# City and County of San Francisco
# Emergency Response Plan

AN ELEMENT OF THE CCSF EMERGENCY MANAGEMENT PROGRAM

## Tsunami Annex

# REVISION HISTORY

| Revision Date | Version # | Section of Plan Revised | Revised by |
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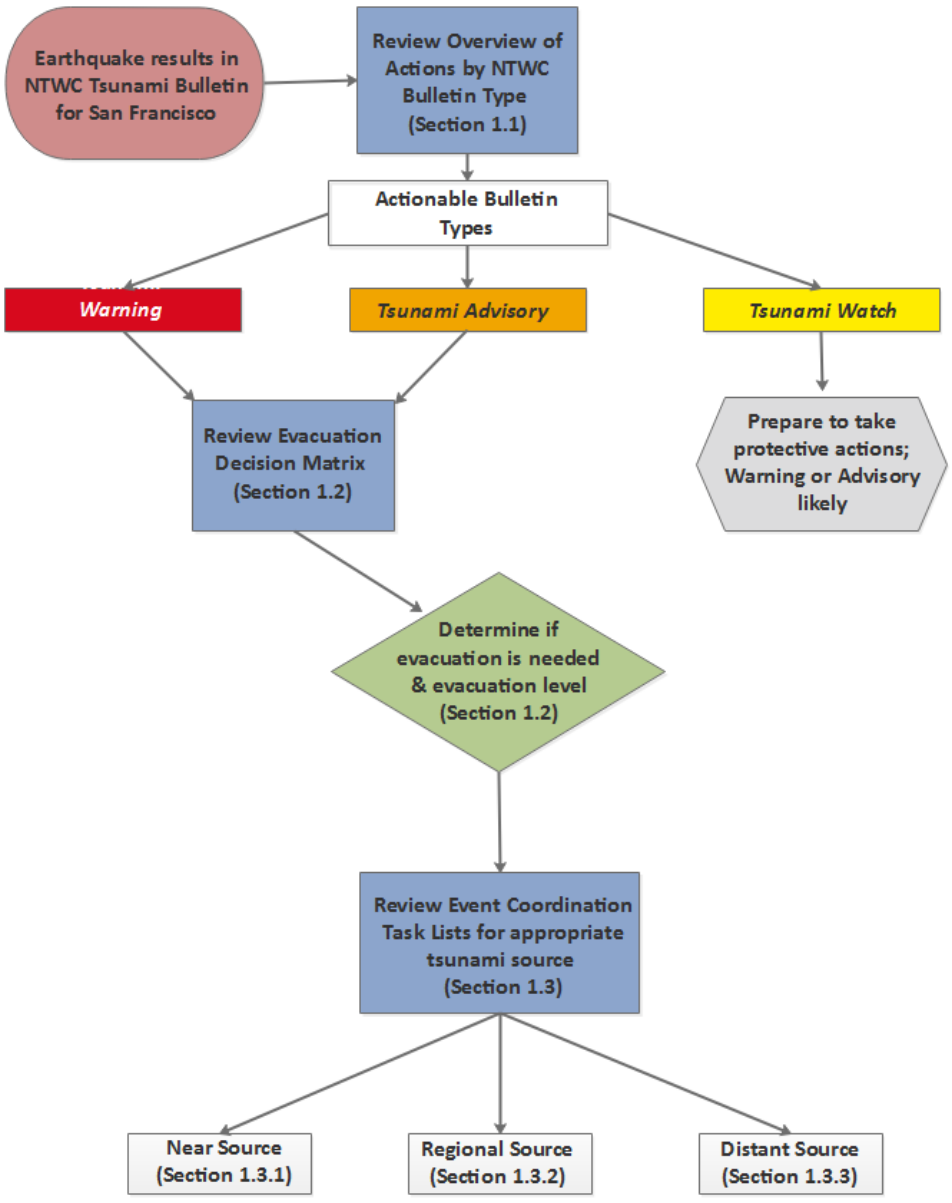
# SECTION 1: CRITICAL ACTION GUIDE

The Critical Action Guide is a tear-away resource for City and County of San Francisco (CCSF) emergency services personnel responding in a tsunami incident impacting the City. The section includes an overview of possible National Tsunami Warning Center (NTWC) Bulletins, with corresponding actions to be taken by CCSF; an Evacuation Decision Matrix to assist decision-makers in determining when and what to evacuate; a Tsunami Event Coordination Task List of critical steps needed to successfully coordinate a tsunami incident; and a Roles and Responsibilities table showing tsunami-related responsibilities by department or agency. CCSF tsunami hazard and evacuation maps are located in Appendix B. The chart in Figure 1.1, below, provides a guide for readers in using Section 1.

**Figure 1.1. Critical Action Guide Flow Chart**



## 1.1 Overview of Actions by Type of NTWC Tsunami Bulletin

| NTWC BULLETIN TYPE | Tsunami Warning For CCSF | Tsunami Advisory for CCSF | Tsunami Watch for CCSF |
|---|---|---|---|
| ***MEANING*** | **SIGNIFICANT, DAMAGING INUNDATION EXPECTED REQUIRING PARTIAL OR FULL EVACUATION OF TSUNAMI INUNDATION AREA, ESPECIALLY AT HIGH TIDE.** | **STRONG CURRENTS MAY BE HAZARDOUS TO PEOPLE IN THE WATER OR NEAR SHORELINE, OR MAY CAUSE DAMAGE REQUIRING EVACUATION OF BEACHES, HARBORS, PORTS, CRANES, PIERS, AND OTHER WATERFRONT AREAS.** | **PREPARE TO TAKE PROTECTIVE ACTION; REMAIN ALERT FOR ADDITIONAL INSTRUCTIONS.** |
| **INCIDENT MANAGEMENT ACTIONS** | • Determine if evacuation of *all or part of tsunami inundation area* is needed. See Section 1.2.1.<br>• Determine if route or area closures are needed.<br>• If evacuation, route, or area closures are needed, proclaim local emergency.<br>• Issue mandatory evacuation order.<br>• Issue public alert and warning.<br>• Implement evacuation or closures.<br>• Assist those who cannot self-evacuate.<br>• Prevent people from returning to evacuated or closed areas until all clear is issued.<br>• Determine when to issue public "all clear" message. | • Determine if evacuation or closure of *shoreline areas* is needed. See Section 1.2.2.<br>• If evacuation or closure of *shoreline areas* is needed, and time permits:<br>- Proclaim local emergency.<br>- Issue mandatory evacuation order.<br>- Issue public alerts.<br>- Implement evacuation or closure of shoreline areas.<br>- Assist those who cannot self-evacuate.<br>- Prevent people from returning to evacuated or closed shoreline areas until "all clear" is issued.<br>- Determine when to issue public "all clear" message. | • *Prepare to take protective actions*, as listed in columns to the left, if NTWC issues a Tsunami Warning or Advisory. |
| **NOTIFICATION TO CCSF DEPARTMENTS AND PARTNERS OF ACTIONS TO TAKE** | Take action, including:<br>• Opening DOCs.<br>• Issuing staff notifications and recalls.<br>• Moving personnel and other resources *in inundation area* to area of safety.<br>• Safeguarding property in *inundation area* that cannot be moved.<br>• Staging response personnel and equipment outside inundation area in | Take action, including:<br>• Opening DOCs.<br>• Issuing staff notifications and recalls.<br>• Moving personnel and other resources *in shoreline area* to safety.<br>• Safeguarding property in *shoreline area* that cannot be moved.<br>• Staging response personnel and equipment in safe location close to shoreline | *Prepare to take protective actions,* as listed in columns to the left, in case the NTWC issues a Tsunami Warning or Advisory. |

| NTWC BULLETIN TYPE | Tsunami Warning For CCSF | Tsunami Advisory for CCSF | Tsunami Watch for CCSF |
|---|---|---|---|
| | preparation for re-entry and response.<br>• Assisting in evacuating people, service and support animals, and pets in *inundation area*.<br>• Providing re-entry and area security for evacuated areas.<br>See Appendix A for CCSF Alerts. | area in preparation for re-entry and response.<br>• Assisting in evacuating people, service and support animals, and pets in *shoreline area*.<br>• Providing re-entry and area security for evacuated areas.<br>See Appendix A for CCSF Alerts. | |
| **NOTIFICATION TO PUBLIC OF ACTIONS TO TAKE** | Alert public of:<br>• Areas to be evacuated.<br>• Location of evacuation facilities.<br>• Timeframe for evacuation, if known.<br>• Other actions public is asked to take.<br>See Appendix D for Alert SF messages. | Alert public of:<br>• Evacuation or closure of shoreline areas such as beaches, harbors, port terminals, cranes, piers.<br>• Location of evacuation facilities.<br>• Other actions public is asked to take.<br>See Appendix D for Alert SF messages. | • Ask public to remain alert for additional instructions.<br>See Appendix D for Alert SF messages. |

## 1.2 Evacuation Decision Matrix

The tables below assist CCSF emergency management officials in determining when to order an evacuation in a tsunami incident, and whether to order a complete or partial evacuation of the tsunami inundation area.

**NOTE:** A Magnitude (M) 7.0 or larger earthquake on a Bay Area fault may cause a near-source tsunami that could impact San Francisco within 10 to 15 minutes. Within five minutes of the quake, the NTWC may place CCSF in a Tsunami Warning based solely on earthquake magnitude, depth, and location, without confirming that a tsunami has been generated. In that situation, emergency officials will make every effort to notify the public to evacuate the maximum tsunami evacuation area shown in Appendix B. However, a local M7.0 or above earthquake may damage alert and warning systems, making it difficult if not impossible to issue timely public warnings. For further discussion of near-source tsunamis, see Sections 3.2.1 and 3.4.

### 1.2.1 NTWC Tsunami Warning for CCSF

| # | ACTION | NOTES/RESOURCES |
|---|---|---|
| 1 | Gather the following information:<br>– Estimated tsunami arrival time (NTWC tsunami bulletin).<br>– Forecasted tsunami wave height (NTWC tsunami bulletin).<br>– Normal tide conditions in first five hours after tsunami arrival (NOAA Tide Table).<br>– Local weather/storm conditions in first five hours after tsunami arrival (see NWS forecast). | – Appendix A, DEM Duty Officer Tsunami Action Sheet<br>– NTWC Alerts: http://ntwc.arh.noaa.gov/<br>– NOAA Tides & Currents: http://1.usa.gov/1K19UVU<br>– NOAA Tides Online: http://tidesonline.nos.noaa.gov/geographic.html<br>– NWS Monterey Marine Forecast: http://www.wrh.noaa.gov/mtr/marine.php<br>– Basecamp: https://launchpad.37signals.com/signin |
| ***Near/Regional Source: If there are less than four hours before arrival of tsunami waves:*** | | |
| 2 | Evacuate maximum tsunami inundation area as shown in Maximum Evacuation Map, Appendix B. | – Near Source Coordination Task List, Section 1.3.1<br>– Regional Source Coordination Task List, Section 1.3.2<br>– Appendix B, Tsunami Maps and Recommended Evacuation Level Descriptions |
| ***Distant Source: If there are more than four hours before arrival of tsunami waves:*** | | |
| 3 | Obtain FASTER Tsunami Flood Level and recommended Evacuation Level from Cal OES or NOAA Weather Forecast Office, and apply to #4, below. | Cal OES/NOAA will issue FASTER and Evacuation Level information within 15 minutes of NTWC issuance of bulletin with forecast tsunami wave amplitude.<br>– Distant Source Coordination Task List, Section 1.3.3<br>– Appendix A, DEM Duty Officer Tsunami Action Sheet |
| 4 | Pair FASTER Tsunami Flood Level Number with correct Evacuation Level in DEM Duty Officer Tsunami Action Sheet, p. 9:<br>**EVAC LEVEL (above Mean Sea Level) — FASTER Tsunami Flood Value**<br>Level 1 Evacuation: Less than 1.00 meters (3.3 feet)<br>Level 2 Evacuation: 1.00-1.50 meters (3.3-5.0 feet) | – Appendix A, DEM Duty Officer Tsunami Action Sheet<br>– Appendix B, Tsunami Maps and Recommended Evacuation Level Descriptions<br>**Note:** Cal OES/NOAA may recommend different Evacuation Levels for the Pacific versus the Bay-side of CCSF. See Section 3.2.5.3 for further discussion. |

| # | ACTION | NOTES/RESOURCES |
|---|---|---|
| | Level 3 Evacuation: 1.50-2.50 meters (5.0-8.0 feet)<br>Maximum Evac Level: Over 2.50 meters (over 8.2 feet) | |
| 5 | Evacuate area indicated in assigned Evacuation Plan Map in Appendix B and follow other directions associated with that Level Evacuation Plan. | – Appendix B, Tsunami Maps and Recommended Evacuation Level Descriptions<br>– Basecamp: https://launchpad.37signals.com/signin |

## 1.2.2 NTWC Tsunami Advisory for CCSF

| # | ACTION | NOTES/RESOURCES |
|---|---|---|
| 1 | Gather the following information:<br>– Estimated tsunami arrival time (NTWC tsunami bulletin).<br>– Forecasted tsunami wave height (NTWC tsunami bulletin).<br>– Normal tide conditions in first five hours after tsunami arrival (NOAA Tide Table).<br>– Local weather/storm conditions in first five hours after tsunami arrival (see NWS forecast). | – Appendix A, DEM Duty Officer Tsunami Action Sheet<br>– NTWC Alerts: http://ntwc.arh.noaa.gov/<br>– NOAA Tides & Currents: http://1.usa.gov/1K19UVU<br>– NOAA Tides Online: http://tidesonline.nos.noaa.gov/geographic.html<br>– NWS Monterey Marine Forecast: http://www.wrh.noaa.gov/mtr/marine.php<br>– California Multi-hazard Information Clearinghouse: http://www.californiaeqclearinghouse.org/ |
| ***Near/Regional Source: If there are less than four hours before arrival of tsunami waves:*** | | |
| 2 | Evacuate beaches, harbor and marina docks, and piers. | – Near Source Coordination Task List, Section 1.3.1<br>– Regional Source Coordination Task List, Section 1.3.2<br>– Appendix B, Tsunami Maps and Recommended Evacuation Level Descriptions |
| ***Distant Source: If there are more than four hours before arrival of tsunami waves:*** | | |
| 3 | Obtain FASTER Tsunami Flood Level and recommended Evacuation Plan from Cal OES or NOAA Weather Forecast Office, and apply to #4, below. | Cal OES/NOAA will issue FASTER and Evacuation Level information within 15 minutes of NTWC issuance of bulletin with forecast tsunami wave amplitude.<br>– Distant Source Coordination Task List, Section 1.3.3<br>– Appendix A, DEM Duty Officer Tsunami Action Sheet<br>– Appendix B, Tsunami Maps and Recommended Evacuation Level Descriptions |
| 4 | Pair FASTER Tsunami Flood Level Number with correct Evacuation Level listed in Duty Officer Tsunami Action Sheet, p. 9:<br>**EVAC LEVEL FASTER Tsunami Flood Value (above Mean Sea Level)**<br>Level 1 Evacuation: Less than 1.00 meters (3.3 feet)<br>Level 2 Evacuation: 1.00-1.50 meters (3.3- 5.0 feet) | – Appendix A, DEM Duty Officer Tsunami Action Sheet<br>– Appendix B, Tsunami Maps and Recommended Evacuation Level Descriptions<br>– Basecamp: https://launchpad.37signals.com/signin<br>**Note:** Cal OES/ NOAA may recommend different Evacuation Levels for the Pacific versus the Bay-side of CCSF. See Section 3.2.5.3 for further discussion. |

| # | ACTION | NOTES/RESOURCES |
|---|---|---|
| 5 | Evacuate area indicated in relevant Level Evacuation Plan Map in Appendix B. | – Appendix B, Tsunami Maps and Recommended Evacuation Level Descriptions<br>– Basecamp: https://launchpad.37signals.com/signin |

## 1.3 Tsunami Event Coordination Task Lists

The task lists below were developed for three scenarios CCSF may face: (1) a near-source tsunami where there are 10 to 15 minutes from tsunami generation to tsunami arrival (see Section 1.3.1, below); (2) a Cascadia-generated tsunami in which there is one hour from NTWC issuance of a Tsunami Warning to tsunami arrival (see Section 1.3.2, below); and (3) an inundating, distant-source tsunami where there are more than four hours until arrival of tsunami waves (see Section 1.3.3, below). The task lists are meant to serve as a guide for emergency management officials in responding to tsunami incidents at the EOC and DOC level. The lists should be adapted depending on the circumstances at the time of the incident, including time for response, safety considerations, and available resources and personnel. In addition, though each task is numbered, some tasks may be performed concurrently or in a different order, depending on the needs of the situation.

### 1.3.1 Near-Source Tsunami

This task list is for a near-source tsunami from a local M7.0 earthquake or above, where there are 10 to 15 minutes from earthquake to tsunami arrival. In this scenario, there will not be time to conduct an official evacuation of the public from the tsunami evacuation area. In addition, because a local M7.0 or greater earthquake may damage alert and warning systems and injure CCSF personnel, it may be difficult if not impossible to alert the public of the need to evacuate. Accordingly, the list below must be adapted to reflect conditions present in the actual event. For task lists for Phases 2 through 5, see Sections 1.2.3.2–1.2.3.5, below. For planning assumptions governing near-source tsunamis, see Section 2.3, below.

#### *1.3.1.1 Phase 1: Tsunami Generation to Tsunami Arrival (10 - 15 minutes)*

| PHASE 1:<br>NEAR-SOURCE TSUNAMI GENERATION TO TSUNAMI EVENT (E) *(10 - 15 MINUTES)* | | | | | | |
|---|---|---|---|---|---|---|
| **PRIORITIES**<br>**1. Provide accessible, accurate, and effective public warning and evacuation information to CCSF inhabitants as able given earthquake impacts.**<br>**2. Determine and take actions needed to minimize impacts to life safety, property, and infrastructure.**<br>**3. Obtain and issue Mayoral proclamation of local emergency and mandatory evacuation order of maximum CCSF Tsunami Inundation Area.** | | | | | | |
| **#** | **ACTION** | **INITIATING ENTITY** | **KEY STAKEHOLDERS** | **ANNEX SECTION** | **ESF #** | **NOTES/RESOURCES** |
| 1 | When NTWC issues a Tsunami Warning for San Francisco following local earthquake, use best efforts to activate public alert and warning systems to notify public in tsunami evacuation area to evacuate and take other protective actions. | DEM-DES and DEM-DEC | DT, 311 | 3.4.4.2 | 2<br>5<br>15 | – Appendix A, DEM Duty Officer Tsunami Action Sheet<br>– Appendix D, Sample CCSF Tsunami Public Messaging |

| PHASE 1:<br>NEAR-SOURCE TSUNAMI GENERATION TO TSUNAMI EVENT (E) *(10 - 15 MINUTES)* | | | | | | |
|---|---|---|---|---|---|---|
| **#** | **ACTION** | **INITIATING ENTITY** | **KEY STAKEHOLDERS** | **ANNEX SECTION** | **ESF #** | **NOTES/RESOURCES** |
| 2 | Ensure public notifications are accessible to people with disabilities and to people with access and functional needs. | DEM-DES | MOD, 311, SFFD, SFPD | 3.4.4.3 | 2<br>5<br>15 | Appendix D, Sample CCSF Tsunami Public Messaging |
| ***THE TASKS BELOW WILL NOT BE ACCOMPLISHED WITHIN 10 - 15 MINUTES, BUT SHOULD BE ADDRESSED WHEN TIME PERMITS.*** | | | | | | |
| 3 | Utilize CCSF Alert to provide initial notice of NTWC Tsunami Warning and status updates to CCSF departments and partners. *This is an ongoing responsibility in all phases.* | DEM-DES | CCSF departments and partners | 3.4.3<br>3.4.4.2<br>3.5.1 | 5 | Appendix A, CCSF Alert tsunami message templates |
| 4 | Activate CCSF Emergency Operations Center (EOC). | DEM-DES | | 3.2<br>3.5.1 | 5 | |
| 5 | Activate Joint Information Section (JIS) to provide public and media information. | DEM-DES | PIOs from other departments | 3.4.4.2 | 15 | – ESF #15: Joint Information System Annex<br>– Appendix D, Sample CCSF Tsunami Public Messaging |
| 6 | Obtain Mayoral Proclamation of Local Emergency under California Emergency Services Act, and Mandatory Evacuation Order to obtain authority to prevent the public from entering tsunami inundation area. | DEM-DES | Mayor<br>*EOC Policy Group* | 3.5.2.2<br>3.5.2.4<br>Appendix C | 5 | Local emergency proclamation under California Emergency Services Act is required to issue mandatory evacuation order.<br>– Evacuation Matrix, Section 1.2<br>– Appendix A, DEM Duty Officer Tsunami Action Sheet<br>– Appendix B, Tsunami Maps and Evacuation Level Descriptions<br>– Appendix C, Sample Local Emergency Proclamation and Mandatory Evacuation Order |
| 7 | Request activation of Department Operations Centers (DOCs). | DEM-DES | CCSF departments with DOCs | 3.2.4<br>3.5.1 | 5 | – Appendix A, CCSF Alert tsunami message templates<br>– EOC Resource Directory, DOC Locations & Phone List |
| 8 | Issue and implement Mayoral Mandatory Evacuation Order under California Emergency Services Act. | SFPD<br>DEM-DES | SFFD, Caltrans, CHP, RPD, GGNRA-NPS, CDPR | 3.5.2.4 - 3.5.2.6 | 5 | Appendix C, Sample Mandatory Evacuation Order |

| PHASE 1: NEAR-SOURCE TSUNAMI GENERATION TO TSUNAMI EVENT (E) *(10 - 15 MINUTES)* | | | | | | |
|---|---|---|---|---|---|---|
| **#** | **ACTION** | **INITIATING ENTITY** | **KEY STAKEHOLDERS** | **ANNEX SECTION** | **ESF #** | **NOTES/RESOURCES** |
| 9 | Notify CCSF departments and partners when Mandatory Evacuation Order is issued. | DEM-DES | All responding departments and partners | 3.5.2.4 - 3.5.2.6 | 5 | |
| 10 | Request assistance from USCG, Presidio, and Caltrans to close routes or areas outside CCSF control. | SFPD | Port, RPD, USCG, Presidio Trust, CHP, Caltrans | 3.5.2.9<br>3.5.3.2<br>3.5.4 | 1<br>5<br>13 | Appendix B, Tsunami Maps and Evacuation Level Descriptions |
| 11 | Request assistance from NPS to evacuate public from, and implement perimeter control of, GGNRA and National Maritime Historic Park areas in evacuation area. | DEM-DEC | RPD, GGNRA-NPS, Presidio Trust | 3.5.2.9<br>3.5.3.2<br>3.5.4 | 1<br>5<br>13 | – Appendix B, Tsunami Maps and Evacuation Level Descriptions<br>– Appendix E, MOU Between SFPD, GGNRA, and MNHP |
| 12 | Request assistance from CDPR to evacuate public from, and implement perimeter control of, portions of Candlestick Point State Recreation Area in evacuation area. | DEM-DES | RPD, GGNRA-NPS, Presidio Trust | 3.5.2.9<br>3.5.3.2<br>3.5.4 | 1<br>5<br>13 | – Appendix B, Tsunami Maps and Evacuation Level Descriptions<br>– Appendix E, MOU Between SFPD, GGNRA, and MNHP |
| 13 | As time, resources, and safety permit, establish traffic control and perimeter security points in safe areas outside but near the inundation area to prevent unauthorized entry. | SFPD | SFMTA, SFPW, SFSD, CHP | 1.4<br>3.5.4 | 1<br>13 | – Appendix F, Preliminary Traffic Control Plan |
| 14 | Request reports from CCSF departments on status of personnel and facilities within tsunami inundation area. | DEM-DES | All departments with resources in inundation area | 3.3.2 | 5 | |
| 15 | Coordinate with USCG Captain of the Port, Sector San Francisco on status of vessels in Port and control of vessel traffic on San Francisco Bay. | Port<br>*EOC Ops Transportation Branch* | USCG, WETA | 3.5.2.9 | 1<br>5 | ESF #1: Transportation Annex |
| 16 | Assess staffing needs and notify and initiate personnel recall as required. | All departments responding | | 3.2.3<br>3.5.1 | 1<br>5<br>7 | |
| 17 | As time, resources, and safety permit, implement route or area closures through temporary signs, barricades, or other methods of restricting public access to the inundation area. | SFPD | SFMTA, RPD, SFPW, Caltrans, CDRA, CHP, GGNRA | 3.5.3<br>3.5.4 | 1<br>13<br>15 | Appendix F, Preliminary Traffic Control Plan |

| PHASE 1: NEAR-SOURCE TSUNAMI GENERATION TO TSUNAMI EVENT (E) *(10 - 15 MINUTES)* | | | | | | |
|---|---|---|---|---|---|---|
| **#** | **ACTION** | **INITIATING ENTITY** | **KEY STAKEHOLDERS** | **ANNEX SECTION** | **ESF #** | **NOTES/RESOURCES** |
| 18 | Identify or confirm assembly area locations outside evacuation area where evacuees can gather. | *EOC Ops Section Chief* | SFPD, SFFD, HSA, SFMTA, MOD | 1.5<br>3.5.2.8 | 1<br>5<br>13 | Appendix L, Tsunami Evacuation Facilities |
| 19 | Publicize locations of assembly areas where evacuees can gather. | *EOC JIS* | 311 | 1.5<br>3.5.2.8 | 5<br>15 | Appendix L, Tsunami Evacuation Facilities |
| 20 | Establish contact with SFO and obtain updates on airport status, FAA restrictions on traffic, ability to remain open, and evacuation support needs. | *EOC Ops Transportation Branch* | SFO, FAA | 3.5.2.9 | 1<br>5 | ESF #1: Transportation Annex |
| 21 | Determine need for mutual aid or outside resources to safely and effectively respond and request resources as needed. | All departments responding | | 3.5.1 | 5<br>4<br>7<br>13 | ESF #7: Logistics Annex |
| 22 | Stage field personnel and resources outside evacuation area. | Departments with field responders | | 3.5.5 | 1<br>4 - 6<br>8 -10<br>13 | |
| 23 | Determine need to open shelters, pick-up points, and reception centers for evacuees. | *EOC Health & Human Services (H&HS) Branch* | HSA, DPH, MOD, ARC | 3.5.2.8,<br>3.5.2.10 - 3.5.2.12<br>3.5.9 | 5<br>6<br>8 | – ESF #6: Mass Care, Housing, and Human Services Annex<br>– ESF #11: Animal Response Annex<br>– Evacuation Annex |
| 24 | Determine the need to appoint a Deputy Operations Section Chief and Evacuation Task Force to coordinate evacuation function in the EOC. | *EOC Ops Section Chief* | *EOC Manager* | 3.5.2.1 | 5 | Evacuation Annex |
| 25 | Participate in Cal OES Coastal Region tsunami conference calls for updates on tsunami conditions. | DEM-DES | | 3.3.2 | 5<br>15 | Appendix A, DEM Duty Officer Tsunami Action Sheet |
| 26 | Share situational status, preliminary damage assessment information, and resource requests with REOC, FEMA, and other entities as needed. | *EOC Planning* | All departments responding | 3.2.3<br>3.3 | 5<br>7 | |
| 27 | Begin re-entry planning. | *EOC Advance Planning* | SFPD, SFFD, DBI, DHR, DPH, Port, SFMTA, SFPUC, SFPW | 3.5.6<br>Appendix I | 5 | Appendix I, Sample Re-Entry Plan |

### 1.3.2 Cascadia-Generated Tsunami

This task list reflects a Cascadia-generated tsunami in which there is one hour from Tsunami Warning to tsunami arrival. It assumes there is time to provide official public notice of the need to evacuate, but no time to conduct an official evacuation of the public from the tsunami evacuation area. It is important to keep in mind that each tsunami is different, and that inundating tsunami waves and dangerous currents may continue for many hours or days. Accordingly, the timeframes included in this task list should be adapted to reflect the conditions present in an actual event. For task lists for Phases 2 through 5, see Sections 1.2.3.2–1.2.3.5, below.

#### *1.3.2.1 Phase 1: Receipt of National Tsunami Warning Center (NTWC) Tsunami Warning Bulletin to Event (One hour)*

| PHASE 1:<br>RECEIPT OF NTWC TSUNAMI WARNING TO TSUNAMI EVENT (E) *(ONE HOUR)* | | | | | | |
|---|---|---|---|---|---|---|
| **PRIORITIES**<br>**1. Provide accessible, accurate, timely, and effective public warning and evacuation information to CCSF inhabitants.**<br>**2. Obtain and issue Mayoral proclamation of local emergency and mandatory evacuation order of maximum CCSF Tsunami Inundation Area.**<br>**3. Determine and take actions needed to minimize impacts to life safety, property, and infrastructure.** | | | | | | |
| **#** | **ACTION** | **INITIATING ENTITY** | **KEY STAKEHOLDERS** | **ANNEX SECTION** | **ESF #** | **NOTES/RESOURCES** |
| 1 | Confirm receipt of NTWC Tsunami Warning bulletin from California State Warning Center. | DEM-DEC | DEM-DES | 3.4.2 | 5 | State Warning Center does not provide threat analysis or advice. |
| 2 | Provide notice of NTWC Tsunami Warning to DEM Duty Officer, SFPD DOC, and SFFD Fire Command and on-duty Division Chief. | DEM-DEC | DEM-DES, SFPD, SFFD | 3.4.1<br>3.4.2 | 5 | For NTWC bulletin descriptions, see Section 3.4.1. |
| 3 | Utilize CCSF Alert to provide initial notice of NTWC Tsunami Warning and status updates to CCSF departments and partners. *This is an ongoing responsibility in all phases.* | DEM-DES | CCSF departments and partners | 3.4.3<br>3.4.4.2<br>3.5.1 | 5 | Appendix A, CCSF Alert tsunami message templates |
| 4 | Activate public alert and warning systems to notify public in tsunami evacuation area to evacuate and take other protective actions. | DEM-DES | DEM-DEC, DT, 311 | 3.4.4.2 | 2<br>5<br>15 | Appendix D, Sample CCSF Tsunami Public Messaging |
| 5 | Ensure public notifications are accessible to people with disabilities and to people with access and functional needs. | DEM-DES | MOD, 311, SFFD, SFPD | 3.4.4.3 | 2<br>5<br>15 | Appendix D, Sample CCSF Tsunami Public Messaging |

| PHASE 1: RECEIPT OF NTWC TSUNAMI WARNING TO TSUNAMI EVENT (E) *(ONE HOUR)* | | | | | | |
|---|---|---|---|---|---|---|
| **#** | **ACTION** | **INITIATING ENTITY** | **KEY STAKEHOLDERS** | **ANNEX SECTION** | **ESF #** | **NOTES/RESOURCES** |
| 6 | Obtain Mayoral Proclamation of Local Emergency under California Emergency Services Act, and Mandatory Evacuation Order. | DEM-DES | Mayor<br>*EOC Policy Group* | 3.5.2.2<br>3.5.2.4<br>Appendix C | 5 | Local emergency proclamation under California Emergency Services Act is required to issue mandatory evacuation order.<br>– Evacuation Matrix, Section 1.2<br>– Appendix A, DEM Duty Officer Tsunami Action Sheet<br>– Appendix B, Tsunami Maps and Evacuation Level Descriptions<br>– Appendix C, Sample Local Emergency Proclamation and Mandatory Evacuation Order |
| 7 | Activate CCSF Emergency Operations Center (EOC). | DEM-DES | | 3.2<br>3.5.1 | 5 | |
| 8 | Request activation of Department Operations Centers (DOCs). | DEM-DES | CCSF departments with DOCs | 3.2.4<br>3.5.1 | 5 | – Appendix A, CCSF Alert tsunami message templates<br>– EOC Resource Directory, DOC Locations & Phone List |
| 9 | Activate Joint Information Section (JIS) to provide public and media information. | DEM-DES | PIOs from other departments | 3.4.4.2 | 15 | ESF #15: Joint Information System Annex |
| 10 | Issue and implement Mayoral Mandatory Evacuation Order under California Emergency Services Act. | SFPD<br>DEM-DES | SFFD, Caltrans, CHP, RPD, GGNRA-NPS, CDPR | 3.5.2.4 - 3.5.2.6 | 5 | Appendix C, Sample Mandatory Evacuation Order |
| 11 | Notify CCSF departments and partners when Mandatory Evacuation Order is issued. | DEM-DES | All responding departments and partners | 3.5.2.4 - 3.5.2.6 | 5 | |
| 12 | Request assistance from NPS to evacuate public from GGNRA and National Maritime Historic Park within evacuation area. | DEM-DEC | RPD, GGNRA-NPS, Presidio Trust, CDPR | 3.5.2.9<br>3.5.3.2<br>3.5.4 | 1<br>5<br>13 | – Appendix B, Tsunami Maps and Evacuation Level Descriptions<br>– Appendix E, MOU Between SFPD, GGNRA, and MNHP |

| PHASE 1: RECEIPT OF NTWC TSUNAMI WARNING TO TSUNAMI EVENT (E) *(ONE HOUR)* | | | | | | |
|---|---|---|---|---|---|---|
| **#** | **ACTION** | **INITIATING ENTITY** | **KEY STAKEHOLDERS** | **ANNEX SECTION** | **ESF #** | **NOTES/RESOURCES** |
| 13 | Request assistance from USCG, Presidio, and Caltrans to close routes or areas outside CCSF control. | SFPD | Port, RPD, USCG, Presidio Trust, CHP, Caltrans | 3.5.2.9<br>3.5.3.2<br>3.5.4 | 1<br>5<br>13 | – ESF #1: Transportation Annex<br>– Appendix B, Tsunami Maps and Evacuation Level Descriptions |
| 14 | Assess staffing needs and notify and initiate personnel recall as required. | All departments responding | | 3.2.3<br>3.5.1 | 5<br>7 | |
| 15 | Coordinate with USCG Captain of the Port, Sector San Francisco on safeguarding vessels in Port and control of vessel traffic on San Francisco Bay. | Port | USCG, WETA | 3.5.2.9 | 1<br>5 | ESF #1: Transportation Annex |
| 16 | Request that CCSF departments with critical, movable resources inside the evacuation area move those resources to safe areas outside the evacuation area, *if possible to do so safety.* | DEM-DES | All departments with field resources | 3.5.5 | 5 | |
| 17 | Ensure field responders leave evacuation area no less than 30 minutes before estimated time of initial tsunami wave. | All departments with field responders | | 3.5.5 | 2<br>5 | |
| ***THE TASKS BELOW MAY NOT BE ACCOMPLISHED WITHIN ONE HOUR, BUT SHOULD BE ADDRESSED WHEN TIME PERMITS.*** | | | | | | |
| 18 | As time, resources, and safety permit, establish traffic control and area security points outside evacuation area to prevent unauthorized entry. | SFPD | SFMTA, SFPW, SFSD, CHP | 1.4<br>3.5.4 | 1<br>13 | Appendix F, Preliminary Traffic Control Plan |
| 19 | As time, resources, and safety permit, implement route or area closures through temporary signs, barricades, or other methods of restricting public access. | SFPD | SFMTA, RPD, SFPW, Caltrans, CDRA, CHP, GGNRA | 3.5.3<br>3.5.4 | 1<br>13<br>15 | Appendix F, Preliminary Traffic Control Plan |
| 20 | Identify or confirm assembly area locations outside evacuation area where evacuees can gather. | *EOC Ops Section Chief* | SFPD, SFFD, HSA, SFMTA, MOD | 1.5<br>3.5.2.8 | 1<br>5<br>13 | Appendix L, Tsunami Evacuation Facilities |
| 21 | Publicize locations of assembly areas where evacuees can gather. | *EOC JIS* | 311 | 1.5<br>3.5.2.8 | 5<br>15 | Appendix L, Tsunami Evacuation Facilities |

| PHASE 1:<br>RECEIPT OF NTWC TSUNAMI WARNING TO TSUNAMI EVENT (E) *(ONE HOUR)* | | | | | | |
|---|---|---|---|---|---|---|
| **#** | **ACTION** | **INITIATING ENTITY** | **KEY STAKEHOLDERS** | **ANNEX SECTION** | **ESF #** | **NOTES/RESOURCES** |
| 22 | Establish contact with SFO and obtain updates on airport status, FAA restrictions on traffic, ability to remain open, and evacuation support needs. | *EOC Ops Transportation Branch* | SFO, FAA | 3.5.2.9 | 1<br>5 | ESF #1: Transportation Annex |
| 23 | Determine need for mutual aid or outside resources to safely and effectively respond and request resources as needed. | All departments responding | | 3.5.1 | 5<br>4<br>7<br>13 | ESF #7: Logistics Annex |
| 24 | Stage field personnel and resources outside evacuation area. | Departments with field responders | | 3.5.5 | 1<br>4 - 6<br>8 -10<br>13 | |
| 25 | Determine need to open shelters, pick-up points, and reception centers for evacuees. | *EOC Health & Human Services (H&HS) Branch* | HSA, DPH, MOD, ARC | 3.5.2.8, 3.5.2.10 - 3.5.2.12<br>3.5.9 | 5<br>6<br>8 | – ESF #6: Mass Care, Housing, and Human Services Annex<br>– ESF #11: Animal Response Annex<br>– Evacuation Annex |
| 26 | Determine the need to appoint a Deputy Operations Section Chief and Evacuation Task Force to coordinate evacuation function in the EOC. | *EOC Ops Section Chief* | *EOC Manager* | 3.5.2.1 | 5 | Evacuation Annex |
| 27 | Participate in Cal OES Coastal Region tsunami conference calls for updates on tsunami conditions. | DEM-DES | | 3.3.2 | 5<br>15 | Appendix A, DEM Duty Officer Tsunami Action Sheet |
| 28 | Share situational status, preliminary damage assessment information, and resource requests with REOC, FEMA, and other entities as needed. | *EOC Planning* | All departments responding | 3.2.3<br>3.3 | 5<br>7 | |
| 29 | Begin re-entry planning. | *EOC Advance Planning* | SFPD, SFFD, DBI, DHR, DPH, Port, SFMTA, SFPUC, SFPW | 3.5.6<br>Appendix I | 5 | Appendix I, Sample Re-Entry Plan |

For task lists for Phases 2 through 5, see Sections 1.2.3.2–1.2.3.5, below.

### 1.3.3 Distant-Source Tsunami

The distant-source task list assumes that there is time to provide both official public notice and evacuation assistance to the public. It also assumes that tsunami waves end within 24 hours. It is important to keep in mind that each tsunami is different, and that inundating tsunami waves and dangerous currents may continue for many hours or days. Accordingly, the list below must be adapted to reflect conditions present in the actual event.

#### *1.3.3.1 Phase 1: Receipt of NTWC Tsunami Warning Bulletin to Event*

**PHASE 1:**
**RECEIPT OF NTWC TSUNAMI WARNING TO TSUNAMI EVENT (E)**

**PRIORITIES**

1. **Determine the need to order mandatory evacuation of all or part of the CCSF Tsunami Inundation Area.**
2. **Determine the need to order closures of routes, beaches, parks, marinas, the Port of San Francisco, or other areas within or outside CCSF control.**
3. **Determine and take actions needed to minimize impacts to life safety, property, and infrastructure.**
4. **Provide accessible, accurate, timely, and effective public information to CCSF inhabitants.**

| # | ACTION | INITIATING ENTITY | KEY STAKEHOLDERS | ANNEX SECTION | ESF # | NOTES/RESOURCES |
|---|---|---|---|---|---|---|
| 1 | Confirm receipt of NTWC Tsunami Warning bulletin from California State Warning Center. | DEM-DEC | DEM-DES | 3.4.2 | 5 | State Warning Center does not provide threat analysis or advice. |
| 2 | Provide notice of NTWC tsunami bulletin to DEM Duty Officer, SFPD DOC, and SFFD Fire Command and on-duty Division Chief. | DEM-DEC | DEM-DES, SFPD, SFFD | 3.4.1<br>3.4.2 | 5 | For NTWC bulletin descriptions, see Section 3.4.1. |
| 3 | Utilize CCSF Alert to provide initial notice of NTWC Tsunami Warning to CCSF Departments and partners. | DEM-DES | CCSF departments and partners | 3.4.3 | | Appendix A, CCSF Alert tsunami message templates |
| 4 | Participate in Cal OES Coastal Region tsunami conference calls for updates on tsunami conditions. | DEM-DES | | 3.3.2 | 5<br>15 | Appendix A, DEM Duty Officer Tsunami Action Sheet |
| 5 | Determine likelihood of inundating tsunami waves or destructive currents impacting CCSF. | DEM-DES | Cal OES, CGS, Port, USCG | 1.2<br>3.5.2 | 5 | – Evacuation Matrix, Section 1.2<br>– Appendix A, DEM Duty Officer Tsunami Resources |

| PHASE 1: RECEIPT OF NTWC TSUNAMI WARNING TO TSUNAMI EVENT (E) | | | | | | |
|---|---|---|---|---|---|---|
| # | ACTION | INITIATING ENTITY | KEY STAKEHOLDERS | ANNEX SECTION | ESF # | – NOTES/RESOURCES |
| 6 | Determine need for mandatory evacuation of all or part of the CCSF maximum tsunami inundation area. | DEM-DES | Mayor, SFPD, SFFD, Cal OES, CGS | 1.2<br>3.5.2<br>Appendix A, B | 5 | – Evacuation Matrix, Section 1.2<br>– Appendix A, DEM Duty Officer Tsunami Resources<br>– Appendix B, Tsunami Maps and Evacuation Level Descriptions |
| 7 | Activate CCSF Emergency Operations Center (EOC). | DEM-DES | All responding departments and partners | 3.2<br>3.5.1 | 5 | |
| 8 | Activate Joint Information Section (JIS) to provide public and media information. | DEM-DES | PIOs from other departments | 3.4.4.2 | 15 | ESF #15: Joint Information System Annex |
| 9 | Utilize CCSF Alert to provide status updates to CCSF departments and partners. *This is an ongoing responsibility in all phases.* | DEM-DES | CCSF departments and partners | 3.4.3<br>3.4.4.2<br>3.5.1 | 5 | Appendix A, CCSF Alert tsunami message templates |
| 10 | Request activation of Department Operations Centers (DOCs). | DEM-DES | CCSF departments with DOCs | 3.2.4<br>3.5.1 | 5 | – Appendix A, CCSF Alert tsunami message templates<br>– EOC Resource Directory, DOC Locations & Phone List |
| 11 | Assess staffing needs and notify and initiate personnel recall as required. | All responding departments | | 3.2.3<br>3.5.1 | 5<br>7 | |
| 12 | If evacuation or route or area closure is needed, obtain and issue Mayoral Proclamation of Local Emergency under California Emergency Services Act. | DEM-DES | Mayor<br>*EOC Policy Group* | 3.5.2.2<br>3.5.2.4<br>Appendix C | 5 | A local emergency proclamation under California Emergency Services Act is required to issue mandatory evacuation order.<br>Appendix C, Sample Local Emergency Proclamation |
| 13 | Obtain Mayoral Mandatory Evacuation Order under California Emergency Services Act. | DEM-DES | Mayor, *EOC Policy Group* | 3.5.2.2 - 3.5.2.6 | 5 | Appendix C, Sample Mandatory Evacuation Order |

| PHASE 1: RECEIPT OF NTWC TSUNAMI WARNING TO TSUNAMI EVENT (E) | | | | | | |
|---|---|---|---|---|---|---|
| **#** | **ACTION** | **INITIATING ENTITY** | **KEY STAKEHOLDERS** | **ANNEX SECTION** | **ESF #** | **NOTES/RESOURCES** |
| 14 | Issue and implement Mayoral Mandatory Evacuation Order under California Emergency Services Act. | SFPD<br>*EOC JIS* | SFFD, Caltrans, CHP, RPD, GGNRA-NPS, CDPR | 3.5.2.4 - 3.5.2.6 | 5 | Appendix C, Sample Mandatory Evacuation Order |
| 15 | Notify CCSF departments and partner organizations when Mandatory Evacuation Order is issued. | *EOC Planning* | All responding departments and partners | 3.5.2.4 - 3.5.2.6 | 5 | |
| 16 | Activate public alert and warning systems to notify public in tsunami evacuation area to evacuate and take other protective actions. | DEM-DES<br>*EOC JIS* | DEM-DEC, DT, 311 | 3.4.4.2 | 2<br>5<br>15 | Appendix D, Sample CCSF Tsunami Public Messaging |
| 17 | Ensure public notifications are accessible to people with disabilities and to people with access and functional needs. | *EOC JIS* | MOD, 311, SFFD, SFPD, SFSD | 3.4.4.3 | 2<br>5<br>15 | Appendix D, Sample CCSF Tsunami Public Messaging |
| 18 | Request assistance from USCG, Presidio, and Caltrans to close routes or areas outside CCSF control. | *EOC Ops Section Chief* | Port, RPD, USCG, Presidio Trust, CHP, Caltrans | 3.5.2.9<br>3.5.3.2<br>3.5.4 | 1<br>5<br>13 | Appendix B, Tsunami Maps and Evacuation Level Descriptions |
| 19 | Request assistance from NPS to implement evacuation of GGNRA and National Maritime Historic Park within evacuation area. | DEM-DEC | RPD, GGNRA-NPS, Presidio Trust, CDPR | 3.5.2.9<br>3.5.3.2<br>3.5.4 | 1<br>5<br>13 | – Appendix B, Tsunami Maps and Evacuation Level Descriptions<br>– Appendix E, MOU Between SFPD, GGNRA, and MNHP |
| 20 | Determine the need to appoint a Deputy Operations Section Chief and Evacuation Task Force to coordinate evacuation function in the EOC. | *EOC Manager* | *EOC Ops Section Chief* | 3.5.2.1 | 5 | Evacuation Annex to CCSF ERP |
| 21 | Ensure CCSF departments with movable resources inside the evacuation area move those resources to safe areas outside the evacuation area. | *EOC Ops Section Chief* | All departments with field resources | 3.5.5 | 5 | |

| PHASE 1: RECEIPT OF NTWC TSUNAMI WARNING TO TSUNAMI EVENT (E) | | | | | | |
|---|---|---|---|---|---|---|
| **#** | **ACTION** | **INITIATING ENTITY** | **KEY STAKEHOLDERS** | **ANNEX SECTION** | **ESF #** | **NOTES/RESOURCES** |
| 22 | Assign evacuation of Treasure Island a high priority to ensure adequate public evacuation resources. | SFPD<br>*EOC Ops Section Chief* | SFFD, SFMTA, TIDA, Cal OES, Caltrans, CHP, USCG, WETA | 3.5.2.13 | 4<br>5<br>13 | Appendix H, TIDA Treasure Island Evacuation Annex |
| 23 | Ensure people who cannot self-evacuate receive evacuation assistance. | SFFD | DEM-DEC, ACC, SFMTA, SFPD, MOD, HSA | 3.4.4.2<br>3.5.2.10<br>3.5.2.12 | 4 - 6<br>13 | Appendix G, Tentative Shuttle Routes for Tsunami Evacuation Support |
| 24 | Identify or confirm assembly area locations outside evacuation area where evacuees can gather. | *EOC Ops Section Chief* | SFPD, SFFD, HSA, SFMTA, MOD | 1.5<br>3.5.2.8 | 1<br>5<br>13 | Appendix L, Tsunami Evacuation Facilities |
| 25 | As resources permit, establish traffic control and area security points outside evacuation area to prevent unauthorized entry. | SFPD | SFMTA, SFPW, SFSD, CHP | 1.4<br>3.5.4 | 1<br>13 | Appendix F, Preliminary Traffic Control Plan |
| 26 | Publicize locations of assembly areas where evacuees can gather. | *EOC JIS* | 311 | 1.5<br>3.5.2.8 | 5<br>15 | Appendix L, Tsunami Evacuation Facilities |
| 27 | Implement route or area closures through temporary signs, barricades, or other methods of restricting public access. | SFPD | SFMTA, RPD, SFPW, Caltrans, CDRA, CHP, GGNRA | 3.5.3<br>3.5.4 | 1<br>13<br>15 | Appendix F, Preliminary Traffic Control Plan |
| 28 | Determine need for mutual aid or outside resources to safely and effectively respond and request resources as needed. | All departments responding | | 3.5.1 | 5<br>4<br>7<br>13 | ESF #7: Logistics Annex |
| 29 | Coordinate with USCG Captain of the Port, Sector San Francisco on evacuation of vessels in Port and control of vessel traffic on San Francisco Bay. | Port<br>*EOC Ops Transportation Branch* | USCG, WETA | 3.5.2.9 | 1<br>5 | ESF #1: Transportation Annex |

| PHASE 1: RECEIPT OF NTWC TSUNAMI WARNING TO TSUNAMI EVENT (E) | | | | | | |
|---|---|---|---|---|---|---|
| | **ACTION** | **INITIATING ENTITY** | **KEY STAKEHOLDERS** | **ANNEX SECTION** | **ESF #** | **NOTES/RESOURCES** |
| 30 | Establish contact with SFO and obtain updates on airport status, FAA restrictions on traffic, ability to remain open, and evacuation support needs. | *EOC Ops Transportation Branch* | SFO, FAA | 3.5.2.9 | 1<br>5 | ESF #1: Transportation Annex |
| 31 | Stage field personnel and resources outside evacuation area. | Departments with field responders | | 3.5.5 | 1<br>4 - 6<br>8 -10<br>13 | |
| 32 | Ensure field responders leave evacuation area no less than 30 minutes before estimated time of initial tsunami wave. | All departments with field responders | | 3.5.5 | 2<br>5 | |
| 33 | Determine need to open shelters and reception centers for evacuees. | *EOC Health & Human Services (H&HS) Branch* | HSA, DPH, MOD | 3.5.2.8,<br>3.5.2.10 -<br>3.5.2.12<br>3.5.9 | 5<br>6<br>8 | – ESF #6: Mass Care, Housing, and Human Services Annex<br>– ESF #11: Animal Response Annex<br>– Evacuation Annex |
| 34 | Begin re-entry planning. | *EOC Advance Planning* | SFPD, SFFD, DBI, DHR, DPH, Port, SFMTA, SFPUC, SFPW | 3.5.6<br>Appendix I | 5 | Appendix I, Sample Re-Entry Plan |
| 35 | Share situational status, preliminary damage assessment information, and resource requests with REOC, FEMA, and other entities as needed. | *EOC Planning* | All departments responding | 3.2.3<br>3.3 | 5<br>7 | |

