

# Northwestern Coastal California EARTHQUAKE & TSUNAMI RESPONSE FACT SHEET



**Purpose:** To enhance knowledge, safety, and local resiliency, this Fact Sheet provides government agency and partner entities in the Humboldt Operational Area (OA) with facts and information to be considered in developing their policies and procedures for response to earthquakes and tsunamis.

**Content Approval:** The content of this Fact Sheet has been reviewed and endorsed by representatives of the following entities:



[Redwood Coast Tsunami Work Group](#)



[California Geological Survey](#)



[National Weather Service](#)



Law Enforcement Chiefs Association of Humboldt



[Cal OES Seismic Hazards Branch](#)



Humboldt Fire Chiefs' Association

## ABOUT OUR AREA

**Reality:** The North Coast is the most earthquake-prone area in the contiguous United States.

**Nearby Risk:** The Cascadia Subduction Zone (CSZ) lies off our coastline, running south to north from Cape Mendocino to British Columbia. The CSZ is capable of producing very strong, long-duration, and destructive ground shaking. Within minutes after the shaking stops, a very large tsunami triggered by the quake may arrive on our coast, with surges continuing for many hours.

**Distant Risk:** Great earthquakes in Alaska, Chile, Japan, Russia, and elsewhere in the Pacific could trigger tsunamis capable of damaging our beaches, harbors, and low-lying coastal areas.

## ABOUT EARTHQUAKES

**Magnitude and Epicenter Don't Tell The Whole Story:** *Magnitude (M)* is related to how much energy is released in an earthquake, but the scale is not linear. A M 7 releases 32 times more energy than a M 6, and about 1000 times more than a M 5. A M 6 onshore may produce more damage than a M 7 offshore. Initial reports of a big quake's magnitude are often revised up or down in the next few hours, affecting public messaging. The *Epicenter* is the point above the spot where the quake started. On the CSZ, the next rupture may extend hundreds of miles, resulting in destructive shaking and tsunami hazards across communities quite distant from the epicenter.

**Damage and Danger Relate to Duration of Shaking:** The larger the magnitude, the longer shaking will last, increasing the potential for structural damage. Duration is the best indicator of the earthquake's likely magnitude and its tsunami-generating potential. A M 6 may produce very strong shaking near the epicenter but may last only 20 seconds. A M 9 may be felt over a large area for several minutes. Even if the shaking seems mild locally, an earthquake that lasts a long time is always a heads-up for agency/entity members to not wait for an official Tsunami Warning message before considering their location and activity. If they are on or near the coast, they should start moving to high ground or inland while awaiting official information; surges could be coming.

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**Foreshocks, Mainshocks, and Aftershocks:** Earthquakes always occur in sequences. The largest quake is the *mainshock*. Some quakes are preceded by smaller earthquakes (*foreshocks*), and all large earthquakes are followed by smaller quakes (*aftershocks*). *Foreshocks, mainshocks, and aftershocks* are all earthquakes in their own right and capable of causing damage if large enough. When a moderate to large earthquake occurs, there is always a small but real chance that it may be followed by an even larger quake. Aftershocks are most frequent in the days and weeks following a mainshock, but may continue for months. After a big quake, expect additional episodes of strong shaking that may cause more damage to structures weakened in the mainshock.

## ABOUT TSUNAMIS

**A Tsunami is a Series of Water Surges** usually caused by an earthquake under the sea floor.

**The First Surge Won't Be the Largest;** successive waves may be spaced irregularly from minutes to an hour or more. Large tsunamis could bring surge heights of 20 to 50 feet to our coastline. The danger of continuing surges could last for 12 hours and in some situations for more than a day.

**Every Tsunami is Different;** the surges may appear as a rapidly rising tide, a sloping wall of water, or as a chaotic mass of swirling water often choked with debris.

**Since 1933, More than 45 Tsunamis** have been recorded across Northern California; at least six of them caused damage. Some were deadly.

**The Biggest Tsunamis** impacting Humboldt County are likely to be triggered by great earthquakes off our coast, but regional or distant quakes can cause dangerous tsunamis here too.

## TSUNAMI HAZARD AREA MAPS

**Tsunami Hazard Areas:** The California Geological Survey has mapped out our official [Tsunami Hazard Areas](#). The projected hazard areas are based on our worst-case tsunami, generated by a hypothetical M 9 on the CSZ. The hazard area boundaries are conservative; they reflect a high tide and potential ground subsidence and include an additional factor of safety.

