditions are expected. Coastal communities are advised that beach and harbor areas could expect rapid, moderate tidal changes and strong currents.</p>	<ul style="list-style-type: none"> • PSAP notifies DEM Duty Officer and Sheriff's Dispatch as per Advisory protocols. • DEM Duty Officer will establish a conference call with coastal jurisdictions, agencies, and NWS to discuss evacuations and maritime closures. • If Estimate Time of Arrival of the Tsunami is less than four hours = Evacuate beaches, harbor and marina docks, piers, and low-lying campgrounds and parks. Or Estimate Time of Arrival of the Tsunami is more than four hours = Use FASTER value with Elevation-Based Evacuation Playbook Plans. • DEM to launch SoCo Alert and WEA to coastal region. • Sherriff's Office to issue Nixle Alert. • Issue joint press release. • OA EOC activated to Level 3 (Low Level). • Tsunami Advisory forwarded to OA. • Monitor and notify jurisdictions and agencies if event is updated to Tsunami Warning or there is a cancellation of the Advisory.
<p>Tsunami Warning</p>	<p>Distant Tsunami with significant widespread inundation is imminent or expected; typically called when forecasted tsunami amplitudes are equal to or greater than 1m (3ft). Coastal communities are advised to evacuate people from low-lying areas identified as vulnerable to tsunamis.</p>	<ul style="list-style-type: none"> • PSAP notifies DEM Duty Officer and Sheriff's Dispatch per protocols established for a Tsunami Warning. • DEM Duty Officer will establish conference call with coastal jurisdictions, agencies, and NWS to discuss evacuations and maritime closures using FASTER playbook. • If Estimate Time of Arrival of the Tsunami is less than four hours = Evacuate maximum evacuation zone. Send alerts immediately. Or Estimate Time of Arrival of the Tsunami is more than four hours =

		<p>Use FASTER value with Elevation-Based Evacuation Playbook Plans.</p> <ul style="list-style-type: none"> • DEM to launch SoCo Alert to coastal region (Protocol states NWS will automatically send WEAs for Tsunami Warnings, however, in the event WEAs are not issued, DEM will also launch WEA/EAS). • Sherriff's Office to issue Nixle Alert. • Issue joint press release. • EOC activated to a Level 2 (Moderate Level). • Tsunami Warning forwarded to OA.
Local Near-Shore Earthquake	<p>Immediate Tsunami – with insufficient response time or warning. The earthquake near-shore, local and greater than 6.8 magnitude.</p>	<ul style="list-style-type: none"> • PSAP notifies DEM Duty Officer and Sheriff's Dispatch per protocols established for a Local Near-Shore Earthquake/Immediate Tsunami. • DEM will activate the EAS/WEA Message for Local Earthquake/Immediate Tsunami (unless already launched by NWS). • DEM to launch SoCo Alert. • Activate EOC to Level 1. • DEM Duty Officer will establish conference call 1 hour after initial earthquake.

CF This is (name of facilitator) and I'm currently serving as the Department of Emergency Management Duty Officer, and will be facilitating the tsunami conference call.

Reminder - please mute your phones during this call in order to keep background noise to a minimum. Please do not place this call on hold – some phone systems have music and it is a disruption.

The National Tsunami Warning Center has issued a Tsunami

CF circle one **(Watch--Advisory--Warning) for Sonoma County due to**

CF provide location and event description causing the tsunami.

This conference call has been initiated to establish communications and discuss if any protective actions need to be implemented. Each of the primary jurisdictions, county departments, and allied agencies are expected to have a Decision Maker on the Conference Call for this event. Each support jurisdiction, county department, and allied agencies is expected to have an agency representative on this for situational awareness.

I will conduct a roll call; primary jurisdictions, county departments, and allied agencies will be called first followed by additional and support agencies.

When prompted, primary entities please respond if your Decision Maker is present and provide the Decision Maker’s name and phone number. Support entities, please respond with your name.