### *1.3.3.2 PHASE 2: DURING TSUNAMI IMPACT (E TO E+24 HOURS)*

| PHASE 2:<br>TSUNAMI ARRIVAL AND IMPACT (EVENT TO EVENT +24 HOURS) | | | | | | |
|---|---|---|---|---|---|---|
| **PRIORITIES**<br>**1. Monitor tsunami impacts and determine whether inundation or other damage has occurred in CCSF.**<br>**2. Determine when it is safe to allow field responders to re-enter impacted areas to perform safety and damage assessments if needed.**<br>**3. Determine when it is safe to issue an evacuation "all clear" notice allowing the public to re-enter evacuated or closed areas.**<br>**4. Determine whether any areas must remain closed to the public in order to protect people, property, or the environment.** | | | | | | |
| **#** | **ACTION** | **INITIATING ENTITY** | **KEY STAKEHOLDERS** | **ANNEX SECTION** | **ESF #** | **NOTES/RESOURCES** |
| 36 | Continue participation in Cal OES Coastal Region tsunami conference calls. | *EOC Planning* | | 3.3.2 | 5 | |
| 37 | Monitor tsunami conditions (e.g., flooding, debris, damage) and determine extent and location of inundation or other impacts through safe, remote means. | *EOC Ops Section Chief* | SFPD, SFFD, DBI, DPH, Port, SFMTA, SFPUC | 3.3.2<br>3.5.6 | 3<br>5<br>12<br>13 | |
| 38 | Open pick-up points, shelters, and reception centers for evacuees as needed, including providing for security, feeding, and emergency medical care, and for people with disabilities or access and functional needs. | HSA<br>*EOC H&HS Branch* | ACC, DPH, MOD, SFPD, SFSD, ARC, TSA | 3.5.9 | 6<br>8<br>11<br>13 | – ESF #6: Mass Care, Housing, and Human Services Annex<br>– ESF #11: Animal Response Annex |
| 39 | Initiate system for locating missing persons and reunifying families. | *EOC H&HS Branch* | ACC, DPH, SFSD, ARC, TSA | 3.5.9 | 6<br>8<br>11<br>13 | – ESF #6: Mass Care, Housing, and Human Services Annex<br>– ESF #11: Animal Response Annex |
| 40 | Continue to staff traffic control and area security points in safe areas outside evacuation area to prevent unauthorized entry. | SFPD | SFMTA, SFSD, SFPW | 3.5.4 | 13 | |
| 41 | Continue media coordination, perform rumor control, and provide accurate information regarding incident status, CCSF actions, and desired action by the public. | *EOC JIS* | DEM-DES | 3.4.4 | 15 | ESF #15: Joint Information System Annex |

| PHASE 2: TSUNAMI ARRIVAL AND IMPACT (EVENT TO EVENT +24 HOURS) | | | | | | |
|---|---|---|---|---|---|---|
| # | ACTION | INITIATING ENTITY | KEY STAKEHOLDERS | ANNEX SECTION | ESF # | – NOTES/RESOURCES |
| 42 | Determine whether safety and damage assessments are needed in impacted areas. | *EOC Infrastructure Branch* | DBI, DPH, Port, SFMTA, SFPUC, SFPW, SFPD, SFFD | 3.5.7 | 2<br>3<br>12 | – ESF #3: Public Works and Engineering Annex<br>– Appendix to ESF #3: Post-Disaster Safety Assessment Guide |
| 43 | Determine when it is safe to allow field responders to re-enter impacted areas to perform safety and damage assessments if needed. | *EOC Ops Section Chief* | SFPD, SFFD, DBI, DPH, Port, SFMTA, SFPW | 3.5.7<br>3.5.8 | 5<br>13 | – ESF #3: Public Works and Engineering Annex<br>– Appendix to ESF #3: Post-Disaster Safety Assessment Guide<br>– ESF #12: Water and Utilities Annex |
| 44 | Determine when it will be safe to issue an evacuation "all clear" notice allowing the public to re-enter evacuated or closed areas. | *EOC Ops Section Chief* | MO, SFPD, SFFD, DBI, DPH, Port, SFMTA, SFPW | 3.5.7.3 | 5 | |
| 45 | Determine whether any areas need to remain closed to the public to allow for route clearance, debris removal, fire suppression, or hazardous material response. | *EOC Infrastructure Branch*<br>*Public Safety Branch* | SFPD, SFFD, Port, SFMTA, SFPUC, SFPW, NPS-GGNRA, Presidio, USCG | 3.5.6 - 3.5.8 | 1 - 5<br>8 - 10<br>12<br>13 | – Appendix to ESF #3: Debris Management Plan<br>– ESF #4: Firefighting Annex<br>– ESF #10: Oil and Hazardous Materials Response Annex<br>– ESF #12: Water and Utilities Annex<br>– Area Contingency Plan<br>– National Contingency Plan |
| 46 | Continue sharing situational status, preliminary damage assessment information, and resource requests with REOC, FEMA, and other entities as needed. | *EOC Planning* | All departments responding | 3.3<br>3.2.3 | 5<br>7 | |

### *1.3.3.3 PHASE 3: FIELD RESPONDER RE-ENTRY (E+24 TO E+48 HOURS)*

| PHASE 3:<br>FIELD RESPONDER RE-ENTRY (E +24 TO E +48 HOURS) | | | | | | |
|---|---|---|---|---|---|---|
| **PRIORITIES**<br>**1. Implement plan for field responder re-entry.**<br>**2. Perform initial safety and damage assessments in impacted areas.**<br>**3. Respond to immediate threats to life safety.**<br>**4. Stabilize hazardous conditions.** | | | | | | |
| **#** | **ACTION** | **INITIATING ENTITY** | **KEY STAKEHOLDERS** | **ANNEX SECTION** | **ESF #** | **NOTES/RESOURCES** |
| 47 | Continue participation in Cal OES Coastal Region tsunami conference calls. | *EOC Planning* | | 3.3.2 | 5 | |
| 48 | Notify CCSF field responders when it is safe to re-enter closed or evacuated areas. | *EOC Ops Section Chief* | DOCs<br>All departments with field personnel | 3.5.6.2<br>3.5.6.3 | 2<br>5 | |
| 49 | Continue to staff traffic control and area security points in safe areas outside evacuation area to prevent unauthorized entry. | SFPD | SFMTA, SFPW, SFSD | 1.4<br>3.5.4 | 1<br>13 | Appendix F, Preliminary Traffic Control Plan |
| 50 | Perform initial safety and damage assessments to facilitate search and rescue and emergency medical services, and to determine continuing hazards. | *EOC Infrastructure Branch* | All CCSF departments and partners | 3.5.8 | 3<br>5<br>9<br>10<br>12 | – ESF #3: Public Works and Engineering Annex<br>– Appendix to ESF #3: Post-Disaster Safety Assessment Guide<br>– SF #12: Water and Utilities Annex |
| 51 | Communicate safety and damage assessment information to DOCs for sharing with EOC, or directly to EOC if reporting entity does not have a DOC. | *EOC Infrastructure Branch* | All CCSF departments and partners | 3.5.7 | 3<br>5 | |

| PHASE 3: FIELD RESPONDER RE-ENTRY (E +24 TO E +48 HOURS) | | | | | | |
|---|---|---|---|---|---|---|
| **#** | **ACTION** | **INITIATING ENTITY** | **KEY STAKEHOLDERS** | **ANNEX SECTION** | **ESF #** | **NOTES/RESOURCES** |
| 52 | Begin field response operations including:<br>– Life-saving search and rescue.<br>– Fire suppression and stabilization of hazardous conditions.<br>– Providing emergency medical services to the injured.<br>– Establishing casualty collection points for initial treatment of the injured.<br>– Debris removal for emergency vehicle ingress and egress.<br>– Maintaining traffic control and area security. | *All departments with field responders* | SFFD, DEM-EMSA, SFMTA, SFPW, USCG | 3.5.8<br>3.5.9 | 1 - 5<br>8 - 13 | |
| 53 | Assess extent of damage to public infrastructure on land and over water, and safety of roads, bridges, machinery, and other infrastructure. | *EOC Infrastructure Branch* | All CCSF departments and partners | 3.5.7 | 3 | – ESF #3: Public Works and Engineering Annex<br>– Appendix to ESF #3: Post-Disaster Safety Assessment Guide<br>– ESF #12: Water and Utilities Annex |
| 54 | Determine and address public health risks from water inundation, broken sewer lines, downed utility lines, animal or human remains. | *EOC H&HS Branch* | DPH, ACC, HSA, OME, SFPUC | 4.6 | 5<br>8<br>11<br>12 | – ESF #3: Public Works and Engineering Annex<br>– ESF #12: Water and Utilities Annex |
| 55 | Finalize re-entry planning for reopening of evacuated and closed areas. | *EOC Advance Planning* | SFPD, SFFD, DBI, DHR, DPH, Port, SFMTA, SFPUC, SFPW | 3.5.6<br>Appendix I | 5 | Appendix I, Sample Re-Entry Plan |
| 56 | Assess need to continue to provide shelter and mass care services. | *EOC H&HS Branch* | HSA, ACC, DPH, SFPD, SFSD, ARC, TSA | 3.5.9 | 6<br>8<br>11<br>13 | – ESF #6: Mass Care, Housing, and Human Services Annex<br>– ESF #11: Animal Response Annex |

| PHASE 3: FIELD RESPONDER RE-ENTRY (E +24 TO E +48 HOURS) | | | | | | |
|---|---|---|---|---|---|---|
| **#** | **ACTION** | **INITIATING ENTITY** | **KEY STAKEHOLDERS** | **ANNEX SECTION** | **ESF #** | **NOTES/RESOURCES** |
| 57 | Establish Local Assistance Centers. | *EOC H&HS Branch* | Cal OES, FEMA, CO, HSA, OEWD | | 6<br>14 | – ESF #6: Mass Care, Housing, and Human Services Annex<br>– ESF #14: Short-Term Recovery Annex |
| 58 | Assess need for outside resources through mutual aid, state resource requests, and request for federal assistance. | *EOC Logistics*<br>*EOC Ops* | All departments responding | 3.2.3<br>3.2.4 | 5<br>7 | ESF #7: Logistics Annex |
| 59 | Continue media coordination, perform rumor control, and provide accurate information regarding incident status, CCSF actions, and desired action by the public. | *EOC JIS* | | 3.4.4 | 15 | ESF #15: Joint Information System Annex |
| 60 | Continue sharing situational status, preliminary damage assessment information, and resource requests with REOC, FEMA, and other entities as needed. | *EOC Planning* | All departments responding | 3.3<br>3.2.3 | 5<br>7 | |

### *1.3.3.4 Phase 4: Issuance of Evacuation "All Clear" Notice (E+48 to E+72 Hours)*

| PHASE 4: ISSUANCE OF EVACUATION "ALL CLEAR" NOTICE (E +48 HOURS TO E +72 HOURS) | | | | | | |
|---|---|---|---|---|---|---|
| **PRIORITIES**<br>**1. Implement public re-entry plan to facilitate orderly re-entry while continuing response operations.**<br>**2. Issue evacuation "all clear" notice allowing the public to re-enter evacuated or closed areas.**<br>**3. Continue to secure areas that remain evacuated or closed.**<br>**4. Conduct damage assessments needed to request state and federal assistance.** | | | | | | |
| **#** | **ACTION** | **INITIATING ENTITY** | **KEY STAKEHOLDERS** | **ANNEX SECTION** | **ESF #** | **NOTES/RESOURCES** |
| 61 | Continue participation in Cal OES Coastal Region tsunami conference calls. | *EOC Planning* | | 3.3.2 | 5 | |

| PHASE 4: ISSUANCE OF EVACUATION "ALL CLEAR" NOTICE (E +48 HOURS TO E +72 HOURS) | | | | | | |
|---|---|---|---|---|---|---|
| **#** | **ACTION** | **INITIATING ENTITY** | **KEY STAKEHOLDERS** | **ANNEX SECTION** | **ESF #** | **NOTES/RESOURCES** |
| 62 | Continue to staff traffic control and area security points to secure areas that need to remain evacuated or closed. | SFPD | SFMTA, SFSD, SFPW | 3.5.4 | 13 | |
| 63 | Issue "all clear" notice when it is safe to allow the public to re-enter evacuated or closed areas, including phased or facilitated reentry where damage or continuing hazards exist. | DEM-DES *EOC JIS* | 311, SFPD, SFFD | 3.5.6.3 | 5<br>13<br>15 | Issuance of "all clear" notice must be based on qualified, first responder assessment. |
| 64 | Continue rescue or evacuation of those in evacuation area who did not reach safe areas before tsunami arrival. | SFFD | SFPD | 3.5.8 | 4<br>9<br>13 | |
| 65 | Implement re-entry plan for reopening evacuated or closed areas to the public, including:<br>– Controlled re-entry through selected entry locations to limit access to those with permission to re-enter.<br>– Phased or facilitated re-entry where damage or continuing hazards exist. | SFPD | SFFD, SFMTA, SFPW, SFSD | 3.5.6 | 1<br>13 | |
| 66 | Continue emergency response activities, including search and rescue, evacuation of injured, incident stabilization, protection of environment, and debris removal. | SFFD | SFPD, SFMTA, SFPW, DPH, OME, SFE, USCG, USACE | 3.5.8<br>3.5.9 | 3<br>4<br>8 - 13 | |
| 67 | Assist in performing preliminary damage estimates to obtain accurate information for requesting state and federal assistance. | *EOC Infrastructure Branch* | CO, Port, SFPW, Cal OES, FEMA | 3.5.7 | 3<br>5<br>14 | ESF #3: Public Works and Engineering Annex |
| 68 | Coordinate with Port and USCG Captain of the Port on underwater damage assessment of Port and other maritime facilities. | *EOC Infrastructure Branch* | Port, USCG, SFPW | 3.5.7 | 1<br>3 | |

| PHASE 4: ISSUANCE OF EVACUATION "ALL CLEAR" NOTICE (E +48 HOURS TO E +72 HOURS) | | | | | | |
|---|---|---|---|---|---|---|
| **#** | **ACTION** | **INITIATING ENTITY** | **KEY STAKEHOLDERS** | **ANNEX SECTION** | **ESF #** | **NOTES/RESOURCES** |
| 69 | Coordinate with SFO on damage assessment of airport infrastructure and facilities. | *EOC Transportation Branch* | SFO, SFPW | 3.5.7 | 1<br>3 | |
| 70 | Begin assessing needs of those with long-term displacement due to tsunami damage. | *EOC Advance Planning* | HSA | 3.5.7 | 6<br>8<br>14 | – ESF #6: Mass Care, Housing, and Human Services Annex<br>– ESF #11: Animal Response Annex<br>– ESF #14: Short-Term Recovery Annex |
| 71 | Address the need for offices, accommodations, and staging areas for responding personnel from other jurisdictions. | *EOC Logistics*<br>*EOC Ops* | | 3.5.6.1 | 6<br>7 | ESF #7: Logistics Annex |
| 72 | Continue media coordination, perform rumor control, and provide accurate information regarding incident status, CCSF actions, and desired action by the public. | *EOC JIS* | | 3.4.4 | 15 | ESF #15: Joint Information System Annex |
| 73 | Continue sharing situational status, damage information, and resource requests with REOC, FEMA, and other entities as needed. | *EOC Planning* | All CCSF departments and partners | 3.3<br>3.2.3 | 5<br>7 | |

### *1.3.3.5 Phase 5: Sustained Operations (72 Hours to Two weeks)*

| PHASE 5:<br>SUSTAINED OPERATIONS (72 HOURS TO TWO WEEKS) | | | | | | |
|---|---|---|---|---|---|---|
| **PRIORITIES**<br>**1. Coordinate restoration of critical government services.**<br>**2. Complete damage assessment activities required for state and federal assistance.**<br>**3. Assist in restoration of private business activities.**<br>**4. Transition to long-term recovery authority.** | | | | | | |
| **#** | **ACTION** | **INITIATING ENTITY** | **KEY STAKEHOLDERS** | **ANNEX SECTION** | **ESF #** | **NOTES/RESOURCES** |
| 74 | Continue participation in Cal OES Coastal Region tsunami conference calls. | *EOC Planning* | | 3.3.2 | 5 | |
| 75 | Continue to secure areas that remain evacuated or closed. | SFPD | SFMTA, SFPW, SFSD | 3.5.4 | 13 | |
| 76 | Continue to coordinate response issues and scarce critical resources. | *EOC Logistics* | All departments responding | | 5<br>7 | ESF #7: Logistics Annex |
| 77 | Coordinate with key agencies on permitting, approval, or authorization requirements to perform needed repairs. | DBI | DBI, Port, SFE, SFPW | | 1<br>3<br>14 | ESF #14: Short-Term Recovery Annex |
| 78 | Coordinate restoration of critical utilities and infrastructure. | *EOC Infrastructure Branch* | SFPW, DBI, SFE, SFPUC | | 1<br>3<br>5<br>14 | – ESF #3: Public Works and Engineering Annex<br>– ESF #14: Short-Term Recovery Annex |
| 79 | Coordinate with Port and USCG Captain of the Port to reopen Port or other maritime areas if closed. | *EOC Transportation Branch* | Port, USCG, MTSRU | 3.5.7 | 1<br>3 | – ESF #1: Transportation Annex<br>– Marine Transportation System Recovery Plan |
| 80 | Coordinate with SFO to address infrastructure damage. | *EOC Transportation Branch* | SFO, FAA | 3.5.7 | 1<br>3 | |

| PHASE 5: SUSTAINED OPERATIONS (72 HOURS TO TWO WEEKS) | | | | | | |
|---|---|---|---|---|---|---|
| **#** | **ACTION** | **INITIATING ENTITY** | **KEY STAKEHOLDERS** | **ANNEX SECTION** | **ESF #** | **NOTES/RESOURCES** |
| 81 | Assist in restoration of private business activity impacted by tsunami. | *EOC Community Branch* | CO, DBI, OEWD | | 14 | ESF #14: Short-Term Recovery Annex |
| 82 | Begin addressing housing needs of CCSF residents with long-term displacement due to tsunami damage. | *TBD* | CO, DBI | | 14 | ESF #14: Short-Term Recovery Annex |
| 83 | Continue to coordinate damage assessment activities to obtain accurate information for state and federal assistance requests. | *EOC Infrastructure Branch* | CO, DBI, Port, SFPUC, SFPW | 3.5.7 | 1<br>3<br>14 | |
| 84 | Assist in completion of Preliminary Damage Assessment by state and federal partners. | *EOC Infrastructure Branch* | CO, DBI, SFPW, Cal OES, FEMA | 3.5.8 | 1<br>3<br>14 | |
| 85 | Monitor status of state emergency proclamation and federal emergency declaration, if requested, and coordinate with REOC to address issues that arise. | *EOC Planning* | EOC Policy Group, Cal OES, FEMA | | 5 | |
| 86 | Continue sharing situational status, damage information, and resource requests with REOC, FEMA, and other entities as needed. | *EOC Planning* | All departments responding | 3.3<br>3.2.3 | 5<br>7 | |
| 87 | Transition to long-term recovery authority. | *EOC Manager* | All departments responding | | 5<br>14 | ESF #14: Short-Term Recovery Annex |
| 88 | Demobilize EOC. | DEM-DES | | | 5 | |

## 1.4 Roles and Responsibilities

This table describes in general the roles and responsibilities of each listed organization in a distant-source tsunami, where there is time to provide official warning and evacuation assistance to the public. However, in near- and regional-source tsunamis, an officially-led evacuation will not be possible. Accordingly, the responsibilities included in the table must be adapted depending on the type of tsunami and other conditions present in the actual event.

### 1.4.1 Coordinating and Supporting Departments

| | |
|---|---|
| **Coordinating Departments** | San Francisco Police Department (SFPD): Evacuation, area security, traffic control. |
| | San Francisco Fire Department (SFFD): Fire suppression, urban search and rescue, hazardous materials response. |
| **Supporting Departments** | 311, Animal Care and Control (ACC), Controller's Office (CO), Department of Building Inspection (DBI), Department of Emergency Management (DEM), Department of Public Health (DPH), General Services Agency (GSA), Human Services Agency (HSA), Mayor's Office on Disability (MOD), Port of San Francisco (Port), Recreation and Parks Department (RPD), San Francisco Department of the Environment (SFE), San Francisco International Airport (SFO), San Francisco Municipal Transportation Agency (SFMTA), San Francisco Public Utilities Commission (SFPUC), San Francisco Public Works (SFPW), San Francisco Sheriff's Department (SFSD), Treasure Island Development Authority (TIDA) |
| **Other Supporting Organizations** | American Red Cross (ARC), California Department of Parks and Recreation (CDPR), California Department of Transportation (Caltrans), California Highway Patrol (CHP), National Park Service (NPS), San Francisco Maritime National Historic Park (SFMNHP), Presidio Trust, United States Coast Guard (USCG), Water Emergency Transportation Authority (WETA) |

### 1.4.2 CCSF Department Responsibilities

| Department | Responsibilities |
|---|---|
| 311 | • Receive and relay Tsunami bulletins to 311 personnel.<br>• Assess staffing needs and notify and recall personnel as required.<br>• Relay tsunami bulletins and other information to the public as required.<br>• Relay information regarding community status and needs to the EOC as required.<br>• Participate in JIS/JIC. |
| ACC | • Receive and relay Tsunami bulletins to ACC personnel.<br>• Assess staffing needs and notify and recall personnel as required.<br>• Staff ESF #11 position in EOC Operations Support Section, Human Services Branch.<br>• Assess animal care and shelter needs.<br>• Ensure all field personnel exit evacuation area at least 30 minutes before initial wave arrival.<br>• Stage resources outside evacuation area until notified that personnel may safely re-enter.<br>• Coordinate and support animal rescue.<br>• Coordinate animal shelter operations as needed. |

| Department | Responsibilities |
|---|---|
| ACC (cont'd) | • Assist with reunification of animals with their companions.<br>• Serve as part of Unified Command at Incident Command Post.<br>• Participate in JIS/JIC. |
| CO | See roles and responsibilities as outlined in CCSF Emergency Response Plan. |
| DBI | • Receive and relay Tsunami bulletins to DBI personnel.<br>• Assess staffing needs and notify and recall personnel as required.<br>• Activate DBI DOC.<br>• Staff position in EOC Operations Support Section, Infrastructure Branch.<br>• Ensure all field personnel exit evacuation area at least 30 minutes before initial wave arrival.<br>• Stage resources outside evacuation area until notified that personnel may safely re-enter.<br>• Coordinate with HSA and MOD to perform shelter inspections prior to occupancy (if local earthquake has caused infrastructure damage).<br>• Coordinate and conduct initial safety assessments in areas impacted by tsunami.<br>• Coordinate CCSF damage assessment teams.<br>• Coordinate with Cal OES and FEMA Damage Assessment Teams.<br>• Participate in JIS/JIC. |
| DEM | • Receive and relay tsunami bulletins from National Tsunami Warning Center and State Warning Center.<br>• Assess nature and extent of threat to CCSF.<br>• Initiate emergency public warning via OPWS, EAS, AlertSF, "List of lists," and other public alert and warning systems as needed.<br>• Assess staffing needs and notify and recall personnel as required.<br>• Advise CCSF leadership and other CCSF departments of nature of threat and appropriate actions.<br>• Activate and staff CCSF Emergency Operations Center (EOC) as appropriate.<br>• Coordinate emergency medical services response with ambulance providers and health care partners.<br>• Coordinate with DPH to relay tsunami information to critical healthcare facilities.<br>• Increase staffing to handle call-in lines for people who cannot self-evacuate and request evacuation assistance (DEM-DEC).<br>• Request activation of Department Operations Centers (DOCs) as appropriate.<br>• Activate Joint Information System (JIS)/Joint Information Center (JIC) to coordinate public and media information dissemination.<br>• Identify areas to be evacuated as necessary.<br>• Advise CCSF leadership on need for Proclamation of Local Emergency under California Emergency Services Act.<br>• Advise CCSF leadership on need for issuance of Mandatory Evacuation Order under California Emergency Services Act.<br>• Maintain contact with regional, state, and federal emergency management agencies. |

| Department | Responsibilities |
|---|---|
| DEM (cont'd) | • Request assistance from NPS-GGNRA to evacuate GGNRA, SFMNHP, and Presidio Trust areas within tsunami evacuation area (DEM-DEC Police Dispatch).<br>• Represent San Francisco County Operational Area in Cal OES and other post-tsunami bulletin conference calls.<br>• Coordinate issuance of notice that it is safe for field responders to re-enter closed or evacuated areas.<br>• Coordinate issuance of public "All Clear" notices as necessary.<br>• Coordinate state and federal assistance through proclamation process as needed.<br>• Coordinate non-discipline specific resources from other counties through state mutual aid system as needed. |
| DPH | • Receive and relay Tsunami bulletins to DPH personnel.<br>• Coordinate with DEM-EMSA to relay tsunami information to critical healthcare facilities.<br>• Assess staffing needs and notify and recall personnel as required.<br>• Activate DPH DOC.<br>• Staff ESF #8 position in EOC Operations Support Section, Public Health.<br>• Ensure all field personnel exit evacuation area at least 30 minutes before initial wave arrival.<br>• Stage resources outside evacuation area until notified personnel may safely re-enter.<br>• Coordinate with HSA to conduct mass care and shelter operations.<br>• Evaluate direct and indirect threats to public health and to the environment.<br>• Advise Unified Command and EOC on exposure, facility, public health, and environmental issues.<br>• Coordinate medical health response with healthcare partners.<br>• Coordinate with Office of Medical Examiner as necessary.<br>• Coordinate mental health response and critical incident stress management.<br>• Participate in JIS/JIC. |
| GSA | See roles and responsibilities as outlined in CCSF Emergency Response Plan. |
| HSA | See roles and responsibilities as outlined in CCSF Emergency Response Plan. |
| MOD | • Receive and relay Tsunami bulletins to MOD personnel.<br>• Assess staffing needs and notify and recall personnel as required.<br>• Staff liaison position in EOC Management.<br>• Coordinate with EOC and Unified Command to ensure people with disabilities and access and functional needs receive appropriate alert and warning, evacuation assistance, and mass care services.<br>• Coordinate with HSA and DBI to perform shelter inspections prior to occupancy (if local earthquake has caused infrastructure damage).<br>• Participate in JIS/JIC. |

| Department | Responsibilities |
|---|---|
| Port | • Receive and relay Tsunami bulletins to Port personnel.<br>• Assess staffing needs and notify and recall personnel as required.<br>• Activate alternate Port DOC and Port Tsunami Plan.<br>• Notify Port lessees, guests, visitors, employees, and partners of event, anticipated impact areas, and need to evacuate.<br>• Staff position in EOC Operations Support Section, Transportation Branch.<br>• Coordinate with SFPD to support land-based evacuation and area security operations.<br>• Utilize California Maritime Tsunami Response Playbook to determine need for evacuation of vessels, and in securing Port personnel and property.<br>• Coordinate with USCG to support water-based evacuation and area security operations.<br>• Ensure all field personnel exit evacuation area at least 30 minutes before initial wave arrival.<br>• Stage resources outside evacuation area until notified personnel may safely re-enter.<br>• Coordinate with USCG, SFFD, and SFPD to support water-based safety and damage assessment and restoration.<br>• Coordinate land-based safety and damage assessment and restoration of Port facilities.<br>• Participate in JIS/JIC. |
| RPD | • Receive and relay Tsunami bulletins to RPD personnel.<br>• Assess staffing needs and notify and recall personnel as required.<br>• Activate RPD DOC.<br>• Notify and evacuate CCSF park guests, visitors, employees, and partners in tsunami evacuation area.<br>• Staff position in EOC Operations Support Section, Infrastructure Branch.<br>• Coordinate with SFPD to support evacuation and security operations within affected park areas.<br>• Assist SFPD and SFFD in providing public notification of tsunami evacuation notices in evacuation area.<br>• Ensure all field personnel exit evacuation area at least 30 minutes before initial wave arrival.<br>• Stage resources outside evacuation area until notified personnel may safely re-enter.<br>• Coordinate with EOC Operations Support Section, Mass Care and Shelter Branch in opening shelters as needed.<br>• Participate in JIS/JIC. |
| SFE | See roles and responsibilities as outlined in CCSF Emergency Response Plan. |
| SFFD | • Receive and relay Tsunami bulletins to SFFD personnel.<br>• Assess staffing needs and notify and recall personnel as required.<br>• Serve as Incident Commander in Unified Command. |

| Department | Responsibilities |
|---|---|
| SFFD (cont'd) | • Staff ESF #4, #9, and #10 positions in EOC Operations Support Section, Public Safety Branch.<br>• Consider activation of the Neighborhood Emergency Response Team (NERT) to support SFFD communications, notification, response, command, and re-entry activities.<br>• Request Fire, Search and Rescue, and Haz-Mat Mutual Aid as needed.<br>• Assist SFPD in evacuating people who cannot self-evacuate such as people with disabilities and access and functional needs.<br>• Assist SFPD in road closures as appropriate.<br>• Ensure all field personnel exit evacuation area at least 30 minutes before initial wave arrival.<br>• Stage resources outside evacuation area until notified personnel may safely re-enter.<br>• Provide land-based search and rescue, emergency medical treatment, and transport services.<br>• Assist USCG and SFPD in providing maritime search and rescue.<br>• Assist WETA in providing water emergency transport.<br>• Provide fire suppression services as needed.<br>• Conduct hazardous materials field testing and analysis.<br>• Advise Unified Command on nature of hazmat threat.<br>• Locate and extricate victims as necessary.<br>• Advise Unified Command on structural and debris management issues.<br>• Assist SFPD in re-entry of displaced persons with disabilities or access and functional needs into formerly evacuated areas as directed by CCSF re-entry plan.<br>• Participate in JIS/JIC. |
| SFMTA, including Accessible Services Unit (San Francisco Paratransit) | • Receive and relay Tsunami bulletins to SFMTA personnel.<br>• Assess staffing needs and notify and recall personnel as required.<br>• Staff ESF #1 position in EOC Operations Support Section, Transportation Branch.<br>• Assist SFPD and SFFD in providing evacuation assistance to people who cannot self-evacuate.<br>• Assist SFFD and SFPD in transporting people who cannot self-evacuate and their service animals, support animals, or household pets to shelters, reception centers, or other evacuation facilities.<br>• Assist SFPD in providing traffic signal regulation, traffic control, route closure, and area security as appropriate.<br>• Ensure all field personnel exit evacuation area at least 30 minutes before initial wave arrival.<br>• As appropriate, stage resources outside evacuation area until notified personnel may safely re-enter.<br>• Coordinate transportation of people and companion animals to shelters, reception centers, and other evacuation facilities.<br>• Participate in JIS/JIC. |

| Department | Responsibilities |
|---|---|
| SFO | • Receive and relay Tsunami bulletins to SFO personnel.<br>• Assess staffing needs and notify and recall personnel as required.<br>• Activate SFO EOC.<br>• Staff ESF #1 Air Transportation Unit position in CCSF EOC.<br>• Provide information to EOC and Federal Aviation Agency regarding condition of SFO systems and infrastructure.<br>• Coordinate with SFFD and SFPD to support airport evacuation and area security operations.<br>• Ensure field personnel exit evacuation area at least 30 minutes before initial wave arrival.<br>• Stage resources outside evacuation area until notified personnel may safely re-enter.<br>• Share SFO-specific damage assessment information and evacuation needs with EOC.<br>• Participate in JIS/JIC. |
| SFPD | • Receive and relay Tsunami bulletins to SFFD personnel.<br>• Assess staffing needs and notify and recall personnel as required.<br>• Serve as Incident Commander in Unified Command.<br>• Staff ESF #13 position in EOC Operations Support Section, Public Safety Branch.<br>• Request mutual aid resources through Law Enforcement Mutual Aid System as needed.<br>• Consider activation of the Auxiliary Law Enforcement Response Team (ALERT) to support SFPD in providing door-to-door notice of evacuation and staffing traffic control and area security checkpoints.<br>• Provide public alert and evacuation notification in areas to be closed or evacuated as needed.<br>• Direct evacuation operations as needed.<br>• Ensure all field personnel exit evacuation area at least 30 minutes before initial wave arrival.<br>• Stage resources outside evacuation area until notified that personnel may safely re-enter.<br>• Maintain a secure perimeter in safe areas outside but near evacuated or closed areas.<br>• Coordinate area security, traffic control, and crowd control as needed.<br>• Coordinate with SFFD on search and rescue operations.<br>• Assist USCG and SFFD in providing maritime search and rescue.<br>• Assist WETA in providing water emergency transport.<br>• Request closure of or restrictions on air space as needed.<br>• Direct re-entry of displaced persons into formerly evacuated areas as directed by CCSF re-entry plan.<br>• Participate in the JIS/JIC. |
| SFPUC | • Receive and relay Tsunami bulletins to SFPUC personnel.<br>• Assess staffing needs and notify and recall personnel as required.<br>• Activate SFPUC DOC. |

| Department | Responsibilities |
|---|---|
| SFPUC (cont'd) | • Staff position in EOC Operations Support Section, Infrastructure Branch.<br>• Take steps to minimize impacts with SFPUC facilities in potential tsunami inundation area.<br>• Ensure all field personnel exit evacuation area at least 30 minutes before initial wave arrival.<br>• Stage resources outside evacuation area until notified personnel may safely re-enter.<br>• Coordinate response to utility issues, including "render safe," restoration, and repair.<br>• Assess, restore, and repair SFPUC facilities that are damaged or disrupted as a result of the tsunami, such as water and wastewater facilities.<br>• Coordinate with SFPW on debris management.<br>• Participate in JIS/JIC. |
| SFPW | • Receive and relay Tsunami bulletins to SFPW personnel.<br>• Assess staffing needs and notify and recall personnel as required.<br>• Activate SFPW DOC.<br>• Staff ESF #3 position in EOC Operations Support Section, Infrastructure Branch.<br>• Assist SFPD and SFFD in providing public notification of tsunami evacuation notices.<br>• Provide barricades, temporary signs, and other resources for area security and traffic control.<br>• Ensure all field personnel exit evacuation area at least 30 minutes before initial wave arrival.<br>• Stage resources outside evacuation area until notified personnel may safely re-enter.<br>• Coordinate public works and utility issues, including "render safe," restoration, and repair.<br>• Coordinate debris management.<br>• Coordinate emergency clearance and repairs to critical transportation routes.<br>• Participate in JIS/JIC. |
| SFSD | • Receive and relay Tsunami bulletins to SFFD personnel.<br>• Assess staffing needs and notify and recall personnel as required.<br>• Consider activation of Sheriff's Auxiliary Air Patrol to:<br>o Perform aerial monitoring of arrival and impact of tsunami waves and currents.<br>o Support safety and damage assessment operations.<br>• Assist SFPD in providing area security and traffic control as needed.<br>• Provide security at CCSF City Hall, EOC, San Francisco General Hospital and clinics, city jails, and other locations as contracted.<br>• Assist with coordination of security at incident facilities as staff is available.<br>• Ensure all field personnel exit evacuation area at least 30 minutes before initial wave arrival.<br>• Stage resources outside evacuation area until notified personnel may safely re-enter.<br>• Participate in JIS/JIC. |

| Department | Responsibilities |
|---|---|
| TIDA | • Receive and relay Tsunami bulletins to TIDA personnel.<br>• Assist SFPD and SFFD in providing public notification of tsunami evacuation notices on Treasure Island.<br>• Assist EOC JIC in relaying tsunami bulletins and other public information to Treasure Island (TI) and Yerba Buena Island community and stakeholders.<br>• Assess staffing needs and notify and recall personnel as required.<br>• Provide Liaison Officers to Incident Command Post and to CCSF EOC as needed.<br>• Support SFPD and SFFD to support TI evacuation and security operations.<br>• Ensure all TIDA personnel exit evacuation area at least 30 minutes before initial wave arrival.<br>• Stage resources outside evacuation area until notified personnel may safely re-enter.<br>• Participate in JIS/JIC. |

### 1.4.3 Other Organization Responsibilities

| Organization | Responsibilities |
|---|---|
| ARC | See roles and responsibilities as outlined in CCSF Emergency Response Plan. |
| CDPR | • Notify and evacuate Candlestick State Recreation Area guests, visitors, employees, and partners in potentially-impacted areas.<br>• Identify individuals and organizations that may require evacuation assistance.<br>• Coordinate with CCSF law enforcement officers and SFFD to support evacuation and security operations.<br>• Provide Liaison Officers to Incident Command Posts and CCSF EOC as needed.<br>• Maintain contact with DEC 911 Dispatch.<br>• Ensure all field personnel exit evacuation area at least 30 minutes before initial wave arrival.<br>• Stage resources outside evacuation area until notified personnel may safely re-enter.<br>• Provide rescue, emergency medical treatment, and transport. |
| Caltrans | • Coordinate with CCSF on closure or reopening of federal and state roads, highways, and freeways within CCSF, including bridges, overpasses, and underpasses.<br>• Provide status and damage reports on status and inspection of federal and state roads, highways, and freeways.<br>• Establish and implement long-term closures for detouring and channeling traffic.<br>• Provide Liaison Officers to CCSF EOC as needed.<br>• Maintain contact with DEC 911 Dispatch.<br>• Ensure all field personnel exit evacuation area at least 30 minutes before initial wave arrival.<br>• Stage resources outside evacuation area until notified personnel may safely re-enter.<br>• Provide rescue, emergency medical treatment, and transport. |

| Organization | Responsibilities |
|---|---|
| CHP | • Provide initial reports on damage to state roads, highways, and freeways within CCSF.<br>• Coordinate with Caltrans and CCSF to provide traffic control on and to secure unsafe sections of state roads, highways, and freeways within CCSF.<br>• Assist emergency vehicles and equipment in entering or leaving evacuation areas or other hazardous locations.<br>• Coordinate with CCSF law enforcement officers and SFFD to support evacuation and area security operations.<br>• Provide Liaison Officers to Incident Command Posts and CCSF EOC as needed.<br>• Maintain contact with DEC 911 Dispatch.<br>• Ensure all field personnel exit evacuation area at least 30 minutes before initial wave arrival.<br>• Stage resources outside evacuation area until notified personnel may safely re-enter.<br>• Provide rescue, emergency medical treatment, and transport.<br>• Monitor traffic to ensure safe transport of debris during debris removal and demolition operations. |
| NPS-GGNRA, SFMNHP, Presidio Trust | • Receive and relay Tsunami bulletins to personnel.<br>• Maintain contact with DEC 911 Police Dispatch.<br>• Receive DEC 911 Police Dispatch request for assistance in evacuating GGNRA, SFMNHP, or Presidio areas within tsunami evacuation area.<br>• Assist SFPD in notifying and evacuating guests, visitors, employees, and partners in park or Presidio areas within tsunami evacuation area.<br>• Identify individuals and organizations that may require evacuation assistance.<br>• Coordinate with CCSF law enforcement officers and SFFD to support evacuation and area security operations.<br>• Provide Liaison Officers to Incident Command Posts and CCSF EOC as needed.<br>• Ensure all field personnel exit evacuation area at least 30 minutes before initial wave arrival.<br>• Stage resources outside evacuation area until notified personnel may safely re-enter.<br>• Provide rescue emergency medical treatment and transport. |
| USCG | • Provide status and timing on closure of Port and other waters to vessel traffic.<br>• Coordinate with Port and WETA to support evacuation and safeguarding of vessels and security operations in water areas of Port.<br>• Coordinate with Port, SFPD, and SFFD to support evacuation and security operations on Yerba Buena and Treasure Islands.<br>• Provide Liaison Officers to Incident Command Posts and CCSF EOC as needed.<br>• Maintain contact with DEC 911 Dispatch.<br>• Ensure all personnel exit evacuation area at least 30 minutes before initial wave arrival.<br>• Stage resources outside evacuation area until notified personnel may safely re-enter.<br>• Provide maritime search and rescue, emergency transport, and medical treatment. |

| Organization | Responsibilities |
|---|---|
| USCG (cont'd) | • Assess coastal zone for pollution and hazardous materials releases resulting from tsunami.<br>• Act as lead federal agency for tsunami-related pollution and hazardous materials responses in coastal zone as needed. |
| WETA | • Receive and relay Tsunami bulletins to WETA personnel.<br>• Coordinate with Port and USCG to support evacuation and safeguarding of vessels, facilities, and security operations in maritime areas.<br>• Coordinate with SFPD, SFFD, and Port to support evacuation of people on Treasure Island.<br>• Ensure all personnel exit evacuation area with enough time to transport personnel and vessels to a safe location before initial wave arrival.<br>• Stage resources outside impacted maritime areas until notified personnel may safely re-enter.<br>• Assist USCG, SFPD, and SFFD in providing water emergency transport. |

# SECTION 2: INTRODUCTION

Like other California coastal communities, the City and County of San Francisco (CCSF) is susceptible to tsunamis. Since 1850, 54 tsunamis have been recorded or observed in San Francisco Bay. None of these tsunamis caused significant damage in San Francisco. However, tsunami inundation maps prepared by the State of California in 2009 indicate that over three square miles of San Francisco County are potentially at risk for tsunami inundation.[1] An estimated 10,761 people reside within this state-designated tsunami inundation area according to the 2010 United States Census.

Inundation from tsunamis may result in great loss of life and extensive damage to homes, businesses, and essential infrastructure in low-lying coastal areas. Tsunamis also may lead to secondary impacts such as fires; hazardous material incidents; contaminated water systems; and disruptions in transportation, energy, and communications systems. The cascading nature and complexity of these impacts may overwhelm existing CCSF resources, which in turn may complicate or delay response and recovery efforts.

It is also likely that a destructive tsunami impacting San Francisco will have resulted in damage to a large area of the California coastline. In that situation, neighboring counties that would otherwise provide CCSF with mutual aid will be fully engaged in their own tsunami response and recovery activities, while inland counties will be inundated with requests for mutual aid. For these reasons, it is critical that the City plan and prepare to meet the demands of tsunami response and restoration efforts.

## 2.1 Annex Purpose

The purpose of this Tsunami Annex is to provide a framework of support and guidance to CCSF departments and decision-makers tasked with coordinating the City's tsunami preparedness, response, and recovery efforts at the Emergency Operations Center (EOC) and at Department Operations Centers (DOCs). The Tsunami Annex sets out in general terms the critical operational steps required to adequately prepare for, respond to, and recover from a tsunami. The Annex also includes an overview of the roles and responsibilities of key CCSF departments, partners, and stakeholders with tsunami-related preparedness, response, and restoration tasks.

## 2.2 Scope and Applicability

The Tsunami Annex is a hazard-specific supplement to the CCSF Emergency Response Plan (ERP). The ERP provides a broad, "all-hazards" framework for use by CCSF organizations working together to manage disasters and emergencies impacting San Francisco. The Tsunami Annex does not alter or replace procedures or policies set forth in the ERP. Rather, the Annex provides additional guidance to CCSF organizations and leaders in conducting tsunami preparedness, response, and recovery efforts. The Tsunami Annex complies with the National Response Framework, the National Incident Management System (NIMS), and the Standardized Emergency Management System (SEMS). The Annex also complies with the California State Emergency Plan.

In keeping with the purpose of the Tsunami Annex as an EOC- and DOC-focused plan, the Annex does not provide specific response actions for field responders. CCSF departments, agencies,

and other partners with field response roles in a tsunami incident are urged to develop plans and standard operating procedures outlining roles and responsibilities of their field personnel during tsunami response and restoration phases.