Map areas shaded in green are sufficiently high or inland to be safe in even the most extreme earthquake event. Map areas shaded in yellow indicate being at risk, especially for people closest to the beach or in low areas.



## FEDERAL TSUNAMI DEFINITIONS – [National Weather Service](#)

**Near-source tsunami (or “local tsunami”)** – A tsunami likely to arrive in an hour or less (could be as quick as 10 minutes). Caused by a quake or event from one to 62 miles away, this type has killed the most people of all tsunamis studied around the Pacific.

**0-1  
Hours**

**Regional tsunami** – A tsunami expected to arrive in one to three hours, typically caused by a quake or event 62-621 miles away.

**1-3  
Hours**

**Distant-source tsunami (or “distant tsunami”)** – A tsunami expected to arrive in three to eight hours, typically caused by a quake or event of 621 to thousands of miles away.

**3 +  
Hours**

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Images reprinted with permission from [Living on Shaky Ground, 2024](#)

Find more detailed Tsunami Maps for these and other areas at [California Geological Survey](#)

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**COMPARISON OF NEAR-SOURCE vs DISTANT-SOURCE TSUNAMIS**

	<b>Near-Source Tsunami</b>	<b>Distant-Source Tsunami</b>
<b>Travel time from source</b>	Arrival within one hour; could be as quick as ten minutes	Arrival in 3 hours or more
<b>Ground shaking felt in Humboldt County</b>	Moderate to very strong, may last for minutes	No ground-shaking felt in Humboldt
<b>Local infrastructure damage from earthquake shaking</b>	Roads & runways may buckle; bridges & overpasses may fall; communication systems impacts/failures are possible	None
<b>Receipt of a government tsunami message from the National Tsunami Warning Center (NTWC) in Alaska</b>	DON'T WAIT FOR IT - it may not come (short time window, no power or internet, damaged cell towers, etc.)	First message should go out within 15 minutes after a distant earthquake; Estimated Time of Arrival (ETA) updates should follow
<b>Immediate traffic and gridlock</b>	Very likely-should leave on foot	Less likely until close to ETA
<b>Deployment into or through tsunami hazard areas</b>	Dangerous, NOT recommended until all-clear.	Permissible if time allows
<b>Time to deploy into or pass through a tsunami hazard area</b>	NO TIME! Leave NOW and STAY OUT	One (1) hour before first surge ETA
<b>Time to get out of hazard areas</b>	Immediately	One (1) hour before first surge ETA

<b>Number and size of surges</b>	Multiple tsunami surges of various sizes are likely, spaced irregularly tens of minutes to hours apart; The first surge is NEVER the biggest!
<b>How long will the threat last?</b>	The tsunami threat could last for hours or even days, and all members should NOT enter hazard areas until the all-clear.
<b>Who determines that the tsunami threat has passed?</b>	The National Tsunami Warning Center (NTWC) in Alaska, (linked to the Eureka Office of the National Weather Service), when it determines a tsunami will not affect our area or it has diminished enough that additional damage is not expected; BUT, cancellation of a message does <u>not</u> mean area is safe.
<b>Who determines if it's now safe to enter hazard areas?</b>	Local agency of geographic jurisdiction ( e.g., special district, city, county, state, tribal, or federal governmental organization responsible for affected land in the Humboldt OA); <u>note</u> : related hazards may persist for hours, days, or weeks.
<b>Who disseminates the “all-clear” message to the public?</b>	The NTWC will cancel a Warning or reduce a Warning to an Advisory when the threat of a land-inundating tsunami has passed; or, cancel an Advisory when potential for strong currents has ended. Upon NTWC or NWS notification to HumCo OES, cancellation or reduction of tsunami messages should be shared with OA partners and the public.



**FEDERAL TSUNAMI MESSAGING – *National Tsunami Warning System***

These are the National Tsunami Warning Center (NTWC) message types used to inform the US West Coast. In a large tsunami, alert level classifications are likely to change as the event progresses.