CF The following jurisdictions are required participants who have decision making authority for this event:

Jurisdiction or Agency Name	“Is your Agency Decision Maker online?”		“Decision Maker Name and Contact Number”
County/Operational Area EOC Director	YES	NO	
Sonoma County Sheriff's Office- Watch Command and Executive Staff (Patrol)	YES	NO	
Sonoma County Regional Parks – Management	YES	NO	
Sonoma County Regional Parks – Rangers	YES	NO	

Sonoma County Regional Parks – Harbor Master/Marina Mgr	YES	NO	
Sonoma County Operational Area Fire Coordinator	YES	NO	
Sonoma County Operational Area Law Enforcement Coordinator	YES	NO	
State of California – State Parks	YES	NO	
State of California – Highway Patrol	YES	NO	
City of Petaluma	YES	NO	
Sea Ranch Association	YES	NO	

CF I will now call other assisting and supporting agencies who are on this call. Please provide the name of the primary point of contact.

CF Conduct roll call of the agencies listed below. If any agency is not listed, indicate in the others column.

Other Participants: “Please list your conference call participant’s name”

Sonoma County Sheriffs Communications Shift Supervisor or Manager		
County of Sonoma HSD-EOC Operations Section Care & Shelter Branch		

County of Sonoma Emergency Operations Plan Annex:
Tsunami Response Plan

Sonoma County Transportation & Public Works		
Sonoma County Permit & Resource Management (PRMD – Permit Sonoma)		
Sonoma County General Services		
Sonoma County – County Communications/PIO		
Sonoma County Operational Area MHOAC Coordinator		
Sonoma County Fire District		
Monte Rio Fire Protection District		
North Sonoma Coast Fire Protection District		
REDCOMM		
Sonoma Water		
City of Santa Rosa		
Kashia Band of Pomo Indians of Stewarts Point Rancheria		
State of California – Cal Trans		
State of California – Cal OES – Sonoma County ESC –or Regional Duty Officer		

National Weather Service		
U.S . Coast Guard – Station Bodega Bay		
American Red Cross		
Others:		

CCF National Weather Service will you please provide an update on the current situation, and provide weather, tide, and marine conditions.

CF, If the National Weather Service is unable to be on the conference call, the CF will provide the current situation update, weather, tide predictions and marine conditions to the group.

NOAA/NWS Status Report:

Current event status

Weather, tide, and marine conditions forecast:

CF National Weather Service can you advise if a Wireless Emergency Alert has been or will be released at this time. This only occurs during a Tsunami Warning

- No
- Yes (CF capture the time to/has be launched and message contents)

CF At this time Regional Parks, State Parks, and Sea Ranch- in that order please, are there any special events scheduled on the coastline today or in the next 24/48 hours?

Regional Parks	
California State Parks	
Sea Ranch Association	
Other	

CF At this time, Sonoma County TPW, Cal Trans – in that order are there any road closures, or scheduled maintenance going on in the coast area that would interfere with evacuation, and/or traffic flow?

Sonoma County TPW	
Cal Trans	
Other	

CF Are there any other relevant status reports that need to be shared at this time?

Others:	
----------------	--

*CF ** Stop and go to the Tsunami Threat Event Level Specific Script either Watch, Advisory or Warning***

Event Level: Tsunami Watch

CF A tsunami watch is issued to alert emergency management officials and the public of an event which may later impact the watch area. The watch area may be upgraded to a warning or advisory - or cancelled - based on updated information and analysis. Therefore, emergency management officials and the public should prepare to take action. Watches are normally issued based on seismic information without confirmation that a destructive tsunami is underway.

Recommend Protective Actions for a Tsunami Warning:

CF For a Tsunami Watch in Sonoma County the protective action recommendations are as follows:

There are:

- No protective actions under a watch
- No alerts
- No evacuations orders
- Jurisdictions will continue to monitor the situation

Is there any discussion, comments, or questions before we continue?

CF shall capture additional comments here, if any:

CF All groups have concurred to the (protective actions recap above). **Does anyone have any changes or modifications?**

CF Is there any jurisdiction with any needs or requests at this time?

CF will capture any needs or requests from jurisdictions, including mutual aid, OA EOC support, etc.

Jurisdiction	Need/Request

CF if the Tsunami event occurred during night time hours, a conference call should be scheduled after sunrise to collect tsunami impact observations and damage data.

CF Our next conference call will be held at _____ time on _____ date.