## 2.3 Planning Assumptions

The following assumptions were made as part of planning for a distant-, regional-, or near-source tsunami impacting CCSF:

- Tsunamis are infrequent, but high impact events that may result in a number of fatalities and injuries, and in widespread property damage.
- The primary tsunami threat to San Francisco is a distant-source tsunami generated by an earthquake in the eastern portion of the Aleutian-Alaska Subduction Zone, due to its spatial orientation toward the Bay Area.[2]
- San Francisco has, at most, a moderate risk of an earthquake-generated tsunami from a regional source (within 621 miles) or near source (within 62 miles).[3]
- Strike-slip faults such as the San Andreas pose a potential threat of earthquake-induced submarine landslides, which may generate a near-source tsunami that could impact San Francisco.[4]
- Distant-source tsunami events may generate a tsunami reaching CCSF within four to 15 hours, allowing time for public warning and official evacuation efforts, and for activation of the CCSF EOC and DOCs in advance of initial wave arrival.[5]
- The Cascadia Subduction Zone could generate a regional tsunami that may impact CCSF within one to two hours. Depending on tidal conditions, such a tsunami may cause inundation of coastal or bay-side areas, requiring evacuation.[6]
- Near-source tsunamis generated by a severe Bay Area earthquake may reach San Francisco within 10 to 15 minutes,[7] leaving no time for official evacuation assistance to the public before tsunami arrival. In addition, a local earthquake strong enough to produce a tsunami will likely result in injuries to CCSF personnel, and in damage to computer, telephone, and other components of San Francisco's public warning system, making it difficult if not impossible to issue evacuation notices before initial tsunami waves arrive.
- The largest, most destructive tsunami waves normally occur within the first five hours of a tsunami incident.[8] The first wave is almost never the largest.[9]
- The National Tsunami Warning Center (NTWC) will take approximately three to five minutes to issue an initial Tsunami bulletin and communicate it to the California State Warning Center.[10] The NTWC also will issue Tsunami Warning messages through the Integrated Public Alert and Warning System (IPAWS), and will share tsunami bulletins with traditional and social media.[11]
- If the NTWC places San Francisco into a Tsunami Watch, it will take an additional 1.5 to two hours for the NTWC to issue a Tsunami Warning or Advisory for CCSF,[12] or to cancel the Tsunami Watch.

- The 2009 State Tsunami Inundation Map for San Francisco is based on theoretical "worst-case" tsunami scenarios. Actual tsunami events may produce less or more inundation.[13]
- CCSF will utilize SEMS, NIMS, and ICS as a basis for preparedness, planning, response, and recovery from a tsunami incident impacting the City.[14]
- Public safety agencies may be unable to quickly deploy personnel living outside San Francisco, or may suffer losses during a tsunami incident, resulting in a shortage of resources to assist with response and recovery efforts.
- Public and private utilities and infrastructure (e.g., power, water, sewer, natural gas networks, phone lines, and communications) may be damaged or inoperative following a tsunami.
- Roads, bridges, and highways may be damaged and become impassable following a significant tsunami.
- People residing, visiting, or operating businesses in shoreline areas of San Francisco may be without food, water, shelter, heat, sanitary facilities, or transportation for extended periods of time following a destructive tsunami.
- Areas of CCSF that are not directly impacted by a tsunami may be overwhelmed by an influx of displaced persons in need of alternate shelter or housing because of damaged or uninhabitable homes, hotels, or other living facilities.
- Crime may increase as a result of areas being evacuated following a tsunami.

# SECTION 3: CONCEPT OF OPERATIONS

## 3.1 Overview

The Concept of Operations (ConOps) section provides guidance to CCSF personnel and decision-makers regarding the sequence and scope of actions that may be necessary in a citywide response to a tsunami event. The ConOps section describes in general terms the operational activities, procedures, and functions of the San Francisco Emergency Operations Center (EOC) and Department Operations Centers (DOCs) during a tsunami event.

NOTE: Most procedures discussed in this section apply to distant-, regional-, and near-source tsunamis. However, there are important differences in preparing for and responding to these distinct types of tsunamis, particularly during the alert and warning and evacuation phases. These differences are noted and discussed throughout the ConOps section. For discussion of the differences between distant-, regional-, and near-source tsunamis, see Section 4.2.2.

## 3.2 Incident Management

In a tsunami incident, CCSF's emergency management and response system is organized as described in the San Francisco Emergency Response Plan (ERP). Response to a tsunami incident is managed at the lowest level possible, in accordance with the National Incident Management System (NIMS), the Standardized Emergency Management System (SEMS), and the Incident Command System (ICS). Accordingly, CCSF is responsible for coordinating tsunami emergency activities within the jurisdiction, including those of special districts such as the San Francisco International Airport and the San Francisco Unified School District.

### 3.2.1 Operational Activity Phases

In a distant-source tsunami incident, there are three phases of operational activity:

- The Alert and Warning phase: Includes receiving and disseminating tsunami bulletins issued by the National Tsunami Warning Center (NTWC) and other information to CCSF departments, partner agencies, and to the public (see Section 3.4, below).
- The Response phase: Includes activation of the CCSF Emergency Operations Center (EOC) and Department Operations Centers (DOCs); evacuation of tsunami inundation areas; providing traffic control and area security; performing safety and damage assessment; responding to life and public safety threats; and issuance of "all clear" notifications when it is safe to allow the public to re-enter evacuated areas (see Section 3.5, below).
- The Restoration phase: May include debris removal, critical route clearance, initial restoration of essential CCSF services, providing essential public health and safety services, and supplying safe interim housing for displaced persons. The Restoration phase is expected to last approximately two weeks. Thereafter, activities will transition to long-term recovery under ESF #14, Short-Term Recovery Annex to the CCSF ERP.

In a regional-source event, such as a Cascadia-generated tsunami, there may be at little as one hour until initial wave arrival. In that scenario, there will be time to provide official public notifications to evacuate, but no time to conduct an officially-led evacuation of the inundation area. Post-tsunami Response and Restoration phases will be similar to those in a distant-source tsunami.

In a near-source tsunami incident, a strong, locally-felt earthquake may be the first "warning" received by the public, with tsunami waves following within 10 to 15 minutes afterwards. In that situation, emergency officials will not have time to assist the public in evacuating the tsunami inundation area. In addition, the city's alert and warning systems may be damaged, and emergency personnel may be impacted, which in turn may make it difficult to issue public alerts in advance of tsunami arrival. Post-tsunami Response and Restoration phases will be similar to those in a distant-source tsunami, with the added potential for widespread earthquake impacts as well as tsunami-related damage. For further discussion of the differences between distant-, regional-, and near-source tsunamis, see Section 4.2.2.

### 3.2.2 Management Priorities

As suggested by the National Response Framework, CCSF's priorities in all phases of tsunami incident management are to:[15]

1. Protect and save lives, both civilian and responder.
2. Protect property and the environment.
3. Stabilize the incident.
4. Provide for basic human needs.
5. Return CCSF to normal operations as quickly and as safely as possible.

### 3.2.3 EOC Activities

The CCSF EOC serves as the central point for jurisdictional coordination of a tsunami incident. The EOC provides support, coordination, and assistance with policy-level decisions needed to successfully manage the incident. The EOC also serves as a central location for collecting and sharing situational information and a common operating picture of citywide status and response activities.

Critical responsibilities of the EOC during a tsunami incident may include the following:

- Determining the need for partial or full evacuation of the tsunami inundation area.
- Determining the need for issuance of a local emergency proclamation under the California Emergency Services Act.
- Initiating and coordinating evacuation of potential inundation areas.
- Communicating with the Mayor's Office and the EOC Policy Group.
- Activating and staffing the EOC Joint Information Section to coordinate public information regarding the incident.
- Collecting, analyzing, and disseminating situational information as part of maintaining a citywide common operating picture during response and restoration activities.
- Requesting that CCSF departments open Department Operations Centers (DOCs), issue staff notifications, assess staffing needs, and take additional actions as necessary.
- Maintaining communication with DOCs and with field-level responders to ensure CCSF departments and partners are aware of EOC management objectives, and to incorporate DOC and field-level information into a citywide common operating picture.

- Establishing resource priorities among multiple ongoing incidents, allocating critical resources based on established resource priorities, and acquiring additional resources through mutual aid or other sources as needed.
- Coordinating with local, state, regional, and federal entities to share information and to obtain needed resources and assistance.
- Determining when it is safe to allow responding personnel to re-enter evacuated areas to conduct safety and damage assessments and to perform lifesaving activities.
- Determining when it is safe to issue a public "all clear" notice allowing the re-entry of the public into evacuated areas.
- Coordinating and providing support for restoration activities.
- Planning and coordination of demobilization activities.

### 3.2.4 DOC Activities

DOCs provide operations and logistics coordination and support for CCSF departments with personnel and resources in the field during a tsunami incident. In general, DOCs serve two primary functions: They maintain departmental continuity of operations during emergencies, and assist with citywide response by communicating and coordinating with the EOC and with the department's field-level personnel. Currently, 17 CCSF departments or special districts maintain DOCs. For a list of DOCs, see the CCSF Emergency and Department Operations Center Resource Directory.

Primary responsibilities of DOCs during a tsunami incident include the following:

- Activating and adequately staffing the DOC.
- Issuing departmental staff notifications and recalling personnel with response roles.
- Coordinating and supporting departmental field response and restoration activities.
- Maintaining communications and coordination between the department's incident command or field responders and the EOC.
- Collecting, validating, and sharing situational information with the EOC as part of maintaining a citywide common operating picture.
- Receiving resource requests from field personnel and, whenever possible, filling them from departmental resources or through discipline-specific mutual aid.
- Flowing resource requests that cannot be filled by department resources or by discipline-specific mutual aid to the appropriate EOC Operations Support Section Branch.
- Ensuring that personnel working in the tsunami evacuation area are relocated, that department equipment and other resources in the evacuation area are moved, and that other appropriate protective measures are taken.
- If staging areas are deemed necessary, ensuring that response personnel are staged in safe locations outside the evacuation area from which they can quickly respond once it is safe to do so.
- Coordinating the set-up and operation of evacuation assembly sites and shelters.

- Ensuring that appropriate traffic-control and security measures are established to safeguard people and property, and to prevent public re-entry in evacuated or impacted areas until it is safe to re-enter.
- Notifying departmental or agency field responders that it is safe to re-enter evacuated areas once this determination is made by the Mayor in consultation with the EOC and Policy Group.
- Ensuring appropriate safety and damage assessment before allowing the public to re-enter evacuated or impacted areas.
- Coordinating departmental demobilization activities.

For general discussion of DOC activities in a disaster, see the CCSF ERP.

## 3.3 Information Gathering, Sharing, and Situational Awareness

### 3.3.1 Overview

The process used to gather and share information and to maintain situational awareness in a tsunami incident is described in general in the CCSF ERP. At the field level, collecting information and maintaining situational awareness are the responsibility of every department conducting field operations. If the department has an activated DOC, information will move from the field to the DOC, and from the DOC to the appropriate CCSF EOC Operations Support Section branch. Departments operating in the field without an established or activated DOC should share information directly with the appropriate Operations Support Section branch in the EOC.

In the EOC, the Planning Section Situation Unit has primary responsibility for gathering, analyzing, validating, and disseminating information from the field, from DOCs, and from other sources as part of developing and maintaining a citywide common operating picture. However, all EOC sections are responsible for gathering, validating, and sharing situational information within the EOC. For a list of essential elements of information to be gathered in a tsunami incident by EOC and DOC personnel, see Appendix J.

### 3.3.2 Monitoring Tsunami Impacts

It is critical that CCSF monitor tsunami impacts during an incident to develop and maintain situational awareness and a common operational picture. Impact monitoring assists personnel in the EOC to:

- Determine tsunami impacts to the public and to CCSF personnel.
- Determine whether the tsunami is causing inundation or other damage within CCSF, and the locations impacted.
- Take all steps possible to protect lives and mitigate tsunami impacts while minimizing danger to responders.
- Enable successful re-entry planning (see Section 3.5.6.1, below).
- Determine when it is safe to allow field responders to re-enter evacuated areas to begin response efforts (see Section 3.5.6.2, below).
- Prioritize response efforts once it is safe to allow responder re-entry.

- Determine when it is safe to issue an evacuation "all clear" allowing the public to re-enter evacuated areas, and whether a phased public re-entry will be needed (see Section 3.5.6.3, below).

When California coastal counties are placed in a NTWC Tsunami Warning, Advisory, or Watch, the California Governor's Office of Emergency Services (Cal OES) Coastal Region will hold telephone conference calls with impacted Operational Areas to share updated tsunami information, and to provide guidance on response options. The DEM Duty Officer and DEM Manager On Call will participate in these conference calls, and will ensure that information from the calls is shared with CCSF departments and partners.

Additional safe methods for monitoring tsunami impacts may include performing unpiloted aerial vehicle, helicopter, or airplane overflights; viewing footage recorded by close circuit television or by television news helicopters; and considering Deep-ocean Assessment and Reporting of Tsunamis (DART) buoy and tide gauge information from NOAA. The San Francisco Sheriff's Department may activate its Auxiliary Air Patrol volunteers to assist in providing helicopter or airplane overflights of shoreline areas. In addition, CCSF may submit a request through Cal OES for a reconnaissance flight of shoreline areas. The Civil Air Patrol, California Wing of the United States Air Force Auxiliary may have local resources that can provide overflight services.

## 3.4 Alert and Warning

For an "advance notice" event like a distant- or regional source tsunami, dissemination of tsunami alerts and life-safety information is the first step in managing the incident. Providing timely, consistent, understandable warnings through multiple communication methods to persons in areas that may be affected is essential to minimize tsunami impacts to people and infrastructure.

The information in this section applies primarily to alert and warning in distant- and regional-source tsunamis. In a near-source tsunami, a local earthquake strong enough to generate a tsunami will likely damage the City's alert and warning systems, making it difficult to issue or delaying public alerts. Local emergency officials will make every effort to alert the public of the need to evacuate in a near-source tsunami event. However, it is critical that the public be familiar with the "natural warning signs" of a tsunami, and be ready to take action to protect themselves. For further discussion of tsunami warning signs, and CCSF's plans for public tsunami education, see Section 5, below.

### 3.4.1 National Tsunami Warning System

San Francisco is within the area of responsibility of the National Tsunami Warning Center (NTWC). When an earthquake occurs that requires activation of the National Tsunami Warning System, the NTWC will issue tsunami bulletins to federal and state partners and to the public as appropriate. The tsunami bulletin products issued by the NTWC are summarized in order of severity in Table 3.1 below. For a more detailed description of each alert level, see Appendix K.

The California State Warning Center is the agency that serves as California's "Warning Point" for dissemination of NTWC tsunami bulletins. The State Warning Center relays NTWC bulletins to 9-1-1 centers in California coastal counties using the California Warning and Alerting System, the California Law Enforcement Telecommunications System, and the Emergency Alert System

(EAS). In addition, the State Warning Center notifies Cal OES Regional Duty Officers and Cal OES Earthquake and Tsunami Coordinators. The State Warning Center does not provide threat analysis or advice. For further discussion of the National Tsunami Warning System, see Appendix K.

**Table 3.1. NTWC Message Definition Summary**

| ALERT LEVEL | THREAT | SUGGESTED ACTION | EAS MESSAGE | WEA MESSAGE |
|---|---|---|---|---|
| **Warning** | Inundating waves possible | Full evacuation suggested | Issued | Issued |
| **Advisory** | Strong currents likely | Stay away from the shore | Not issued | Not Issued |
| **Watch** | Danger level not known yet *(will likely be upgraded to Advisory or Warning)* | Stay alert for more information | Issued | Not Issued |
| **Information Statement** | Minor waves at most | No action suggested | Not issued | Not Issued |

Source: NOAA, NWS, NTWC Message Definitions. Retrieved from http://wcatwc.arh.noaa.gov/?page=message_definitions

### 3.4.2 CCSF 9-1-1 Center Reception of Tsunami Bulletins

In San Francisco, State Warning Center notifications are relayed to the Department of Emergency Management, Division of Emergency Communications (DEM-DEC) 9-1-1 Dispatch Center (DEC Dispatch). On receiving a State Warning Center communication indicating that the NTWC has placed San Francisco in a Tsunami Watch, Advisory, or Warning, DEC Dispatch will:

- Confirm receipt of the bulletin with the State Warning Center.
- Provide notification that a NTWC bulletin for San Francisco has been received to:
  - The Department of Emergency Management, Division of Emergency Services (DEM-DES) 24-hour Duty Officer and the DEM Manager On Call.
  - The San Francisco Police Department (SFPD) Department Operations Center (DOC).
  - The San Francisco Fire Department's Fire Command Staff and on-duty Division Chief.
- Attempt to activate the Outdoor Public Warning System (OPWS) when the NTWC, based solely on earthquake parameters (i.e., no confirmation a tsunami has been generated), places San Francisco in a Tsunami Warning within five minutes of a strong local earthquake.

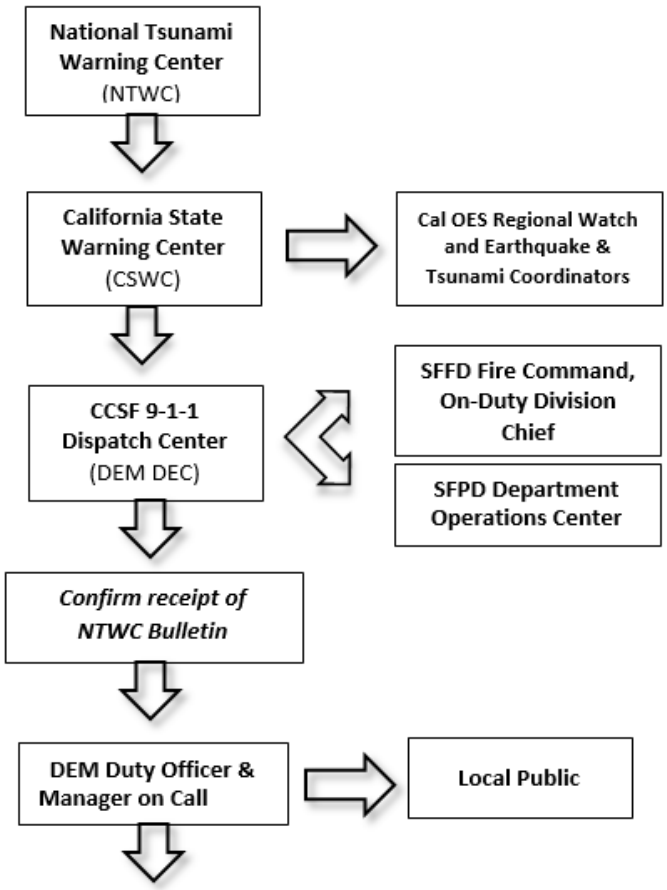
A diagram of CCSF's message communications appears in Figure 3.1, below.

### 3.4.3 CCSF Tsunami Information Dissemination

DEM is responsible for initiating and coordinating citywide alert and warning activities as appropriate depending on the type of NTWC tsunami bulletin issued, and the expected impact to CCSF. The DEM Duty Officer, DEM Manager On Call, and when necessary, the DEM Executive Director, will determine next steps. Next steps may include, but are not limited to:

- Assessing the possibility of inundating or destructive waves or currents, and the need for partial or full evacuation of tsunami inundation areas (see Section 3.5.2).
- Activating the CCSF EOC at the appropriate staffing level (see Section 3.5.1).

**Figure 3.1. CCSF Tsunami Message Communications**




**DEM DUTY OFFICER TSUNAMI NOTIFICATIONS**

**All CCSF Departments AND**

**Partner Organizations**

Almar Marinas
American Red Cross Bay Area
Bay Area Rapid Transit (BART)
California Department of Parks & Recreation
California Highway Patrol (CHP)
California Department of Transportation (Caltrans)
Consulate Corps
Mission Creek Harbor Association
Moor + South/PIER Management Co.
National Park Service
Presidio Trust
The Salvation Army
The Volunteer Center Serving San Francisco and San Mateo Counties
United States Coast Guard
Water Emergency Transportation Authority (WETA)

- Activating the Joint Information Section to coordinate media and public information regarding the incident (see ESF #15: Joint Information System Annex to the CCSF ERP).
- Issuing CCSF Alert and other notifications to CCSF departments and partner agencies.
- Briefing the Mayor and members of the Policy Group.
- Issuing a local disaster proclamation under the California Emergency Services Act (see Section 3.5.2.4).
- After consultation with the Mayor and Policy Group, initiating evacuation of potential inundation areas (see Section 3.5.2.2–3.5.2.6).
- Requesting that CCSF departments open Department Operations Centers (DOCs), issue staff notifications, and take additional response actions as necessary.
- Alerting the public via the OPWS, Emergency Alert System (EAS), Commercial Mobile Alert System (CMAS) and AlertSF, announcements in impacted neighborhoods using vehicles equipped with public address systems, and other appropriate public warning methods (see Section 3.4.4).
- Participation in Cal OES Coastal Region or statewide tsunami conference calls to receive updated information regarding expected tsunami conditions.
- Continuous monitoring of the situation, with modification of actions depending on additional NTWC bulletins and on local conditions.

For further information regarding specific steps to be taken by the DEM Duty Officer and the Manager On Call after receiving a tsunami bulletin, see Appendix A, DEM Duty Officer Tsunami Resources. For further discussion of tsunami response activities, see Section 3.5.

When DEM receives notice that the NTWC has issued a Tsunami Warning, Tsunami Advisory, or Tsunami Watch for San Francisco, DEM will notify the public and CCSF departments and partners regarding what is happening, steps the City is taking in response, and actions city partners and the public are asked to take. For a table summarizing potential DEM notifications for Tsunami Warnings, Advisories, and Watches, see Section 1.1, above. For sample CCSF public tsunami messages, see Appendix D.

### 3.4.4 Public Alert and Warning

#### *3.4.4.1 Overview*

When the NTWC issues a Tsunami Watch, Advisory, or Warning that includes San Francisco, it is essential that CCSF issue effective public messages regarding what has happened, actions the City is taking in response, and what the City is asking the public to do. During a tsunami incident, DEM is responsible for initiating and coordinating public tsunami alerts and messaging within CCSF. In general, initial public alert and warning functions will be performed by the DEM Duty Officer, after consultation with the DEM Manager On Call. The DEM Duty Officer will activate the Joint Information Section to assist with and manage public information and media coordination.

#### *3.4.4.2 Roles and Responsibilities*

In a distant- or regional-source tsunami, on direction by the DEM Manager On Call, the DEM Duty Officer will:

- Activate the Outdoor Public Warning System (OPWS) sirens and accompanying voice messages in potentially-impacted areas to advise the public that a Tsunami Warning has been issued and to move inland to higher ground.
- Activate the Emergency Alert System (EAS) to provide tsunami messages on local EAS radio and television stations. NOTE: The NTWC does not activate the EAS for Tsunami Advisories. However, the EAS code "Local Area Emergency" (LAE) may be used for Tsunami Advisories if agreed to by the Mayor and Policy Group.[16]
- Activate the Commercial Mobile Alert System, also known as Wireless Emergency Alerts (WEA), to provide messages to subscribing mobile phone users.
- Activate "Alert SF," DEM's emergency public messaging system, to send text and email messages to people in CCSF who have opted to receive these alerts.
- Activate the Joint Information Section as soon as possible after receiving a Tsunami Warning, Advisory, or Watch for San Francisco.
- Coordinate with the San Francisco Department of Public Health (DPH) to activate the "List of Lists," a list maintained by DPH of service providers for people with disabilities and access and functional needs, to request that those providers contact clients residing in the tsunami evacuation area to ask if they need assistance in evacuating.
- Request that 911 Dispatch provide additional staff to handle phone calls from people with disabilities and access and functional needs located in the tsunami evacuation area who call for evacuation assistance.
- Begin sending tsunami messages via social media platforms such as Twitter. This activity will be assumed by the Joint Information Section as soon as it is activated.

Pre-scripted public tsunami messages are included in Appendix D. For further information on the Joint Information Section, see Emergency Support Function (ESF) #15: Joint Information System Annex to the CCSF Emergency Response Plan.

In addition, if there is sufficient time before initial tsunami arrival so that field responder safety is assured, the following additional steps will be taken to provide public notification of a tsunami evacuation:

- San Francisco Police Department (SFPD) and San Francisco Fire Department (SFFD) personnel in emergency vehicles equipped with public address systems will provide notice of the tsunami warning and order to evacuate in the evacuation area.
- The San Francisco Public Works communications van may also assist in providing neighborhood public address messages.
- SFPD and SFFD personnel will go door-to-door in the tsunami evacuation area to provide notification of the tsunami warning and order to evacuate.
    - Volunteers from the SFPD's Auxiliary Law Enforcement Emergency Response Team (ALERT) may be activated by the SFPD to assist in providing door-to-door notification.
    - Volunteers from the SFFD's Neighborhood Emergency Response Team (NERT) may be activated by the SFFD to assist in providing door-to-door notification.

In a near-source tsunami scenario in which the NTWC issues a Tsunami Warning including San Francisco based solely on earthquake parameters, the DEM Duty Officer and DEC Dispatch

personnel will make every effort to activate the OPWS and other alerting systems to notify the public to move to high ground. Due to the 10- to 15-minute timeframe from a M7.0 or greater local earthquake to arrival of tsunami waves, there will not be time for the DEM Duty Officer to consult the Manager On Call before attempting to activate the OPWS. It is also important to note that a local M7.0 or above earthquake may injure personnel and damage alert and warning systems, making it difficult if not impossible to issue timely public warnings. For further discussion of near-source tsunamis, see Sections 3.2.1 and 3.4. For DEM Duty Officer Tsunami Resources, see Appendix A.

#### *3.4.4.3 Accessibility of Public Tsunami Messages*

It is critical that CCSF issue public tsunami messages and alerts that are accessible to all members of the public, including people with disabilities and people with access and functional needs, such as those with limited English proficiency. Accessibility of alert and warning messages refers to whether individuals can receive and understand the messages. In issuing tsunami alerts and messages to the public, CCSF will:

- Compose messages that are simply worded and free of technical jargon, acronyms, abbreviations, or other phrases that are hard to understand.
- Provide ample text and audio to explain any images or maps included in messages so recipients who are blind or have low vision can understand the meaning of what is being shown graphically.
- Create pre-recorded audio files for later use in tsunami incidents. Pre-recorded audio will be as consistent as possible with the message text.
- Ensure messages are delivered in multiple formats, including:
  - The Emergency Alert System.
  - Wireless Emergency Alerts.
  - Alert SF.
  - The Outdoor Public Warning System.
  - Social media, such as Twitter and Facebook.
  - Emails, phone calls, or other messaging to vulnerable populations by CCSF agencies and by nonprofit organizations that regularly serve them.
  - If first responder safety is not endangered by these actions, the following additional means of message delivery will be employed in affected areas:
    - Emergency vehicles with sirens and public address systems.
    - Door-to-door notification.
- CCSF will issue warnings and other emergency messages in English and in other languages spoken by a substantial percentage of the City's population, as required by the San Francisco Language Access Ordinance, San Francisco Administrative Code, Chapter 91. The CCSF Language Access Ordinance currently requires translation in Chinese (Cantonese and Mandarin), Spanish, and Tagalog.
- To avoid errors and confusion, automated translations of emergency messages during a tsunami incident will be validated with a person who speaks the language before dissemination.

Pre-scripted public tsunami messages are provided in Appendix D.

## 3.5 Response

This section describes key responsibilities and issues to be addressed at the EOC- and DOC-level during the response to a tsunami incident. The response phase may include activating the CCSF Emergency Operations Center (EOC) and Department Operations Centers (DOCs); evacuating the public from tsunami inundation areas; imposing route and area closures; confirming assembly areas, and setting up and staffing shelters and other evacuation facilities; providing security and traffic control; conducting safety and damage assessments; and issuing "all clear" notifications indicating that the public may re-enter evacuated areas.

### 3.5.1 Activation of CCSF EOC

Once DEM confirms that the NTWC has placed San Francisco in a Tsunami Warning, Advisory, or Watch, the CCSF EOC will be activated. The following persons have authority to activate the EOC:

- The Mayor.
- The DEM Executive Director.
- The Deputy Director of DEM, Division of Emergency Services.
- The DEM Manager On Call.
- The DEM Duty Officer, in consultation with the Manager On Call.

DEM is responsible for determining the appropriate EOC activation and staffing level based on assessment of the potential for tsunami inundation, damaging currents, or other adverse impacts to CCSF. Once the staffing level is determined, the DEM Duty Officer will send out a CCSF Alert to key stakeholders and partner agencies notifying them of the activation and requesting that they send representatives to the EOC. The CCSF Alert may also include a request that departments activate their DOCs. For sample CCSF Alerts, see Appendix A.

The EOC is the central location in San Francisco for multiagency emergency coordination during a tsunami incident. EOC personnel gather, verify, and share situational information, and maintain a common operating picture to support decision-making and management of the incident. In addition, the EOC manages the public information process, and obtains and coordinates critical resources to support response activities. For further information regarding activation of the EOC and EOC activities, see ESF #5: Emergency Management Annex to the CCSF ERP.

### 3.5.2 Evacuation

In a tsunami incident requiring evacuation of areas within CCSF, local officials are responsible for determining:

- Whether and when to issue an evacuation order (see Section 3.5.2.2, below).
- Authority for issuing the evacuation order (see Section 3.5.2.4, below).
- Whether the evacuation order is mandatory or voluntary (see Section 3.5.2.5, below).
- The area to be evacuated (see Section 3.5.2.3, below).
- Officials empowered to enforce the order (see Section 3.5.2.4, below).

- When to allow field responders to re-enter evacuated areas to perform safety and damage assessments (see Section 3.5.6.2, below).
- When to issue an "all clear" notice lifting the evacuation order and allowing public re-entry into evacuated areas (see Section 3.5.6.3, below).

NOTE: Section 3.5.2 applies primarily to evacuation in a distant-source tsunami, where there is time to provide both official warning and assistance to the public in evacuating the tsunami inundation area. In both near- and regional-source tsunamis, CCSF emergency officials will not have time to assist people in leaving the inundation area. Accordingly, public education on the warning signs of a near-source tsunami and what to do in response is essential. For further discussion of CCSF's tsunami public awareness program, see Section 5, below. For discussion of the differences between distant-, regional-, and near-source tsunamis, see Section 4.2.2, below.

#### *3.5.2.1 EVACUATION COORDINATION*

***Field-Level***

In a tsunami incident, the San Francisco Police Department will act as the lead agency in evacuating the public from designated evacuation areas. The San Francisco Fire Department, Municipal Transportation Agency, Public Works, Recreation and Parks, and the Sheriff's Department will provide evacuation support.

***EOC-Level***

During a tsunami evacuation, critical, ongoing tasks to be carried out in the CCSF EOC include:

- Continued communication with state and federal tsunami forecast officials and field observers to obtain and relay information regarding tsunami arrival time and impacts.
- Coordinating setup and staffing of evacuation facilities (see Section 3.5.2.8, below).
- Ensuring sufficient resources for evacuation activities.
- Tracking the progress of evacuation.
- Planning for re-entry of field responders into the evacuation area to perform safety and damage assessments, search and rescue, and additional evacuations as needed (see Sections 3.5.6.2, below).
- Planning for issuance of "all clear" notifications allowing the public to re-enter the evacuation area (see Section 3.5.6.3, below).
- Coordinating with traditional and social media to perform rumor control and to provide accurate information regarding the evacuation area and the need to stay outside that area until CCSF officials issue an "all clear" that it is safe for the public to return.

When an evacuation is ordered, the EOC Manager or Operations Support Section Chief should consider appointing a special Deputy Section Chief to assist with coordination of evacuation-related information, and with tracking evacuation progress and resources needed to support response efforts. In addition, the EOC Manager may appoint an Evacuation Task Force to strengthen coordination of evacuation functions in the EOC. The Evacuation Task Force may be composed of existing EOC participants from relevant CCSF departments and partner organizations, or if necessary may be staffed with additional personnel. For further discussion of EOC evacuation coordination, see the Evacuation Annex to the CCSF ERP.

### *3.5.2.2 When to Evacuate*

Each tsunami event presents different circumstances; each must be evaluated and acted on depending on the situation presented. To assist emergency managers and officials in determining whether to evacuate in a tsunami incident, and what portions of the city to evacuate, the California Geological Survey (CGS), Cal OES, and National Oceanic and Atmosphere Administration (NOAA) have created Tsunami Evacuation Playbooks for CCSF and other California coastal communities.[17] DEM has integrated the CCSF Tsunami Evacuation Playbooks for land-based evacuation planning into this Annex and into its Duty Officer Manual (see Appendix A, DEM Duty Officer Tsunami Resources; Appendix B, Tsunami Maps and Recommended Evacuation Level Descriptions).

In general, Cal OES, CGS, and NOAA provide the following tsunami evacuation guidance:

- When the NTWC issues a Tsunami Warning including San Francisco and there are:
  - Less than four hours before tsunami arrival: Evacuate the Maximum Tsunami Evacuation Level, the 2009 State Tsunami Inundation Map drawn to streets and roads. (See Appendix B, Tsunami Maps and Recommended Evacuation Level Descriptions).
  - More than four hours before tsunami arrival: Use the "FASTER flood value" provided by Cal OES or NOAA to determine if evacuation is necessary, and if so, the areas to evacuate. For further discussion of the FASTER flood value, see Section 3.5.2.3, below.
- When the NTWC issues a Tsunami Advisory including San Francisco and there are:
  - Less than four hours before tsunami arrival: Evacuate the Level One Evacuation Area, shoreline areas that may be impacted by dangerous, unpredictable tsunami currents. (See Appendix B, Tsunami Maps and Recommended Evacuation Level Descriptions).
  - More than four hours before tsunami arrival: Use the FASTER flood value to determine whether evacuation is necessary, and if so, what shoreline areas to evacuate. Shoreline areas include public beaches, finger piers, harbor and marina docks, and other maritime facilities located along the shoreline.

This information is summarized in Table 3.2, below.

**Table 3.2. Evacuation Guidance**

| Time from NTWC Bulletin to Tsunami Arrival | NTWC Issues Tsunami Warning | NTWC Issues Tsunami Advisory |
|---|---|---|
| **Less than four hours** | Evacuate *Maximum* Tsunami Evacuation Area | Evacuate *Level One* Evacuation Area |
| **More than four hours** | Use "FASTER flood value" to determine whether and what areas to evacuate | Use "FASTER flood value" to determine whether and what *shoreline* areas to evacuate |

Source: CGS, Cal OES, USC, et al. (2015). California Tsunami Evacuation Playbooks for the City of San Francisco, West/Ocean Side and East/Bay Side and Islands. No. 2015-SF-01, -02.

NOTE: *The ultimate responsibility for decision-making with regard to tsunami evacuation and response activities in San Francisco rests with CCSF officials.*

For further discussion of evacuation of maritime facilities, see Section 3.5.2.9, below. For further discussion of whether to order a complete or partial evacuation, see Section 3.5.2.3,

below. For DEM Duty Officer Tsunami Resources, see Appendix A. For CCSF Tsunami Maps and Recommended Evacuation Level Descriptions, see Appendix B.

#### *3.5.2.3 What to Evacuate: Complete or Partial Evacuation*

A tsunami evacuation in CCSF may involve either a complete or partial evacuation of the tsunami inundation area shown in the 2009 State Tsunami Inundation Map. Complete evacuation involves relocating members of the public in the Maximum Tsunami Evacuation Level, which is the 2009 state inundation map drawn to streets and roads, to locations that are safely outside the evacuation area. Partial evacuation involves relocation of a portion of the maximum tsunami evacuation area.

The Mayor is responsible for determining whether to order a complete or partial evacuation with guidance from the DEM Executive Director, Police and Fire Chiefs, and other city officials. The DEM Executive Director will make a recommendation to the Mayor regarding whether to order a complete or partial evacuation. When partial evacuation is an option, DEM will provide the Mayor with recommended evacuation area boundaries for a partial evacuation. As outlined in Table 3.2, above, partial evacuation is an option in a Tsunami Warning or Tsunami Advisory when there are more than four hours to tsunami arrival, providing the "FASTER Analytical Tool" indicates it is safe to evacuate less than the Maximum Tsunami Evacuation area.

Cal OES, CGS, and NOAA use the FASTER Analytical Tool to make recommendations to CCSF and other California coastal communities on complete or partial evacuation of coastal areas. Within 15 minutes of receiving a NTWC-issued Tsunami Warning or Tsunami Advisory containing forecasted tsunami wave amplitudes, Cal OES and NOAA will calculate the FASTER Tsunami Flood value, and will make specific recommendations to CCSF emergency managers regarding the ***minimum*** evacuation level suggested.[18] Cal OES, CGS, and NOAA have provided CCSF with maps showing four different evacuation levels, depending on the associated FASTER tsunami flood value as recommended by Cal OES and NOAA. See Table 3.3, below.

**Table 3.3. FASTER Flood Values and Associated Evacuation Levels**

| Evacuation Level | FASTER Tsunami Flood Value (Above Mean Sea Level) |
|---|---|
| Level 1 Evacuation | Less than 1.00 meters (3.3 feet) |
| Level 2 Evacuation | 1.00 –1.50 meters (3.3–5.0 feet) |
| Level 3 Evacuation | 1.50–2.50 meters (5.0–8.0 feet) |
| Maximum Evacuation Level | Over 2.50 meters (over 8.2 feet) |

Source: Cal OES, CGS, NOAA, Evacuation Playbooks for City and County of San Francisco, July 2015.

The FASTER tool considers forecasted maximum tsunami wave amplitudes issued by the NTWC, storm surge or existing ocean conditions, maximum tidal height for the first five hours of the tsunami, forecast error, and site-amplified run-up potential to calculate the maximum tsunami run-up height. Each of these variables are or should be based on height above or below Mean Sea Level. Cal OES and NOAA then associate the FASTER value with predesignated evacuation level maps for each coastal community that show the recommended evacuation area.

The FASTER formula for the CCSF peninsula is as follows:

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

\+ **S:** Storm **surge** or existing ocean conditions for first five hours of tsunami

\+ **T:** Maximum **tidal** height for first five hours of 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)

For Treasure Island, Yerba Buena Island, and Alcatraz, the R value is 0.2.

Because conditions will differ outside versus inside San Francisco Bay, tsunami wave heights may be higher on the Pacific coast than on the San Francisco Bay side of the City. Accordingly, Cal OES, CGS, and NOAA may recommend different Evacuation Levels for the Pacific and bayside shorelines of CCSF. For example, Cal OES and NOAA may recommend a Level 3 evacuation for the Pacific coast, and a Level 2 evacuation for areas on the bayside of CCSF. For the state's tsunami evacuation guidance for San Francisco, and for maps associated with each of the different evacuation levels, see Appendix B. See also the Evacuation Decision Matrix in Section 1.2, above.

#### *3.5.2.4 AUTHORITY TO ISSUE EVACUATION ORDER*

To provide CCSF officials and personnel with the broadest authority and protection in issuing and enforcing a tsunami evacuation order, the preferred practice is for the Mayor or the Board of Supervisors to issue an evacuation order under the California Emergency Services Act.[19] To issue an evacuation order under the Emergency Services Act, the Mayor or Board of Supervisors must first proclaim a local emergency under the Act.[20] (For a sample proclamation see Appendix C.) In San Francisco, only the Mayor or Board of Supervisors have authority to proclaim a local emergency,[21] or to issue an evacuation order under the California Emergency Services Act.[22] Violation of an evacuation order issued under the California Emergency Services Act is a misdemeanor punishable by a fine, by imprisonment for up to six months, or by both.[23]

Under Penal Code § 409.5, when a calamity or disaster creates a menace to public health or safety, local police officers and sheriff's deputies have the power to close the area where the menace exists to any person not authorized to enter or remain in the area. The local health officer is similarly empowered if there is an immediate menace to public health.[24] Violation of Penal Code § 409.5(a) is also a misdemeanor.[25] However, Penal Code § 409.5 does not explicitly grant law enforcement personnel the authority to evacuate people from an area.[26] In addition, under Penal Code § 409.5(d), authorized members of the media cannot be excluded from closed areas unless peace officers at the scene reasonably determine that unrestricted media access will interfere with emergency operations.[27] For further discussion of local authority to issue an evacuation order, see the Evacuation Annex to the CCSF ERP.

#### *3.5.2.5 MANDATORY OR VOLUNTARY EVACUATION*

An evacuation order may be mandatory or voluntary. In a mandatory tsunami evacuation, the order requires the public to leave an area in order to protect life, safety, or the general welfare of the population during an emergency. Those who fail to abide by a mandatory evacuation

order may be arrested, charged with a misdemeanor, and evacuated, though only reasonable force may be used to enforce the order. In a voluntary evacuation, the order recommends but does not require evacuation of the public from a designated area.

When tsunami evacuation is necessary, the Mayor should issue a mandatory evacuation order. Issuing a mandatory evacuation order emphasizes the urgency and seriousness of the situation, and increases the likelihood that people will comply with the order. In contrast, issuing a voluntary evacuation order gives people in the evacuation area the mistaken impression that they can remain in the area without serious consequences, or that the city will be able to rescue them if inundating waves or dangerous currents occur. A sample mandatory tsunami evacuation order is provided in Appendix C.

Enforcement of a mandatory evacuation order is a different issue. Actually using force to enforce a mandatory evacuation order, even if reasonable under the circumstances, presents practical and ethical questions. Accordingly, whenever possible, San Francisco Police Department (SFPD) and supporting law enforcement officials will use nonphysical means to enforce mandatory evacuation orders. Nonphysical enforcement means will include:

- Ensuring people in the evacuation area are aware that a mandatory evacuation order has been issued, and the penalties for refusing to evacuate. This also must include providing information through accessible communication methods such as sign language messaging, audio and visual announcements, and messaging in languages other than English (see Section 3.4.4.3, above).
- Providing information in multiple formats and languages on available evacuation routes, public transportation, shelter, and evacuation assistance for people with disabilities.
- If time allows, requesting that those who refuse to evacuate share contact information for next of kin, to communicate the magnitude of the risk they are assuming.

In enforcing a mandatory evacuation order, SFPD and supporting officers may encounter unaccompanied minors (age 17 and under) and people with dementia or cognitive limitations that leave them unable to understand or to comply with a mandatory evacuation order. In the absence of a parent, guardian, or other person who can legally make decisions for such persons, law enforcement officers carrying out the evacuation will determine, on a case-by-case basis, whether to forcibly remove the person from the evacuation area if they refuse to abide by the evacuation order. When a minor or a person with dementia or cognitive limitations is accompanied by a parent, guardian, or other person legally empowered to make decisions for them, and the parent, guardian, or other person refuses to evacuate, law enforcement officers will not forcibly evacuate the minor or person with dementia or cognitive limitations.

#### *3.5.2.6 ORDER REQUIREMENTS*

A local evacuation order issued under the California Emergency Services Act must be in writing and must be given widespread publicity and notice.[28] In CCSF, evacuation orders will include the following information:[29]

- Whether the order is for a mandatory or voluntary evacuation (see Section 3.5.2.5, above);

- The personnel empowered to enforce the order (e.g., Police, Sheriff, Fire Department, etc.);
- What enforcing personnel are authorized to do to enforce the order (see Section 3.5.2.5, above);
- The consequences of disobeying the order (see Section 3.5.2.5, above);
- The duration of the order, if known; and
- That the order is issued under the California Emergency Services Act, which invokes the penalty provision and immunity allowed under the Act (see Section 3.5.2.4, above).

A sample mandatory tsunami evacuation order is provided in Appendix C.

The EOC Joint Information Section is responsible for ensuring that issuance of the evacuation order is adequately publicized. Publicity must include the type of order issued (whether mandatory or voluntary), the penalties for refusing to comply with the order, that first responders will not be able to assist anyone who remains in the evacuation area once tsunami waves begin arriving; and information on available evacuation routes, public transportation, and shelter facilities. A sample media release on issuance of an evacuation order is provided in Appendix D.

#### *3.5.2.7 VERTICAL EVACUATION*

In areas where there is limited egress and ingress, or when there is not enough time to fully evacuate an area, there may be a desire to encourage the use of "vertical evacuation." Vertical evacuation should be considered a last resort. Moving to higher ground, if available, is always the safest option for life preservation. [30] This is especially true when considering that evacuees may need to remain out of harm's way for many hours or days.

A tsunami vertical evacuation refuge is a building or earthen mound with sufficient height to elevate evacuees above the level of tsunami inundation that is designed and constructed with the strength and resiliency needed to withstand the effects of tsunami waves. [31] Unless structures have been pre-identified, inspected by qualified building engineers, and found able to withstand the destructive forces of inundating tsunami waves, they cannot be safely relied on as a tsunami vertical evacuation refuge. Generally, multistory steel-frame or concrete structures may be strong enough to withstand a destructive tsunami; wood-frame structures may not be.

#### *3.5.2.8 EVACUATION FACILITIES*

When CCSF issues an evacuation order requiring public evacuation of areas within San Francisco, the EOC Operations Support Section, Health and Human Services Branch, Mass Care Group will work with the Human Services Agency DOC, the American Red Cross of the Bay Area, the Salvation Army, and other mass care providers to coordinate setup and management of facilities to support the evacuation of people from the tsunami evacuation area. Evacuation facilities may include:

- Assembly areas where people evacuating from tsunami inundation areas who have nowhere else to go may assemble to await additional direction or assistance from CCSF officials. CCSF will likely not provide assembly areas with management, staffing, or other

logistical support. Accordingly, whenever possible, an evacuee's stay at an assembly area should not exceed six hours.

- Pick-up points where people with disabilities or access and functional needs, commuter evacuees (persons who live outside CCSF), and others with critical transportation needs can obtain transportation assistance to a local shelter or to another assistance center within CCSF. CCSF is responsible for management, staffing, and logistical support to pick-up points. Whenever possible, an evacuee's stay at a pick-up point should not exceed 12 hours.
- Reception centers where people may receive state-provided transportation assistance in leaving San Francisco. A reception center assists commuter evacuees in returning to their home counties. Whenever possible, an evacuee's stay at a reception center should not exceed 12 hours.
- Shelters are facilities where evacuees may receive temporary housing, food and water, and other support services for a period of days. CCSF is responsible for management, staffing, and logistical support to shelters.

An assembly area may be colocated with or may transition to a pick-up point or shelter. A number of assembly areas and shelters have been predesignated for possible use in a tsunami evacuation. For a list of tsunami-related evacuation facilities, see Appendix L. For further discussion of the setup and management of evacuation facilities, see the Evacuation Annex to the ERP. For further discussion of shelter and mass care in a tsunami incident, see ESF #6: Mass Care, Housing, and Human Services Annex to the ERP.