Alert Level	Action	Hazard	Notes
<b>WARNING</b>	Get to high ground or inland!	Dangerous coastal flooding & powerful currents are possible.	Warning may be downgraded or cancelled.
<b>ADVISORY</b>	Stay out of water, away from beaches and waterways.	Strong currents & dangerous waves are possible.	Advisory may be upgraded to a Warning or cancelled.
<b>WATCH</b>	Prepare to take action; monitor official information.	A distance-source tsunami is possible; arrival may be in hours.	Watch may be upgraded or cancelled.
<b>INFORMATION STATEMENT</b>	No action needed now; monitor official information.	No threat; or, very distant event and threat not determined.	Information statement may be upgraded.

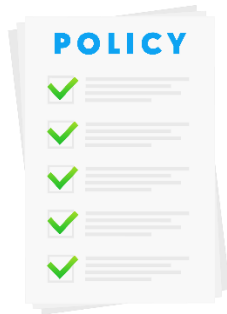
- As of 2025, the NWS operates two tsunami warning centers. The NTWC in Alaska analyzes events and disseminates messages for the California coast and other state coastlines except Hawaii. The Pacific Tsunami Warning Center (PTWC) in Hawaii analyzes events and disseminates messages for Hawaii and certain U.S. territories. The PTWC may also publish “tsunami threat messages” for foreign countries, prompting news and social media coverage.
- Information originating from the NTWC ([tsunami.gov](https://tsunami.gov)) about tsunami events affecting our coast may be further interpreted by local and state-based experts. Local government messaging (e.g., [humboldt.gov/emergency](https://humboldt.gov/emergency)) may repeat, clarify, expand upon, or differ from NTWC info.
- **NOTE:** The NTWC may not send Cancellations on all pathways and systems originally used to disseminate an earlier Tsunami Warning. For example, visiting tourists might receive a NTWC-initiated Wireless Emergency Alert (WEA) Tsunami Warning on their cell phones or an Emergency Alert System (EAS) Tsunami Warning on their hotel TV or car radio, but getting news of the NTWC Warning Cancellation may require other local entities (e.g., tribal and local government partners) to disseminate the Tsunami Warning Cancellation across Humboldt.

**“ONE-HOUR RULE” AND “T-MINUS” TSUNAMI WARNING CONCEPTS**

In a Tsunami Warning event, agency/entity leadership should consider the concept of withdrawing all personnel from tsunami hazard areas at least one hour prior to the ETA of a regional- or distant-source tsunami. A “T-Minus” approach similar to a rocket launch countdown may be used to verbally share updates in timing to remind and prepare all personnel to leave hazard areas by “T-Minus One Hour”. Once out, agency/entity members should stay out of tsunami hazard areas until official local government updates (e.g., [humboldt.gov/emergency](https://humboldt.gov/emergency)) indicate otherwise.

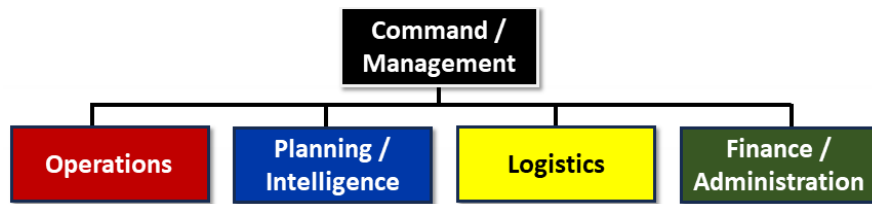


**AGENCY/ENTITY PREPAREDNESS**



**Develop Policy:** Agency/entity leadership should develop written policy describing their organization's intended approach during earthquake and tsunami hazard response. The content of this Fact Sheet should help.

The nature of tsunami or earthquake impacts will require coordinated field response from multiple agencies and entities; policy should emphasize the use of the [Incident Command System \(ICS\)](#).



**ICS Functional Areas**

The ICS approach of [Area Commands](#) may be a policy option to manage scarce entity/agency resources among several incident scenes, especially when a Tsunami Warning, roadway damage, and/or other hazards result in “isolated islands” of people separated from one another.

Policy content should include guidance statements for on-duty and off-duty members, including conditions during which personnel and resources should STAY OUT of tsunami hazard areas, or when they may work in the safe areas they are currently in or can reasonably reach.

Elected officials and/or administrators may be involved in review and/or approval of policy. Government agencies in overlapping jurisdictions should seek to develop policies that are consistent, or at least compatible.

**Develop Procedure:** Agency/entity leadership should develop standard operating procedures/guidelines (SOPs or SOGs, based on policy) providing members with guidance.