CF This concludes this conference call. Thank you.

CF Immediately send out next scheduled conference call date and time information via email for the Tsunami Partners Conference Call contact list.

CF should indicate time call ended here: _____

CF Ensure an updated situation report is sent to OA Partners email list from the Duty Officer

Event Level: Tsunami Advisory

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

Recommend Protective Actions for a Tsunami Warning:

CF For a Tsunami Advisory in Sonoma County the protective action recommendations are as follows:

Protective Actions to be taken at this time including:

- Evacuation of pre-identified tsunami inundation zones based on current full inundation maps and/or FASTER calculations
- Closure of specified beaches, parks, campgrounds, harbors, and piers based on inundation maps and/or FASTER calculations
- Activate WEA for a Tsunami Advisory
- Issue SoCo Alert for a Tsunami Advisory
- Issue a Nixle Alert for a Tsunami Advisory
- Issue a press release

CF **Sonoma County Sheriff's Office Patrol**, with the information provided from the National Tsunami Warning Center, and the recommended protective actions to be taken for a Tsunami Warning: (list protective actions here) **are you in support of this, and will you start to coordinate the evacuation and/or closure efforts?**

Sonoma County Regional Parks RANGERS, with the evacuation order/closure decision(s) from the Sheriff's Office, will you start the implementation of the Coastal County Parks Tsunami Emergency Action Procedures, and coordinate in unified command with the Sheriff's Office?

Sonoma County Regional Parks HARBOR MASTER OR MARINA MANAGER, with the evacuation order/closure decision(s) from the Sheriff's Office, will you start the implementation of the Marina Tsunami Emergency Action Procedures, and coordinate in unified command with the Sheriff's Office?

California State Parks, with the evacuation order/closure decision(s) from the Sheriff's Office, will you start the implementation of your Tsunami Emergency Action Procedures for your areas of responsibility, and coordinate in unified command with the Sheriff's Office?

Sea Ranch Association, with the evacuation order/closure decision(s) from the Sheriff's Office, will you start the implementation of your Tsunami Emergency Action Procedures for your areas of responsibility, and coordinate with the Sheriff's Office as needed?

(If needed) **County DEM**, with the evacuation order/closure decision(s) from the Sheriff's Office, please prepare and send the agreed upon alert and warning messages for a Tsunami Advisory and Evacuation Order and prepare to open the Emergency Operations Center at a Level 3.

(If needed) **County/Operational Area EOC Operations – Care & Shelter Branch (Sonoma County HSD)**, please start to coordinate Temporary Evacuation Points (TEP's), and Care & Shelter locations.

Is there any discussion, comments, or questions before we continue?

CF shall capture additional comments here, if any:

CF The group has determined a SoCo Alert/WEA will be issued at _____ time on _____ date by Sonoma County DEM. Is there any further discussion, comments, or questions on alerts before we continue?

CF shall capture additional comments here, if any:

CF All groups have concurred to the (protective actions recap above). Does anyone have any changes or modifications?

CF Our next conference call will be held at _____ time on
_____ date.

CF This concludes this conference call. Thank you.

CF Immediately send out next scheduled conference call date and time information via email for the Tsunami Partners Conference Call contact list.

CF should indicate time call ended here: _____

CF Ensure an updated situation report is sent to OA Partners email list from the Duty Officer.

Event Level: Tsunami Warning

CF 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 arrival of the initial wave. Warnings also alert emergency management officials to take action for the entire tsunami hazard zone. Appropriate actions to be taken by local officials may include the evacuation of low-lying coastal areas, and the repositioning of ships to deep waters when there is time to safely do so. Warnings may be updated, adjusted geographically, downgraded, or canceled. To provide the earliest possible alert, initial warnings are normally based only on seismic information.