#### *3.5.2.9 Evacuation of Areas Not Controlled by CCSF*

A number of areas within the San Francisco tsunami inundation area as shown on the 2009 State Tsunami Inundation Map are owned, operated, or controlled by entities other than the City. These areas include the Port of San Francisco and San Francisco Bay, in terms of evacuation and control of vessel traffic within these areas; federal and state parks within San Francisco County; and the San Francisco International Airport. CCSF officials lack full authority to evacuate these areas. Accordingly, CCSF officials must coordinate evacuation of these areas with the entities authorized to order or implement an evacuation, as outlined below.

***Maritime Areas***

**Port of San Francisco and San Francisco Bay**

CCSF emergency managers, in consultation with the Port of San Francisco (the Port), are responsible for determining if and when *land-based* evacuations are necessary in the Port. The Port is responsible for evacuation of Port personnel, for safeguarding Port property to the best of its ability, and for post-disaster inspection and assessment of Port property. In contrast, the United States Coast Guard (USCG) Captain of the Port, Sector San Francisco, under the jurisdiction of the Commander, USCG District 11, is responsible for: [32]

- Notifying commercial vessels and appropriate facilities of the tsunami threat.
- Evaluating the tsunami threat to the Port and to vessel traffic on San Francisco Bay.
- Restricting the movement of all vessels.
- Requiring tugboats to be ready to respond.

- Establishing appropriate safety or security zones.
- Coordinating assets to meet escort requirements.
- Issuing an order for movement of vessels in keeping with the USCG 12-hour movement requirement for all vessels for natural disaster evacuations.
- If necessary, closing or partially closing the Port.
- Conducting patrols of waterways within the affected area to ensure maritime security.
- Conducting assessments of federal waterways and of commercial maritime facilities regulated under the Maritime Transportation Security Act (MTSA) after a tsunami incident as a prerequisite to reopening the Port to vessel traffic.
- Reopening the Port to vessel traffic following the incident.

The Vessel Traffic Service (VTS) San Francisco will manage the safe movement of vessels within the VTS Area based on directions from the Captain of the Port. In addition, a Maritime Transportation System Recovery Unit (MTSRU) will normally be established to assist in prioritizing vessel movement and to begin port reconstitution. The CCSF EOC Operations Support Section, Transportation Branch, Water Unit is responsible for working with the Port DOC, the USCG Captain of the Port, and MTSRU to coordinate information and to assist in resource management and procurement if needed.

Cal OES, CGS, and NOAA have created a Maritime Tsunami Response Playbook for San Francisco to assist the USCG, maritime facility operators, and vessel owners in planning for and responding to Advisory-level, noninundating tsunami events in which strong currents and sudden water-level changes may damage boats, docks, and maritime infrastructure. For the California Maritime Tsunami Response Playbooks for San Francisco, see Appendix P. In general, Cal OES, CGS, and NOAA do not recommend that vessels be evacuated offshore before or during a tsunami. However, if vessel owners decide to evacuate a port, harbor, or marina in advance of a tsunami, scientific evidence indicates that navigable, nondamaging offshore tsunami conditions in California can be found beyond an ocean depth of 30 fathoms (180 feet).[33]

**Harbors and Marinas**

The Harbormasters of small boat harbors or marinas within CCSF will follow orders issued by the Captain of the Port calling for closure of a harbor or marina to the extent possible. Harbormasters are also responsible for reopening harbors and marinas following the incident. Harbormasters should also follow guidance from the USCG, Cal OES, National Weather Service, and local officials. The CCSF EOC Operations Support Section, Transportation Branch, Water Unit is responsible for coordinating with the Port and the USCG to maintain situational awareness in the EOC regarding the evacuation and sheltering of vessels in advance of a tsunami incident.

Small Boat harbors or marinas within CCSF include the following:

- Pier 39 Marina: A 300-berth marina operated by Moor + South/PIER Management Co., LP.
- San Francisco Marina Small Craft Harbor: A 727-berth marina operated by the CCSF Recreation and Parks Department. The San Francisco Marina is divided into a West Harbor and an East Harbor, which is also known as Gashouse Cove Marina.

- Hyde Street Harbor: A commercial fishing boat marina in Fisherman's Wharf operated by the Port of San Francisco.
- South Beach Harbor: A 700-slip harbor operated by the Port of San Francisco.
- Treasure Island Yacht Harbor: A 100-birth marina subleased by the Treasure Island Development Authority to a private operator, Almar Marinas.

**San Francisco Bay Area Water Emergency Transportation Authority**

During a tsunami evacuation, the CCSF EOC Operations Support Section, Transportation Branch, Water Unit is responsible for coordinating requests for water transit on San Francisco Bay with the San Francisco Bay Area Water Emergency Transportation Authority (WETA). WETA is a regional public transit agency tasked with operating and expanding ferry service on San Francisco Bay and with coordinating water transit during a regional emergency. In its daily operations under the San Francisco Bay Ferry brand, WETA operates a fleet of high speed, passenger-only ferry vessels serving San Francisco, Alameda, Oakland, South San Francisco, and Vallejo. Any CCSF EOC request for water transit assistance from WETA must flow through the Cal OES-operated Regional Emergency Operations Center (REOC), and back to WETA. For further information on WETA roles and responsibilities in a regional emergency, see the San Francisco Bay Area Regional Emergency Coordination Plan, Transportation Subsidiary Plan.

**San Francisco International Airport**

Small portions of the San Francisco International Airport (SFO) are shown as within the 2009 State Tsunami Inundation Map, though runways would not appear to be impacted even in a maximum tsunami evacuation. (See Appendix B.) The U.S. Department of Transportation, Federal Aviation Administration (FAA) oversees operation of the San Francisco International Airport (SFO). Under FAA regulations, SFO is required to close the airport to protect its users if hazardous conditions cannot be mitigated through physical marking of the area and the use of Notices to Airmen.[34] FAA approval is not needed for such closures. However, the FAA may restrict airport traffic depending on information from SFO regarding conditions such as damage to runways, communications, navigation, and air traffic control systems. SFO is required to take prompt action to restore airport facilities to a serviceable condition as soon as possible.[35]

During tsunami-related activations, SFO will activate its department operations center (SFO DOC) to coordinate its response to tsunami impacts on airport operations. SFO will also provide a representative to staff the Air Transportation Unit within the CCSF EOC Operations Support Section Transportation Branch. The Air Transportation Unit will:

- Establish and maintain contact with the SFO DOC (the SFO EOC).
- Monitor the status of SFO operations.
- Share situation updates between the CCSF EOC and SFO DOC.

For further discussion of the Air Transportation Unit, see ESF #1: Transportation Annex to the CCSF ERP.

Though SFO should not be significantly impacted in a distant- or regional-source tsunami, Oakland International Airport may experience significant inundation impacting most runways in a worst-case scenario. SFO should consider this in its planning.

### *Federal and State Parks*

The CCSF tsunami inundation area contains a number of federal, state, and local parks, which draw thousands of tourists and San Francisco residents each day. CCSF lacks authority to close federal or state park lands, and must coordinate the closure and evacuation of these areas with their respective controlling authorities as outlined below.

#### National Parks

The Golden Gate National Recreation Area (GGNRA) is a National Park Service (NPS) site that is partly located within the CCSF tsunami inundation area. The GGNRA includes Fort Funston, Ocean Beach, the Cliff House, Sutro Bath ruins, Lands End, China Beach, Baker Beach, Fort Point National Historic Site, the Presidio of San Francisco, Crissy Field, Fort Mason, and Alcatraz. The San Francisco Maritime National Historic Park (SFMNHP) is a separate NPS site that includes a portion of Fort Mason Center (Building E), and the structures, piers, and vessels at Aquatic Park.

The General Superintendent of the GGNRA, the Superintendent of the SFMNHP, or their authorized representatives, are empowered to close all or any portion of their parks when emergency conditions dictate.[36] The superintendent of each site, or their authorized representative, is also authorized to designate park areas for a specific use or activity, to impose conditions or restrictions on park use or activity, and to end closures, restrictions, or other conditions imposed as a result of emergency conditions.[37] The NPS and the United States Park Police (USPP) have commissioned Park Rangers and USPP Officers with authority to conduct law enforcement activities within both the GGNRA and SFMNHP.

In 2007, the GGNRA executed a Memorandum of Understanding (MOU) with the San Francisco Police Department (SFPD). The MOU provides that the SFPD may request NPS law enforcement assistance, and vice versa. Such requests must be channeled through the police communications centers of each organization. In addition, under the MOU the SFPD may take immediate action in areas within NPS boundaries, pending arrival of NPS law enforcement personnel, when necessary to protect or preserve human life or to assist at an emergency scene. Areas within the SFMNHP and the Presidio Trust are included in the MOU. For a copy of the MOU, see Appendix E.

Accordingly, when NPS assistance is sought to close and evacuate shoreline areas within the tsunami evacuation area that are part of the GGNRA, the SFMNHP, and the Presidio, DEM-DEC 911 Police Dispatch will inform the NPS Police Dispatch of the request. The EOC Public Safety Branch will ensure that the Evacuation Order is shared with the Superintendent of the GGNRA, the Executive Director of the Presidio Trust, and the Superintendent of the SFMNHP.

#### State Parks

Candlestick Point State Recreation Area (CPSRA) is the only California state park located in the CCSF tsunami inundation area. The CPSRA skirts approximately 3.4 miles along San Francisco Bay. A large portion of the park is located within the tsunami inundation area, including the Bay Trail and the Ranger's Office. When fully staffed, the CPSRA employs three full-time State Park Peace Officers, including one supervising ranger and two rangers. CPSRA is located in the San Francisco Police Department's Bayview District.[38]

The California Department of Parks and Recreation (CDPR), or "State Parks," has authority to close all or a portion of a state park. In addition, when a calamity or disaster creates a menace to public health or safety, any CDPR officer or employee who is a designated peace officer

under California Penal Code § 830.2(f) has authority to close a state park to a person not authorized to enter or remain in the closed area for the duration of the menace.[39] Requests for assistance in closing, evacuating, and securing the portion of Candlestick Point State Recreation Area located in the tsunami inundation area should be directed from the EOC Operations Section Public Safety Branch to the Supervising Ranger for CPSRA, or to the CDPR Northern Dispatch Number, (916)358-0333. CDPR dispatch will then determine who to summon from nearby parks to assist with evacuation.

#### *3.5.2.10 Evacuation of People Who Cannot Self-Evacuate*

When a tsunami evacuation order is issued in a distant-source tsunami, the amount of time before arrival of the first wave will likely be short—only a few hours. CCSF may lack the time or resources to completely evacuate designated evacuation areas. In that situation, *providing evacuation assistance to those people who are unable to self-evacuate—including people with disabilities—will be given the highest priority*. People with disabilities include those who have mobility, visual, hearing, speech, or cognitive functional limitations. Evacuating people with mobility disabilities will require a significant commitment of personnel, specialized vehicles, and other resources. For further discussion of mass transit support for evacuation, see Section 3.5.2.11, below.

At the field level, the San Francisco Fire Department (SFFD) will serve as the lead department in coordinating the transportation of people with disabilities who require evacuation assistance. CCSF departments supporting the SFFD in meeting this responsibility include the Mayor's Office on Disability; the San Francisco Municipal Transportation Agency (SFMTA); and SFMTA's Accessible Services Unit, which coordinates San Francisco Paratransit. In addition, the SFFD may activate volunteers from the SFFD's Neighborhood Emergency Response Team (NERT) to provide additional support to the SFFD in assisting those who are unable to self-evacuate.

Given the high demand and limited resources available to accomplish a short-notice tsunami evacuation, it is essential that licensed residential, rehabilitation, school, and other group care facilities within the inundation area have workable, tested evacuation plans detailing how they will transport persons under their care *using their own resources*. All people who live or work in tsunami inundation areas—and especially people with disabilities—must also take responsibility for themselves by creating personal evacuation plans with family, coworkers, friends, or neighbors. Ongoing public outreach to these groups will be a critical part of CCSF's tsunami public awareness efforts. For further discussion of CCSF's tsunami public awareness program, see Section 5, below.

#### *3.5.2.11 Mass Transit Support for Evacuation*

Though most people in the tsunami evacuation area will be able to walk to safety, people who are unable to self-evacuate, including people with disabilities, will need transportation assistance to move to areas of safety. On issuance of an evacuation order in a distant-source tsunami, providing there is enough time before arrival of initial waves, mass transit resources will be deployed to facilitate moving those who cannot self-evacuate out of the evacuation area. Private transit providers and school bus operators also have a role to play in providing accessible transit resources to support evacuation of people who cannot self-evacuate.

In the CCSF EOC, the Operations Support Section Transportation Branch is tasked with overseeing and coordinating the use of mass transit resources to move those who cannot self-evacuate out of the evacuation area. A Movement Control Group will be established at the SFMTA DOC to handle the tactical aspects of supporting the evacuation of those who cannot self-evacuate. Whenever possible, existing mass transit routes will be used to move people who need assistance out of the evacuation area. A tentative transit evacuation support plan for use in evacuating people who cannot self-evacuate is included in Appendix G.

#### *3.5.2.12 Evacuation of Service Animals, Support Animals, and Household Pets*

Many people with disabilities rely on service animals to assist them with daily living activities and other functions. In general, a service animal is a dog that is individually trained to do work or perform tasks for the benefit of an individual with a disability.[40] For example, service animals may assist individuals who are blind or have low vision with navigation; may alert individuals with a hearing disability to the presence of people or sounds; or may pull a wheelchair, retrieve items, or provide support and assistance with balance and stability to individuals with mobility disabilities. Service animals do not have to be licensed or certified by local or state government. During a tsunami incident requiring an evacuation, service animals must be permitted to remain with their evacuating humans, and to accompany them to shelters. San Francisco Animal Care and Control (ACC) will provide care and assistance to those shelters with service animals.

Individuals who have psychological disabilities also may rely on support or assistance animals. These animals may not have training in performing specific work or tasks, but the bond they have with their owner provides therapeutic benefits. The presence of emotional support or assistance animals is treated as a reasonable accommodation under the federal Fair Housing Act.[41] Accordingly, emotional support or assistance animals also must be allowed to remain with their evacuating humans, and to accompany them to shelters.

In addition, people evacuating in a tsunami incident must be allowed to evacuate with their household pets. ACC will coordinate shelters to house and care for displaced household pets, and will provide assistance to shelters with people with disabilities and their service, support, or assistance animals. Volunteers from the San Francisco Disaster Animal Rescue Team, the California Veterinary Medical Association, and nonprofit animal groups may support ACC pet shelter activities. Household pet sheltering and care may occur at temporary shelters that are colocated with shelters for displaced people, or may occur at an existing ACC facility, or both, depending on the situation. Whenever possible, CCSF will locate household pet shelters close to human shelters. Owners will be expected to provide feeding, watering, exercise, and other care to their pets during the time they are sheltered. For further discussion of sheltering of animals in a tsunami, see Section 3.5.9.2.

#### *3.5.2.13 Evacuation of Treasure Island*

Treasure Island, a low-lying artificial island in San Francisco Bay, and Yerba Buena Island, a natural island adjacent to Treasure Island, are part of CCSF, and are collectively considered a city neighborhood. Both islands were part of a former United States Naval Station. Limited portions of the islands remain under Navy ownership, but are being environmentally remediated for eventual transfer to CCSF. The Treasure Island Development Authority (TIDA), a

nonprofit public benefit agency staffed by the San Francisco City Administrator's Office, is responsible for administering municipal services and for leasing property on both islands.

TIDA's on-Island staff is normally available only during weekdays. Besides TIDA, CCSF Departments with regular personnel and operations on Treasure Island and Yerba Buena Island are:

- San Francisco Fire Department, Fire Station 48 and Fire Training Facility: Typically 11 SFFD personnel are at Station 48 at all times; an additional 10 to 15 people at located at the Fire Training Facility during weekdays.
- San Francisco Police Department (SFPD): Typically two Southern Police Station patrol officers at all times.
- San Francisco Public Utilities Commission: Typically three full-time employees and three to five part-time employees during weekdays; one Wastewater Plant employee at all times.
- San Francisco Department of Public Works, Bureau of Building Repair: Typically three to four people on weekdays.
- San Francisco Municipal Transportation Agency, Treasure Island Muni Line 25, providing daily bus service to and from the island. Up to two Muni buses may be on-Island at any given time.

As with other neighborhoods within CCSF, the decision on whether to evacuate Treasure Island in a tsunami incident will be made by the Mayor, in consultation with the DEM Executive Director, and Police and Fire officials (see Sections 3.5.2.2 and 3.5.2.3, above). During a tsunami incident requiring evacuation of Treasure Island, TIDA will serve in the CCSF EOC as a liaison between the EOC and the Island community. TIDA will communicate through its on-Island Incident Command Post to provide situational information and updates to the EOC. TIDA will also assist in disseminating vital public information regarding evacuation to those on the Island. TIDA has adopted a Treasure Island Emergency Response Plan, including an Evacuation Annex that is included in Appendix H.

Evacuation of Treasure Island in a tsunami incident presents significant challenges. The 2009 state tsunami inundation map for CCSF shows the island to be completely within the tsunami inundation area (see Appendix B). The current daytime population of Treasure Island is approximately 2,600 people, including approximately 500 people at the federal Department of Labor Job Corps campus, visitors, and nonresident employees. Overnight, the island's population is approximately 2,000 people. Those living on the island rent their residences from one of six property managers with residential subleases through TIDA. Many of these residents have limited economic resources; a significant percentage also have functional disabilities.

High ground closest to Treasure Island is located on adjacent Yerba Buena Island. However, Yerba Buena Island is smaller in area than Treasure Island, and has steep topography not well-suited for mass assembly of evacuees. Tower Park and Blue Park, small parks located near the summit of Yerba Buena Island, may accommodate 100 to 200 people at most. However, these parks are slated for development, along with other portions of Yerba Buena Island and Treasure Island itself. Development is expected to continue from 2016 through 2034, and will add a hotel, parks, open space, and an additional 8,000 homes on Treasure Island.[42]

In addition, the United States Coast Guard, Sector San Francisco maintains a base on Yerba Buena Island. Yerba Buena Island also contains easement areas for the San Francisco-Oakland Bay Bridge (Interstate 80), the Yerba Buena Island tunnel, and local and regional transportation-related construction projects. Until completion of the Bay Bridge Bicycle and Pedestrian Path, which will provide a safe pedestrian walkway from Yerba Buena Island to the Bay Bridge, there is no safe pedestrian egress from Treasure Island or Yerba Buena Island using the Bay Bridge.

The only way to exit Treasure Island in a motor vehicle is via Treasure Island Road to either Macalla Road or Hillcrest Road on Yerba Buena Island, and on to the Bay Bridge. Authority to close or to maintain open the Bay Bridge and the on- and off-ramps leading from the Bridge to Yerba Buena Island belongs to the California Department of Transportation, or "Caltrans" (see Section 3.5.3.2, below). The California Highway Patrol (CHP) is the agency charged with opening or closing the Bay Bridge and the on- and off- ramps leading from the Bridge to Yerba Buena Island and Treasure Island. During an emergency incident, Caltrans may need to close the Bay Bridge Toll Plaza to traffic, which would prevent westbound vehicle access to Yerba Buena or Treasure Island from the East Bay.

Though plans to build a ferry terminal on Treasure Island are part of planned development, at present there is no ferry service to the Island. Pier 1 on Treasure Island might serve as a location where rescue vessels could dock. However, it currently lacks a permanent docking structure to allow for accessible passenger boarding of ferries or other vessels. Until the Treasure Island ferry terminal is built, the Water Emergency Transportation Authority (WETA) will require accessible docking to provide water evacuation of Treasure Island. WETA would also require land-based security for crowd control and management in order for vessels to dock and board passengers.

Given the challenges outlined above, the CCSF EOC should take the following steps if evacuation of Treasure Island becomes necessary in a distant-source tsunami:

- Assign evacuation of people on Treasure Island a high priority in terms of providing adequate resources, such as SFPD and SFFD personnel and SFMTA transit vehicles, to assist with public evacuation of the Island.
- Request that Caltrans and CHP:
  - Restrict vehicle access to the Bay Bridge ramps leading to Yerba Buena Island to field responders assigned to assist with evacuation of Treasure Island;
  - Facilitate expedited egress of vehicular traffic from Yerba Buena Island onto the Bay Bridge.
- Submit a request through the REOC for assistance from WETA to provide vessels for water evacuation of Treasure Island from Pier 1. (For further discussion of WETA, see Section 3.5.2.9, above.)
- Submit a request through the REOC for assistance from the USCG to:
  - Ensure WETA can provide water evacuation ferry service from Treasure Island to the Port of San Francisco if it can be done safely preceding arrival of initial tsunami waves;
  - Provide in-water security for WETA vessels offering water evacuation service;
  - Assist with traffic control on Yerba Buena Island to help ensure emergency vehicles and evacuation resources have ready access to Treasure Island; and

- Ensure vessels and personnel leave the area with enough time to transit to a safe location before the arrival of tsunami currents or inundating waves.

- Coordinate with the Port of San Francisco regarding vessel arrivals from Treasure Island.

For further discussion of route closures and the Bay Bridge, see Sections 3.5.3.2, below. For general information on evacuation of Treasure Island, see the Treasure Island Evacuation Annex in Appendix H.

## 3.5.3 Route Closures

This section discusses the authority and actions needed to close streets, highways, and other routes of ingress and egress in the event of a tsunami impacting CCSF.

### *3.5.3.1 Local Streets*

By statute, California cities normally lack authority to interfere with the free flow of vehicular traffic in their jurisdictions unless the State Legislature expressly grants that authority.[43] However, CCSF's emergency powers supersede these statutes during a local emergency.[44] Accordingly, CCSF emergency officials may close or restrict the use of city streets as necessary following a mayoral proclamation of a local emergency. For further discussion of traffic control, see Section 3.5.4, below. For general discussion of coordination of street closure and other transportation issues in emergencies, see ESF #1: Transportation Annex to the ERP.

### *3.5.3.2 State and Federal Highways*

State and federal highways within CCSF that may be impacted in a tsunami include:

- State Highway 35, also known as Skyline Boulevard, on the southwestern side of San Francisco.
- State Highway 101, also known as the Bayshore Freeway, on the southeastern side of the City.
- State Highway 1, crossing the Golden Gate Bridge.
- US Interstate 80, crossing the San Francisco-Oakland Bay Bridge.

Because these routes are state or federal highways, CCSF officials lack authority to close them.[45] Entities with authority to close state or federal highways within CCSF are:

- The California Department of Transportation (Caltrans), which has authority to close any state highway when necessary to protect the public.[46]
- The Golden Gate Bridge Highway and Transportation District (the Bridge District), which has authority to close the Golden Gate Bridge.[47]

In addition, the California Highway Patrol (CHP) is required to cooperate with Caltrans in enforcing the closure or restricted use of a state highway.[48] CHP officers also have authority to direct traffic, and may do so in an emergency or to expedite traffic or ensure safety.[49]

In a tsunami incident, as in other types of incidents, CCSF requests for closure, reopening, or safety and damage assessment of a state or interstate highway should flow from the San Francisco Metropolitan Transportation Agency (SFMTA) DOC or the CCSF EOC Operations Support Section, Transportation Branch, to Caltrans, CHP, or to Bridge District representatives at the REOC. For further discussion of regional emergency transportation coordination involving

Caltrans and the Bridge District, see the San Francisco Bay Area Regional Emergency Coordination Plan, Transportation Subsidiary Plan.

### 3.5.4 Traffic Control and Perimeter Security

CCSF officials 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. The SFPD is the lead agency in providing traffic control and perimeter security. Supporting agencies include SFMTA Parking Control Officers; San Francisco Public Works, which provides barricades, signs, and other resources to assist with route closure; and the San Francisco Sherriff's Department. Volunteers from the SFPD's Auxiliary Law Enforcement Response Team (ALERT), who have training in traffic control and staffing area security checkpoints, may be activated by the Chief of Police or his or her designee to provide additional traffic control and perimeter security support.

As time, resources, and personnel safety permit, SFPD, SFMTA Parking Control Officers, and other first responders may 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 SFPD, SFMTA Parking Control, and other supporting departments may set up traffic control points at strategic locations to restrict traffic and access to evacuated areas, and to prevent "sightseers" from entering evacuation areas. Traffic control points will consist of barricades, roadblocks, and—as resources permit—a system of officer patrols of the evacuated area perimeter to secure the area. Blockades also need to be set up on sidewalk areas around the evacuation area perimeter to curtail pedestrian traffic into evacuated areas.

A Preliminary SFPD Traffic Control Plan for use in facilitating evacuation in a tsunami incident is included in Appendix F. The Preliminary Traffic Control Plan was developed as a starting place for Police Districts in implementing evacuation traffic control in their Districts. The EOC Operations Support Section, Public Safety and Transportation Branch Coordinators will coordinate with SFPD DOC as soon as possible after EOC activation to ensure the EOC maintains awareness of traffic control issues and resource needs.

**NOTE:** Establishing and staffing traffic control points and providing security around the perimeter of the evacuation area requires a large number of law enforcement personnel for successive operational periods. Accordingly, the CCSF EOC Operations Support Section, Public Safety Branch should quickly assess the need for, and take action to:

- Call on local private security companies to provide additional security personnel.
- 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 CCSF personnel in providing perimeter control.

California State Park Rangers and United States Park Police are tasked with providing traffic control and perimeter security in state and federal park areas, respectively. However, given their limited staffing, the time constraints associated with tsunami evacuation, and the fact that other state and federal parks along the California coast may be impacted, it may not be possible for park law enforcement officers to provide adequate staffing for their parks. The CCSF EOC Operations Support Section, Public Safety Branch, will coordinate with representatives of the

state and federal parks to ensure adequate traffic and perimeter control in park areas within the evacuation area.

### 3.5.5 Staging of Field Responders and Equipment

When the Mayor issues an evacuation order, CCSF departments with personnel and equipment inside the evacuation area must notify their personnel to evacuate, and if possible must move equipment outside the evacuation area. Departments needing to stage personnel and emergency equipment in readiness for response must ensure that their staging areas are sited in safe locations outside the tsunami evacuation area.

***CAUTION:*** All field responders must leave the evacuation area *no less than 30 minutes* before the NTWC's estimated time of initial tsunami wave arrival. Neither field responders nor the public will be allowed to return to evacuated areas until CCSF issues an official notice that it is safe to re-enter.[50] The CCSF EOC Operations Support Section will issue periodic reminders to CCSF departments and partners with field personnel regarding when to leave the evacuation area prior to tsunami arrival. For further discussion of field responder re-entry, see Section 3.5.6.2, below.

### 3.5.6 Re-Entry

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.

#### *3.5.6.1 RE-ENTRY PLANNING*

The CCSF EOC Planning Section Advance Planning Unit is responsible for coordinating the development of a re-entry plan with other EOC sections and DOCs, as appropriate. Work on the re-entry plan should begin as soon as possible after the Mayor orders a tsunami evacuation. Issues to be addressed in the re-entry plan include:

- Field responder re-entry:
  - Roles and responsibilities of participating departments.
  - Identification requirements for field-responder re-entry.
  - Scheduling of safety and damage assessments, building inspections, debris removal, utility restoration, and other critical restoration activities.
  - Guidance to CCSF personnel on how to avoid injuries while performing safety and damage assessments and other field activities.
  - Transportation of CCSF and other field response personnel into evacuated areas.
  - Medical plan for injured personnel.
- Public evacuation "all clear":
  - Roles and responsibilities of participating departments.
  - How evacuees will be notified that the evacuation order has been lifted.

- The need for a phased re-entry if there are areas that remain unsafe for public re-entry.
- Identification and release requirements for resident and business re-entry.
- Selected routes for re-entry, and the process by which residents, business owners, and others will be screened before access is allowed.
- The means by which CCSF will continue to control access and provide security for areas that remain closed to the public.
- Location and staffing of pick-up points where evacuees may gather for transportation assistance in returning to their homes.
- Development of public messaging regarding re-entry dangers, and how to avoid injury, especially while performing clean-up activities.
- Controlling media access to the evacuation area to ensure safety.

A sample re-entry plan is included in Appendix I. For further discussion of field responder re-entry, see Section 3.5.6.2, below. For further discussion of public re-entry, see Section 3.5.6.3, below.

#### *3.5.6.2 Field Responder Re-Entry*

The decision on when to allow field responders to re-enter the evacuation area will be made by the Mayor, in consultation with the EOC Manager, the Policy Group, state and federal tsunami experts, and the Unified Command or Incident Commanders in the field, using the all-clear guidelines set forth in Section 3.5.6.3, below. Re-entry will be governed by a re-entry plan (see Section 3.5.6.1, above). The EOC Operations Support Section is responsible for monitoring of the field responder re-entry process.

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.

#### *3.5.6.3 Issuing Public Evacuation "All Clear" Notice*

CCSF 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 made by the Mayor or his or her designee, in consultation with the EOC Manager, the Policy Group, state and federal tsunami experts, and the Unified Command or field Incident Commanders, using the following guidelines:

- If no tsunami was generated: The NTWC's cancellation of a Warning or Advisory indicates that CCSF officials may issue an all-clear notice allowing public re-entry into evacuated areas.
- If a tsunami was generated:
  - CCSF officials can assume the threat to land-based areas from destructive tsunami waves has passed when the NTWC cancels 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 in CCSF, 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 (see Section 3.5.7, below).
  - A phased re-entry may be needed if there are locations within the evacuation area that remain unsafe for the public.

The NTWC 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. For discussion of field responder re-entry, see Section 3.5.6.2, above.

### 3.5.7 Safety and Damage Assessments

When a tsunami incident results in damage within CCSF, or it is unclear whether damage has occurred, a safety assessment must be conducted before the public can be allowed to re-enter. The EOC Operations Support Section Infrastructure Branch is responsible for coordinating post-disaster safety assessments of public and private property. CCSF has adopted the California State Safety Assessment Program (SAP) protocols for conducting safety assessments of facilities and infrastructure. For further discussion of safety assessments, see ESF #3: Public Works and Engineering Annex to the ERP, Appendix to ESF #3: Post-Disaster Safety Assessment Guide.

The safety assessment should be distinguished from an Initial Damage Estimate (IDE) and from a Preliminary Damage Assessment (PDA). CCSF must prepare an IDE during the emergency response phase to support a request that the Governor declare a state of emergency, and to enable the State to request a presidential disaster declaration. The PDA is a joint assessment conducted by Cal OES and FEMA to determine the magnitude and impact of damage, and to determine if the damage is beyond the capabilities of local and state resources, so that federal assistance is necessary.

### 3.5.8 Fire Suppression, Search and Rescue, Hazardous Materials Response

The San Francisco Fire Department (SFFD) is the lead agency responsible for fire suppression, search and rescue operations, and response to land-based oil and hazardous materials spills and releases within CCSF. The SFFD will manage fire suppression, search and rescue, and land-based oil and hazardous materials operations from the San Francisco Fire DOC (FDOC), and will assume the role of Incident Commander for such incidents. SFFD will also serve in the CCSF EOC Operations Support Section Public Safety Branch as Fire and Rescue Group Supervisor, and as the Oil and Hazardous Material Unit Leader. For further discussion of firefighting response, see ESF #4: Firefighting Annex; for further discussion of search and rescue, see ESF #9: Urban Search and Rescue Annex.

ESF #10: Oil and Hazardous Materials Response Annex to the San Francisco ERP outlines how CCSF will respond to potential or actual oil and hazardous materials incidents posing a threat to life safety, property, and the environment. During a land-based oil or hazardous materials release requiring activation of ESF #10, SFFD will assume the role of Incident Commander for the incident, and will be serve as the CCSF EOC Public Safety Branch Coordinator or Land-Based Oil and Hazardous Material Response Unit Leader. SFFD is responsible for monitoring and assessing the status of the spill or release; organizing the containment, cleanup, and disposal of oil or hazardous substances; and coordinating resource acquisition for the response. ESF #10 also supports CCSF emergency operations through coordinating cleanup and recovery activities associated with hazardous spills or releases of hazardous substances. For further information regarding CCSF's land-based oil and hazardous materials response, see ESF #10: Oil and Hazardous Materials Response Annex, Part A: Land Response.

Any marine oil or other hazardous substance spill that threatens or impacts the CCSF shoreline will involve local government responders, the United States Coast Guard (USCG), the California Department of Fish and Wildlife, Office of Spill Prevention and Response (OSPR), and the responsible party. Under the National Contingency Plan (NCP) and the Sector San Francisco Area Contingency Plan (ACP), the USCG acts as On-Scene Coordinator for incidents involving a discharge or substantial threat of discharge of oil or other hazardous substances in the coastal zone. In this context, "coastal zone" is defined as all United States waters subject to the tide, and the land surface or substrata, ground waters, and ambient air proximal to those waters.[51] During a tsunami-related oil spill or other type of hazardous materials release in a location where CCSF responders have direct and immediate access, such as a dock, the SFFD may assume incident command until the appropriate USCG or OSPR representative arrives. For further information regarding CCSF's oil and hazardous materials response, see ESF #10: Oil and Hazardous Materials Response Annex, Part B: Marine Response.

### 3.5.9 Mass Care and Shelter

A tsunami event impacting CCSF may result in the displacement of thousands of people who live, work, or are visiting in San Francisco. If tsunami inundation produces significant damage to shoreline areas of the city, CCSF may need to provide emergency medical care, sheltering, feeding, security, and other shelter-related services to thousands of people and their companion animals for an extended period of time. ESF #6: Mass Care, Housing, and Human Services Annex to the San Francisco ERP outlines how CCSF will meet the mass care and shelter needs of families and individuals within the City.

The CCSF Human Services Agency (HSA) is the coordinating local government agency for ESF #6. HSA staffs the CCSF EOC Operations Support Section, Human Services Branch Coordinator position, and operates the HSA DOC to coordinate the involvement of other CCSF departments and partners supporting mass care and shelter operations. Under ESF #6, other departments and agencies providing support to HSA in the EOC Community Branch include Animal Care and Control, the Department of Public Health, the American Red Cross, and The Salvation Army.

#### *3.5.9.1 Human Shelter Needs*

FEMA has estimated that roughly 20 percent of the population at risk may require shelter in a mass care facility following an emergency requiring evacuation.[52] In contrast, the FEMA Hazus-MH 2.1 flood module assumes that approximately nine percent of the estimated number of residents in an evacuated area may require shelter in a mass care facility.[53] Applying these estimates to the maximum tsunami evacuation area yields the figures in Table 3.4, below.*

**Table 3.4. Estimated Number of People in San Francisco Needing Shelter in Tsunami Incident Requiring Maximum Evacuation** (Based on 2010 US Census data)

| ESTIMATE SOURCE | NUMBER OF RESIDENTS | NUMBER OF NONRESIDENT EMPLOYEES | NUMBER OF TOURISTS | TOTAL |
|---|---|---|---|---|
| Hazus-MH (9%) | 1,494 | 767 | 1,800 | 4,062 |
| FEMA (20%) | 3,322 | 1,705 | 4,000 | 9,027 |

Sources: U.S. Census Bureau 2010 Census, FEMA, Hazus-MH 2.1 Flood Module

For further discussion of CCSF vulnerability to tsunami, see Section 4.7, below. For general information regarding mass care and shelter planning, see ESF #6: Mass Care, Housing, and Human Services Annex.

#### *3.5.9.2 Animal Shelter Needs*

It is difficult to estimate the number of companion animals in San Francisco, much less to estimate the number of companion animals in the maximum tsunami evacuation area that may need shelter in a tsunami incident. Table 3.5 below uses 2010 U.S. Census Bureau figures and formulas developed by the American Veterinarian Medical Society to estimate the number of households and companion animals living within the maximum tsunami evacuation area in the City. It is generally accepted that about 10 percent of the companion animals in a community's impacted area will need housing in an emergency animal shelter.[54]

In addition, it must be assumed that a percentage of the public will evacuate without their companion animals because they are unable to reach their animals or they become separated from their animals by the disaster itself. This in turn creates a potential need for animal rescue or evacuation, adding to the number of animals that may need emergency shelter.[55]

* The maximum tsunami evacuation area is the tsunami inundation area as mapped by the State in 2009, drawn to streets and roads. For further discussion of the maximum tsunami evacuation area, see Section 4.4, below.

**Table 3.5. Estimated Household Companion Animals in San Francisco Maximum Tsunami Evacuation Area** (Based on 2010 US Census data)

| COMPANION ANIMAL ESTIMATES | DOGS | CATS | BIRDS | TOTAL |
|---|---|---|---|---|
| Number of Households With Companion Animals in Maximum Evacuation Area | 2,332 | 1,942 | 198 | NA |
| Companion Animal Population in Maximum Evacuation Area | 3,731 | 4,076 | 454 | 8,261 |
| Estimated Number of Pets Needing Shelter | 373 | 408 | 45 | 826 |

Sources: US Census Bureau 2010 Census. American Veterinary Medical Association, Pet Ownership Calculator. Accessed at https://www.avma.org/KB/Resources/Statistics/Pages/US-pet-ownership-calculator.aspx

For further discussion of sheltering of animals in a disaster, see ESF #11: Animal Response Annex to the CCSF ERP.

# SECTION 4: TSUNAMI RISK ASSESSMENT

## 4.1 Nature of Tsunami Hazard

A tsunami is a *series* of sea waves caused by displacement of a large volume of water, typically as a result of an undersea earthquake or landslide. In the open ocean, tsunamis can travel over 500 miles per hour (mph), the speed of a jet airplane, and are barely perceptible to ships at sea. However, as tsunami waves reach shallow water, they slow in speed and grow in height. At the shoreline, tsunami waves may range in height from a few inches to over 30 feet. The first wave is almost never the largest.

Normal, wind-driven ocean waves move only the surface layer of the water. In contrast, tsunami waves are longer in length, and move the entire "column" of water from the ocean floor to the surface. As a result, tsunami waves have increased power to inundate or flood low-lying coastal areas, making them far more dangerous and destructive than normal ocean waves. In addition, unlike normal ocean waves, the wave period (time between tsunami waves) may vary from a few minutes to up to two hours. Thus, damaging tsunami waves may last for hours or days, though typically the largest, most damaging tsunami waves occur in the first five hours of a tsunami incident.[56] Tsunamis also can cause powerful, dangerous currents in harbors, ports, and other shoreline areas that may last for several days after the initial tsunami wave. For a summary of the differences between tsunami waves and normal ocean waves, see Table 4.1, below.

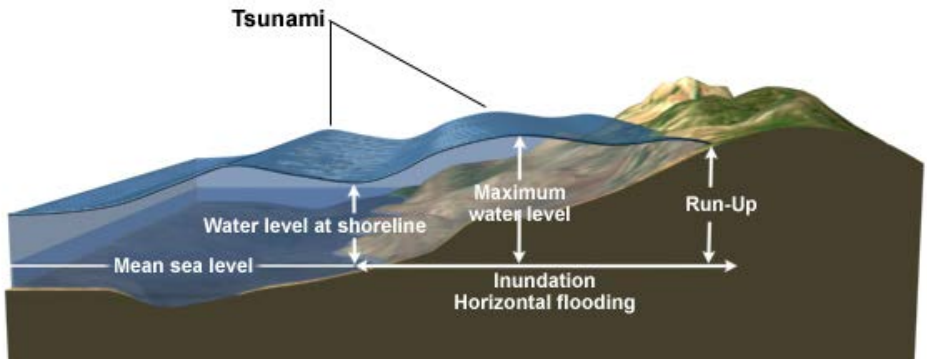
**Table 4.1. Typical Tsunami Wave vs. Normal Wave Features**

| WAVE FEATURE | TSUNAMI WAVES | NORMAL WAVES |
|---|---|---|
| **Cause** | Submarine earthquake, landslide, volcanic activity, meteorite | Wind, weather, tides, and currents |
| **Wave Speed in Deep Ocean** | 500–600 mph | 5–60 mph |
| **Wavelength (horizontal distance between successive waves)** | 60–300 miles | 300–600 feet |
| **Wave Period (time between two successive waves)** | 10 minutes–2 hours | 5–20 seconds |
| **Amplitude (height of wave above still water line)** | 3 feet or less in deep ocean; up to 32 feet or more at shoreline | Up to 45 feet in deep ocean |
| **Water Moved** | Entire water column, from sea floor to wave surface | Uppermost layer of water |

Sources: NOAA, Pacific Tsunami Warning Center, Frequently Asked Questions (FAQ), How are tsunami waves different from normal waves? Retrieved from http://ptwc.weather.gov/faq.php#4; Monterey Institute, NOAA Learning Objects, Lesson 9. Retrieved from http://www.montereyinstitute.org/noaa/

Tsunami inundation is the maximum distance that tsunami waves travel on shore. “Run-up” is the maximum height and distance of tsunami-related water inundation onshore. Inundation is measured horizontally from the mean sea level position at the water's edge. Run-up is measured vertically from mean sea level. (See Figure 4.1, below.)

**Figure 4.1. Tsunami Run-Up Diagram**




Source: MetEd, *Community Tsunami Preparedness*, 2nd ed. (2015). Retrieved from https://www.meted.ucar.edu/tsunami/community/print.htm

## 4.2 Types of Earthquakes Generating Tsunamis

### 4.2.1 Magnitude, Depth, and Type of Fault

Earthquakes generally must exceed magnitude 8.0 to cause a destructive, ocean-wide tsunami. However, earthquakes of magnitude 7.0 or less may trigger near-source tsunamis, or may cause landslides and underwater or submarine slides that trigger a near-source tsunami. Most damaging tsunamis are generated by shallow earthquakes of 43 miles or less in depth that occur in subduction zones. A subduction zone is an area where two tectonic plates converge, with one plate riding over the other, forcing it under the earth's crust. Pacific Ocean subduction zones occur off the coasts of Alaska, the Aleutian Islands, Japan, and Chile, and in the South Pacific and Pacific Northwest. In the Pacific Northwest, the Cascadia Subduction Zone stretches from Northern Vancouver Island to Cape Mendocino, California. San Francisco may experience tsunamis generated from any of these Pacific Ocean subduction zones.

Earthquake faults off the California coast south of Cape Mendocino are strike-slip faults like the San Andreas, which move horizontally along fault lines. Strike-slip faults are less likely to trigger damaging tsunamis. The National Tsunami Warning Center (NTWC) estimates that approximately 10 to 15 percent of damaging tsunamis are generated by strike-slip earthquakes.[57] When strike-slip- generated earthquakes cause local tsunamis, they typically impact only areas near the source quake. However, strike-slip faults can produce earthquakes that trigger landslides, which in turn may cause a local tsunami if an aerial landslide enters the water, or as water displaces due to a submarine landslide. Landslides have the potential to produce tsunamis with higher wave heights or "amplitudes" than tsunamis generated by earthquakes, because the amount of water displaced by a landslide increases the wave size more than an earthquake.

### 4.2.2 Distant-, Regional-, and Near-Source Tsunamis

San Francisco may experience distant-, regional-, and local-source tsunamis. A distant-source tsunami is generated by an earthquake or other source event located over 1000 kilometers (621 miles) from San Francisco. A regional-source tsunami results from a source less than 621 miles from San Francisco. A near-source tsunami results from a source less than 62 miles from

San Francisco.

Travel times for distant-source tsunamis vary from four to 15 hours. Initial waves from a tsunami generated by an Alaskan earthquake would typically arrive in San Francisco in four to six hours. Tsunami waves from a Chilean earthquake would typically take 13 to 15 hours to reach San Francisco. Longer travel periods associated with distant-source tsunamis allow CCSF officials to provide official warnings and assistance to the public in evacuating potential inundation areas before tsunami waves arrive.

A regional-source tsunami generated in the Cascadia Subduction Zone, which extends from Cape Mendocino, California northward to Vancouver Island, British Columbia, could result in a tsunami reaching San Francisco within one to two hours. This travel period would allow time for official alert and warning, but not for an officially-conducted evacuation.

In contrast, a near-source tsunami generated by a Bay Area earthquake may arrive in San Francisco within 10 to 15 minutes. Though local emergency management officials will make every effort to alert the public of the need to evacuate in a near-source tsunami, this short travel time will make it impossible for CCSF officials to provide evacuation assistance to the public. In addition, a Bay Area earthquake strong enough to produce a near-source tsunami will likely damage communications and other infrastructure, which may make it impossible to provide the public with warning of a near-source tsunami before waves begin arriving.

Accordingly, it is essential that the City have a robust public education program for those who live, work, or visit in San Francisco regarding the "natural warning signs" of a near-source tsunami, and what to do to in response. It is also critical that adequate tsunami warning signs are posted to demarcate the tsunami inundation area and tsunami evacuation routes. For further discussion of CCSF's tsunami public education program, see Section 5.

## 4.3 San Francisco Tsunami History

Since 1850, 54 tsunamis have generated run-up that was recorded or observed in San Francisco coastal areas. None of these tsunamis produced inundation or flooding. Only one resulted in damage.[58] Of these 54 tsunamis:

- 51 (94 percent) resulted from earthquakes.
- 50 (93 percent) were caused by distant-source events.
- One (two percent) was caused by a regional-source event.
- Three (six percent) were caused by near-source events.
- Ten (19 percent) were generated by earthquakes in the Japan Trench, the subduction zone east of Japan.
- Nine (17 percent) were generated in the Aleutian-Alaska Subduction Zone.
- Nine (17 percent) were generated from earthquakes off the Peru-Chile Trench.
- Eight (15 percent) were generated by earthquakes along the Kuril-Kamchatka Trench.

For a table showing credible historic tsunamis causing run-up of one foot or more in San Francisco, see Table 4.2, below. For a full list of credible historical tsunamis impacting San Francisco coastal areas since 1850, see Appendix M.

**Table 4.2. San Francisco Historic Tsunamis Resulting in Run-Up of 1 Foot or More**

| NEAR- OR DISTANT-SOURCE | DATE | MAGNITUDE - SOURCE AREA | OBSERVATION LOCATION | MAXIMUM WATER HEIGHT (above sea level) | NOTES |
|---|---|---|---|---|---|
| **Near-Source** (less than 62 miles from source) | 2/15/1856 | M5.5 - San Francisco Bay (possible submarine landslide) | San Francisco | 2 feet | "water in the bay is exceedingly thick . . . by throwing up of mud and sand at bottom of bay . . . ." (Lander 1993) |
| | 10/21/1868 | M6.8 - Hayward Fault (possible submarine or aerial landslide) | Alameda; San Francisco-Cliff House | 15 feet | "decided commotion in the ocean . . . wave sent inland . . . ." (Lawson 1908) |
| **Distant-Source** (over 621 miles from source) | 8/13/1868 | M8.5 - Chile | Fort Point | 1 feet | no damage or severe conditions reported |
| | 4/1/1946 | M8.8 - Aleutian Islands | Presidio | 1 feet | no damage or severe conditions reported |
| | | | Hunters Point | > 1 feet | |
| | 11/4/1952 | M9.0 - Kamchatka | San Francisco | 2 feet | no damage or severe conditions reported |
| | | | Hunters Point | 1 feet | |
| | 3/9/1957 | M8.6 - Aleutian Islands | San Francisco | 1 feet | no damage or severe conditions reported |
| | 5/22/1960 | M9.5 - Chile | San Francisco | 2 feet | San Francisco ferry service disrupted by current "running like the Mississippi River" |
| | 3/28/1964 | M9.2 - Alaska | San Francisco | 4 feet | no damage or severe conditions reported |
| | 2/27/2010 | M8.8 - Chile | San Francisco | 1 feet | no damage or severe conditions reported |
| | 3/11/2011 | M9.0 - Japan | San Francisco | 2 feet | Two piles broken, boats keeled over in San Francisco Marina |

Sources: California Geological Survey, Cal OES, University of Southern California, 2012; National Geophysical Data Center, NOAA, World Data Service: Global Historical Tsunami Database, http://www.ngdc.noaa.gov/hazard/tsu_db.shtml, accessed on January 22, 2015.