Consideration may be given to: what off-duty members can do if they are able to work but are unable to get to their worksite; and, what positions might be assigned to go to or link with the Humboldt OA Emergency Operations Center (EOC).

**Get Resources:** Agencies/entities should address their preparedness needs, including but not limited to: emergency supplies and equipment for personnel; agency/entity EOC facilities, spaces for meetings; communications equipment; pre-printed tsunami maps and guidance documents.

**Training:** Agency/entity leadership should ensure all members are trained in the policy, oriented to SOPs/SOGs, and prepared for the situations that they may face in an earthquake or tsunami event. Participation in the [Great California ShakeOut](#) each fall is a yearly opportunity for government agencies and partner entities to review and enhance their preparedness for earthquakes.

A safety meeting based on this Fact Sheet may immediately improve operational resilience.

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## FACILITIES RESPONSIBLE FOR PEOPLE: COLLEGES, SCHOOLS, DAYCARE, SENIOR SITES, ETC.

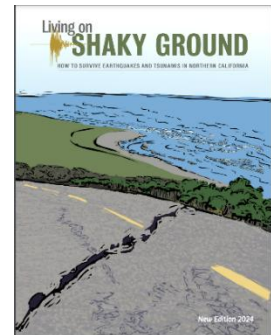
**Awareness:** Response agencies/entities should be aware of the facilities within their jurisdictions with some responsibility for the safety of the people they host (e.g., university, college, TK-12 schools, pre-schools, daycare, assisted living, nursing homes), especially those facilities located within or close to tsunami hazard areas as mapped by the [California Geological Survey](#).

**Problem:** Without a pre-identified approach to the risk (or the absence of risk) of tsunami surges, facility staff may act ineffectively or inappropriately. Without clear understanding of facility policy, family members may put themselves at personal risk and complicate response efforts by driving through and into tsunami hazard areas trying to reach or retrieve loved ones that should already be safe either because the facility is in a safe area, or because they moved to high ground.

**Engagement and Support:** Response agencies/entities should support preparedness efforts and internal response planning by facility leadership. Special attention should be given to facility development of internal SOPs/SOGs that provide clear guidance for evacuating and for NOT evacuating. Robust and continuing public education for the people they serve, and their families, should be encouraged. Procedures for texting or otherwise notifying families may be considered.

## EDUCATE THE PUBLIC

**Living on Shaky Ground Magazine:** Response personnel should read, endorse, and share copies of the current version of the [Living on Shaky Ground](#) magazine. The magazine should serve as a consistent foundation for public education efforts by all response agencies/entities on the North Coast. It is authored by the [Redwood Coast Tsunami Work Group](#) (RCTWG).



The [RCTWG website](#) includes information about recent earthquakes, tsunamis, and preparedness. It includes a [downloadable interactive PDF map of tsunami hazard areas](#) of many areas around Humboldt Bay.

## PERSONAL PREPAREDNESS

**Register to receive local emergency notifications** via the [Humboldt ALERT](#) system.

**Plan and Prepare:** Explore the [HumCo OES Get Prepared webpage](#) and [Know Your Hazards webpage](#). Check [tsunami hazard area maps](#). Collect emergency supplies, plan ways to communicate and meeting locations, check workplace procedures, and review resources such as: [Living on Shaky Ground](#) magazine; the California Geological Survey's [Earthquakes webpage](#) and [Tsunamis webpage](#); [Ready.gov](#), and Cal OES [Earthquake Readiness Guide](#) at [earthquake.ca.gov](#).

**Procedure:** Agency/entity members, in partnership with their family or household, should discuss and decide what family/household members should do if they are at home, work, school, or any other sites they often visit in tsunami hazard areas. Agency/entity members should identify their options as to what to do if they are able to work but are unable to get to their worksite.

**Practice:** Agency/entity members and their families should discuss and practice their plans. Some coastal communities carry out tsunami evacuation drills. Any household can benefit from participation in the [Great California ShakeOut](#), a yearly opportunity to prepare for earthquakes.

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[earthquake.ca.gov](http://earthquake.ca.gov)

**Get [ShakeAlert Earthquake Early Warning \(EEW\)](#):** There are several ways to get EEW alerts on a cell phone: downloading and authorizing location services on an alerting App like [MyShake](#), via alerts delivered to Android phones by Google, and via Wireless Emergency Alerts (WEAs) that most modern cell phones are already programmed to receive.