Recommend Protective Actions for a Tsunami Warning:

CF For a Tsunami Warning in Sonoma County the protective action recommendations are as follows:

Protective Actions to be taken at this time including:

- **Evacuation of pre-identified tsunami inundation zones based on current full inundation maps and/or FASTER calculations**
- **Closure of specified beaches, parks, campgrounds, harbors, and piers based on inundation maps and/or FASTER calculations**
- **Activate EAS/WEA/NOAA Weather Radios for a Tsunami Warning (if not already done so by NWS)**
- **Issue SoCo Alert for a Tsunami Warning**
- **Issue a Nixle Alert for a Tsunami Warning**
- **Issue a press release**

CF Sonoma County Sheriff's Office Patrol, with the information provided from the National Tsunami Warning Center, and the recommended protective actions to be taken for a Tsunami Warning: (list protective actions here) **are you in support of this, and will you start to coordinate the evacuation effort?**

Sonoma County Regional Parks RANGERS, with the evacuation order from the Sheriff's Office, will you start the implementation of the Coastal County Parks Tsunami Emergency Action Procedures, and coordinate in unified command with the Sheriff's Office?

Sonoma County Regional Parks HARBOR MASTER OR MARINA MANAGER, with the evacuation order from the Sheriff's Office, will you start the implementation of the Marina Tsunami Emergency Action Procedures, and coordinate in unified command with the Sheriff's Office?

California State Parks, with the evacuation order from the Sheriff's Office, will you start the implementation of your Tsunami Emergency Action Procedures for your areas of responsibility, and coordinate in unified command with the Sheriff's Office?

Sea Ranch Association, with the evacuation order from the Sheriff's Office, will you start the implementation of your Tsunami Emergency Action Procedures for your areas of responsibility, and coordinate with the Sheriff's Office as needed?

County DEM, with the evacuation order from the Sheriff's Office, please prepare and send the agreed upon alert and warning messages for a Tsunami Warning and Evacuation Order and prepare to open the Emergency Operations Center at a Level 2. Operations, Logistics, Planning, Finance, Public Information, and County COOP will be activated.

County/Operational Area EOC Operations – Care & Shelter Branch (Sonoma County HSD), please start to coordinate Temporary Evacuation Points (TEP's), and Care & Shelter locations.

Is there any discussion, comments, or questions before we continue?

CF shall capture additional comments here, if any:

CF The group has determined a SoCo Alert/WEA/EAS/NWR alert(s) will be issued at _____ time on _____ date by Sonoma County DEM. Is there any further discussion, comments, or questions on alerts before we continue?

CF shall capture additional comments here, if any:

CF All groups have concurred to the (protective actions recap above). Does anyone have any changes or modifications?

CF if the Tsunami event occurred during night time hours, a conference call should be scheduled after sunrise to collect tsunami impact observations and damage data.

CF Our next conference call will be held at _____ time on _____ date.

CF This concludes this conference call. Thank you.

CF Immediately send out next scheduled conference call date and time information via email for the Tsunami Partners Conference Call contact list.

CF should indicate time call ended here: _____

CF Ensure an updated situation report is sent to OA Partners email list from the Duty Officer.

ATTACHMENT C: Tsunami Definitions

Amplitude: The rise above or drop below the ambient water level as read on a tide gauge.

Bathymetry: The measurement of the depths of oceans, seas, etc.

Bore: Traveling wave with an abrupt vertical front or wall of water. Under certain conditions, the leading edge of a tsunami wave may form a bore as it approaches and runs onshore. A bore may also be formed when a tsunami wave enters a river channel and may travel upstream penetrating to a greater distance inland than the general inundation.

Distant- Source Tsunami: can cause damage across the Pacific. The 1964 Alaskan Earthquake and Tsunami as well as the 2004 Indonesian Tsunami are examples of this kind of massive, far-reaching event. Other potential sources of tsunami that could affect Sonoma County are Chile, Japan, and any other gigantic seismic event on the Pacific Rim.

ETA: Estimated Time of Arrival. Computed arrival time of the first tsunami wave at coastal communities after a specific earthquake has occurred.

FASTER: A simple analytical tool that incorporates real-time tsunami Forecast Amplitudes (wave heights), Storm and Tidal conditions, potential tsunami forecast Errors, and site-specific tsunami Run-up potential on land to determine a more exact tsunami flood height along the coast.

First Motion: Initial motion of the first wave. A rise in the water level is denoted by R, a fall by F.

Harbor Resonance: The continued reflection and interference of waves from the edge of a harbor or narrow bay. This interference can cause amplification of the wave heights and extend the duration of wave activity from a tsunami.