The magnitude 9 Great Tohoku Earthquake on March 11, 2011, resulted in run-up of approximately 0.62 meters (two feet) at the San Francisco Marina, where two pilings were broken, and several boats heeled over. The tsunami generated maximum currents of seven knots (approximately eight miles per hour) in shoreline areas.[59] However, damage was minimal along San Francisco's shoreline because the largest surges occurred during low tide. Future tsunamis may not occur at low tide.

On March 28, 1964, the 9.2 magnitude Great Alaskan Earthquake generated a distant-source tsunami that produced maximum water heights over sea level of 1.13 meters (3.7 feet) as recorded on the tide gauge at the San Francisco Presidio near Crissy Field. Again, the largest waves from the Great Alaskan tsunami occurred during low tide. Had the largest waves coincided with high tide, it is believed that the absolute water level could have reached over 12

feet above sea level at the Presidio.[60] The magnitude 6.8 Hayward Earthquake of October 21, 1868, is reported to have produced maximum water height above sea level of 4.5 meters (14.76 feet) in Alameda. There were also published reports of a wave at the Cliff House that was 15 to 20 feet higher than usual. The likely cause of this tsunami was an earthquake-triggered submarine landslide.[61]

## 4.4 San Francisco Tsunami Inundation Mapping

In 2009, the California Geological Survey (CGS), the California Governor's Office of Emergency Services (Cal OES), and the University of Southern California produced tsunami inundation maps for California coastal counties. The state tsunami inundation maps were prepared to assist California coastal communities in identifying tsunami hazards and creating evacuation plans. In addition, Cal OES and CGS have provided CCSF with a "maximum evacuation level" map by drawing the City's tsunami inundation area to streets and roads. The maximum evacuation level map was created to facilitate evacuation implementation and area security by establishing a worst-case evacuation perimeter. The 2009 State Tsunami Inundation Maps for CCSF, and the maximum evacuation maps, are included in Appendix B.

Inundation areas shown on the 2009 State Tsunami Inundation Map have the potential to be flooded in a tsunami. However, the 2009 inundation map does not show inundation from a single tsunami event. Rather, the map presents a "worst case" scenario based on over 50 local and distant tsunami sources. Future tsunami events may not produce inundation throughout the full hazard area shown on the 2009 map. Conversely, it is possible that actual tsunami inundation could exceed that shown on the map in a major tsunami event.[62]

CCSF neighborhoods in the tsunami inundation area include Outer Parkside, Outer Sunset, Outer Richmond on the Pacific Coast side of the City; and Sea Cliff, the Presidio, the Marina, Russian Hill, North Waterfront, the Financial District, South Beach, Mission Bay, Central Waterfront/Dogpatch, Hunters Point, and Candlestick Point on the bayside of the City. The 2009 state inundation map also shows Treasure Island as completely within the tsunami inundation area, along with shoreline areas of Yerba Buena Island, and portions of SFO.

CGS, Cal OES, and USC have developed more detailed, Tsunami Evacuation "Playbooks" for San Francisco and other California coastal counties for use during Tsunami Warnings and Advisories, when there is sufficient time for officials to implement evacuation. The goal of the Evacuation Playbook is to allow jurisdictions to avoid an "all or nothing" decision with regard to evacuation when the situation permits. For further discussion of the Cal OES, Tsunami Evacuation Playbooks, see Section 3.5.2.3, above.

## 4.5 Probability and Extent of Future Tsunami Events

The primary tsunami threat to the San Francisco Bay Area is from a distant-source earthquake originating in the eastern portion of the Aleutian-Alaska-Cascadia Subduction Zone. Tsunami waves from the northern portion of the Kuril and Japan subduction zones and from the southern portion of Chile also pose a significant risk to the San Francisco area.[63] A 2008 study using probabilistic hazard modeling estimates that San Francisco may experience a 1 meter (3-foot) distant-source tsunami once every 50 to 60 years, and a 3 meter (9-foot) tsunami every

426 years.[64] In general, tsunami wave heights for San Francisco are not expected to exceed 3 meters, but that calculation does not include the possibility of submarine landslides.[65]

In contrast, a near-source tsunami caused by a Bay Area earthquake is not seen as a major threat to CCSF because the majority of Northern California's faults are strike-slip rather than subduction faults. Cal OES considers CCSF's risk for a near-source tsunami to be moderate.[66] Strike-slip faults like the San Andreas do pose a potential threat of earthquake-induced submarine landslides, which may result in a local tsunami. However, the topography of near-shore areas of San Francisco Bay is gentle, with no steep slopes or canyons other than adjacent to the Golden Gate. Nor is there a history of large landslides into San Francisco Bay. Even if a large slide entered San Francisco Bay, scientists believe the amount of water displaced by the slide would be small.[67]

Though the Cascadia Subduction Zone extending from Northern Vancouver Island to Cape Mendocino in Northern California poses a concern for regional-source tsunamis, the effect of the Cascadia Subduction Zone decays rapidly south of Cape Mendocino. This is due to the spatial orientation of Northern California, and the directivity of tsunamis from Cascadia toward the mid-Pacific.[68] However, because of the regional proximity of the Cascadia Subduction Zone, it is likely that the NTWC would place all California coastal areas, including San Francisco, into a Warning in the event of a large-magnitude Cascadia tsunami.

The extent of inundation in San Francisco from a significant tsunami is difficult to predict. Historically, tsunami events have produced run-ups in San Francisco of only a few inches. However, inundation modeling done by Cal OES, CGS, and USC to create the 2009 State Tsunami Inundation Maps has produced higher run-up estimates for shoreline areas around San Francisco. The Tsunami Source Scenario Model Results in Table 4.3, below, indicate that the highest estimated run-ups from both distant- and near-source tsunamis may occur on the Pacific-side of San Francisco, at Ocean Beach, Baker Beach, and Fort Point. For discussion of historical tsunamis impacting CCSF, see Section 4.3. For the 2009 State Tsunami Inundation Area Map, see Appendix B.

## 4.6 Tsunami Impacts

The impact of tsunamis varies from location to location, depending on the topography of the sea floor and on land features in the area, as well as on the orientation of arriving waves. Wave direction from the tsunami source area, undersea features, and the steepness, shape, and configuration of land features in the area can affect wave behavior. This is why tsunami waves may be a few inches in height at one location, but much higher a short distance away.

Injuries and deaths are one of the primary impacts of tsunamis. Drowning is the most common cause of death associated with tsunami. People who return to shoreline areas after the first wave in the mistaken belief that danger has passed account for many deaths. Orthopedic and soft tissue injuries are the most common injuries suffered by tsunami survivors, though they also may suffer from aspiration pneumonia, dehydration, and hypothermia.[69] Displacement of people from damaged homes in coastal areas is an additional concern after a destructive tsunami.[70]

## Table 4.3. CCSF Tsunami Source Scenario Model Results—Height and Travel Time Estimates

| Tsunami Sources | | Approx. Travel Time From Source | Near-Shore Tsunami Height (Flow Depth), In Feet Above Mean Sea Level* | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Ocean Beach | Baker Beach | Fort Point | Chrissy Field | Marina Green | Aqua-tic Park | Fisher-man's Wharf | Ferry Build-ing | China Basin | Hunters Point | Candle-stick Park | Alca-traz | Trea-sure Island | Yerba Buena Island | SFO |
| **Near Source** | M7.3 Point Reyes Thrust Fault | 10-15 min. | 6 | 6 | 4 | 4 | 4 | 4 | 3 | 3 | 3 | 3 | 3 | 4 | 3 | 3 | 4 |
| | M6.6 Rodgers Creek-Hayward Fault | 10-15 min. | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | |
| | M7.1 San Gregorio Fault | 10-15 min. | 4 | 4 | 4 | 4 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | |
| **Maximum Run-Up–Near Source** | | | 6 | 6 | 5 | 4 | 4 | 3 | 3 | 3 | 3 | 3 | 3 | 4 | 4 | 4 | 4 |
| **Dis-tant Source** | M9 Cascadia full rupture | 1 hour | 5 | 4 | 4 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 4 | 3 | |
| | M9.2 Alaska 1964 EQ | 5 hours | 12 | 10 | 8 | 8 | 7 | 7 | 6 | 5 | 5 | 5 | 4 | 6 | 5 | 6 | |
| | M8.9 Central Aleutians I | 5 hours | 11 | 9 | 7 | 7 | 6 | 6 | 6 | 4 | 4 | 5 | 4 | 6 | 5 | 4 | 4 |
| | M8.9 Central Aleutians II | 5 hours | 6 | 7 | 6 | 5 | 5 | 5 | 4 | 4 | 4 | 4 | 3 | 5 | 4 | 4 | |
| | M9.2 Central Aleutians III | 5 hours | 22 | 21 | 15 | 13 | 12 | 11 | 10 | 8 | 7 | 7 | 6 | 10 | 8 | 7 | 5 |
| | M8.8 Kuril Islands II | 9 hours | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 2 | |
| | M8.8 Kuril Islands III | 9 hours | 4 | 4 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | |
| | M8.8 Kuril Islands IV | 9 hours | 5 | 4 | 4 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | |
| | M8.8 Japan II | 10 hours | 5 | 4 | 4 | 4 | 4 | 4 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | |
| | M8.6 Marianas Trench | 11 hours | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 2 | 3 | 3 | 3 | 3 | 3 | 3 | 4 |
| | M9.5 Chile 1960 EQ | 13 hours | 6 | 5 | 4 | 4 | 4 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | |
| | M9.4 Chile North | 13 hours | 5 | 5 | 4 | 4 | 4 | 4 | 4 | 3 | 3 | 3 | 3 | 4 | 4 | 4 | |
| **Maximum Run-Up–Distant Source** | | | 24 | 25 | 18 | 13 | 13 | 12 | 11 | 9 | 7 | 8 | 6 | 12 | 10 | 9 | 6 |

* CAUTION: The projections shown in this table do not include adjustments for model error or for ambient conditions such as storm surge and tidal fluctuations. Those numbers can increase projected water height during an event.

Source: Cal OES, CGS, USC, NOAA, NTHMP.

Another primary tsunami impact is damage to infrastructure, including roads, public transportation and power systems, and sewage treatment plants, stemming from the power and velocity of tsunami waves, and from debris in the water. Inundating waves are capable of carrying large debris, such as vessels, vehicles, docks, and other structures, into buildings and other infrastructure, resulting in additional damage.[71] In addition, tsunami waves may cause erosion or scouring of building foundations, bridges, roads, and other structures.[72]

Even a relatively small tsunami may cause strong currents and rip tides that pose a danger to people, vessels, and maritime facilities in or near coastal waters. Currents of three knots (3.5 miles per hour) or more have resulted in damage to fixed piers and structures, and may present navigation hazards to vessels in the area. Damaging currents may last for hours or days inside ports and harbors after arrival of the leading wave, endangering maritime interests and boaters on the water or near shore.

Secondary impacts that may occur as a result of a tsunami include:[73]

- Fires from ruptured oil tanks, gas lines, and service stations.
- Hazardous material spills.
- Contaminated food and water supplies.
- Disease outbreaks and post-traumatic stress issues, such as skin, diarrheal, and respiratory infections.
- Damage to tourism and maritime industries, including damage to port facilities and vessels, and the deposit of sediment in harbors.

If a tsunami occurs as a result of a local earthquake, San Francisco may be responding to the impacts of two disasters instead of one. A severe earthquake in the Bay Area may cause coastal subsidence, which in turn may lead to tsunami inundation in areas that would not otherwise be expected to flood.[74] For further discussion of earthquake impacts, response, and restoration, see the CCSF Earthquake Annex.

## 4.7 Vulnerability Analysis

This section considers the extent of exposure that may result from a tsunami, and the human and environmental characteristics of San Francisco that may impact our City's capacity to respond to and recover from the impacts of a tsunami. The vulnerability analysis also provides quantitative information that may be used to identify and prioritize preparedness and mitigation efforts by focusing on areas of the community with the greatest risk of harm or damage.

A number of factors affect community vulnerability, including population distribution and growth, land use, and the social and economic characteristics of people located in the hazard area. These social and economic characteristics may impact the ability of people to protect themselves or to recover from harm, which in turn impacts the city's capacity to fully recover. Examples of characteristics that may impact both individual and community vulnerability to tsunamis include income level, age, disabilities, and language or other access and functional needs.

## 4.7.1 People

### *4.7.1.1 Population at Risk*

In 2010, the United States Census Bureau estimated that San Francisco's total population was 805,235. As of July 2013, the Census Bureau projected CCSF's population to be 837,442, an increase of approximately four percent. Using 2010 Census population figures, an estimated 10,761 people in San Francisco, or about 1.3 percent of the total population, reside in the tsunami inundation area shown in the 2009 State Tsunami Inundation Map. Again, relying on 2010 Census figures, an estimated 16,610 people reside within the "maximum tsunami evacuation level," which is the State 2009 Tsunami Inundation Area drawn to streets and roads.

Accurately estimating the number of nonresident commuters and tourists in the 2009 tsunami inundation area or maximum evacuation area each day is difficult. Data from the 2011 Infogroup Employer Database estimates there are approximately 8,525 nonresident employees working at 509 businesses in the CCSF tsunami inundation area as mapped by the state.[75] A USGS study estimates that 20,000 tourists visit federal and state parks located in the tsunami inundation area in San Francisco each day.[76] However, it is likely that at least some of these tourists live in CCSF, and that some will be visiting areas outside the tsunami inundation area.

Another group that is difficult to estimate is the homeless. The San Francisco Human Services Agency leads a biennial homeless count. The most recent survey in 2015 identified 6,686 homeless people. Of that number, approximately 3,505 people (52 percent) were living without shelter. The survey includes a breakdown of population by City Supervisor district: The largest percentage of homeless people counted were in District 6 (63 percent), which includes South Beach, Mission Bay, Treasure Island, and Downtown; and District 10 (19 percent), which includes Bayview and Hunters Point. The survey does not include a breakdown by neighborhood or by census parcel. Thus, it is not possible using these figures to estimate how many homeless people may be at risk during a tsunami inundation.[77]

### *4.7.1.2 Community Vulnerability*

To adequately prepare for, mitigate, respond to, and recover from a tsunami incident impacting CCSF, it is important to understand how individuals within our community will be impacted. For example, demographic factors such as age, gender, race, ethnicity, and socioeconomic status may influence both individual and community resiliency in a disaster.[78] Such information may be used to prioritize preparedness and mitigation efforts. For tables showing the estimated number of San Francisco residents in the demographic groups that may be most vulnerable in a destructive tsunami, see the tables below.

Table 4.4A below shows numbers of residents in the 2009 State Tsunami Inundation Area, and breaks those numbers down by demographic categories. Table 4.4B shows number and types of housing categories in the 2009 State Tsunami Inundation Area. Table 4.5A shows numbers of residents in the Maximum Tsunami Evacuation Level, and breaks those numbers down by demographic categories. Table 4.5B shows number and types of housing categories in the Maximum Tsunami Evacuation Level.

**Table 4.4A. Demographic Characteristics of San Francisco Residents in 2009 State Tsunami Inundation Area for CCSF** (Based on 2010 US Census Bureau Data, collected at the Census block level)

| US CENSUS DEMOGRAPHIC CATEGORY | NUMBER IN INUNDATION AREA | TOTAL NUMBER IN CCSF | PERCENT OF TOTAL CCSF POPULATION IN INUNDATION AREA | PERCENT OF TOTAL NUMBER IN CCSF |
|---|---|---|---|---|
| **Total Population** | 10,761 | 805,235 | 100% | 1% |
| **Hispanic or Latino** | 1,137 | 121,774 | 11% | 1% |
| **Race: White** | 7,075 | 420,823 | 66% | 2% |
| **Race: Black or African-American** | 1,084 | 57,810 | 10% | 2% |
| **Race: American Indian & Alaska Native** | 216 | 10,873 | 2% | 2% |
| **Race: Asian** | 2,481 | 288,529 | 23% | 1% |
| **Race: Native Hawaiian & Other Pacific Islander** | 95 | 6,173 | 1% | 2% |
| **Other Race** | 481 | 62,482 | 4% | 1% |
| **Population less than 5 years old** | 511 | 35,201 | 5% | 1% |
| **Population over 65 years old** | 1,059 | 109,842 | 10% | 1% |
| **Population in institutionalized group quarters** | 0 | 5,362 | 0% | 0% |
| **Population in noninstitutionalized group quarters** | 834 | 18,902 | 8% | 4% |

Sources: US Census Bureau; Wood, et al, 2013, Community exposure to tsunami hazards in California: U.S. Geological Survey Scientific Investigations Report 2012–5222, 49 p.; Cal OES, CGS, USC, 2009 State Tsunami Inundation Area Map.

**Table 4.4B. Housing Characteristics of San Francisco Residents in 2009 State Tsunami Inundation Area for CCSF** (Based on 2010 US Census Bureau Data, collected at the Census block level)

| US CENSUS HOUSING CATEGORY | NUMBER IN INUNDATION AREA | TOTAL NUMBER IN CCSF | PERCENT OF TOTAL NUMBER IN CCSF |
|---|---|---|---|
| **Total occupied housing units** | 4,741 | 345,811 | 1% |
| **Renter-occupied housing units** | 3,274 | 222,165 | 1% |
| **Female householder** (no husband present) | 219 | 13,846 | 2% |

Sources: US Census Bureau; Wood, et al, 2013, Community exposure to tsunami hazards in California: U.S. Geological Survey Scientific Investigations Report 2012–5222, 49 p.; Cal OES, CGS, USC, 2009 State Tsunami Inundation Area Map.

**Table 4.5A. Demographic Characteristics of San Francisco Residents in Maximum Tsunami Evacuation Level for CCSF** (Based on 2010 US Census Bureau Data, collected at the Census block level)

| US CENSUS DEMOGRAPHIC CATEGORY | NUMBER IN MAXIMUM EVACUATION LEVEL | TOTAL NUMBER IN CCSF | PERCENT OF TOTAL CCSF POPULATION IN MAXIMUM EVACUATION LEVEL | PERCENT OF TOTAL NUMBER IN CCSF |
|---|---|---|---|---|
| **Total Population** | 16,610 | 805,235 | 100% | 2% |
| **Hispanic or Latino** | 1,551 | 121,774 | 9% | 1% |
| **Race: White** | 11,102 | 420,823 | 67% | 3% |
| **Race: Black or African-American** | 1,269 | 57,810 | 8% | 2% |
| **Race: American Indian & Alaska Native** | 273 | 10,873 | 2% | 3% |
| **Race: Asian** | 4,149 | 288,529 | 25% | 1% |
| **Race: Native Hawaiian & Other Pacific Islander** | 128 | 6,173 | 1% | 2% |
| **Other Race** | 613 | 62,482 | 4% | 1% |
| **Population less than 5 years old** | 777 | 35,201 | 5% | 2% |
| **Population over 65 years old** | 1,887 | 109,842 | 11% | 2% |
| **Population in institutionalized group quarters** | 0 | 5,362 | 0% | 0% |
| **Population in noninstitutionalized group quarters** | 927 | 18,902 | 6% | 5% |

Sources: US Census Bureau; Cal OES, CGS Maximum Tsunami Evacuation Level Map, 2015.

**Table 4.5B. Housing Characteristics of San Francisco Residents in Maximum Tsunami Evacuation Level for CCSF** (Based on 2010 US Census Bureau Data, collected at the Census block level)

| US CENSUS HOUSING CATEGORY | NUMBER IN INUNDATION AREA | TOTAL NUMBER IN CCSF | PERCENT OF TOTAL NUMBER IN CCSF |
|---|---|---|---|
| **Total occupied housing units** | 7,767 | 345,811 | 2% |
| **Renter-occupied housing units** | 5,255 | 222,165 | 2% |
| **Female householder** (no husband present) | 277 | 13,846 | 2% |

Sources: US Census Bureau; Cal OES, CGS, Maximum Tsunami Evacuation Level Map, 2015.

### 4.7.2 Property

As mapped in the 2009 State Tsunami Inundation Map, the tsunami inundation area in CCSF encompasses three square miles, or approximately 6.7 percent of San Francisco County. Approximately 0.18 square miles of residential buildings (1.09 percent), 0.01 square miles of mixed residential/commercial buildings (1.20 percent), and 0.13 square miles of commercial buildings (5.06 percent) are located in the tsunami inundation area. (See Table 4.6, below.)

Approximately 156 CCSF-owned facilities and infrastructure are located in the tsunami inundation area shown in the 2009 State Tsunami Inundation Map. CCSF-owned facilities within the tsunami inundation area include the following:

- San Francisco Port facilities.
- San Francisco Fire Department Pumping Station #2.
- San Francisco Fire Station 35.
- Fire Station 48, Treasure Island.
- Fire Training Facility, Treasure Island.
- Treasure Island Development Authority Administration Building.
- Treasure Island Waste Water Treatment Plant.

Additional CCSF-owned facilities within the Maximum Evacuation Level include the San Francisco Police Department Southern Station. A complete list of potentially impacted CCSF-owned facilities and infrastructure is included in Appendix N.

**Table 4.6. CCSF Building Inventory In the 2009 State Tsunami Inundation Area (in square miles)**

| | RESIDENTIAL BUILDINGS | MIXED RESIDENTIAL/ COMMERCIAL BUILDINGS | COMMERCIAL BUILDINGS |
|---|---|---|---|
| **In Inundation Area** | 0.18 | 0.01 | 0.04 |
| **Total Inventory in Area** | 16.54 | 0.83 | 2.57 |

Sources: US Census Bureau San Francisco County Quick Facts; San Francisco Planning Department, 2013.

### 4.7.3 Environment

In a destructive, inundating tsunami, low-lying coastal habitats such as beaches, marshes, sloughs, and waterways connected to the ocean will be inundated with sea water and debris, impacting nearshore submarine habitats as well. Beach erosion and the large amount of debris produced by the tsunami will be major challenges. Endangered species and protected areas will be at risk. Commercial fisheries and fishing fleets may also be impacted.

Environmental impacts from destructive, inundating tsunamis may include:[79]

- Solid waste, debris, and sewage: An inundating, destructive tsunami event will likely result in large amounts of debris. In addition, hazardous materials such as sewage and other toxic substances may be intermixed with ordinary debris.
- Soil and water contamination: Raw sewage, hazardous materials, and debris may contaminate water supplies and natural aquatic systems. In addition, groundwater supplies, wells, and lakes may be contaminated with sea water.
- Loss of infrastructure and facilities: Tsunamis may result in extensive damage to environmental infrastructure, buildings, and industrial sites, such as water and sanitation systems, solid waste disposal sites, and wastewater treatment plants. Oil storage facilities may release oil and wastes into the environment, presenting complex clean-up issues.
- Nutrification of coastal waters: Tsunamis may transport materials that are heavy in nutrients and trace elements from inundated areas to the ocean. This can lead to

phytoplankton blooms and increases in the populations of "secondary consumers," or animals that eat herbivores. Extreme nutrification may lead to hypoxia, or oxygen depletion, resulting in the loss of fish and other aquatic species.

- Loss of natural ecosystems: Beaches, wetlands, parklands, and other coastal areas may be heavily damaged by tsunamis. Such damage may include beach erosion and disappearance. Beaches are primary ecological sites that are critical nesting, feeding, breeding, and haul-out locations for birds and marine mammals. In addition, San Francisco beaches are a primary resource for recreation and tourism.
- Impact to biological communities and species: Heavy sediment deposits in inundated areas may cause changes in the species composition of organisms living on or in soil, including reductions in the diversity and number of species in impacted areas.

Recovery from such consequences will likely be lengthy, complicated, and expensive, and will require coordination among all levels of government. Shoreline restoration may cost millions of dollars. Moreover, damage to or destruction of shoreline habitats may worsen the impact of the tsunami on those who live and work in San Francisco, where we rely heavily on our coastal environment as an economic and recreational resource, and as a source of emotional and physical well-being.

# SECTION 5: PUBLIC TSUNAMI AWARENESS AND PREPARATION

## 5.1 Importance of Public Tsunami Education

Though the probability of a tsunami impacting San Francisco is low, the destruction a tsunami may cause requires us to take steps to prepare and to mitigate. A near-source tsunami may arrive in San Francisco within 10 to 15 minutes, making effective official public warnings or evacuation assistance impossible. A distant-source tsunami allows more, though not unlimited, time for official warning and evacuation. In both scenarios, having an educated public who can take appropriate protective action makes our city safer and more resilient. It is essential that CCSF implement a robust public awareness program to educate those who live, work, or visit in San Francisco regarding natural tsunami warning signs, what to do in a tsunami, and steps they can take to prepare for tsunamis.

Natural tsunami warning signs include:

- A strong earthquake felt in shoreline areas, during which it is difficult to stand or walk, or where shaking lasts longer than 20 seconds.
- Unusual fluctuations in sea water level, where the water abnormally recedes or increases near shore.
- Unusual wave behavior, such as a wall of water, a rising flood, frothing or bubbling of the water, or boats tossing.
- Roaring or “train-like” sounds coming from the Pacific Ocean or San Francisco Bay.

It is also important to share the information below regarding the nature of the threat posed by tsunamis:

- A tsunami is not just one wave. It’s a series of ocean waves usually caused by a large earthquake (magnitude 7.5 and above).
- Damaging tsunami waves can last for many hours. The first wave is almost never the largest.
- Unlike regular wind-driven waves, which only move the water surface, tsunami waves move the whole column of water from sea floor to surface. That’s what makes them so powerful and dangerous.
- Tsunamis also may create strong, dangerous currents that can last for days near beaches and in harbors, marinas, and ports.
- In some areas, tsunami waves may reach 20 to 30 feet or more at the shore—the height of a two- or three-story building. Wave size depends on the shape of the shoreline and the ocean floor; small waves at one area may be much larger a mile away.
- You cannot surf tsunami waves: Tsunamis waves do not curl or break so they have no face. They also contain dangerous debris.
- Tsunamis may cause other hazards, including flooding, contamination of drinking water, fires from ruptured gas lines or tanks, and hazardous material spills.

The following tips on what the public should do should also be shared:

- If you feel a strong earthquake making it difficult to stand or where shaking lasts more than 20 seconds, and you are within the 2009 state tsunami inundation area, move to high ground immediately.
- If you are not sure whether you are within the tsunami inundation area, move at least one-half mile or at least five blocks inland, away from shoreline areas.
- Stay away from shoreline areas until CCSF officials issue an "all-clear" message telling you it is safe to return. If you can see a tsunami wave, you are too close to outrun it.
- Do not try to surf tsunami waves: Tsunamis waves generally do not curl or break and they contain dangerous debris.
- During a tsunami emergency, San Francisco Police, Fire, Sheriff, and other organizations will be working to save lives and to safeguard property and the environment. Give them your full cooperation.

## 5.2 CCSF Tsunami Preparedness Outreach Communications Plan

The CCSF Tsunami Preparedness Outreach Communications Plan is attached to this Annex in Appendix O. The Plan's goals are to:

- Provide the public, especially those living, working, or visiting in the tsunami inundation area, with information they need to properly plan and prepare for a tsunami event in San Francisco.
- Develop messaging and materials that are accessible to all populations.
- Establish opportunities for sustained education and engagement.

Outreach and communications envisioned by the Plan include the following:

- Developing and placing tsunami-specific information on SFDEM's preparedness website, www.sf72.org.
- Developing and posting social media content related to tsunami education throughout the year, with increased messaging during National Tsunami Preparedness Week, National Preparedness Month, and during the launch of tsunami-specific announcements, events, or initiatives.
- Scheduling discussion of the Tsunami Annex and tsunami information at a Citizen Corps meeting.
- Exploring community outreach opportunities with partner organizations such as the Resilient Neighborhoods program, the Interfaith Council, and NERT.
- Engaging the Board of Supervisors on opportunities to conduct outreach in their districts.
- Exploring the possibility of hosting a community open house focused on the City's emergency plans, including the Tsunami Annex.
- Developing Community and Education Centers, Senior Center, and Library Displays during Tsunami Preparedness Week.
- Exploring placement of Tsunami education materials and interpretive displays in public facilities.

- Working with the Treasure Island Development Authority to develop specially-developed messaging and outreach for Treasure Island residents and workers concerning the Island's limited ingress and egress, and what to do in the event of a tsunami.
- Working with the Mayor's Office on Disability and the Department of Aging and Adult Services to develop an outreach program for people with disabilities and access and functional needs who live or work in tsunami inundation areas regarding how they can best prepare for a tsunami.
- Working with the Department of Public Health to create an outreach program for licensed residential, rehabilitation, and other group care facilities in the inundation area to help them develop evacuation plans for transporting persons under their care *using their own resources*.
- Developing a press release, one-pager, or media advisory on the revised Tsunami Annex and new or augmented tsunami evacuation signs.

Outreach materials to be developed include a Tsunami Education Insert for SF72 Portfolio, direct mail or door hangers for residents and businesses in the tsunami inundation area, a FAQ or Fact Sheet for public meetings, and display materials for open houses.

# SECTION 6: ANNEX MAINTENANCE

This section describes the process for maintaining the Tsunami Annex. It identifies how the Annex will be updated, and the training and exercises to be developed to enhance understanding and execution of the Annex. The section also discusses after-action review of the Annex following a tsunami exercise or an actual tsunami incident.

## 6.1 Annex Updates

The San Francisco Department of Emergency Management (DEM) is responsible for maintenance, revision, and distribution of this plan. Every two years, in coordination with key stakeholders and agencies with critical roles and responsibilities during a tsunami incident, DEM will assess the need for revisions to the Annex based on the following considerations:

- Changes to city, state, or federal ordinances, laws, regulations, requirements, or organization.
- Lessons learned through exercises or actual events.
- Development of new research, tools, or procedures that require changes in the Annex.

DEM will maintain a record of amendments and revisions as well as executable versions of all Annex documents, and is responsible for distributing the Annex to all applicable agencies.

## 6.2 Annex Testing, Training, and Exercises

Exercises provide an excellent means of evaluating the effectiveness of an emergency plan, as they allow emergency responders and decision-makers to become familiar with the procedures, facilities, and systems they are expected to use in an emergency. Exercising the Annex and evaluating its effectiveness involves using training and exercises and evaluation of actual disasters to determine whether goals, objectives, decision, actions, and timeframes outlined in the plan will lead to successful tsunami preparedness, response, and restoration efforts. Exercises will be conducted on a regular basis to maintain readiness, will include relevant city departments, and if possible, representatives from city partners such as Cal OES, Caltrans, CHP, California State Parks, the USGS, the NPS-GGNRA, and the Presidio Trust.

## 6.3 After-Action Review and Corrective Action

After every tsunami exercise or an actual incident, DEM is responsible for working with its partners to complete an After Action Report (AAR)/Improvement Plan (IP). The AAR/IP has two components: The AAR captures observations and recommendations based on incident objectives as associated with relevant core capabilities and tasks. The IP identifies specific corrective actions, assigns them to responsible parties, and establishes target dates for their completion.

# SECTION 7: AUTHORITIES AND REFERENCES

## 7.1 Authorities

### 7.1.1 Federal

Americans with Disabilities Act of 1990, as amended, 42 U.S. Code §§ 12101 et seq.

Homeland Security Act of 2002, Pub. L. 107–296, as amended (6 U.S. Code §§ 101 et seq.).

Pets Evacuation and Transportation Standards Act of 2006, Pub. L. 109-308, as amended.

Post-Katrina Emergency Management Reform Act of 2006, Pub. L. 109-295, 6 U.S. Code §§ 701 et seq.

Presidential Policy Directive (PPD)-8: National Preparedness, http://www.dhs.gov/presidential-policy-directive-8-national-preparedness.

National Incident Management System (NIMS), https://www.fema.gov/nims-doctrine-supporting-guides-tools.

National Response Framework, http://www.fema.gov/national-response-framework.

Robert T. Stafford Disaster Relief and Emergency Assistance Act, Pub. L. 93-288, as amended, 42 U.S. Code §§ 5121 et seq.

### 7.1.2 State

California Disaster and Civil Defense Master Mutual Aid Agreement, http://www.caloes.ca.gov/PlanningPreparednessSite/Documents/CAMasterMutAidAgreement.pdf.

California Emergency Services Act, California Government Code §§ 8550 et seq.

California Health and Safety Code § 1336.3 (among other requirements, mandates that each long-term care facility licensed by Department of Health Services to adopt written emergency plan).

Standardized Emergency Management System (SEMS) Regulations, 19 California Code of Regulations §§ 2400 et seq.

External Disaster and Mass Casualty Program, 22 California Code of Regulations § 72551 (contents to be included in written disaster and mass casualty plan for community care facilities licensed by Department of Social Services).

### 7.1.3 Local

San Francisco Charter, Article III, § 3.100(14) (Mayor's powers in an emergency).

San Francisco Administrative Code, Chapter 7 (provisions governing CCSF emergency services).

San Francisco Administrative Code, Chapter 91 (San Francisco Language Access Ordinance).

## 7.2 Applicable Plans

### 7.2.1 CCSF Plans

City and County of San Francisco Emergency Response Plan (ERP) (2009).

Emergency Support Function Annexes to the ERP:

ESF #1: Transportation Annex.

ESF #3: Public Works and Engineering Annex.

Appendix to ESF 3: Debris Management Plan.

Appendix to ESF 3: Post Disaster Safety Assessment Guide.

ESF #4: Firefighting Annex.

ESF #5: Emergency Management Annex.

ESF #6: Mass Care, Housing and Human Services Annex.

Appendix E to ESF #6: Disability Policy & Resource Manual.

ESF #7: Logistics Annex.

ESF #9: Urban Search and Rescue Annex.

ESF #10: Oil and Hazardous Materials Response Annex.

ESF #11: Animal Response Annex.

ESF #15: Joint Information System Annex.

### 7.2.2 Regional Plans

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Cal OES, Legal Guidelines for Controlling Movement of People and Property During an Emergency (1999). Retrieved from http://www.caloes.ca.gov/PlanningPreparednessSite/Documents/LegalGuidelinesforControllingMovementPeopleProperty%28FEAT%20doc%29.pdf

### 7.2.4 Federal Plans

FEMA, California Cascadia Subduction Zone Earthquake and Tsunami Response Plan (2013).

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[23] See Cal. Gov. Code § 8665.

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[44] See S.F. Charter art. III, § 3.100(14).

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[46] See Cal. Sts. & Hy. Code § 124(a).

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# GLOSSARY OF KEY TERMS AND TERMINOLOGY

**"All Clear":** Notice to be issued by CCSF authorities after the effects of a tsunami have ended, when it is safe for members of the public to re-enter an evacuated area.

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

**Arrival time**: Time of arrival of the first wave of a tsunami at a particular location.

**Bathymetry**: The "submarine topography," or depth and shape of underwater terrain; the study of "beds" or "floors" of water bodies, including the ocean.

**Distant-source tsunami:** A tsunami that originates more than 1000 kilometers (621 miles) from the area of interest; also known as a teletsunami or far-field tsunami.

**Earthquake:** The term used to describe a sudden slip on a fault, and the resulting ground shaking and radiated seismic energy caused by the slip, by volcanic or magmatic activity, or by other sudden stress changes in the earth.

**ETA**: Estimated time of arrival. Computed arrival time of the first tsunami wave at a given location after a specific earthquake has occurred.

**Inundation**: The distance inland that tsunami waves penetrate. Inundation varies depending on the coastal or bathymetric features in the area affected by the tsunami.

**Inundation area**: The area that is flooded with water during a tsunami.

**Local tsunami**: A tsunami that originates within 100 kilometers (62 miles) of the area of interest; also known as a near-source, near-field, or regional tsunami. "Local tsunami" is sometimes used to refer to a tsunami of landslide origin.

**Magnitude:** The most commonly-reported measure of an earthquake's size. Types of magnitude include the following:

**ML:** Local magnitude, commonly referred to as "Richter magnitude."

**Ms**: Surface Wave Magnitude. Magnitude of an earthquake as measured from the amplitude of seismic surface waves.

**Mw**: Moment Magnitude. Magnitude based on the size and characteristics of the fault rupture, determined from long-period seismic waves.

**Mean sea level:** An average level for the surface of the ocean, which can be used to measure heights such as elevation.

**Near-source tsunami:** A tsunami that originates within 100 kilometers (62 miles) from the area of interest; also referred to as a near-field tsunami, local tsunami, or regional tsunami. Near-source tsunamis have a short travel time of 30 minutes or less.

**People with Access and Functional Needs:** Any person who may have additional functional needs before, during, and after an incident, including but not limited to maintaining independence, communication, transportation, safety, support, and health care. Individuals with additional functional needs may include people with disabilities, people who live in long-term care facilities, who are elderly, who are children, who have limited English proficiency or are non-English speaking, or who are transportation disadvantaged.

**People with Disabilities:** Individuals who have a physical or mental impairment that limits one or more major life activities, who have a record of such impairment, or who are regarded as having such an impairment.

**Period**: The length of time between two successive tsunami waves. Tsunami wave periods may range from 10 minutes to two hours.

**Regional tsunami**: A tsunami that originates within 1000 kilometers (621 miles) of the area of interest.

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

**Strike-slip fault**: Vertical or nearly vertical fractures where the blocks mostly move horizontally.

**Subduction zone:** A location where two tectonic plates meet and one slides under the other.

**Tectonic plate:** Large, thin, relatively rigid plates that move relative to each other on the outer surface of the Earth.

**Teletsunami**: A tsunami that originates more than 1000 kilometers (621 miles) from the area of interest; also known as a distant-source or far-field tsunami.

**Transportation disadvantaged:** Individuals who, by choice or for other reasons, do not have access to a personal vehicle. These can include persons with disabilities; low-income, homeless, or transient persons; children without an adult present at home; tourists and commuters who are frequent users of public transportation; and those with limited English proficiency who tend to rely on public transit more than English speakers. U.S. Government Accountability Office, *Transportation-Disadvantaged Populations: Actions Needed to Clarify Responsibilities and Increase Preparedness for Evacuations*, GAO-07-44 (Washington, DC, 2006), 56, http://www.gao.gov/new.items/d0744.pdf.

**Travel time**: The amount of time that it takes a tsunami to travel from the generating source to a particular location. Travel time is typically expressed in hours and tenths of hours.

**Tsunami**: A tsunami is a series of sea waves caused by large-scale seafloor displacements associated with large submarine earthquakes, volcanic eruptions, or landslides.

**Tsunami Advisory:** The National Tsunami Warning Center (NTWC) issues a Tsunami Advisory when a potential tsunami may produce strong currents or waves that are dangerous to those in or near the water. Though strong, dangerous currents may continue for several hours after arrival of the initial wave, significant widespread inundation is not expected for areas under a Tsunami Advisory.

**Tsunami Watch:** The NTWC issues a Tsunami Watch to alert emergency management officials and the public that a tsunami event may later impact the watch area. Therefore, emergency management officials and the public should prepare to take action when placed in a Tsunami Watch. The NTWC may upgrade the Watch to a Warning or Advisory, or may cancel the Watch based on updated information and analysis.

**Tsunami Warning:** The NTWC issues a Tsunami Warning when a tsunami that may cause significant, widespread inundation (flooding) and powerful currents is possible and may continue for several hours after arrival of the initial wave.

**Wavelength:** Distance between two successive tsunami waves.

# ABBREVIATIONS AND ACRONYMS

| | |
|---|---|
| AAR/IP | After Action Report/Improvement Plan |
| ACC | Animal Care and Control |
| ACP | Area Contingency Plan |
| ALERT | Auxiliary Law Enforcement Response Team |
| ANSS | Advanced National Seismic System |
| ARC | American Red Cross |
| Cal OES | California Governor's Office of Emergency Services |
| Caltrans | California Department of Transportation |
| CALWAS | California Warning System |
| CCSF | City and County of San Francisco |
| CDPR | California Department of Parks and Recreation |
| CGS | California Geological Survey |
| CLETS | California Law Enforcement Telecommunications System |
| CHP | California Highway Patrol |
| CMAS | Commercial Mobile Alert System |
| CO | Controller's Office |
| CPSRA | Candlestick Point State Recreation Area |
| CSWC | California State Warning Center |
| DART | Deep-ocean Assessment and Reporting of Tsunamis |
| DBI | Department of Building Inspection |
| DEM-DEC | Department of Emergency Management, Division of Emergency Communications |
| DEM-DES | Department of Emergency Management, Division of Emergency Services |
| DPH | Department of Public Health |
| DOC | Department Operations Center |
| DT | Department of Technology |
| EAS | Emergency Alert System |
| EOC | Emergency Operations Center |
| ERP | Emergency Response Plan |
| ESF | Emergency Support Function |
| ETA | Estimated time of arrival |
| FA | Forecasted Amplitude |
| FAA | Federal Aviation Administration |
| FASTER | Forecasted Amplitude of maximum tsunami wave + Storm surge or existing ocean conditions + Maximum Tidal height + Forecast Error potential + Site-amplified Run-up potential |
| FEMA | Federal Emergency Management Agency |
| GGNRA | Golden Gate National Recreation Area |
| GSA | General Services Agency |
| Hazus-MH | Hazus Multihazard |
| HSA | Human Services Agency |
| ICS | Incident Command System |
| IPAWS | Integrated Public Alert and Warning System |

| | |
|---|---|
| JIC | Joint Information Center |
| JIS | Joint Information System |
| LAE | Local Area Emergency |
| LEPC | Local Emergency Planning Committee |
| MOD | Mayor's Office on Disability |
| Mph | miles per hour |
| MSL | Mean Sea Level |
| MTSRU | Maritime Transportation System Recovery Unit |
| NCP | National Oil and Hazardous Substances Pollution Contingency Plan |
| NERT | Neighborhood Emergency Response Team |
| NIMS | National Incident Management System |
| NOAA | National Oceanic and Atmospheric Administration |
| NPS | National Park Service |
| NRP | National Response Plan |
| NTWC | National Tsunami Warning Center |
| NWS | National Weather Service |
| OPWS | Outdoor Public Warning System |
| OSPR | Office of Spill Prevention and Response, California Department of Fish and Wildlife |
| PDA | Preliminary Damage Assessment |
| PIO | Public Information Officer |
| PTWC | Pacific Tsunami Warning Center |
| REOC | Regional Emergency Operations Center |
| RPD | Recreation and Parks Department |
| SEMS | Standardized Emergency Management System |
| SF | San Francisco |
| SFE | San Francisco Department of the Environment |
| SFFD | San Francisco Police Department |
| SFMNHP | San Francisco Maritime National Historic Park |
| SFMTA | San Francisco Municipal Transportation Agency |
| SFO | San Francisco International Airport |
| SFPD | San Francisco Police Department |
| SFPUC | San Francisco Public Utilities Commission |
| SFPW | San Francisco Public Works |
| SFSD | San Francisco Sheriff's Department |
| SOC | State Operations Center |
| TI | Treasure Island |
| TIDA | Treasure Island Development Authority |
| USCG | United States Coast Guard |
| USGS | United States Geologic Survey |
| USACE | United States Army Corps of Engineers |
| USPP | United States Park Police |
| VTS | Vessel Traffic Service |
| WEA | Wireless Emergency Alerts |
| WETA | San Francisco Bay Area Water Emergency Transportation Authority |

# APPENDIX

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# Appendix A: DEM Duty Officer Tsunami Resource

# A-1 DEM Duty Officer Tsunami Action Sheet

## Tsunami Action Sheet

Last Updated: 04/08/2016

**Description** This action sheet reviews the steps to take when the National Tsunami Warning Center issues a tsunami bulletin that includes San Francisco. For detailed notification and response information, see the 2016 Tsunami Annex.

**Key Resources**

| | |
|---|---|
| NOAA-NWS Monterey | 831-656-1717 |
| DEC Dispatch | 415-575-0737 |
| Cal OES Earthquake & Tsunami Duty Officer (24/7) *OR* Kevin Miller, Cal OES Earthquake & Tsunami Coordinator, Coastal Region | 916-845-8911 510-326-1141 |
| Rick Wilson, California Geological Survey | 916-327-0981 |
| 2016 CCSF Tsunami Annex to ERP: | V:\Planning_Hazard Specific Plans\Tsunami_2016 Revised Plan_Revised Plan Doc\ |
| NTWC web site: | http://www.tsunami.gov/ |
| Basecamp: | bit.ly/1S42LrZ |
| CCSF Tsunami Evacuation Level Maps: | http://arcg.is/1CUHWOD |

**OVERVIEW**

When you receive a page that an earthquake of magnitude (M) 6.5 or above has occurred on Pacific Ocean "Ring of Fire":

1. Check the National Tsunami Warning Center (NTWC) website listed above to see if NTWC has issued a tsunami bulletin for the earthquake that includes California.
2. Click on "text" link(s) for the earthquake on NTWC page and review all bulletins issued.
3. Gather information listed on page 7 of this Action Sheet.
4. Compare information on page 7 to Tsunami Response Decision Tree on page 8 to determine recommended response activities.
5. Follow additional steps listed below for type of NTWC bulletin issued, as Manager on Call (MOC) directs.

***NTWC BULLETIN TYPES AND NEXT STEPS ARE LISTED BELOW:***

**LEVEL OF TSUNAMI DANGER IS BEING EVALUATED:**

1. Monitor NTWC web page for additional bulletins until NTWC concludes its evaluation. Update MOC as needed.
2. If MOC directs, issue CCSF Alert using "Tsunami Danger Being Evaluated" template provided in Everbridge.
3. Participate in Cal OES/NWS tsunami conference calls and brief MOC as needed.
4. If NTWC issues an Advisory or Warning, follow steps for that bulletin type listed below.

1 | Page

**TSUNAMI INFORMATION STATEMENT** *(Minor waves at most; no action suggested)*:

1. No action needed.

**TSUNAMI WATCH** *(Danger level not yet known; stay alert for more information.* ***A NTWC Tsunami Advisory or Warning for California is likely****)*:

1. Review bulletins on NTWC website to confirm that Watch includes San Francisco.
2. If needed, call Cal OES Earthquake & Tsunami Coordinator for additional information.
3. Contact MOC and brief him/her on situation. If MOC agrees:
   a. Issue an AlertSF and a CCSF Alert using the Tsunami Watch templates in Everbridge.
   b. Notify appropriate DES EOC team to respond to EOC, and request DEM Public Information (PIO) to activate Joint Information System (JIS).