EEW is not earthquake prediction but can give people time to DROP, COVER, and HOLD ON before the strongest shaking arrives. Learn more about EEW alerts sent to your phone: [usgs.gov/FAQ/BeShakeAlertSafe](http://usgs.gov/FAQ/BeShakeAlertSafe)

**SURVIVING THE INITIAL EARTHQUAKE**

**Drop, Cover, Hold On:** People should stay in one place, and not try to run outside while the shaking is going on. Instead, get under sturdy furniture, hold on, and keep away from things that could fall. Stay put until the shaking stops.



(Details and options at [earthquakecountry.org](http://earthquakecountry.org))

**Outside or Driving:** People should move away from power lines, structures or signs, or other hazards that may fall on them. Drivers should pull over and stop, avoiding bridges or overpasses.



**Estimate the Time of Shaking:** If possible, agency/entity members should look at a watch or clock, or mentally count seconds, to get an idea of the total elapsed time of shaking.

**Prolonged Shaking that Lasts for Minutes** is a warning that surges of a near-source tsunami may be arriving quickly.

**ACTIONS AFTER THE GROUND STOPS SHAKING**

**If in a Tsunami Hazard Area After Prolonged Shaking:** Head inland to a safe area as soon as you can safely walk; otherwise, head upslope, higher in elevation. Last resort: a sturdy building or tree.

**If Not in a Tsunami Hazard Area:** Do not enter or drive through tsunami hazard areas (including roads/highways in hazard areas) until officially informed it is safe to do so. Anticipate aftershocks.

**Get Official Info:** Mobile phone alerts. Check [NTWC](#). For local info: [humboldt.gov/emergency](http://humboldt.gov/emergency) .

**Follow Procedures:** Your response agency/entity should have expectations of you, whether you are on- or off-duty. Follow procedures and supervisor orders as reasonable and practicable.



[earthquakecountry.org](http://earthquakecountry.org)

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## RESPONSE PRIORITIES – Adapted from [FEMA ICS 200c](#)

FEMA's *Basic ICS for Initial Response* training lays out recommended overall priorities for the response, defining what is most important. The priorities in this section may be applied to earthquakes and tsunamis. Although numbered, priorities are not a set of sequenced steps (e.g., responders don't complete every life safety action before starting efforts to stabilize an emergency incident). Activities for different priority levels can and often should be performed simultaneously.

1. **Life safety:** protect human life and health
2. **Incident stabilization:** mitigate hazards, reduce impacts
  - Stabilize and protect community lifelines, critical infrastructure, and key resources
3. **Property preservation:** private, public, cultural & historical resources, environment

During the first hours of response to a catastrophic earthquake or tsunami on the North Coast, adoption of a common set of priorities should help Area and Incident Commanders set achievable objectives and manage limited resources among multiple emergency scenes.

## FEMA COMMUNITY LIFELINES APPROACH TO IMPACT ASSESSMENT AND REPORTING

In a catastrophic earthquake and/or tsunami event, interstate and federal resources (including FEMA) will be needed across the Northwest to help state and local entities from short-term response through the phases of recovery. One of the challenges to receiving the levels and types of help we will need is to clearly communicate the nature, scope, and severity of Humboldt's impacts.

FEMA developed the [community lifelines](#) construct to address this communication challenge.



Using a community lifelines approach means organizing impacts into the eight standardized categories above. These eight lifelines represent the most fundamental services in the community that, when stabilized, enable all other aspects of society to function. Each lifeline's components and subcomponents (infrastructure and key resources) support the continuous operation of the critical government and business functions that are essential to health, safety, and security.

In advance of a catastrophic earthquake or tsunami, local agencies and partner entities should consider the lifelines they support and pre-identify the critical components and subcomponents they depend on and/or are responsible for. These are among the first things to check, even before a systematic "windshield survey". **Entities should report to the Humboldt OA EOC the status of these lifeline components and subcomponents as part of their impact reporting process.**

The Humboldt County Sheriff's Office of Emergency Services (HumCo OES) should, after a significant earthquake, tsunami, or other major emergency, gather and organize impact information in a format consistent with FEMA's community lifelines.

This approach should allow government leaders and FEMA to quickly comprehend the event and address priority issues. Lifeline status can be tracked over time as conditions change.

- END -