Horizontal Inundation Distance: The distance that a tsunami wave penetrates onto the shore. Measured horizontally from the mean sea level position of the water's edge, it is usually measured as the maximum distance for a particular segment of the coast.

Inundation: The depth, relative to a stated reference level, to which a particular location is covered by water.

Inundation area: An area that is flooded with water.

Inundation Line (limit): The inland limit of wetting, measured horizontally from the edge of the coast, defined by mean sea level.

Leading-Depression Wave: Initial tsunami wave is a trough, causing a draw-down of water level.

Leading-Positive Wave: Initial tsunami wave is a crest, causing a rise in water level. Also called a leading-elevation wave.

Local- Source Tsunami: Also known as a “near shore tsunami”, the first wave could arrive on shore with minutes after an earthquake. In Sonoma County, such an event would most probably be caused by an earthquake at the Cape Mendocino junction near the Oregon border. This type of event can cause destruction up to 600 miles from the source.

Maremoto: Spanish term for tsunami.

Marigram: Tide gauge recording showing wave height as a function of time.

Marigraph: The instrument which records wave height.

MLLW: (Mean Lower Low Water) The average low tide water elevation often used as a reference to measure run-up.

Ms: (Surface Wave Magnitude) Magnitude of an earthquake as measured from the amplitude of seismic surface waves. Often referred to as the “Richter” magnitude.

Mw: (Moment Magnitude) Magnitude based on the size and characteristics of the fault rupture and determined from long-period seismic waves. It is a better measure of earthquake size than surface wave magnitude, especially for very large earthquakes.

Tsunami period: The length of time between two successive peaks or troughs. Will vary due to complex interference of waves. Tsunami periods generally range from 5 to 60 minutes.

Run-up: Maximum height of the water onshore observed above a reference sea level. Usually measured at the horizontal inundation limit.

Seiche: An oscillating wave (also referred to as a seismic sea wave) in a partially or fully enclosed body of water. May be initiated by long period seismic waves, wind and water waves, or a tsunami.

Strike-Slip Earthquake: An earthquake caused by horizontal slip along a fault.

Thrust Earthquake: Earthquake caused by slip along a gently sloping fault where the rock above the fault is pushed upward relative to the rock below. The most common type of earthquake source generating tsunamis.

Tidal Wave: Common term for tsunami used in older literature, historical descriptions, and popular accounts. Tides, caused by the gravitational attractions of the sun and moon, may increase or decrease the impact of a tsunami, but have nothing to do with their generation or propagation. However, most tsunamis (initially) give the appearance of a fast-rising or fast-ebbing tide as they approach shore, and only rarely appear as a near-vertical wall of water.

Travel Time: Time (usually measured in hours and tenths of hours) that it took the tsunami to travel from the source to a particular location.

Tsunami: A Japanese term derived from the characters "tsu" meaning harbor and "nami" meaning wave. Now generally accepted by the international scientific community to describe a series of traveling waves in water produced by the displacement of the sea floor associated with submarine earthquakes, volcanic eruptions, or landslides.

Tsunami Earthquake: A tsunamigenic earthquake which produces a much larger tsunami than expected for its magnitude.

Tsunami Magnitude: A number that characterizes the strength of a tsunami based on the tsunami wave amplitudes. Several different tsunami magnitude determination methods have been proposed.

Wave Period: is the time between waves, which can typically vary from 5 minutes to two hours.

ATTACHMENT D: Tsunami Hazard Areas (THA) and Playbooks

Estero Americano Tsunami Playbook



Adobe Acrobat
Document

Bodega Bay Tsunami Playbook



Adobe Acrobat
Document

Bodega Bay Tsunami Maritime Playbook



Adobe Acrobat
Document

Salmon Creek Tsunami Playbook



Adobe Acrobat
Document

Coastline Salmon Creek to Jenner Tsunami Playbook



Adobe Acrobat
Document

Jenner Tsunami Playbook



Adobe Acrobat
Document

Coastline Jenner to Sea Ranch Tsunami Playbook



Adobe Acrobat
Document

Sea Ranch Tsunami Playbook



Adobe Acrobat
Document

Sears Point Tsunami Playbook



Adobe Acrobat
Document