      *When activated, the JIS will take over public messaging and will notify the media.*
4. Participate in Cal OES/NWS tsunami conference calls and brief MOC/EOC Manager as needed.
5. Notify MOC when the above actions are completed.
6. Report to EOC once it opens and assumes Duty Officer functions.
7. If NTWC issues an Advisory or Warning, follow steps below for the bulletin issued.
8. If NTWC cancels Watch, issue CCSFAlert using the Watch Cancellation template in Everbridge.

   *The JIS is responsible for issuing AlertSF Watch cancellation messages using template in Everbridge.*

**TSUNAMI ADVISORY** (*Strong, dangerous currents expected; keep people out of the ocean and away from shoreline areas*):

***NOTE: THERE ARE TWO SCENARIOS FOR A TSUNAMI ADVISORY SO READ CAREFULLY!***

1. Review bulletins on NTWC website to confirm that Advisory includes San Francisco.
2. If needed, call Cal OES Earthquake & Tsunami Coordinator for more information.
3. Contact MOC and brief him/her on situation.
4. **A. Scenario 1: Tsunami currents expected in LESS THAN 4 HOURS:** ***EVACUATE beaches, marina and harbor docks, and piers.***
   a. Recommend to MOC evacuation of all beaches, marina and harbor docks, and piers.

      *If MOC agrees, MOC will inform DEM Executive Director of need to evacuate beaches, harbor and marina docks, and piers.*

      *If Executive Director concurs, MOC will fill in the attached (1) proclamation of local emergency and (2) mandatory evacuation order forms (pages 10-11), and provide them to Executive Director for Mayor's Office use. MOC will inform Duty Officer as soon as possible if Executive Director concurs with decision to evacuate and is contacting the Mayor.*
   b. Once Executive Director concurs with recommendation to evacuate, Duty Officer will notify the public of the Advisory and need to move away from beaches, harbor and marina docks, and piers using the following systems ***in order listed below***:
      1) OPWS – using the message template attached (page 12-18).
      2) AlertSF to entire City – using the AlertSF Advisory template in Everbridge.

3) EAS – using the message template attached (page 12-18).
4) Twitter – using the AlertSF Advisory template in Everbridge.

**d.** Issue CCSFAlert to City Partners using Tsunami Advisory template in Everbridge.

**e.** Notify appropriate DES EOC team to respond to EOC, and request that PIO activate JIS.

*When activated, the JIS will take over public messaging and will notify the media.*

**f.** Notify MOC when above actions are completed.

**g.** Continue monitoring NTWC web site. If NTWC cancels or downgrades Advisory so evacuation is not necessary, inform MOC and PIO immediately. Issue CCSFAlert cancellation messages using Tsunami Advisory Cancelled template in Everbridge.

*The JIS is responsible for issuing AlertSF Advisory cancellation messages using template in Everbridge.*

**h.** Participate in Cal OES/NWS tsunami conference calls and brief MOC/EOC Manager.

**i.** Report to EOC once it opens and assumes Duty Officer functions.

**4. B. Scenario 2: Tsunami currents are expected in MORE THAN 4 HOURS: *Evacuation of beaches, harbor and marina docks, and piers MAY be necessary.***

**a.** Obtain FASTER tsunami hazard value and recommended Evacuation Plan from Cal OES or NOAA-NWS Monterey Weather Office. This information should be provided to Duty Officer within 15 minutes of NTWC issuance of tsunami bulletin with expected tsunami wave heights.

**b.** Match FASTER value and recommended Evacuation Plan to Plan description and maps in 2016 Tsunami Annex Appendix B using Elevation-Based Evacuation Table on page 9. NOTE: Evacuation Level may be different for Coast and Bay side. Electronic versions of maps are available on Basecamp (see url above).

**c.** Immediately call MOC and inform him/her of recommended Evacuation Plan.

*If MOC agrees that evacuation is necessary, MOC will inform DEM Executive Director of need to evacuate.*

*If Executive Director concurs, MOC will fill in attached (1) proclamation of local emergency and (2) mandatory evacuation order forms (pages 10-11), and provide them to Executive Director for Mayor's Office use. MOC will inform Duty Officer as soon as possible if Executive Director concurs with decision to evacuate and is contacting the Mayor.*

**d.** Once the Mayor issues the proclamation and mandatory evacuation order, the Duty Officer will notify the public of the need to evacuate beaches, harbor and marina docks, and piers using the following systems ***in the order listed below***:

1) EAS – using the message template attached (page 12-18).
2) OPWS – using the message template attached (page 12-18).
3) AlertSF to entire City – using the Alert SF Advisory template in Everbridge.
4) Twitter – using the AlertSF Advisory template in Everbridge.

**e.** Issue CCSFAlert to City Partners using Tsunami Advisory template in Everbridge.

**f.** Notify appropriate DES EOC team to respond to EOC, and request that PIO activate JIS.

*When activated, the JIS will take over public messaging and will notify the media.*

**g.** Notify MOC when the above actions are completed.

**h.** Continue to monitor NTWC web site. If NTWC cancels or downgrades the Advisory so evacuation is no longer necessary, inform MOC and PIO immediately. Issue CCSFAlert Advisory cancellation messages using templates provided in Everbridge.

*The JIS is responsible for issuing AlertSF Advisory cancellation messages using template in Everbridge.*

**i.** Participate in Cal OES/NWS tsunami conference calls and brief MOC/EOC Manager as needed.

**j.** Report to EOC once it opens and assumes Duty Officer functions.

**TSUNAMI WARNING** ***(FLOODING WAVES POSSIBLE; EVACUATION SUGGESTED):***

***NOTE: THERE ARE TWO SCENARIOS FOR A WARNING SO READ CAREFULLY!***

1. Review NTWC bulletins on NTWC website to confirm that Warning includes San Francisco.
2. If needed, call Cal OES Earthquake & Tsunami Coordinator for additional information.
3. Immediately contact MOC and brief him/her on situation.
4. **A. Scenario 1: Tsunami expected to arrive in LESS THAN 4 HOURS (near-source or regional tsunami – State/NWS recommend MAXIMUM TSUNAMI EVACUATION):**
   - **a.** Recommend evacuation of Maximum Tsunami Evacuation Level to MOC.
   - **b.** If MOC agrees that maximum evacuation is necessary, MOC will inform DEM Executive Director of need for maximum evacuation.

     *If Executive Director concurs, MOC will fill in (1) proclamation of local emergency and (2) Mandatory Evacuation Order forms attached (pages 10-11), and provide them to Executive Director for use by the Mayor's Office. MOC will inform Duty Officer as soon as possible if Executive Director concurs with decision to evacuate and is contacting the Mayor.*
   - **c.** Once Executive Director concurs with decision to evacuate, Duty Officer will notify the public of the Warning and need to move inland to high ground using the following systems ***in the order listed below***:
     - **1)** OPWS – using the message template attached (page 12-18).
     - **2)** AlertSF to entire City – using the AlertSF Warning template in Everbridge.
     - **3)** EAS – using the message template attached (page 12-18).
     - **4)** Twitter – using the AlertSF Warning template in Everbridge.
   - **d.** Issue CCSFAlert to City Partners using Tsunami Warning template in Everbridge.
   - **e.** Notify appropriate DES EOC team to respond to EOC, and request that PIO activate JIS.

     *Once the Mayor signs proclamation and issues Mandatory Evacuation Order, JIS will continue issuing public messaging and will notify the media.*
   - **f.** Notify MOC when above actions are completed.
   - **g.** Continue to monitor NTWC web site. If NTWC cancels or downgrades Warning so evacuation is no longer necessary, inform MOC and PIO immediately. Issue CCSFAlert Warning cancellation messages using template in Everbridge.

*The JIS is responsible for issuing AlertSF Warning cancellation messages using template in Everbridge.*

**h.** Participate in Cal OES/NWS tsunami conference calls and brief MOC/EOC Manager as needed.

**i.** Report to EOC once it opens and assumes Duty Officer functions.

**4. B. Scenario 2: Tsunami expected to arrive in MORE THAN 4 HOURS:**

**a.** Obtain FASTER tsunami hazard value and recommended Evacuation Level from Cal OES or NOAA-NWS Monterey Weather Office. This should be provided to Duty Officer within 15 minutes of NTWC issuance of tsunami bulletin with expected tsunami wave heights.

**b.** Match the FASTER value and recommended Evacuation Level descriptions in 2016 Tsunami Annex Appendix B using the Elevation-Based Evacuation Table on Page 9. NOTE: Evacuation Level may be different for Coast and Bay side. Electronic versions of maps are available on Basecamp (see url above).

**c.** Immediately call MOC and inform him/her of recommended Evacuation Plan.

**d.** If MOC agrees, he/she will inform DEM Executive Director of the need to evacuate, and the recommended Evacuation Plan.

*If Executive Director concurs, MOC will fill in the attached (1) proclamation of local emergency and (2) mandatory evacuation order forms (pages 10-11), and provide them to Executive Director for use by the Mayor's Office. MOC will inform Duty Officer as soon as possible if Executive Director concurs with decision to evacuate and will contact the Mayor. If Executive Director concurs with decision to evacuate, he/she will contact the Mayor and request issuance of proclamation of emergency and mandatory evacuation order.*

**e.** Once the Mayor issues proclamation and mandatory evacuation order, Duty Officer will begin notifying the public of the Warning and need to evacuate using the following systems ***in the order listed below***:

**1)** EAS – using the message template attached (page 12-18).

**2)** OPWS – using the message template attached (page 12-18).

**3)** AlertSF to entire City – using the AlertSF Warning template in Everbridge.

**4)** Twitter – using the AlertSF Warning template in Everbridge.

**f.** Issue CCSFAlert to City Partners using Tsunami Warning template in Everbridge.

**g.** Notify appropriate DES EOC team to respond to EOC, and request that PIO activate Joint Information System (JIS).

*Once activated, the JIS will take over public messaging and will notify the media.*

**h.** Notify MOC when above actions are completed.

**i.** Continue to monitor NTWC web site. If NTWC cancels or downgrades Warning so evacuation is no longer necessary, inform MOC and PIO immediately. Issue CCSFAlert cancellation message using template in Everbridge.

*The JIS is responsible for issuing AlertSF Warning cancellation messages using template in Everbridge.*

## QUICK REFERENCE PAGE FOR DETERMINING TSUNAMI RESPONSE ACTIVITIES

Obtain basic information about the earthquake and tsunami from National Tsunami Warning Center (NTWC) or NOAA National Weather Service (NWS)-Monterey.

Earthquake location: _____

Earthquake magnitude: _____

Tsunami Alert level (circle one): WATCH ADVISORY WARNING

**NOTE: The Tsunami Alert Level may change in the first few hours after an earthquake. The NTWC may upgrade a WATCH to an ADVISORY or a WARNING.**

NTWC forecasted tsunami amplitude/wave height: _____

NTWC Forecasted tsunami arrival time: _____

State/NOAA Recommended CCSF evacuation plan: _____

State/NOAA FASTER tsunami flood value (if needed): _____

***CAUTION:* The State and NOAA-NWS will provide CCSF with the "FASTER" tsunami flood level value, and recommended evacuation plan to use. Do NOT**

Tsunami evacuation and response depends on the amount of time before tsunami arrival. Four hours is considered the threshold timeframe needed for an officially-led public evacuation.

***As a Quick Reference, the State offers the following recommendations:***

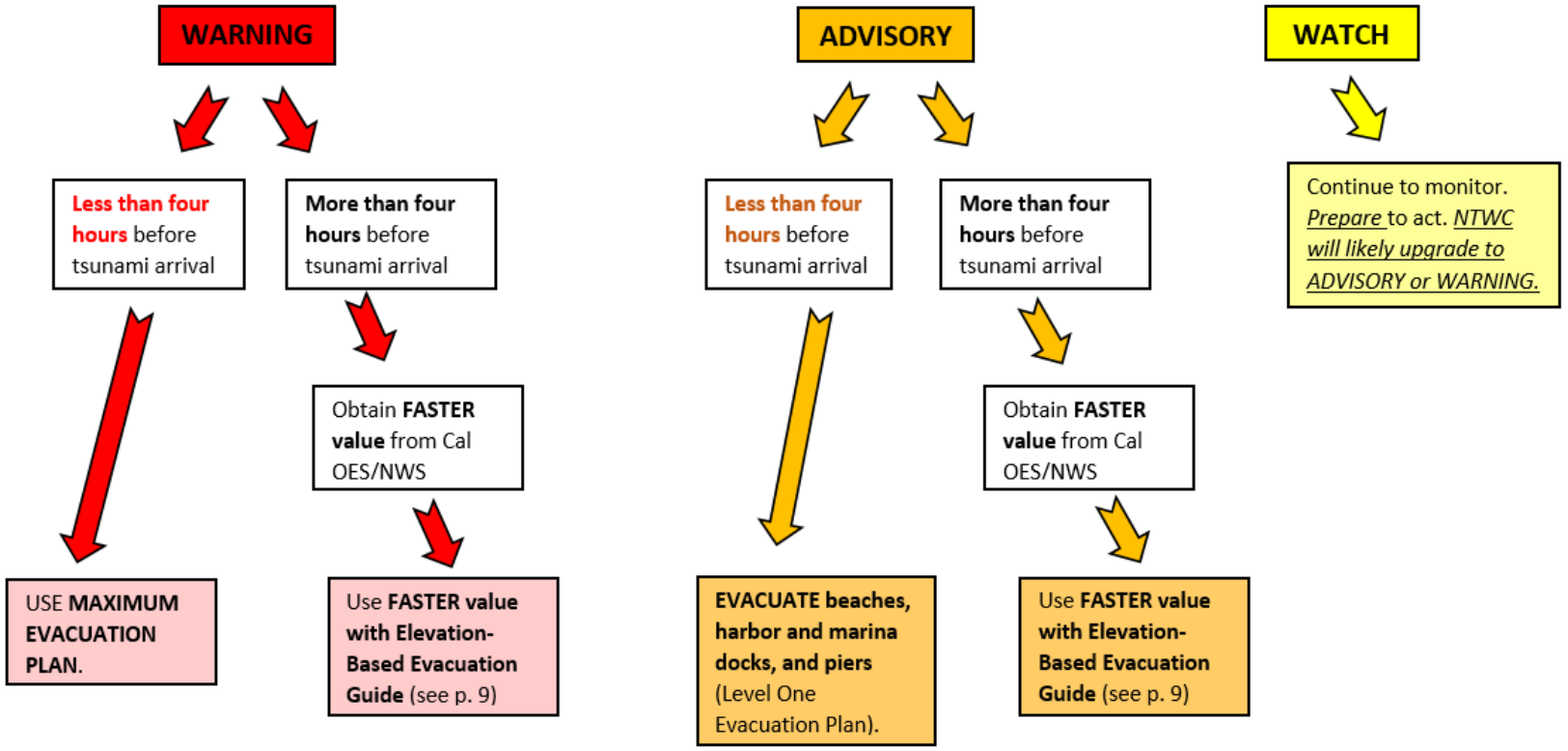
1) **If less than four hours before tsunami arrival:**
   - **ADVISORY:** Evacuate beaches, marina and harbor docks, and piers.
   - **WARNING:** Evacuate Maximum Evacuation area.
2) **If more than four hours before tsunami arrival**: Use the Elevation-Based FASTER Table on page 9 below, paired with the evacuation plan "Level" provided by the state and NOAA.

**For Tsunami Evacuation Level Maps and Descriptions see the 2016 Tsunami Annex Appendix B.**

Source: CGS, Cal OES (2015). California Tsunami Evacuation Playbook - City of San Francisco, Playbooks 2015-SF-01-02.

# Recommended Tsunami Response Decision Tree

**Gather information on the potential tsunami event as listed on page 7.**




Source: CGS, Cal OES (2015). California Tsunami Evacuation Playbook - City of San Francisco, Playbooks 2015-SF-01-02.

# FASTER Elevation-Based Evacuation Table

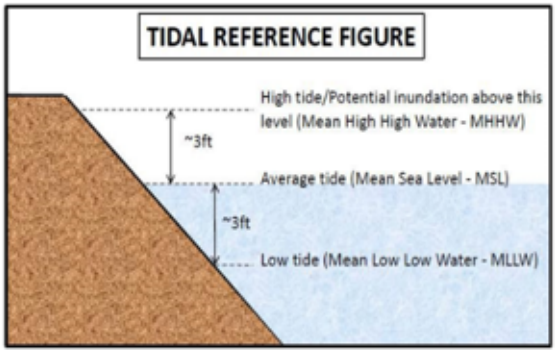
**Use this table for tsunami events where there is more than four hours until tsunami arrival.**

Once the State and NWS calculate a FASTER value for CCSF, they will share it with the DEM Duty Officer with a recommended Evacuation Plan or other response activities. The table below pairs the FASTER value with the appropriate recommended Elevation-Based Evacuation Response Plan. Example: If the FASTER number is 1.3 meters, the State/NWS recommends that CCSF use the Level 2 Evacuation Plan.

**For Tsunami Evacuation Level Maps and Descriptions see the 2016 Tsunami Annex Appendix B.**

***NOTE: The ultimate decision-making responsibility for tsunami evacuation and response activities rests with local CCSF officials.***

| NTWC Tsunami Alert Level | Cal OES/NWS *FASTER* Tsunami Flood Level Number (Meters above Mean Sea Level) | Cal OES/NWS *FASTER* Tsunami Flood Level Number (Feet above Mean Sea Level) | Tsunami height compared to other tidal reference points | | Recommended Evacuation Level |
|---|---|---|---|---|---|
| | | | Flood level above high tide line (MHHW) | Flood level above low tide (MLLW) | |
| **Advisory** | less than 1.00 meter | less than 3.3 feet | none (less than 0 feet) | 0 – 6 feet | **Level 1:** Appendix B, Page B-4 – B-8 |
| **Advisory or Warning** | 1.00 – 1.50 meters | 3.3 – 5.0 feet | 0 – 1.7 feet | 6 – 7.7 feet | **Level 2:** Appendix B, Page B-9 – B-13 |
| **Warning** | 1.50 – 2.50 meters | 5.0 – 8.2 feet | 1.7 – 5.0 feet | 7.7 to 11.0 feet | **Level 3:** Appendix B, Page B-14 – B-20 |
| **Warning** | over 2.50 meters | over 8.2 feet | over 5.0 feet | over 11 feet | **Maximum:** Appendix B, Page B-21 – B-27 |




***NOTE FOR TABLE ABOVE:***
Use *only* the FASTER number provided by Cal OES or NWS-Monterey with the Elevation-Based Table above. The NTWC forecasted tsunami wave amplitude should not be used with this Table because it does not include tide, storms, or other factors that may increase flooding potential.

Source: CGS, Cal OES (2015). California Tsunami Evacuation Playbook - City of San Francisco, Playbooks 2015-SF-01-02.

## Sample Proclamation of Local Emergency – Tsunami Warning

**(For Maximum Evacuation Level)**

WHEREAS, California Government Code Sections 8550 et seq., San Francisco Charter Section 3.100, and Chapter 7 of the San Francisco Administrative Code empower the Mayor to proclaim the existence of a local emergency, subject to ratification by the Board of Supervisors, when the City and County is affected or threatened by a natural disaster or other emergency posing conditions of extreme peril to life or property; and,

WHEREAS, Conditions of extreme peril to the safety of persons and property have arisen within the City and County of San Francisco, caused by the Tsunami which occurred on _____ [date], and at which time the Board of Supervisors was not in session; and,

WHEREAS, These conditions of extreme peril require the proclamation of the existence of a local emergency,

NOW, THEREFORE, I, _____, Mayor of the City and County of San Francisco, do hereby proclaim the existence of a local emergency within the City and County, to be effective immediately; and,

IT IS FURTHER PROCLAIMED AND ORDERED that during this emergency, the government of the City and County of San Francisco shall be organized, as needed, under the Incident Command System (ICS).

Dated: _____ By:_____

Print Name_____

Mayor of the City and County of San Francisco
City Hall, Room 200
1 Dr. Carlton B. Goodlett Place
San Francisco, CA 94102

## Mandatory Evacuation Order -- Tsunami Incident

**CITY AND COUNTY OF SAN FRANCISCO**

**MANDATORY TSUNAMI EVACUATION ORDER (For Maximum Evacuation Level)**

The City and County of San Francisco, has proclaimed a Local Emergency under the California Emergency Services Act as a result of the Tsunami generated by the _____ [Name of Earthquake], which is expected to cause flooding in shoreline areas of San Francisco beginning at approximately _____ [time].

Therefore:

1. The Mayor hereby orders the IMMEDIATE MANDATORY EVACUATION of all persons located within three blocks (one quarter mile) of the Pacific Ocean, within five blocks (three-tenths of a mile) of San Francisco Bay, and all persons located on Treasure Island. Anyone in these areas is ORDERED TO MOVE IMMEDIATELY AT LEAST ONE-HALF MILE INLAND, OR AT LEAST 30 FEET ABOVE SEA LEVEL. People on Treasure Island are asked to go IMMEDIATELY to _____ [designated TI assembly areas] for assistance in leaving the Island.
2. Persons located in the Tsunami Evacuation Area are asked to evacuate on foot if possible.
3. If you cannot self-evacuate and need evacuation assistance, call 911.
4. Those evacuating should bring only essential items: water, medications, any special food you require, a change of clothing, toiletries, baby supplies, money, and valuable papers.
5. Evacuees may bring their service animal, support animal, or household pet, but must place their animals on a leash or in a cage or carrier.
6. Local Law Enforcement Agencies will restrict re-entry into the Tsunami Evacuation Area until it is determined safe to re-enter.
7. STAY OUT OF THE EVACUATION AREA UNTIL THE CITY ISSUES AN OFFICIAL NOTICE THAT IT IS SAFE TO RETURN. San Francisco Officials will advise the public of the lifting of this Order when public safety is assured.
8. VIOLATION OF THIS ORDER IS A MISDEMEANOR PUNISHABLE BY A FINE OF UP TO $1000, BY IMPRISONMENT FOR UP TO SIX MONTHS, OR BOTH.
9. This order may be enforced by Officers from the San Francisco Police Department, with the assistance of the San Francisco Sheriff's Department, Parking Control Officers of the San Francisco Municipal Transportation Agency, the San Francisco Fire Department, the United States Park Police, and the California State Park Rangers. Police officers may use reasonable force if necessary to evacuate anyone in the Tsunami Evacuation Area to an area of safety.
10. During this emergency, local emergency officials are trying to save lives and preserve our city. Give them your full cooperation.

Date: _____ _____

Mayor of the City of San Francisco

## A-2 DEM Tsunami CCSF Alert Message Templates

## CCSF ALERT DRAFT LANGUAGE

**CCSF ALERT TEXT - LEVEL OF TSUNAMI DANGER IS BEING EVALUATED:**
The National Tsunami Warning Center is evaluating the likelihood of a tsunami affecting San Francisco as a result of the _____ [location] earthquake. Check your email for more information.

**CCSF ALERT EMAIL - LEVEL OF TSUNAMI DANGER IS BEING EVALUATED:**

Following the _____ Magnitude Earthquake located in _____ [location] at _____ [time of earthquake], on _____ [date], the National Tsunami Warning Center is evaluating the likelihood of a tsunami affecting the California Coast, including San Francisco. The San Francisco Department of Emergency Management (DEM) is monitoring the situation and will issue CCSF Alerts and public updates as soon as possible.

A tsunami is a series of powerful sea waves that can flood shoreline areas, causing great damage. Tsunamis may also kill or injure people caught in the waves. Tsunami waves can last for many hours; the first wave is almost never the largest. Tsunamis also may cause powerful, unpredictable currents off beaches and in marinas and harbors, making it dangerous to be in those areas.

Again, the NTWC is evaluating whether a tsunami may affect San Francisco. DEM will issue updates when more information is available.

**TSUNAMI WATCH CCSF ALERT**

**CCSF ALERT TEXT - TSUNAMI WATCH:**
National Tsunami Warning Center has issued a Tsunami Watch that includes San Francisco. Open your DOC. THERE IS A POTENTIAL NEED TO EVACUATE. Check your email for more information.

**CCSF ALERT EMAIL - TSUNAMI WATCH:**

Following the _____ Magnitude Earthquake located in _____ [location] at _____ [time of earthquake] on _____ [date], the National Tsunami Warning Center has issued a Tsunami Watch that includes San Francisco. A Tsunami Watch means the danger level is not yet known. The NTWC may upgrade the Watch to a Warning or Advisory.

The San Francisco Department of Emergency Management is activating the City's Emergency Operations Center, and will send out updated CCSFAlerts as soon as further information is available. In the meantime, the Department of Emergency Management requests that your department or organization take the following steps:

- Remain alert for more information.
- Open your Department Operations Center, if applicable.
- Assess your organization's staffing levels and recall additional staff if needed.
- Prepare to move personnel and other resources located in the Tsunami Inundation Area at least one-half mile inland or to higher ground (i.e., 30 feet or more in elevation).
- Prepare to safeguard facilities or property in the Tsunami Inundation Area that cannot be moved.
- Prepare to stage response personnel and equipment outside the Tsunami Inundation Area in preparation for re-entry and response.

A tsunami is a series of powerful sea waves that can flood shoreline areas, causing great damage. Tsunamis may also kill or injure people caught in the waves. Tsunami waves can last for many hours; the first wave is almost never the largest. Tsunamis also may cause powerful, unpredictable currents off beaches and in marinas and harbors, making it dangerous to be in those areas.

Again, a Tsunami Watch has been issued that includes San Francisco. Please take the steps listed above. The Department of Emergency Management will send out additional CCSFAlerts and public updates when more information is available.

**TSUNAMI WATCH CANCELLED CCSF ALERT**

**CCSF ALERT TEXT - TSUNAMI WATCH CANCELLED:**
National Tsunami Warning Center has CANCELLED the Tsunami Watch for San Francisco. Check your email for more information.

**CCSF ALERT EMAIL - TSUNAMI WATCH CANCELLED:**

The National Tsunami Warning Center has cancelled the Tsunami Watch for San Francisco. [Add if included in NTWC cancellation message: Some shoreline areas, marinas, and harbors may see dangerous, unpredictable currents. City personnel and the public are advised to avoid going in the water for the next 12 hours.]

The San Francisco Department of Emergency Management will continue to monitor the situation and will send out additional CCSFAlerts and public updates if needed.

## TSUNAMI ADVISORY CCSF ALERT (LESS THAN FOUR HOURS UNTIL ARRIVAL - LEVEL 1 EVACUATION)

**CCSF ALERT TEXT - TSUNAMI ADVISORY (LESS THAN FOUR HOURS UNTIL ARRIVAL - LEVEL 1 EVACUATION):**
National Tsunami Warning Center has issued a Tsunami Advisory that includes San Francisco. Open your DOC. CCSF IS EVACUATING BEACHES, HARBOR AND MARINA DOCKS, AND PIERS. Check your email for more information NOW.

**CCSF ALERT EMAIL - ADVISORY (LESS THAN FOUR HOURS UNTIL ARRIVAL - LEVEL 1 EVACUATION)**

Following the _____ Magnitude Earthquake located in _____ [location] at _____ [time of earthquake] on _____ [date], the National Tsunami Warning Center has issued a Tsunami Advisory that includes San Francisco. A Tsunami Advisory means a tsunami with the potential to generate strong, currents dangerous to those in or near the water is expected to impact San Francisco shoreline areas. Dangerous currents are expected to begin at _____ [ETA from NTWC], and may last for many hours.

The San Francisco Department of Emergency Management is activating the City's Emergency Operations Center, and will send out updated CCSFAlerts as soon as further information is available. In the meantime, the Department of Emergency Management requests that your department or organization take the following steps:

- If time permits, Law Enforcement and Fire personnel are asked to direct people out of the Level 1 Evacuation area, which includes beaches, harbor and marina docks, and finger piers. A map and description of the Level 1 Tsunami Evacuation area are attached. A Level 1 Tsunami Evacuation Area map is also available at www.sf72.org.
- If you are responsible for tenants or others located in shoreline areas of San Francisco, direct them to evacuate beaches, harbor and marina docks, and finger piers.
- Move your personnel and resources located on beaches, harbor and marina docks, and finger piers inland to a safe location away from these shoreline areas.
- Open your Department Operations Center, if applicable.
- Assess your organization's staffing levels and recall additional staff if needed.
- If time permits, safeguard facilities or property on beaches, harbor and marina docks, and finger piers that cannot be moved.
- FOR THEIR SAFETY, CCSF PERSONNEL MUST BE AWAY FROM BEACHES, HARBOR AND MARINA DOCKS, AND FINGER PIERS NO LATER THAN _____ [time 30 minutes before expected tsunami arrival].
- STAY OUT OF EVACUATED AREAS UNTIL THE CITY ISSUES AN OFFICIAL NOTICE THAT IT IS SAFE TO RETURN.

- If necessary, stage response personnel and equipment close to but away from shorelines areas until the city issues an official notice that it is safe for personnel to return to these areas.
- Remain alert for more information.

A tsunami is a series of powerful sea waves that can flood shoreline areas, causing great damage. Tsunamis may also kill or injure people caught in the waves. Tsunami waves can last for many hours. The first wave is almost never the largest. Tsunamis also may cause powerful, unpredictable currents off beaches and in marinas and harbors, making it dangerous to be in those areas.

Again, a Tsunami Advisory has been issued that includes San Francisco. Please take the steps listed above. The Department of Emergency Management will send out additional CCSFAlerts and public updates as soon as more information is available.

## TSUNAMI ADVISORY CCSF ALERT (MORE THAN FOUR HOURS UNTIL ARRIVAL - EVACUATION EVALUATION IN PROCESS)

### CCSF ALERT TEXT - TSUNAMI ADVISORY (MORE THAN FOUR HOURS UNTIL ARRIVAL - EVACUATION EVALUATION IN PROCESS):

National Tsunami Warning Center has issued a Tsunami Advisory that includes San Francisco. Open your DOC. THERE IS A POTENTIAL NEED TO EVACUATE BEACHES, HARBOR AND MARINA DOCKS, AND PIERS. Check your email for more information.

### CCSF ALERT EMAIL - TSUNAMI ADVISORY (MORE THAN FOUR HOURS UNTIL ARRIVAL - EVACUATION EVALUATION IN PROCESS):

Following the _____ Magnitude Earthquake located in _____ [location] at _____ [time of earthquake] on _____ [date], the National Tsunami Warning Center has issued a Tsunami Advisory that includes San Francisco. A Tsunami Advisory means a tsunami with the potential to generate strong currents or waves dangerous to those in or near the water is expected to impact San Francisco shoreline areas. Dangerous currents are expected to begin at _____ [ETA from NTWC], and may last for many hours.

The San Francisco Department of Emergency Management (DEM) is activating the City's Emergency Operations Center, and is assessing whether evacuation of shoreline areas is necessary. DEM will send out updated CCSFAlerts as soon as further information is available. In the meantime, DEM requests that your department or organization take the following steps:

- Remain alert for more information.
- Open your Department Operations Center, if applicable.
- Assess your organization's staffing levels and recall additional staff if needed.

A tsunami is a series of powerful sea waves that can flood shoreline areas, causing great damage. Tsunamis may also kill or injure people caught in the waves. Tsunami waves can last for many hours; the first wave is almost never the largest. Tsunamis also may cause powerful, unpredictable currents off beaches and in marinas and harbors, making it dangerous to be in those areas.

Again, a Tsunami Advisory has been issued that includes San Francisco. Please take the steps listed above. DEM will send out additional CCSFAlerts and public updates as soon as more information is available.

**TSUNAMI ADVISORY CCSF ALERT (MORE THAN FOUR HOURS UNTIL ARRIVAL - MANDATORY EVACUATION ORDERED)**

**CCSF ALERT TEXT - TSUNAMI ADVISORY (MORE THAN FOUR HOURS UNTIL ARRIVAL - EVACUATION ORDERED):**
National Tsunami Warning Center has issued a Tsunami Advisory that includes San Francisco. The Mayor has ordered Mandatory Evacuation of shoreline areas. Open your DOC. CCSF IS EVACUATING BEACHES, HARBOR AND MARINA DOCKS, AND PIERS. Check your email for more information.

**CCSF ALERT EMAIL - TSUNAMI ADVISORY (MORE THAN FOUR HOURS UNTIL ARRIVAL - EVACUATION ORDERED):**

Following the _____ Magnitude Earthquake located in _____ [location] at _____ [time of earthquake] on _____ [date], the National Tsunami Warning Center has issued a Tsunami Advisory that includes San Francisco. A Tsunami Advisory means a tsunami with the potential to generate strong currents dangerous to those in or near the water is expected to impact San Francisco shoreline areas. Dangerous currents are expected to begin at _____ [ETA from NTWC], and may last for many hours.

The Mayor of San Francisco has issued a Local Emergency Proclamation and a Mandatory Evacuation Order for San Francisco beaches, harbor and marina docks, and finger piers. The San Francisco Department of Emergency Management (DEM) is activating the City's Emergency Operations Center, and requests that your department or organization take the following immediate steps:

- Law Enforcement and Fire personnel are asked to begin evacuating people out of the Level 1 Evacuation area, which includes beaches, harbor and marina docks, and finger piers. A map and description of the Level 1 Tsunami Evacuation area are attached. A Level 1 Tsunami Evacuation Area map is also available at www.sf72.org.
- If you are responsible for tenants or others located in shoreline areas of San Francisco, direct them to move away from beaches, harbor and marina docks, and finger piers.
- Move personnel and resources located on beaches, harbor and marina docks, and finger piers to a safe location away from these areas.
- Open your Department Operations Center, if applicable.
- Assess your organization's staffing levels and recall additional staff if needed.
- FOR THEIR SAFETY, CCSF PERSONNEL MUST BE OUTSIDE EVACUATED AREAS NO LATER THAN _____ [time 30 minutes before expected tsunami arrival].
- STAY OUT OF EVACUATED AREAS UNTIL THE CITY ISSUES AN OFFICIAL NOTICE THAT IT IS SAFE TO RETURN.

- If necessary, prepare to stage response personnel and equipment away from evacuated beaches, harbor and marina docks, and finger piers until the city issues an official notice that it is safe for personnel to return.
- Remain alert for more information.

A tsunami is a series of powerful sea waves that can flood shoreline areas, causing great damage. Tsunamis may also kill or injure people caught in the waves. Tsunami waves can last for many hours; the first wave is almost never the largest. Tsunamis also may cause powerful, unpredictable currents off beaches and in marinas and harbors, making it dangerous to be in those areas.

Again, a Tsunami Advisory has been issued that includes San Francisco. Please take the steps listed above. DEM will send out additional CCSFAlerts when further information is available.

**TSUNAMI ADVISORY CANCELLED CCSF ALERT**

**CCSF ALERT TEXT - TSUNAMI ADVISORY CANCELLED:**
National Tsunami Warning Center has CANCELLED the Tsunami Advisory for San Francisco. Check your email for more information.

**CCSF ALERT EMAIL - TSUNAMI ADVISORY CANCELLED:**

The National Tsunami Warning Center has cancelled the Tsunami Advisory for San Francisco. [Add if included in NTWC cancellation message: Some shoreline areas, marinas, and harbors may see dangerous, unpredictable currents. City personnel and the public are advised to avoid going in the water for the next 12 hours.]

The San Francisco Department of Emergency Management will continue to monitor the situation and will send out additional CCSFAlerts and public updates if needed.

## TSUNAMI WARNING CCSF ALERT (LESS THAN FOUR HOURS UNTIL ARRIVAL - MAXIMUM EVACUATION)

**CCSF ALERT TEXT - TSUNAMI WARNING (LESS THAN FOUR HOURS UNTIL ARRIVAL - MAXIMUM EVACUATION):**

National Tsunami Warning Center has issued a Tsunami Warning that includes San Francisco. The Mayor has ordered Mandatory Evacuation of shoreline areas. Open your DOC. CCSF IS EVACUATING MAXIMUM TSUNAMI EVACUATION AREA. Check your email for further information NOW.

**CCSF ALERT EMAIL - TSUNAMI WARNING (LESS THAN FOUR HOURS UNTIL ARRIVAL - MAXIMUM EVACUATION):**

Following the _____ Magnitude Earthquake located in _____ [location] at _____ [time of earthquake] on _____ [date], the National Tsunami Warning Center has issued a Tsunami Warning that includes San Francisco. A Tsunami Warning means a tsunami with the potential to cause dangerous flooding is expected to impact San Francisco shoreline areas. Tsunami waves are expected to begin reaching San Francisco at _____ [ETA from NTWC], and may last for many hours.

The San Francisco Department of Emergency Management (DEM) is activating the City's Emergency Operations Center, and is seeking a Mandatory Evacuation Order from the Mayor's Office. DEM will send out updated CCSFAlerts as soon as further information is available. In the meantime, DEM requests that your department or organization ***immediately take the following steps:***

- Move personnel and resources located in the Maximum Tsunami Evacuation Area to a location at least one-half mile inland or at least 30 feet in elevation. A map and description of the Maximum Tsunami Evacuation area are attached. A map is also available at www.sf72.org.
- If you are responsible for tenants or others located in the Maximum Tsunami Evacuation Area, direct them to move immediately to a location at least one-half mile inland or at least 30 feet in elevation.
- Open your Department Operations Center, if applicable.
- Assess your organization's staffing levels and recall additional staff if needed.
- FOR THEIR SAFETY, CCSF PERSONNEL MUST BE OUTSIDE THE MAXIMUM EVACUATION AREA NO LATER THAN _____ [time 30 minutes before expected tsunami arrival].
- STAY OUT OF EVACUATED AREAS UNTIL THE CITY ISSUES AN OFFICIAL NOTICE THAT IT IS SAFE TO RETURN.
- If necessary, stage response personnel and equipment in safe areas outside the Maximum Tsunami Evacuation Area until the city issues an official notice that it is safe for personnel to return.

- Remain alert for more information.

A tsunami is a series of powerful sea waves that can flood shoreline areas, causing great damage. Tsunamis may also kill or injure people caught in the waves. Tsunami waves can last for many hours; the first wave is almost never the largest. Tsunamis also may cause powerful, unpredictable currents off beaches and in marinas and harbors, making it dangerous to be in those areas.

Again, a Tsunami Warning has been issued that includes San Francisco. Please take the steps listed above. The Department of Emergency Management will send out additional CCSFAlerts when further information is available.

**TSUNAMI WARNING CCSF ALERT (MORE THAN FOUR HOURS UNTIL ARRIVAL - Evacuation Evaluation in process)**

**CCSF ALERT TEXT - TSUNAMI WARNING (MORE THAN FOUR HOURS UNTIL ARRIVAL - Evacuation Level Evaluation in process):**
National Tsunami Warning Center has issued a Tsunami Warning that includes San Francisco. DEM is assessing the need for evacuation. Open your DOC. THERE IS A POTENTIAL NEED TO EVACUATE. Check your email for further information.

**CCSF ALERT EMAIL - TSUNAMI WARNING (MORE THAN FOUR HOURS UNTIL ARRIVAL - Evacuation Evaluation in process):**

Following the _____ Magnitude Earthquake located in _____ [location] at _____ [time of earthquake] on _____ [date], the National Tsunami Warning Center has issued a Tsunami Warning that includes San Francisco. A Tsunami Warning means a tsunami with the potential to cause dangerous flooding is expected to impact San Francisco shoreline areas. Tsunami waves are expected to begin reaching San Francisco at _____ [ETA from NTWC], and may last for many hours.

The San Francisco Department of Emergency Management (DEM) is activating the City's Emergency Operations Center, and is assessing whether evacuation of shoreline areas is necessary. DEM will send out additional CCSFAlerts as soon as more information is available. In the meantime, your department or organization should ***immediately take the following steps:***

- Remain alert for more information.
- Open your Department Operations Center, if applicable.
- Assess your organization's staffing levels and recall additional staff if needed.

A tsunami is a series of powerful sea waves that can flood shoreline areas, causing great damage. Tsunamis may also kill or injure people caught in the waves. Tsunami waves can last for many hours; the first wave is almost never the largest. Tsunamis also may cause powerful, unpredictable currents off beaches and in marinas and harbors, making it dangerous to be in those areas.

Again, a Tsunami Warning has been issued that includes San Francisco. Please take the steps listed above. DEM will send out additional CCSFAlerts when further information is available.

**TSUNAMI WARNING CCSF ALERT (MORE THAN FOUR HOURS UNTIL ARRIVAL - Mandatory Evacuation Order Issued)**

**CCSF ALERT TEXT - TSUNAMI WARNING (MORE THAN FOUR HOURS UNTIL ARRIVAL - Mandatory Evacuation Order Issued):**
National Tsunami Warning Center has issued a Tsunami Warning that includes San Francisco. The Mayor has ordered Mandatory Evacuation of shoreline areas. Open your DOC. MAYOR HAS ORDERED A _____ [LEVEL 2/LEVEL 3/MAXIMUM] TSUNAMI EVACUATION. Check your email for further information NOW.

**CCSF ALERT EMAIL - TSUNAMI WARNING (MORE THAN FOUR HOURS UNTIL ARRIVAL - Mandatory Evacuation Order Issued):**
Following the _____ Magnitude Earthquake located in _____ [location] at _____ [time of earthquake] on _____ [date], the National Tsunami Warning Center has issued a Tsunami Warning that includes San Francisco. A Tsunami Warning means that a tsunami with the potential to cause dangerous flooding is expected to impact San Francisco shoreline areas. Tsunami waves are expected to begin reaching San Francisco at _____ [ETA from NTWC], and may last for many hours.

The Mayor of San Francisco has issued a Local Emergency Proclamation and a ***Mandatory Evacuation Order*** to evacuate San Francisco shoreline areas in a Level _____ [2/3/Maximum] Evacuation. The San Francisco Department of Emergency Management (DEM) is activating the City's Emergency Operations Center, and requests that your department or organization ***immediately take the following steps:***

- Law Enforcement and Fire personnel are asked to begin evacuating people out of the Level _____ [2/3/Maximum] Evacuation area. A map of the Level _____ [2/3/Maximum] Tsunami Evacuation area and a description of the area to be evacuated are attached. A map of the Level _____ [2/3/Maximum] Tsunami Evacuation Area is also available at www.sf72.org.
- If you are responsible for tenants or others located within the Level _____ [2/3/Maximum] Evacuation Area, direct them to move immediately to a location at least one-half mile inland or at least 30 feet in elevation.
- Move personnel and other resources located within the Level _____ [2/3/Maximum] Tsunami Evacuation Area to a safe location away from the Evacuation Area.
- Open your Department Operations Center, if applicable.
- Assess your organization's staffing levels and recall additional staff if needed.
- FOR THEIR SAFETY, CCSF PERSONNEL MUST BE OUTSIDE THE TSUNAMI EVACUATION AREA NO LATER THAN _____ [time 30 minutes before expected tsunami arrival].
- STAY OUT OF THE TSUNAMI EVACUATION AREA UNTIL THE CITY ISSUES AN OFFICIAL NOTICE THAT IT IS SAFE TO RETURN.

- If necessary, prepare to stage response personnel and equipment outside the Tsunami Evacuation Area until the city issues an official notice that it is safe for personnel to return.
- Remain alert for more information.

A tsunami is a series of powerful sea waves that can flood shoreline areas, causing great damage. Tsunamis may also kill or injure people caught in the waves. Tsunami waves can last for many hours; the first wave is almost never the largest. Tsunamis also may cause powerful, unpredictable currents off beaches and in marinas and harbors, making it dangerous to be in those areas.

Again, a Tsunami Warning has been issued that includes San Francisco. Please take the steps listed above. DEM will send out additional CCSFAlerts when further information is available.

**TSUNAMI WARNING CANCELLED - NO INUNDATION - NO ADVISORY ISSUED - CCSF ALERT**

**CCSF ALERT TEXT - TSUNAMI WARNING CANCELLED - NO ADVISORY ISSUED:**
National Tsunami Warning Center has CANCELLED the Tsunami Warning for San Francisco. Check your email for more information.

**CCSF ALERT EMAIL - TSUNAMI WARNING CANCELLED - NO ADVISORY ISSUED:**

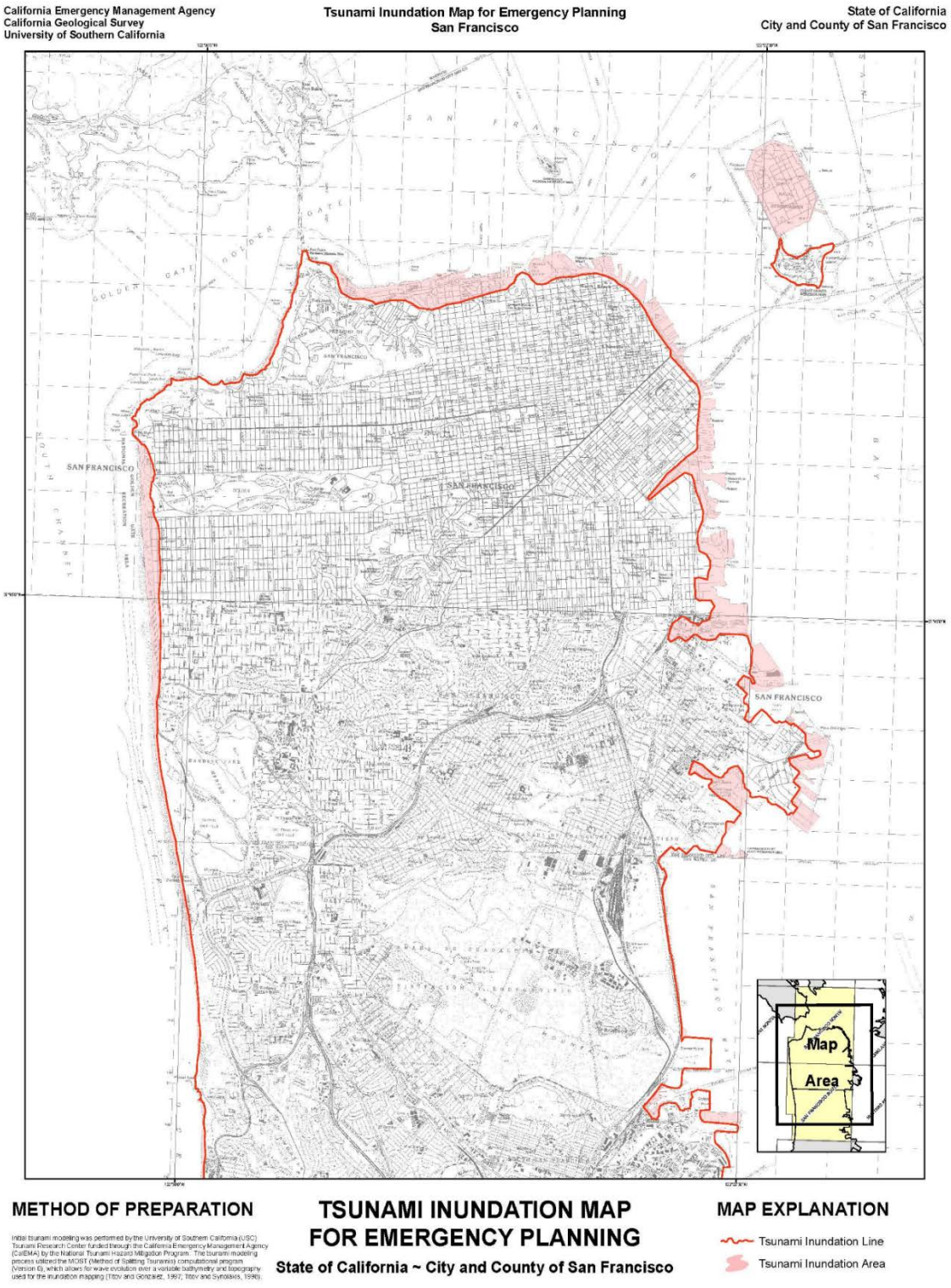
The National Tsunami Warning Center has cancelled the Tsunami Warning for San Francisco. [Add if included in NTWC cancellation message: A tsunami was generated but does not pose a threat to San Francisco. Shoreline areas, marinas, and harbors may see small sea level changes and dangerous, unpredictable currents. City personnel and the public are advised to avoid going in the water for the next 12 hours.]

The San Francisco Department of Emergency Management will continue to monitor the situation and will send out additional CCSFAlerts and public updates if needed.

# Appendix B: Tsunami Maps and Evacuation Level Descriptions

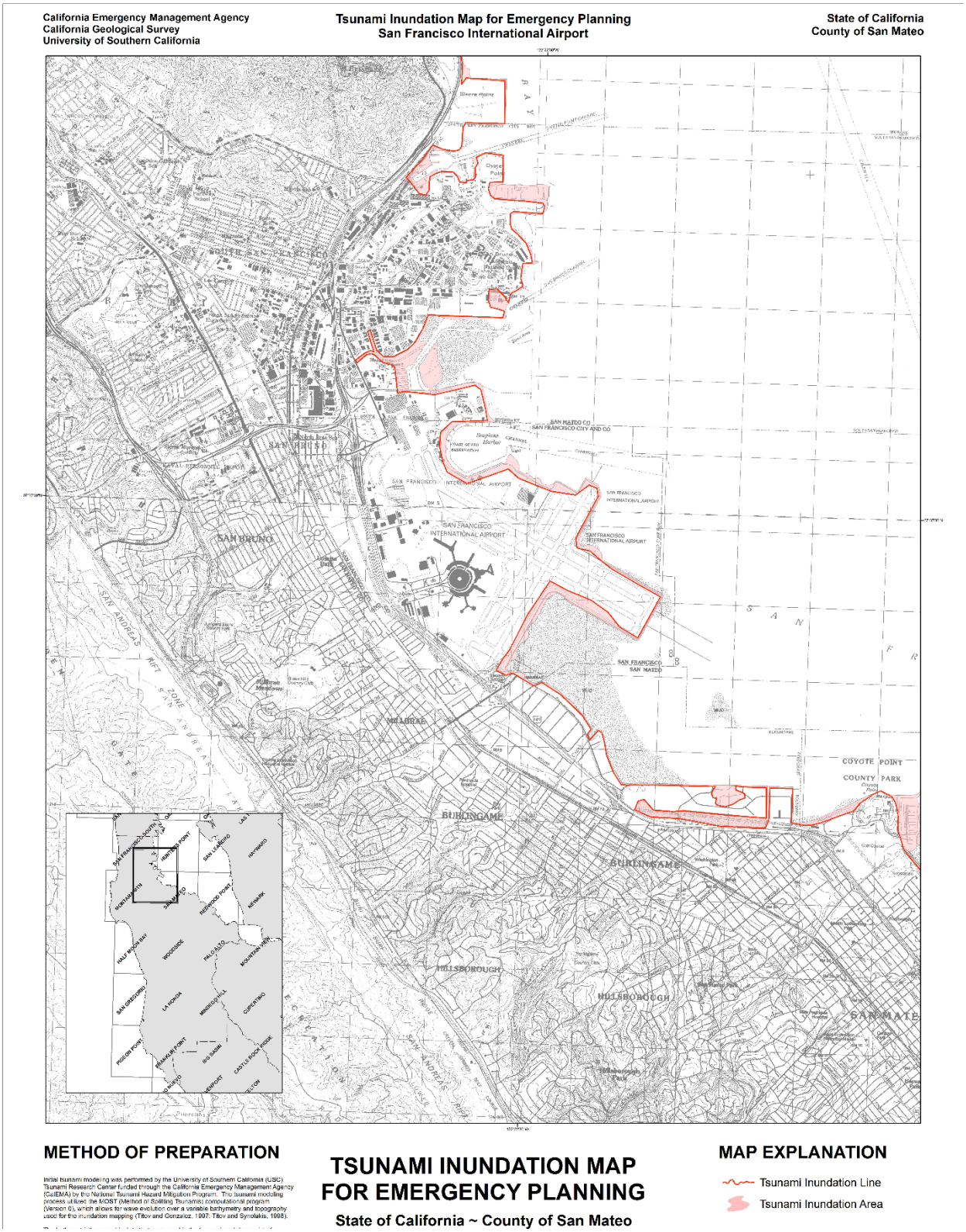
NOTE: Electronic versions of tsunami evacuation level maps in Appendix B are available at http://arcg.is/1CUHWOD. During a distant-source tsunami incident, they will also be made available on Basecamp at https://cgstsunamidb.basecamphq.com/login.

# B-1 State Tsunami Inundation Map – San Francisco Overview




Source: Cal OES, CGS, USC. Retrieved from http://www.conservation.ca.gov/cgs/geologic_hazards/Tsunami/Inundation_Maps/SanFrancisco/Pages/SanFrancisco.aspx

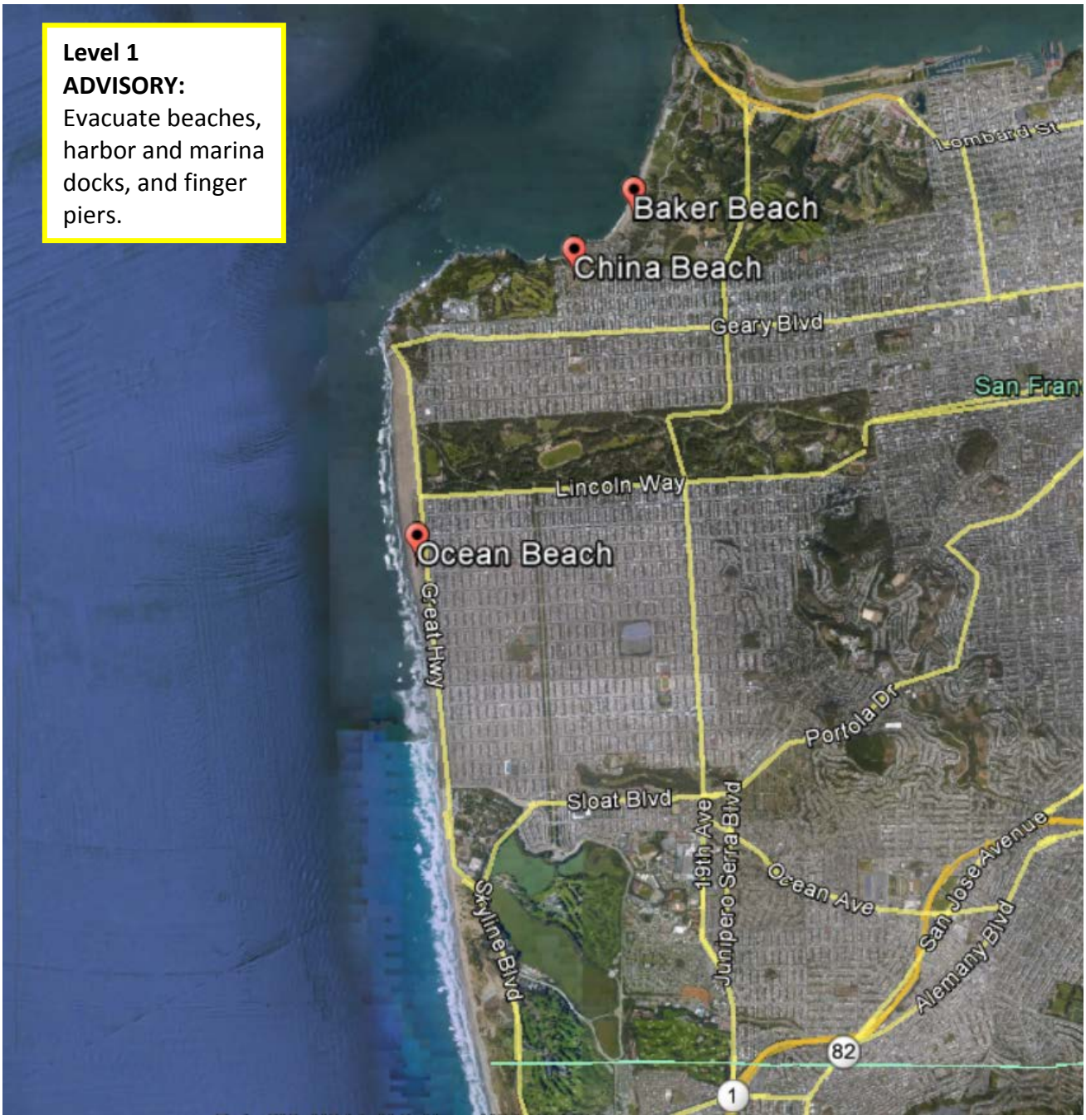
# B-2 State Tsunami Inundation Map – San Francisco International Airport




Source: Cal OES, CGS, USC. Retrieved from http://www.conservation.ca.gov/cgs/geologic_hazards/Tsunami/Inundation_Maps/SanMateo/Pages/SanMateo.aspx

## B-3 Evacuation Level Descriptions and Maps

# Level 1 Evacuation Maps – CCSF West Pacific Ocean Side




Sources: Cal OES, CGS, NOAA-NWS, SFDEM, ESRI

# Level 1 Evacuation Maps – CCSF East, Bay-side and Islands

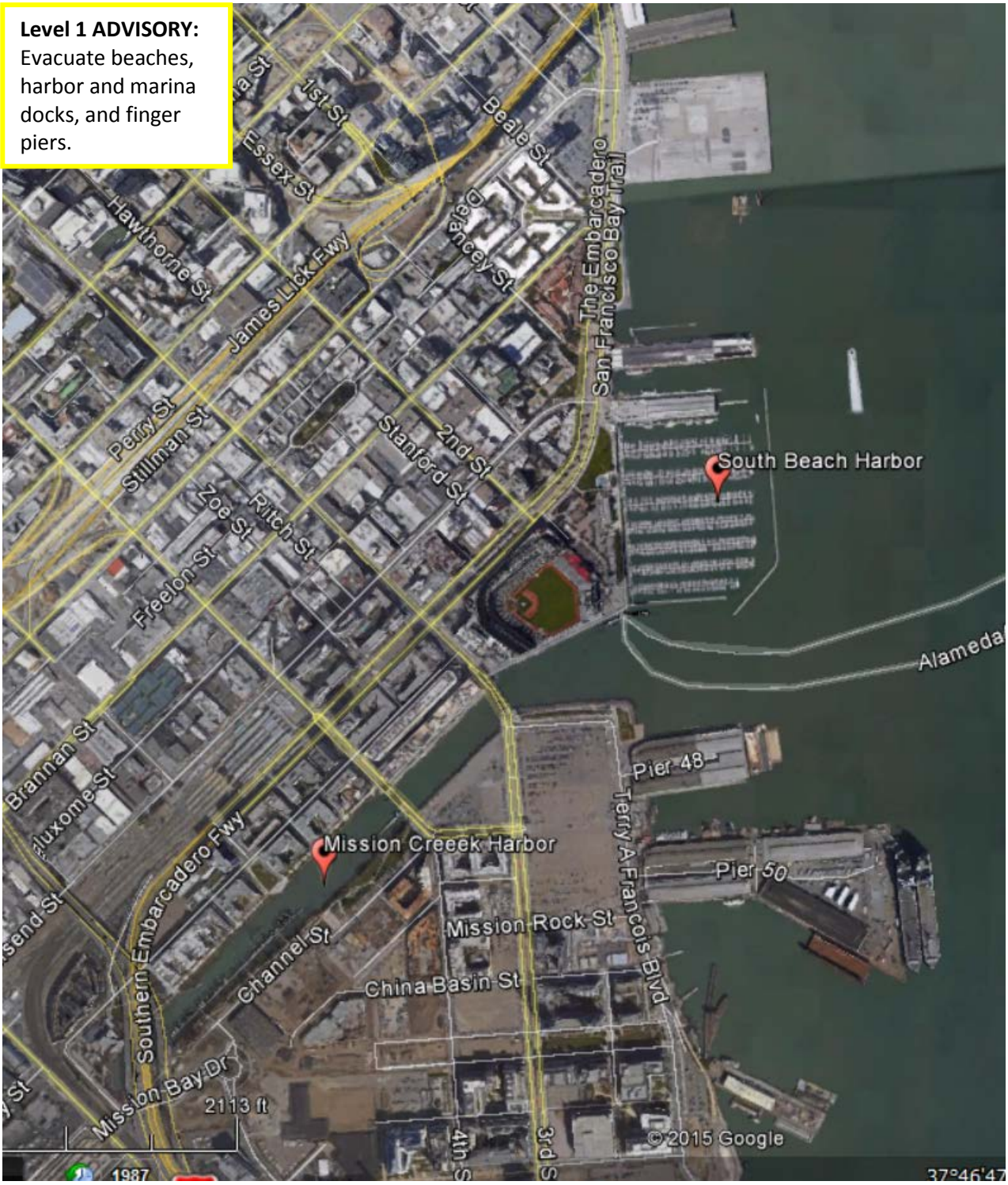
**Level 1 ADVISORY:** Evacuate beaches, harbor and marina docks, and finger piers.

**Level 1 ADVISORY:** Evacuate beaches, harbor and marina docks, and finger piers.

Sources: Cal OES, CGS, NOAA-NWS, SFDEM, ESRI (2015).

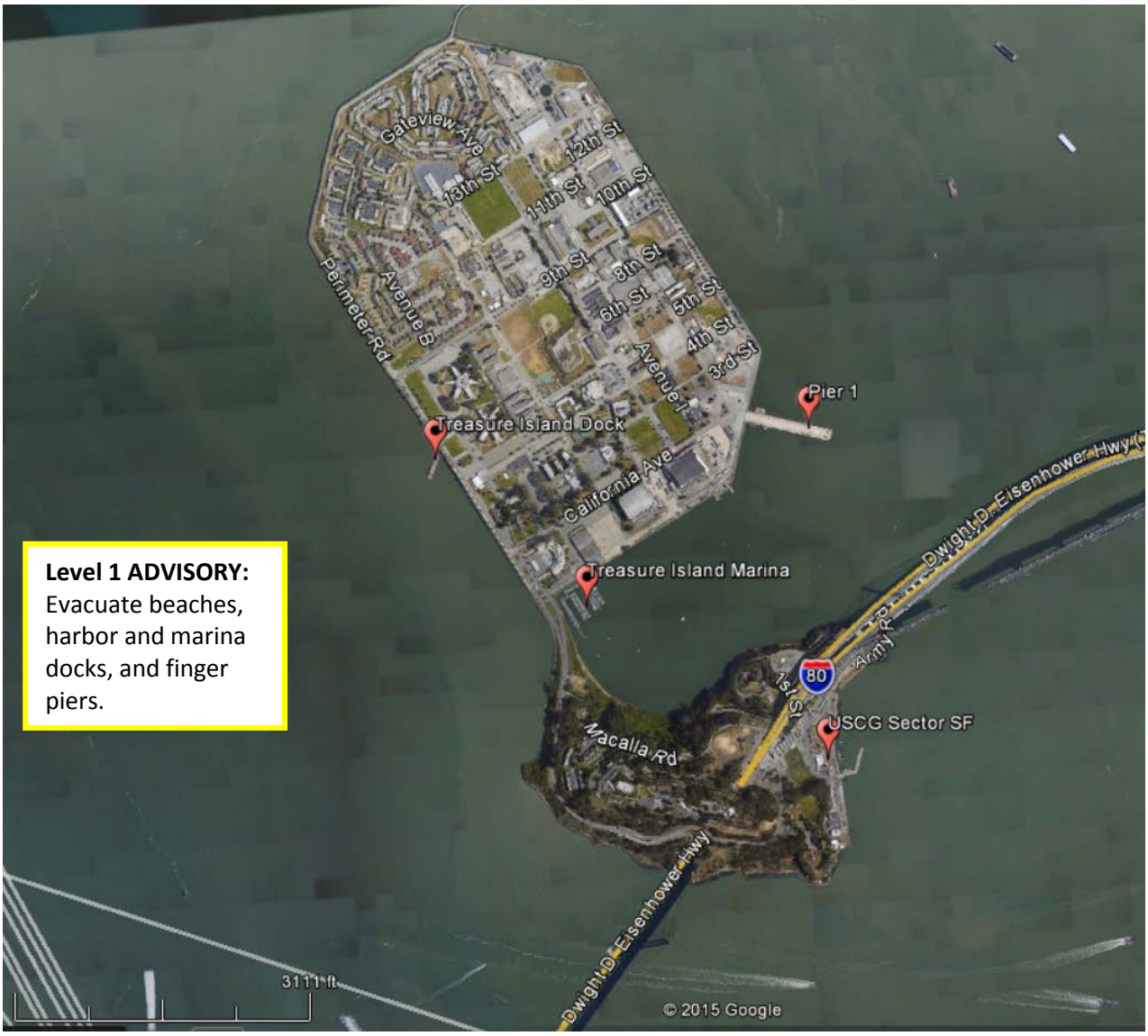
# Level 1 Evacuation Maps – CCSF East, Bay-side and Islands

**Level 1 ADVISORY:** Evacuate beaches, harbor and marina docks, and finger piers.




Sources: Cal OES, CGS, NOAA-NWS, SFDEM, ESRI (2015).

# Level 1 Evacuation Maps – CCSF East, Bay-side and Islands




Sources: Cal OES, CGS, NOAA-NWS, SFDEM, ESRI (2015).

# LEVEL 1 RECOMMENDED EVACUATION PLAN

**Applies to:**

NTWC Tsunami Alert Level = ADVISORY

State/NWS FASTER Tsunami Value = Less than 1.0 meter (3.3 feet)

**General Recommendations:**

- Strong currents and potential scour may be expected in marinas and harbors.
- Follow Tsunami Response Decision Tree guidance for Advisory-level tsunamis (see Appendix A, page A-8).

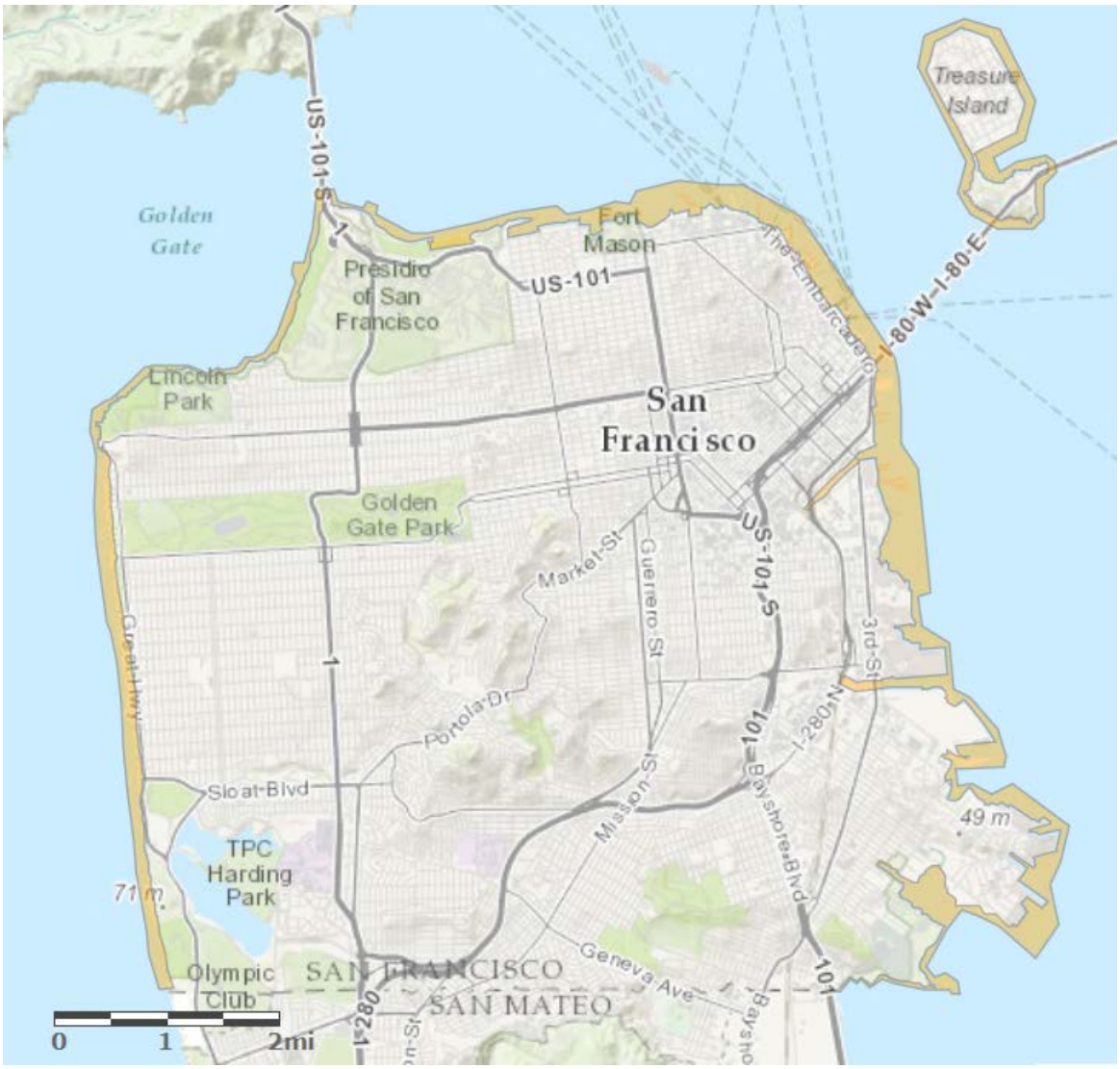
  Less than four hours to arrival: Evacuate beaches, marina and harbor docks, piers, and any vessels at these locations with people aboard.

  Over four hours to arrival: Review Elevation-Based Evacuation Table in Appendix A, page A-9 to determine need for evacuation of beaches, marina and harbor docks, piers, and occupied vessels in those locations.
- A digital file with evacuation maps and response instructions is available from the State for use at http://arcg.is/1CUHWOD.

**Specific Evacuation and Response Recommendations:**

- See SFDEM Duty Officer Action Sheet, pages 1 - 3.
- Areas to evacuate and close may include:
  - Ocean Beach (NPS-GGNRA)
  - Baker Beach and Marshall's Beach (NPS-GGNRA)
  - China Beach (NPS-GGNRA)
  - Crissy Field beach, Torpedo Wharf, and Coast Guard pier (The Presidio)
  - Alcatraz Island Ferry pier (NPS-GGNRA)
  - San Francisco Small Craft Harbor (includes West and East Harbors) (RPD)
  - Fort Mason pavilions (NPS-GGNRA)
  - Hyde Steet Harbor (Port)
  - Hyde Street Pier - San Francisco Maritime National Historic Park (NPS-GGNRA)
  - Aquatic Park Cove and Pier (NPS-GGNRA)
  - All waterfront finger piers (Port)
  - Pier 39 Marina (Port)
  - South Beach Harbor (Port)
  - Mission Creek Harbor (Port - Mission Creek Harbor Association)
  - Treasure Island Pier 1 (TIDA)
  - Treasure Isle Marina (TIDA)
  - Treasure Island Sailing Center (TIDA)

# Level 2 Evacuation Maps – City View



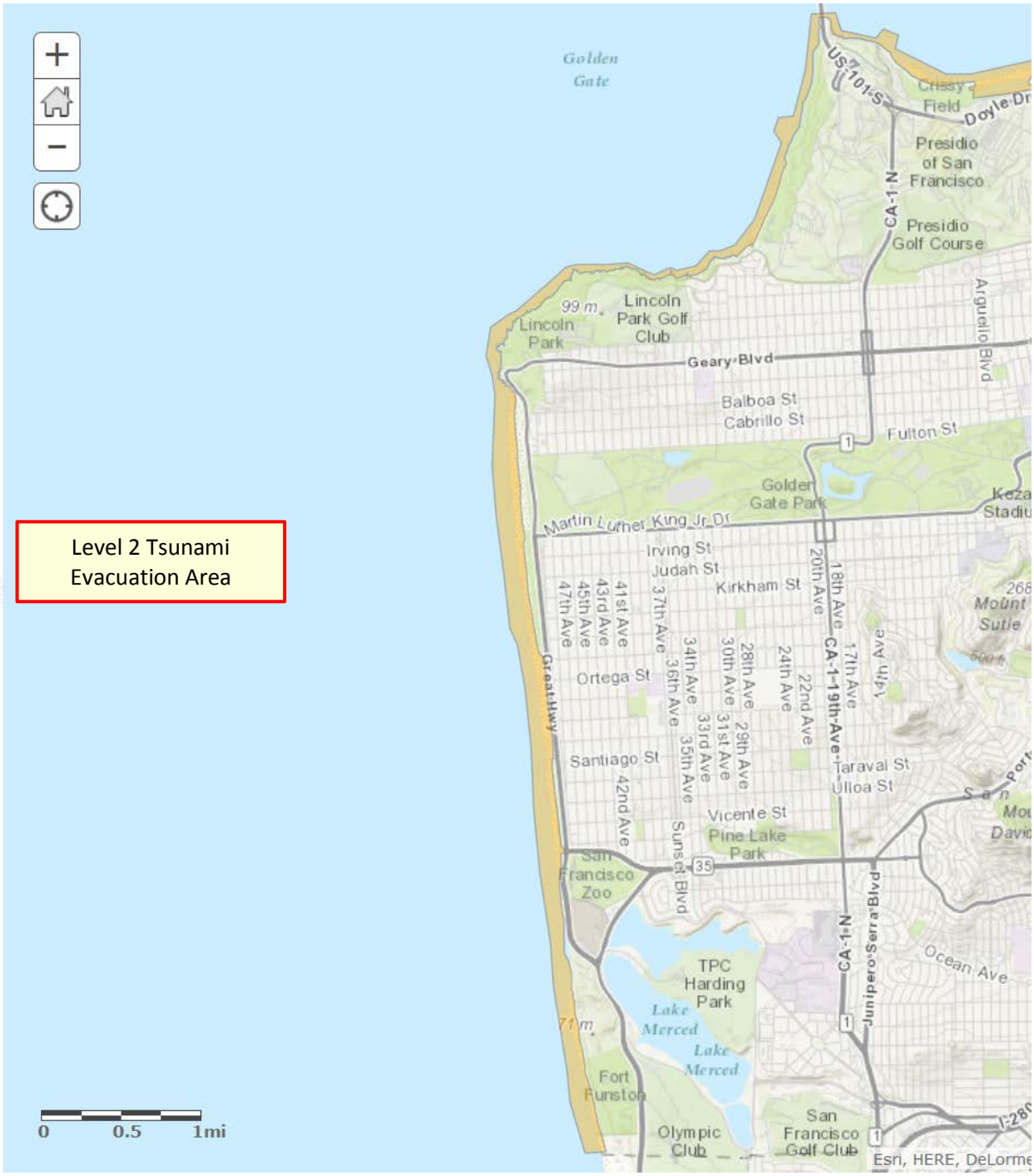

## San Francisco Tsunami Evacuation Level 2

**CCSF Tsunami Evacuation Level 2**

**Method of Preparation:**
This map was created by Cal OES, CGS, and NOAA by combining digital elevation models for the City and County of San Francisco with "worst-case" tsunami inundation modeling. The level lines typically follow roads for ease of implementation.

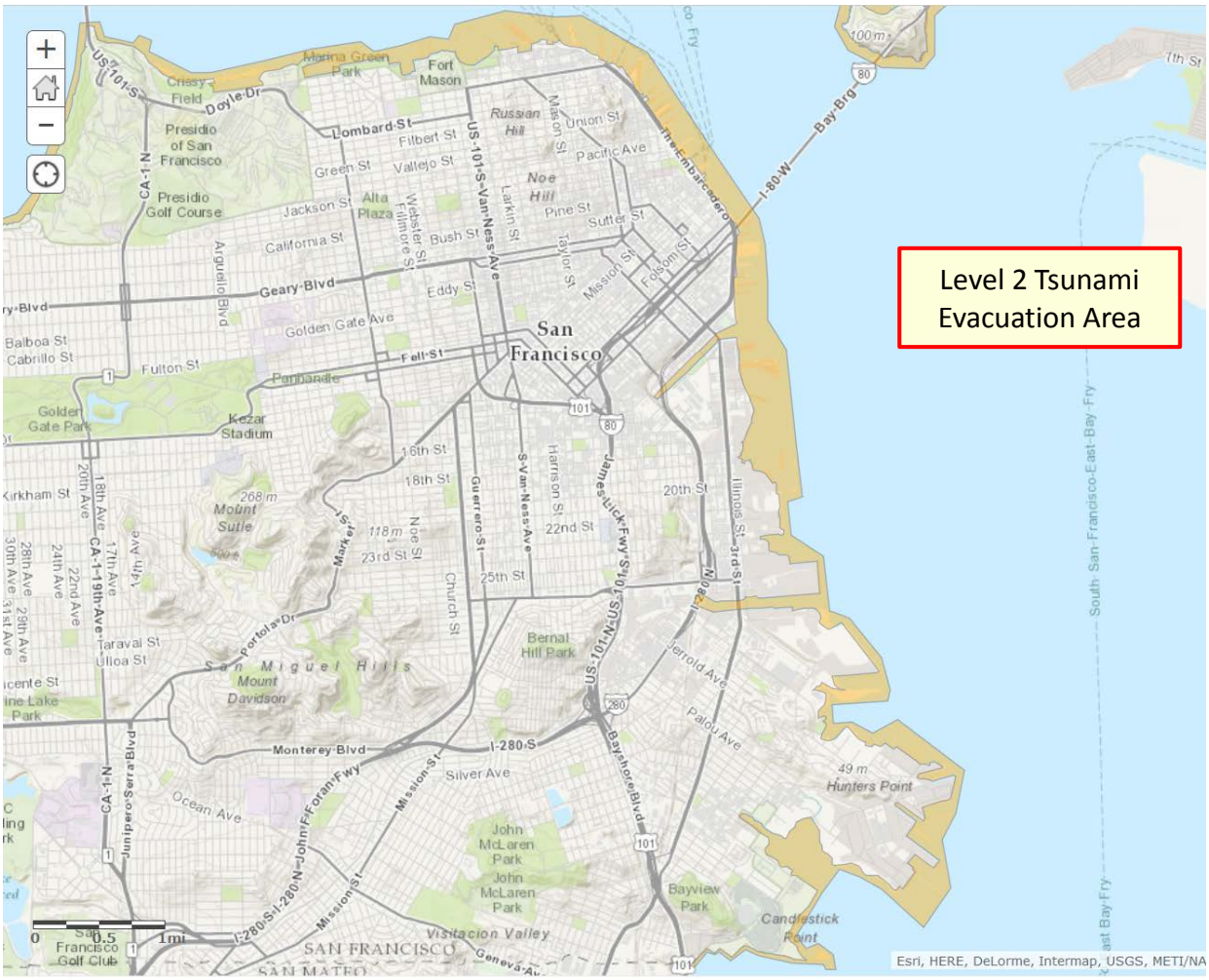
Sources: CGS, Cal OES, NOAA, SFDEM, ESRI.

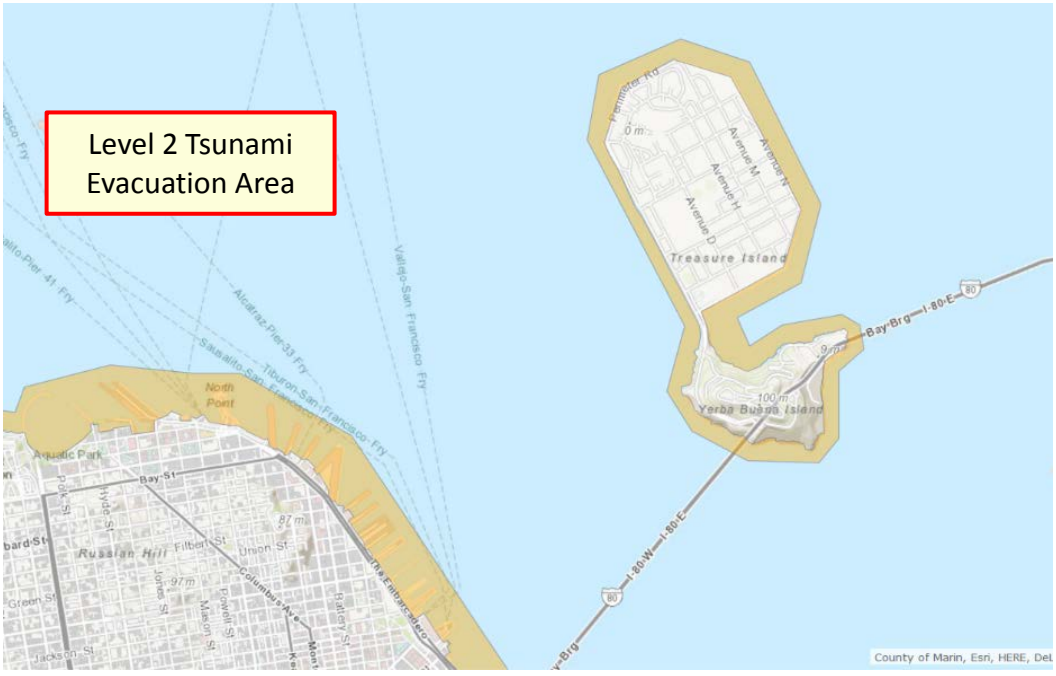
# Level 2 Evacuation Maps – CCSF West – Pacific Ocean side




Sources: Cal OES, CGS, NOAA-NWS, SFDEM, ESRI (2015).

# Level 2 Evacuation Maps – CCSF East, Bay-side and Islands




Sources: Cal OES, CGS, NOAA-NWS, SFDEM, ESRI (2015).

# LEVEL 2 RECOMMENDED EVACUATION PLAN

## Applies to:

NTWC Tsunami Alert Level = WARNING

State/NWS FASTER Tsunami Value = 1.0 meter (3.3 feet) to 1.5 meters (5.0 feet)

## General Instructions:

- Follow Tsunami Response Decision Tree guidance for Advisory-level tsunamis (see Appendix A, page A-8).

  Less than four hours to arrival: Evacuate areas in orange on the above maps, including beaches, harbor and marina docks and boats, and piers.

  Over four hours to arrival: Review Elevation-Based Evacuation Table in Appendix A, page A-9 to determine need to evacuation areas in orange on the above maps.
- Strong currents and potential scour may be expected in marinas and harbors.
- A digital file showing evacuation maps and response instructions is available for use at http://arcg.is/1CUHWOD.

## Specific Instructions:

- Recommended evacuation or other response by Police District or Park Authority:

**CCSF West:**

Presidio (GGNRA-NPS):

- Evacuate and close Baker Beach, China Beach, Marshall Beach, and Fort Point.
- Street closures: Marine Drive at Andrews Road.

SFPD Richmond District:

- Evacuate and close Ocean Beach.
- Move people inland to east of the Great Highway.

SFPD Taraval District:

- Evacuate and close Ocean Beach.
- SF Zoo (RPD): Move people inland to east of the Great Highway. Zoo's West Parking lot should not be flooded.
- Fort Funston (GGNRA-NPS): Evacuate and close Ocean Beach.

**CCSF Bay-side and Islands**

Presidio (Presidio Trust):

- Evacuate and close Crissy Field beach, Torpedo Wharf, and Coast Guard pier.
- Move people inland south of Marine Drive - San Francisco Bay Trail - Mason Street - Marina Boulevard.

SFPD Northern District:

- Evacuate and close St. Francis Yacht Club, Golden Gate Yacht Club, San Francisco Small Craft Harbor West and East (RPD).
- Street closures: Marina Boulevard between Baker Street and Laguna Street; Marina Drive entrance to Fort Mason and parking lots; Beach Street between Van Ness

Avenue and Larkin Street.

# LEVEL 2 RECOMMENDED EVACUATION PLAN (cont'd)

- Move people inland south of Marina Boulevard (between Baker St. and Laguna St.).

Fort Mason (NPS-GGNRA): Evacuate and close Fort Mason.

SFPD Central District:

- Evacuate and close Hyde Steet Harbor (Port), Hyde Street Pier - San Francisco Maritime National Historic Park (NPS-GGNRA), and Aquatic Park Cove and Acquatic Park Pier (NPS-GGNRA).
- Evacuate and close Fisherman's Wharf, the Ferry Building, and waterfront piers (Port).
- Street closures: Hyde Street, Leavenworth, and Al Scoma Way at Jefferson Street.
- Move people inland south of Jefferson Street (between Hyde St. and Powell St.) - south or west of The Embarcadero (between Powell St. and Mission St.).

SFPD Southern District:

- Evacuate and close all waterfront piers (Port).
- Evacuate and close Pier 39 Marina, South Beach Harbor (Port), and Mission Creek Harbor (aka China Basin) houseboat occupants (Port, Mission Creek Harbor Assn).
- Move people inland west of The Embarcadero - King Street - Terry A. Francois Street, and at least one block from Mission Creek (China Basin Water Channel) in all directions.
- Note: AT&T Park is outside Level 2 evacuation zone.
- Treasure Island:
  - Move people inland at least one block in all directions from San Francisco Bay.
  - Close Treasure Island Pier 1, Treasure Isle Marina, and Island Sailing Center, and Northeast Boat Ramp Windsurfer Access Point (TIDA).

SFPD Bayview District:

- Evacuate and close all waterfront finger piers (Port).
- Evacuate and close all buildings adjacent to Islais Creek Channel (Port).
- Evacuate and close India Basin Shoreline Park (RPD).
- Street closures: Block access to 2nd Avenue by closing Hussey Street, H Street, and J Street at Mahan Street.
- Move people inland at least one block from Bay shoreline, and at least one block away from Islais Creek Channel.

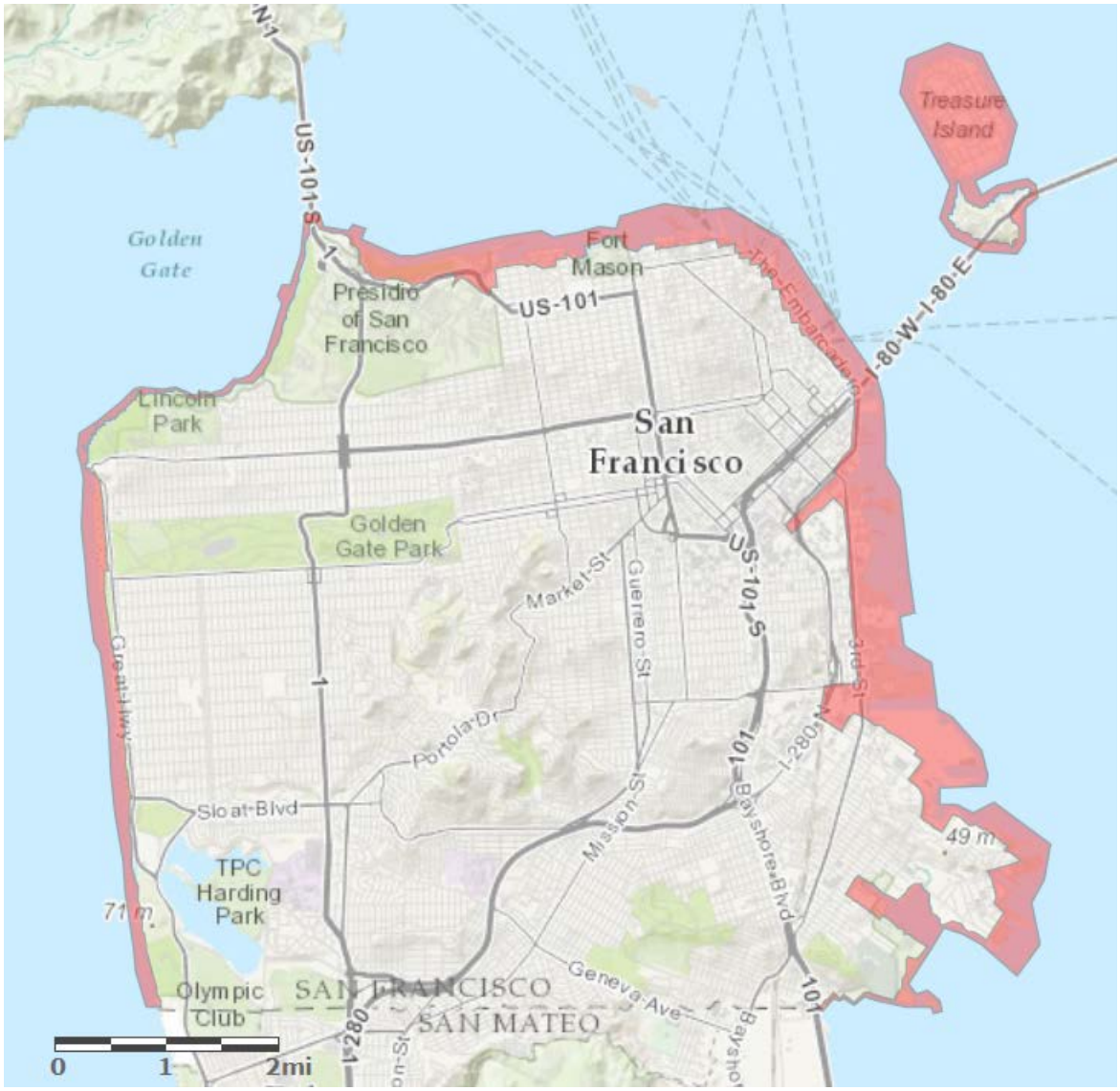
Candlestick Point State Recreation Area (SRA) (California Department of Parks and Recreation (CDPR)):

- Evacuate and close all beaches and shoreline areas.

Alcatraz Island (NPS-GGNRA):

- Evacuate and close Alcatraz Ferry pier.
- Move people inland to at least 30 feet in elevation.

# Level 3 Evacuation Maps – City View




**CCSF Tsunami Evacuation Level 3**

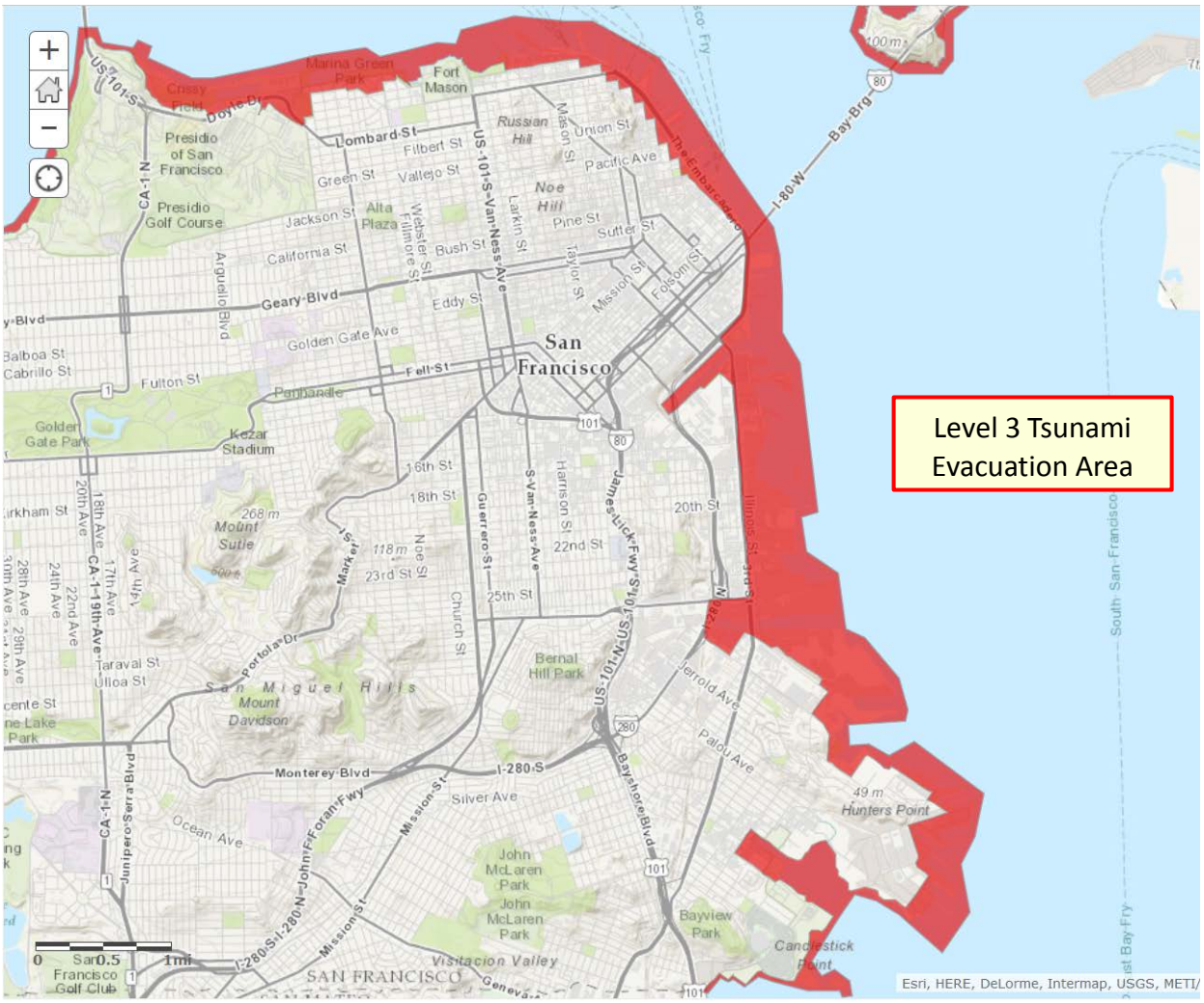
**Method of Preparation:**
This map was created by Cal OES, CGS, and NOAA by combining digital elevation models for the City and County of San Francisco with "worst-case" tsunami inundation modeling. The level lines typically follow roads for ease of implementation.

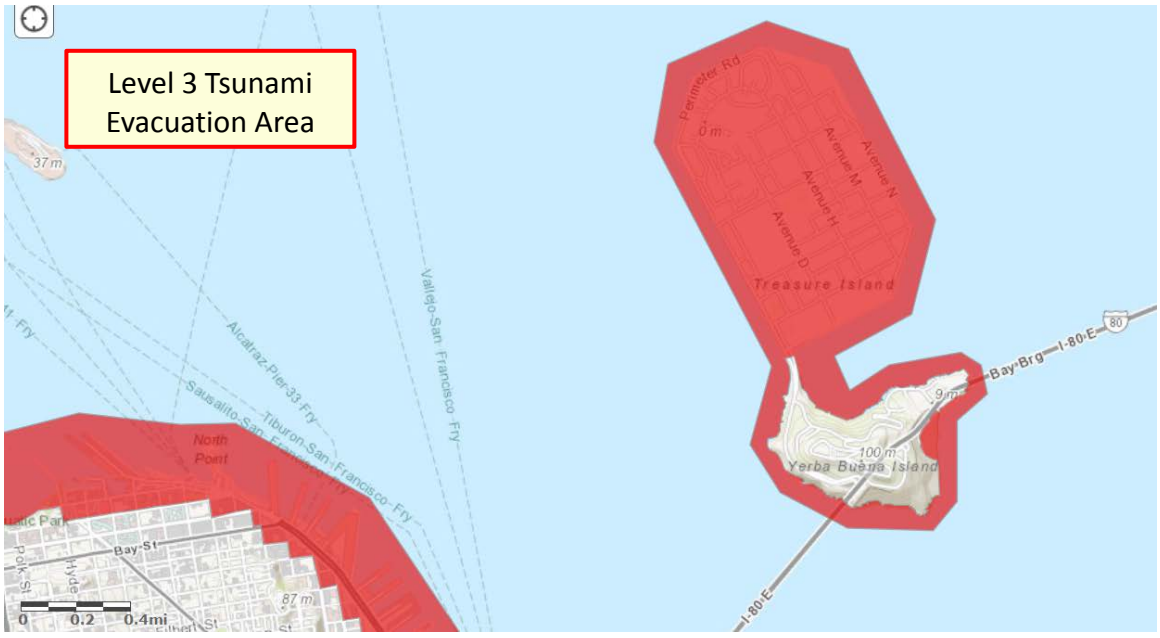
Sources: CGS, Cal OES, NOAA, SFDEM, ESRI.

# Level 3 Evacuation Maps – CCSF West – Pacific Ocean side

Sources: Cal OES, CGS, NOAA-NWS, SFDEM, ESRI (2015).

# Level 3 Evacuation Maps – CCSF East, Bay-side and Islands




Sources: Cal OES, CGS, NOAA-NWS, SFDEM, ESRI (2015).

# LEVEL 3 RECOMMENDED EVACUATION PLAN

## Applies to:

NTWC Tsunami Alert Level = WARNING

State/NWS FASTER Tsunami Value = 1.5 meter (5.0 feet) to 2.50 meters (8.2 feet)

## General Instructions:

- Follow Tsunami Response Decision Tree guidance for Advisory-level tsunamis (see Appendix A, page A-8).

  Less than four hours to arrival: Evacuate areas in red on the above maps, including beaches, harbor and marina docks and boats, and piers.

  Over four hours to arrival: Review Elevation-Based Evacuation Table in Appendix A, page A-9 to determine need for evacuation of areas in red on the above maps.
- Strong currents and potential scour may be expected in marinas and harbors.
- A digital file showing evacuation maps and response instructions is available for use at http://arcg.is/1CUHWOD.

## Specific Instructions:

- Recommended evacuation or other response by Police District or Park Authority:

**CCSF West:**

Presidio (GGNRA-NPS):

- Evacuate and close all beaches, roads, or trails within Level 3 evacuation zone, including Baker Beach, China Beach, and Marshall Beach, and Fort Point.

SFPD Richmond District:

- Evacuate and close Ocean Beach.
- Move people inland to east of the Great Highway.

SFPD Taraval District:

- Evacuate and close Ocean Beach.
- Move people inland to east of the Great Highway.
- Road closures: Close turnaround/parking lot at end of Sloat Boulevard.
- SF Zoo: Move people inland to east of the Great Highway. Should not impact Zoo.

Fort Funston (GGNRA-NPS):

- Evacuate and close Ocean Beach.

**CCSF Bay-side and Islands**

Presidio (Presidio Trust):

- Evacuate and close all structures east of Level 3 evacuation line, including Crissy Field beach, Torpedo Wharf, Coast Guard pier, and Crissy Field from Crissy Field Avenue to Doyle Drive to Lincoln Blvd.
- Road closures: US-101/Doyle Drive at CA-1, detour SB traffic to CA-1S (Caltrans, CHP); Marine Drive at Andrews Road; West Bluff at Long Avenue; Crissy Field Ave. between Lincoln Blvd. and Cowles Street; Gorgas Avenue between Lyon Street and

Girard Road.

# LEVEL 3 RECOMMENDED EVACUATION PLAN (cont'd)

- Move people inland south of Doyle Drive - Halleck Street - Edie Road - Francisco Street.

SFPD Northern District:

- Evacuate and close all structures east of Level 3 evacuation line, including Palace of Fine Arts, St. Francis Yacht Club, and San Francisco Small Craft Harbor West and East (RPD).
- Road closures: US-101N/Richardson Avenue at Lyon Street (Caltrans, CHP); Marina Blvd. between Lyon Street and Buchanan Street; Marina Green Drive; Baker Street at Bay Street; Jefferson Street between Baker and Scott Street; Scott Street at Prado Street; Prado Street; Cervantes Blvd. between Prado Street and Beach Street; Fillmore Street at Beach Street; Jefferson Street between Fillmore and Webster Street; Retiro Way; Casa Way; and Rico Way.
- Move people inland south of Bay Street (between Lyon and Baker) - Jefferson Street (between Baker and Scott St.) - Prado Street (between Scott St. and Cervantes Blvd.) - Beach Street (between Cervantes Blvd. and Fillmore St.) - Jefferson Street (between Fillmore and Webster St.) - Marina Blvd. (between Webster and Buchanan St.).

Fort Mason (NPS-GGNRA):

- Evacuate and close all structures east of Level 3 evacuation line, including Fort Mason Center, Fort Mason pavilions, and Fort Mason parking lot.
- Road closures: McDowell Avenue between Battery Street and Van Ness Avenue.

SFPD Central District:

- Evacuate and close all structures north or east of Level 3 evacuation line, including including the Ferry Building, Fisherman's Wharf, and all waterfront finger piers (Port); Hyde Steet Harbor (Port); Hyde Street Pier - San Francisco Maritime National Historic Park, Aquatic Park Cove and Acquatic Park Pier (NPS-GGNRA); and the Cannery and Anchorage.
- Evacuate and close Fire Department Pump Station #2 (SFFD).
- Road closures: Beach Street between Hyde Street and Stockton Street; Hyde Street, Leavenworth, Jones, Taylor, Mason, and Powell Streets at Beach Street; Stockton Street at North Point Street; Bay Street and Francisco Street at Kearny Street; Chestnut Street between Montgomery and Sansome Street; Sansome Street between Greenwich and Chestnut Street; Front Street between Union Street and Battery Street; Broadway Street at Front Street; The Embarcadero.
- Move people inland south or west of Beach Street (betw. Hyde and Stockton St.) - Bay Street (between Stockton and Kearny St.) - Francisco Street (between Kearny and Montgomery St.) - Chestnut Street (between Montgomery and Sansome St.) - Greenwich Street (between Sansome and Battery St.) - Union Street (between Battery and Front St.) - Broadway (between Front and Davis St.) - Davis Court

(between Broadway and Jackson St.) - Drumm Street (between Jackson St. and Clay St.) - Steuart Street (between Clay St. and Mission St.).

# LEVEL 3 RECOMMENDED EVACUATION PLAN (cont'd)

SFPD Southern District:

- Evacuate and close all structures east of Level 3 evacuation line, including all waterfront finger piers (Port); AT&T Park (SF Giants); and Pier 39 Marina, South Beach Harbor, and Mission Creek Harbor (aka China Basin) houseboat occupants (Port, Mission Creek Harbor Association).
- Road closures: Steuart Street at Mission St.; The Embarcadero from inception to 3rd Street; 3rd Street between King Street and Mariposa Street; 4th Street from Berry Street to Channel Street; all streets east of 3rd Street.
- Move people inland west or south of Steuart Street - The Embarcadero - 3rd Street, and at least one block from Mission Creek (China Basin Water Channel) in all directions.
- Note: UCSF Mission Bay is not within Level 3 evacuation zone.
- Treasure Island:
  - Evacuate and close all structures on Treasure Island.
  - Move people inland to Yerba Buena Island to locations at least 30 feet in elevation; or, if time and resources permit, transport people by bus to Moscone Center Assembly Area in San Francisco.

SFPD Bayview District:

- Evacuate and close all structures east of Level 3 evacuation line, including all waterfront finger piers (Port), India Basin Shoreline Park (RPD), Caltrain tracks between Cesar Chavez and Evans Avenue (Caltrain), and buildings within one block of Islais Creek Channel (Port).
- Road closures: 3rd Street between Mariposa Street and Cesar Chavez Street; Cesar Chavez Street between I-280 and end of street; all streets east of 3rd Street; Custer, Davidson, and Evans Avenues at Quint Street; Quint Street between Evans Avenue and Cargo Way; Cargo Way beween Quint Street and Jennings Street; Hunters Point Blvd. between Jennings Street and Innes Avenue; Arelious Walker Drive; Robinson Drive at Lockwood Avenue and Fisher Avenue; Spear Avenue between Lockwood Avenue and Morrell Street; Morrell Street between Spear Avenue and Manseau Street; Manseau Street at Cochrane Street; Mahan Street; J Street, H Street, and Hussey Street at Mahan Street; 2nd Avenue; C Street; Nimitz Avenue; Hudson Street; Griffith Street; Fairfax Avenue.
- Move people inland to west of Cal Train tracks from Cesar Chavez to Evans Ave, southwest of Evans Avenue (bewteeen Caltrain tracks and Quint St.), southeast of Quint Street (between Evans Ave. and Cargo Way), south and east of Cargo Way (between Quint St. and Jennings St.), west of Jennings Street (between Cargo Way and Evans Ave.), south and west of Evans Avenue - Hunters Point Boulevard - Innes Avenue, east and south of Arelious Walker Drive (between Innes Ave. and end of

Arelious Walker Dr.), at least one block from Bay shoreline between Arelious Walker Dr. and Lockwood Ave., at least one block away from Bay shoreline, south and west of Lockwood Avenue (between Donohue Ave. and Spear Ave.), north and west of Spear Avenue (between Lockwood Ave. and Morrell St.), west of Morrell Street (between Spear Ave. and Manseau St.), west of Mahan Street (between end of Mahan St. to J St.).

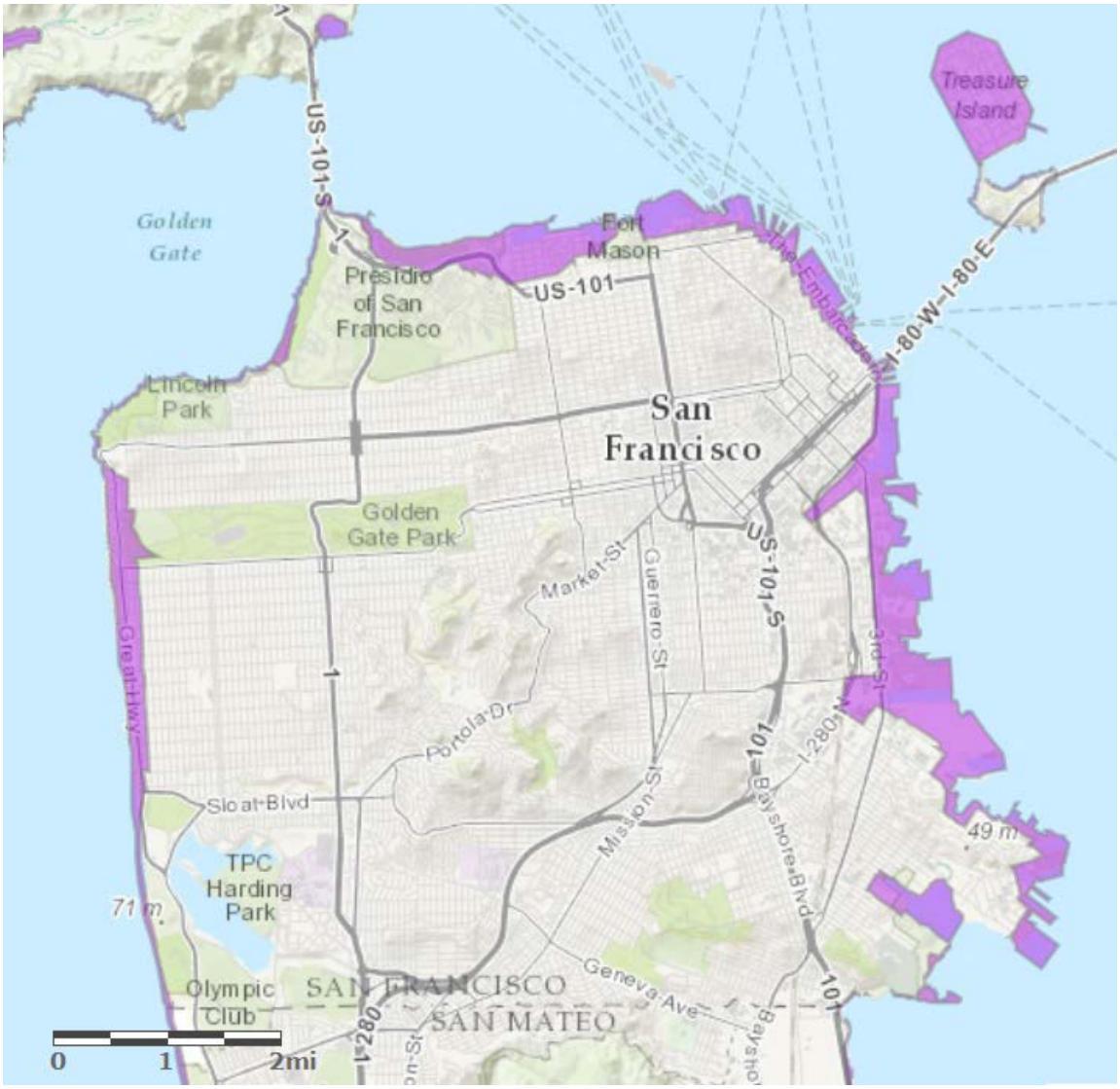
Candlestick Point SRA (CDPR):

- Evacuate and close Candlestick Point SRA.
- Move people inland at least one block away from Candlestick Point SRA, and west of Ingalls Street (between Wallace Ave. and Carroll Ave.).

Alcatraz Island:

- Evacuate and close Alcatraz Ferry pier (NPS-GGNRA).
- Move people inland to areas at least 30 feet in elevation.

# Maximum Evacuation Maps – City View



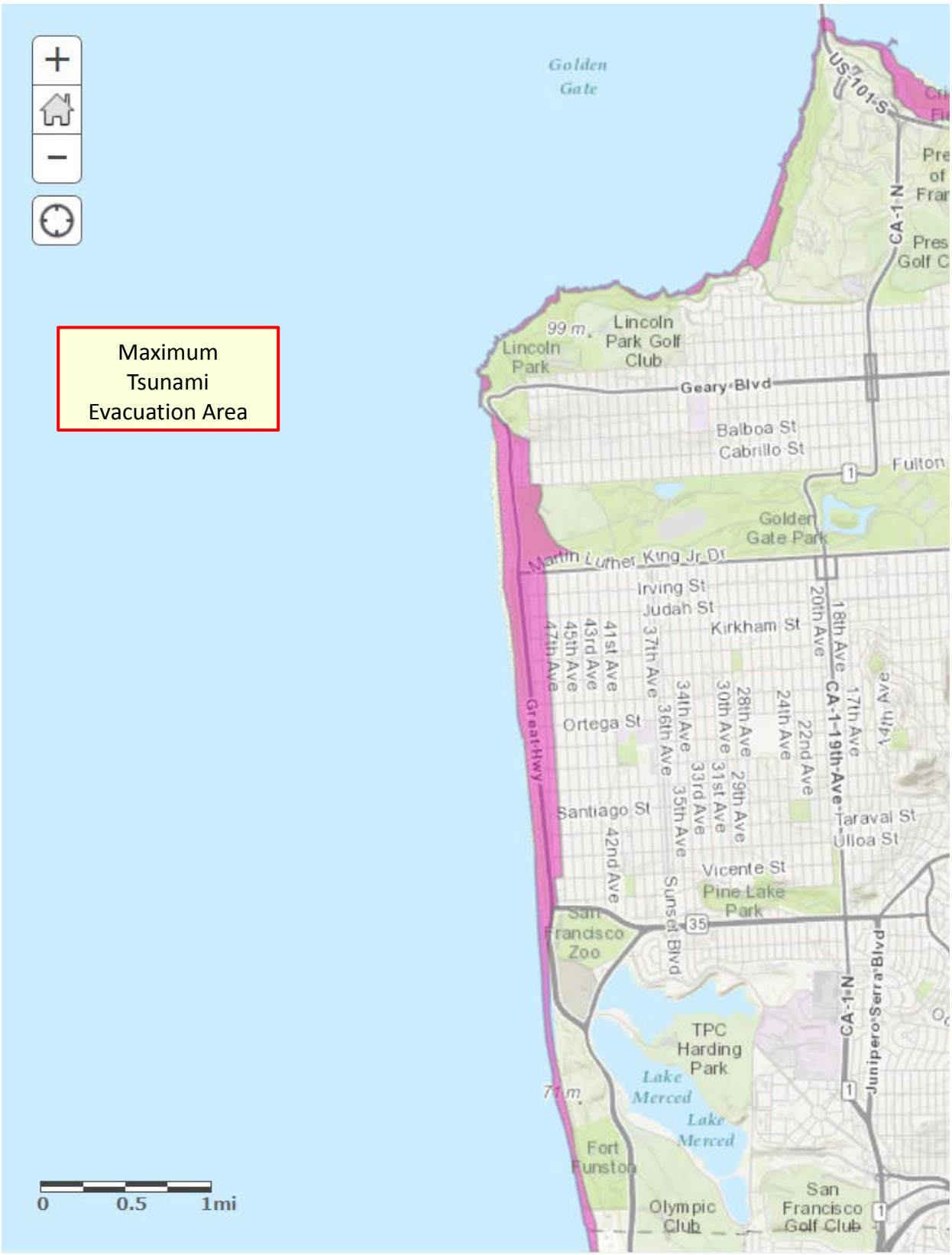

**San Francisco Maximum Tsunami Evacuation Area**

**CCSF Maximum Tsunami Evacuation Level**

**Method of Preparation:**
This map was created by the CGS and Cal OES by taking the inundation polygon from the 2009 State Tsunami Inundation Map for San Francisco and extending the boundaries to streets and roads for ease of evacuation implementation.

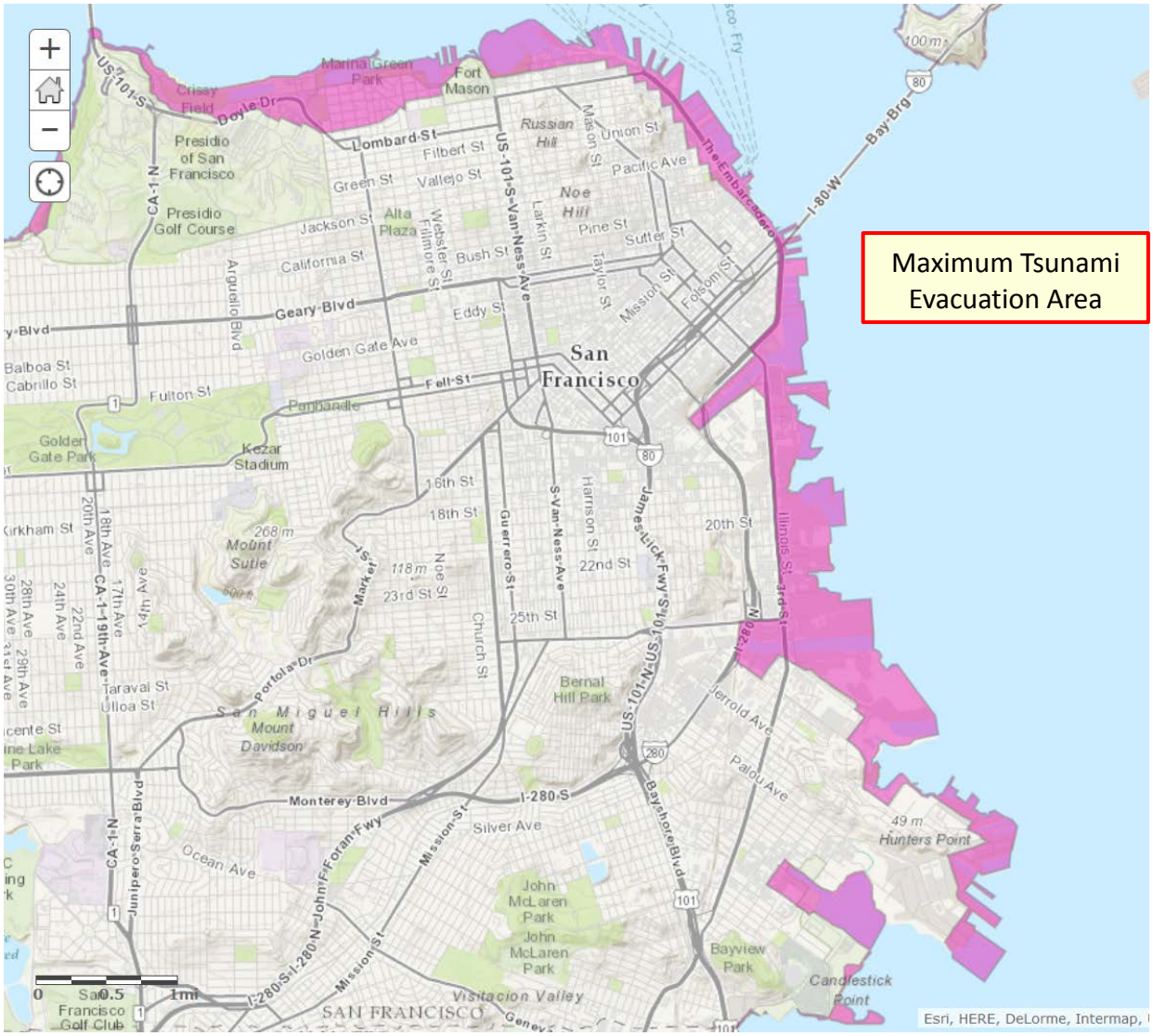
Sources: CGS, Cal OES, NOAA, SFDEM, ESRI.

# Maximum Evacuation Maps – CCSF West – Pacific Ocean side




Sources: Cal OES, CGS, NOAA-NWS, SFDEM, ESRI (2015).

# Maximum Tsunami Evacuation Maps – CCSF East (cont'd)




Sources: Cal OES, CGS, NOAA-NWS, SFDEM, ESRI (2015).

# RECOMMENDED MAXIMUM EVACUATION PLAN

## Applies to:

NTWC Tsunami Alert Level = WARNING

State/NWS FASTER Tsunami Value = Over 2.5 meters (8.2 feet)

## General Instructions:

- Follow Tsunami Response Decision Tree guidance for Warning-level tsunamis (see Appendix A, page A-8).

  Less than four hours to arrival: Evacuate areas in purple on the above maps, including beaches, harbor and marina docks and boats, and piers.

  Over four hours to arrival: Review Elevation-Based Evacuation Table on Appendix A, page A-9 to determine need for evacuation of areas in purple on the above maps.
- Strong currents and potential scour may be expected in marinas and harbors.
- A digital file showing evacuation maps and response instructions is available for use at http://arcg.is/1CUHWOD.

## Specific Instructions:

- Recommended evacuation/closures by Police District or Park Authority:

  **CCSF West:**

  Presidio (GGNRA-NPS:

  - Evacuate and close all beaches, structures, or facilities within Maximum Evacuation Area, including Baker Beach, China Beach, Marshall Beach, Battery Chamberlain, and Fort Point.
  - Road closures: Close road to China Beach at Sea Cliff Drive; Gibson Road; Battery Chamberlain Road.
  - Move people inland to south of Sea Cliff Drive - east of Lincoln Blvd.

  SFPD Richmond District:

  - Evacuate and close all beaches, structures, or facilities within Maximum Evacuation Area, including Ocean Beach, Balboa Natural Area.
  - Road closures: Great Highway between Cliff House and Lincoln Way; Great Highway (lower) between Balboa Street and Cabrillo Street; La Playa Street; Fulton Street at 47th Avenue; Cabrillo Street, and Balboa Street at 48th Avenue.
  - Move people inland east of 48th Avenue between Balboa St. and Fulton St.
  - Golden Gate Park (RPD):
    - Evacuate and close all structures within Maximum Evacuation Area, including Beach Chalet Restaurant.
    - Move people inland east of 47th Avenue - JFK Drive - Bernice Rodgers Way - MLK Drive - 47th Avenue.

# RECOMMENDED MAXIMUM EVACUATION PLAN (cont'd)

SFPD Taraval District:

- Evacuate and close all beaches and structures within Maximum Evacuation Area, including Ocean Beach (GGNRA-NPS), and Great Highway trail (RPD).
- Road closures: Great Highway from Lincoln Way to Sloat Boulevard, and south to Skyline (CA-35) (SFPD, Caltrans, CHP); Lower Great Highway between Lincoln Way and Sloat Blvd.; La Playa Street between Lincoln Way and Kirkham Street; 48th Avenue between Lincoln Way and Sloat Blvd.; 47th Avenue between Lincoln Way and Vincente Street; Sloat Blvd. at Lower Great Highway.
- Move people inland east of 47th Avenue (between MLK Drive and Vincente St.) and Lower Great Highway (between Vincente St. and Sloat Blvd).
- Note: Oceanside Wastewater Treatment Plant (SFPUC) may be impacted.
- SF Zoo (RPD): Western edge of zoo may be flooded. Consider Zoo closure.

Fort Funston:

- Evacuate and close Ocean Beach (GGNRA-NPS).

**CCSF Bay-side and Islands**

Presidio (Presidio Trust):

- Evacuate and close all beaches and structures within Maximum Evacuation Area, including Crissy Field, Crissy Field beach, Torpedo Wharf, Coast Guard pier, and Fort Point.
- Road closures: US-101/Doyle Drive at CA-1; detour SB traffic to CA-1S (Caltrans, CHP); Marine Drive; Long Avenue at Lincoln Blvd.; West Bluff; Mason Street; Crissy Field Avenue north of Doyle Drive; Old Mason Street; Roberts Street; French Court; Gorgas Avenue between Lyon Street and Girard Road; East Beach Street; Yacht Road; Jefferson Street - Palace Drive.
- Move people inland south or west of Marine Drive - Long Avenue - Crissy Field Avenue - Doyle Drive - Lincoln Blvd. - French Court - Girard Road - Edie Road - Thornburg Road.

SFPD Northern District:

- Evacuate and close all structures within Maximum Evacuation Area, including Palace of Fine Arts, St. Francis Yacht Club, San Francisco Small Craft Harbor West and East (RPD); Fort Mason Center, pavilions, and parking lot (NPS-GGNRA).
- Road closures: US-101N/Richardson Avenue at Francisco Street (Caltrans, CHP); Marina Blvd., Jefferson Street; Beach Street; North Point Street; Bay Street; Francisco Street - Alhambra Street; Laguna Street at North Point Street; Scott Street, Avila Street, Pierce Street, and Mallorca Way at Alhambra Street; Prado Street; Cervantes Blvd.; Rico Way; Casa Way; Retiro Way; Webster north of North Point Street; McDowell Avenue (NPS-GGNRA).
    - Move people inland south of Francisco Street - Alhambra Street (between Lyon and Cervantes Blvd.) - east of Cervantes Blvd. (between Alhambra St. and Fillmore St.) - east of Fillmore Street (between Cervantes Blvd. and Bay

# RECOMMENDED MAXIMUM EVACUATION PLAN (cont'd)

St.) - south of and North

- Point Street (between Fillmore St. and Laguna St.).

SFPD Central District:

- Evacuate and close all structures in Maximum Evacuation Area, including Hyde Steet Harbor (Port), the Ferry Building, Fisherman's Wharf, and all waterfront piers (Port); Hyde Street Pier - San Francisco Maritime National Historic Park, Aquatic Park Cove, and Acquatic Park Pier (NPS-GGNRA); the Cannery, and the Anchorage.
- Evacuate and close Fire Department Pump Station #2 (SFFD).
- Road closures: Van Ness Avenue at Beach Street; Beach Street; Jefferson Street - The Embarcadero; Al Scoma Way; Hyde, Leavenworth, Jones, Taylor, Mason, Powell, and Stockton Streets at Beach Street; Stockton Street at North Point Street; Bay Street and Francisco Street at Kearny Street; Chestnut Street between Montgomery and Sansome Street; Sansome Street between Greenwich and Chestnut Street; Front Street between Union Street and Battery Street; Broadway Street at Front Street.
- Move people inland south or west of Beach Street (betw. Hyde and Stockton St.) - Bay Street (betw. Stockton and Kearny St.) - Francisco Street (betw. Kearny and Montgomery St.) - Chestnut Street (betw. Montgomery and Sansome St.) - Greenwich Street (betw. Sansome and Battery St.) - Union Street (betw. Battery and Front St.) - Broadway (betw. Front and Davis St.) - west of Davis Court (betw. Broadway and Jackson St.) - Drumm Street (betw. Jackson St. and Clay St.) - Steuart Street.

SFPD Southern District:

- Evacuate and close all structures east of Maximum Evacuation Area, including Southern Police Station; all waterfront piers (Port); AT&T Park (SF Giants); Pier 39 Marina, South Beach Harbor (Port), and Mission Creek Harbor (aka China Basin) houseboat occupants (Port, Mission Creek Harbor Association).
- Road closures: 3rd Street between Mariposa Street and Cesar Chavez Street; Cesar Chavez Street between I-280 and end of street; all streets east of 3rd Street; Custer, Davidson, and Evans Avenues at Quint Street; Quint Street between Evans Avenue and Cargo Way; Cargo Way beween Quint Street and Jennings Street; Hunters Point Blvd. between Jennings Street and Innes Ave.; Arelious Walker Drive; Robinson Drive at Lockwood Avenue and Fisher Avenue; Spear Avenue between Lockwood Avenue and Morrell Street; Morrell Street between Spear Avenue and Manseau Street; Manseau Street at Cochrane Street; Mahan Street; J Street, H Street, and Hussey Street at Mahan Street; 2nd Avenue; C Street; Nimitz Avenue; Hudson Street; Griffith Street; Fairfax Avenue.
- Move people inland to west or south of Steuart Street - The Embarcadero - north or west of Berry Street - south or east of Channel Street - west of 3rd Street.
- Note: UCSF Medical Center Mission Bay is not in Maximum Evacuation Area.

# RECOMMENDED MAXIMUM EVACUATION PLAN (cont'd)

- Treasure Island:
  - Evacuate and close all structures on Treasure Island.
  - Move people inland to Yerba Buena Island to locations at least 30 feet in elevation; or, if time and resources permit, move people by bus to Moscone Center Assembly Area in San Francisco.

SFPD Bayview District:

- Evacuate and close all parks and structures within the Maximum Evacuation Area, including all waterfront finger piers (Port), India Basin Shoreline Park (RPD), Caltrain tracks between Cesar Chavez and Evans Avenue (Caltrain), buildings adjacent to Islais Creek Channel (Port?).
- Move people inland west of Cal Train tracks from Cesar Chavez to Evans Ave, southwest of Evans Avenue (bewteeen Caltrain tracks and Quint St.), southeast of Quint Street (between Evans Ave. and Cargo Way), south and east of Cargo Way (between Quint St. and Jennings St.), west of Jennings Street (between Cargo Way and Evans Ave.), south and west of Evans Avenue - Hunters Point Boulevard - Innes Avenue, east and south of Arelious Walker Drive (between Innes Ave. and end of Arelious Walker Dr.), at least one block from Bay shoreline bewteen Arelious Walker Dr. and Lockwood Ave., at least one block away from Bay shoreline, south and west of Lockwood Avenue (between Donue Ave. and Spear Ave.), north and west of Spear Avenue (between Lockwood Ave. and Morrell St.), west of Morrell Street (between Spear Ave. and Manseau St.), west of Mahan Street (between end of Mahan St. to J St.).

Candlestick Point SRA (CDPR):

- Evacuate and close Candlestick Point SRA.
- Move people inland at least one block away from Candlestick Point SRA, and west of Ingalls Street (between Wallace Ave. and Carroll Ave.).

Alcatraz Island:

- Evacuate and close Alcatraz Ferry pier (NPS-GGNRA).
- Move people inland to areas at least 30 feet in elevation.

# Appendix C: Sample Local Emergency Proclamation and Mandatory Evacuation Order

## C-1 Sample Proclamation of Local Emergency – Tsunami Warning

**(For Maximum Evacuation Level)**

WHEREAS, California Government Code Sections 8550 et seq., San Francisco Charter Section 3.100, and Chapter 7 of the San Francisco Administrative Code empower the Mayor to proclaim the existence of a local emergency, subject to ratification by the Board of Supervisors, when the City and County is affected or threatened by a natural disaster or other emergency posing conditions of extreme peril to life or property; and,

WHEREAS, Conditions of extreme peril to the safety of persons and property have arisen within the City and County of San Francisco, caused by the Tsunami which occurred on _____ [date], and at which time the Board of Supervisors was not in session; and,

WHEREAS, These conditions of extreme peril require the proclamation of the existence of a local emergency,

NOW, THEREFORE, I, _____, Mayor of the City and County of San Francisco, do hereby proclaim the existence of a local emergency within the City and County, to be effective immediately; and,

IT IS FURTHER PROCLAIMED AND ORDERED that during this emergency, the government of the City and County of San Francisco shall be organized, as needed, under the Incident Command System (ICS).

Dated: _____ By:_____

Print Name_____

Mayor of the City and County of San Francisco
City Hall, Room 200
1 Dr. Carlton B. Goodlett Place
San Francisco, CA 94102

## C-2 Mandatory Evacuation Order -- Tsunami Incident

**CITY AND COUNTY OF SAN FRANCISCO**

**MANDATORY TSUNAMI EVACUATION ORDER (For Maximum Evacuation Level)**

The City and County of San Francisco, has proclaimed a Local Emergency under the California Emergency Services Act as a result of the Tsunami generated by the _____ [Name of Earthquake], which is expected to cause flooding in shoreline areas of San Francisco beginning at _____ [time].

Therefore:

1. The Mayor hereby orders the IMMEDIATE MANDATORY EVACUATION of all persons located within three blocks (one quarter mile) of the Pacific Ocean, within five blocks (three-tenths of a mile) of San Francisco Bay, and all persons located on Treasure Island. Anyone in these areas is ORDERED TO MOVE IMMEDIATELY AT LEAST ONE-HALF MILE INLAND, OR AT LEAST 30 FEET ABOVE SEA LEVEL. People on Treasure Island are asked to go IMMEDIATELY to _____ [designated TI assembly area] for assistance in leaving the Island.
2. Persons located in the Tsunami Evacuation Area are asked to evacuate on foot if possible.
3. If you cannot self-evacuate and need evacuation assistance, call 911.
4. Those evacuating should bring only essential items: water, medications, any special food you require, a change of clothing, toiletries, baby supplies, money, and valuable papers.
5. Evacuees may bring their service animal, support animal, or household pet, but must place their animals on a leash or in a cage or carrier.
6. Local Law Enforcement Agencies will restrict re-entry into the Tsunami Evacuation Area until it is determined safe to re-enter.
7. STAY OUT OF THE EVACUATION AREA UNTIL THE CITY ISSUES AN OFFICIAL NOTICE THAT IT IS SAFE TO RETURN. San Francisco Officials will advise the public of the lifting of this Order when public safety is assured.
8. VIOLATION OF THIS ORDER IS A MISDEMEANOR PUNISHABLE BY A FINE OF UP TO $1000, BY IMPRISONMENT FOR UP TO SIX MONTHS, OR BOTH.
9. This order may be enforced by Officers from the San Francisco Police Department, with the assistance of the San Francisco Sheriff's Department, Parking Control Officers of the San Francisco Municipal Transportation Agency, the San Francisco Fire Department, the United States Park Police, and the California State Park Rangers. Police officers may use reasonable force if necessary to evacuate anyone in the Tsunami Evacuation Area to an area of safety.
10. During this emergency, local emergency officials are trying to save lives and preserve our city. Give them your full cooperation.

Date: _____ _____

Mayor of the City of San Francisco

# Appendix D: Sample Tsunami Public Messaging

## D-1 ALERT SF Message Templates

**ALERT SF LEVEL OF TSUNAMI DANGER IS BEING EVALUATED**

**ALERT SF TEXT - LEVEL OF TSUNAMI DANGER IS BEING EVALUATED:**
The National Tsunami Warning Center is evaluating the possibility of a tsunami affecting San Francisco. Check your email for more information.

**ALERT SF EMAIL - LEVEL OF TSUNAMI DANGER IS BEING EVALUATED:**
Due to the _____ [location] Earthquake at _____ [time of earthquake], on _____ [date], the National Tsunami Warning Center is evaluating whether a tsunami may affect San Francisco. The San Francisco Department of Emergency Management is watching the situation and will send out additional Alerts as soon as more information is available. Please be alert for more information by tuning to 740AM or 106.9 FM on your radio, listening for the Outdoor Public Warning System sirens, or following @SF_emergency on Twitter.

**TSUNAMI WATCH ALERT SF**

**ALERT SF TEXT - TSUNAMI WATCH:**
National Tsunami Warning Center has placed San Francisco in a Tsunami Watch. BE READY TO EVACUATE. Check your email for more information NOW.

**ALERT SF EMAIL - TSUNAMI WATCH:**
Due to the _____ [location] Earthquake at _____ [time of earthquake], on _____ [date], the National Tsunami Warning Center has issued a Tsunami Watch that includes San Francisco. A Tsunami Watch means the danger of a tsunami affecting San Francisco is not yet known; stay alert for more information.

The San Francisco Department of Emergency Management is watching the situation and will send out additional Alerts as soon as more information is available. In the meantime, ***take the following steps to be prepared:***

- Remain alert for more information by tuning to 740AM or 106.9 FM on your radio, listening for the Outdoor Public Warning System Sirens, or following @SF_emergency on Twitter.
- If you are in San Francisco within three blocks of the Pacific Coast, or within five blocks of San Francisco Bay, PREPARE TO EVACUATE, SO YOU ARE READY IF EVACUATION BECOMES NECESSARY. See www.sf72.org for more evacuation information.
- If you have neighbors, co-workers, friends, or others near you who may need help to evacuate, check on them and offer to help if evacuation becomes necessary.

A tsunami is a series of powerful sea waves that can cause flooding and other damage. Tsunamis may also kill or injure people caught in the waves. Tsunami waves can last for many hours; the first wave is almost never the largest. Tsunamis also can cause powerful, unpredictable currents off beaches and in marinas and harbors, making it dangerous to be in those areas.

Again, a Tsunami Watch has been issued that includes San Francisco. Please take the preparatory steps listed above. The San Francisco Department of Emergency Management will send out more information as soon as possible.

**TSUNAMI WATCH CANCELLED ALERT SF**

**ALERT SF TEXT - TSUNAMI WATCH CANCELLED:**
National Tsunami Warning Center has CANCELLED the Tsunami Watch for San Francisco. Check your email for more information.

**ALERT SF EMAIL - TSUNAMI WATCH CANCELLED:**

The National Tsunami Warning Center has cancelled the Tsunami Watch for San Francisco. [Add if included in NTWC cancellation message: Some shoreline areas, marinas, and harbors may have dangerous, unpredictable currents. Avoid going in the water for the next 12 hours.]

The San Francisco Department of Emergency Management will send out additional alerts if needed.

**TSUNAMI ADVISORY ALERT SF - LESS THAN FOUR HOURS UNTIL ARRIVAL - LEVEL 1 EVACUATION**

**ALERT SF TEXT - TSUNAMI ADVISORY (LESS THAN FOUR HOURS UNTIL ARRIVAL - LEVEL 1 EVACUATION):**

National Tsunami Warning Center has placed San Francisco in a Tsunami Advisory. MOVE AWAY FROM BEACHES, HARBOR AND MARINA DOCKS, AND PIERS NOW. Check your email for more information.

**ALERT SF EMAIL - TSUNAMI ADVISORY (LESS THAN FOUR HOURS UNTIL ARRIVAL - LEVEL 1 EVACUATION):**

Due to the earthquake in _____ [location] at _____ [time of earthquake] on _____ [date], the National Tsunami Warning Center has issued a Tsunami Advisory that includes San Francisco. A Tsunami Advisory means strong, dangerous currents are expected to impact San Francisco beaches, harbor and marina docks, and finger piers in shoreline areas. Dangerous currents are expected to begin at _____ [ETA from NTWC], and may last for many hours.

The San Francisco Department of Emergency Management requests that you take the following IMMEDIATE steps:

- MOVE AWAY FROM ALL SAN FRANCISCO BEACHES, HARBOR OR MARINA DOCKS, OR PIERS NOW.
- Move on foot when possible. Do not drive. Keep roads open and clear for emergency vehicles.
- If you are in a safe area, STAY THERE.
- IF YOU ARE ON A BEACH, HARBOR OR MARINA DOCK, OR PIER, AND YOU CANNOT SELF-EVACUATE, CALL 911 FOR EVACUATION ASSISTANCE NOW.
- STAY AWAY FROM SAN FRANCISCO BEACHES, HARBOR AND MARINA DOCKS, AND PIERS UNTIL THE CITY ISSUES AN OFFICIAL NOTICE THAT IT IS SAFE TO RETURN.
- Be alert for more information by tuning to 740AM or 106.9 FM on your radio, listening for the Outdoor Public Warning System Sirens, or following @SF_emergency on Twitter.

A tsunami is a series of powerful sea waves that can cause powerful, unpredictable currents off beaches and in marinas and harbors, making it dangerous to be in those areas. Again, a Tsunami Advisory has been issued that includes San Francisco. Please take the steps listed above. The San Francisco Department of Emergency Management is watching the situation and will send out additional Alerts as soon as possible.

**TSUNAMI ADVISORY ALERT SF - MORE THAN FOUR HOURS UNTIL ARRIVAL - Evacuation Evaluation in process**

**ALERT SF TEXT - TSUNAMI ADVISORY (MORE THAN FOUR HOURS UNTIL ARRIVAL - Evacuation Evaluation in process):**
National Tsunami Warning Center has placed San Francisco in a Tsunami Advisory. Evacuation of beaches, harbor and marina docks, and piers may be necessary. Check your email for more information.

**ALERT SF EMAIL - TSUNAMI ADVISORY (MORE THAN FOUR HOURS UNTIL ARRIVAL - Evacuation Evaluation in process):**
Due to the Earthquake in _____ [location] at _____ [time of earthquake] on _____ [date], the National Tsunami Warning Center has issued a Tsunami Advisory that includes San Francisco. A Tsunami Advisory means strong, dangerous currents may impact San Francisco beaches, harbor and marina docks, and piers. Dangerous currents are expected to begin at _____ [ETA from NTWC], and may last for many hours.

The San Francisco Department of Emergency Management (DEM) is evaluating whether evacuation of shoreline areas is necessary, and will send out additional Alerts as soon as possible. In the meantime, stay alert for more information by tuning to 740AM or 106.9 FM on your radio, by listening for the Outdoor Public Warning System Sirens, or by following @SF_emergency on Twitter.

A tsunami is a series of powerful sea waves that can cause powerful, unpredictable currents off beaches and in marinas and harbors, making it dangerous to be in those areas.

Again, a Tsunami Advisory has been issued that includes San Francisco. The Department of Emergency Management is watching the situation and will send out additional Alerts as soon as possible. Please remain alert for more information.

**TSUNAMI ADVISORY CANCELLED ALERT SF**

**ALERT SF TEXT - TSUNAMI ADVISORY CANCELLED:**
National Tsunami Warning Center has CANCELLED the Tsunami Advisory for San Francisco. Check your email for more information.

**ALERT SF EMAIL - TSUNAMI ADVISORY CANCELLED:**

The National Tsunami Warning Center has cancelled the Tsunami Advisory for San Francisco. [Add if included in NTWC cancellation message: Some shoreline areas, marinas, and harbors may have dangerous, unpredictable currents. Avoid going in the water for the next 12 hours.]

The San Francisco Department of Emergency Management will send out additional alerts if needed.

**TSUNAMI WARNING ALERT SF - LESS THAN FOUR HOURS UNTIL ARRIVAL - MAXIMUM TSUNAMI EVACUATION**

**CCSF ALERT TEXT - TSUNAMI WARNING (LESS THAN FOUR HOURS UNTIL ARRIVAL - MAXIMUM TSUNAMI EVACUATION):**
National Tsunami Warning Center has placed San Francisco in a Tsunami Warning. MOVE INLAND AND AWAY FROM SHORELINE AREAS NOW. Check your email for further information.

**CCSF ALERT EMAIL - TSUNAMI WARNING (LESS THAN FOUR HOURS UNTIL ARRIVAL - MAXIMUM TSUNAMI EVACUATION):**
Due to the Earthquake in _____ [location] at _____ [time of earthquake] on _____ [date], the National Tsunami Warning Center has issued a Tsunami Warning that includes San Francisco. A Tsunami Warning means ocean waves with the power to cause dangerous flooding are expected to impact San Francisco shoreline areas. Tsunami waves are expected to begin reaching San Francisco at _____ [ETA from NTWC], and may last for many hours.

The San Francisco Department of Emergency Management advises you to ***IMMEDIATELY TAKE THE FOLLOWING STEPS:***

- IF YOU ARE WITHIN THREE BLOCKS OF THE PACIFIC COAST, OR WITHIN FIVE BLOCKS OF SAN FRANCISCO BAY, MOVE INLAND at least one-half mile or to a location at least 30 feet in elevation. See www.sf72.org for more evacuation information.
- IF YOU ARE ON TREASURE ISLAND, MOVE TO YERBA BUENA ISLAND NOW, to a location at least 30 feet in elevation. See www.sf72.org for more evacuation information.
- Move on foot when possible. Do not drive. Keep roads open and clear for emergency vehicles.
- IF YOU CANNOT SELF-EVACUATE, CALL 911 FOR EVACUATION ASSISTANCE NOW.
- If you are in the evacuation area and people near you need help to evacuate, offer to help them.
- If you are located in a safe area, stay there.
- ONCE TSUNAMI WAVES BEGIN ARRIVING, FIRST RESPONDERS WILL NOT BE ABLE TO ASSIST THOSE WHO REMAIN IN EVACUATED AREAS.
- STAY OUT OF THE EVACUATION AREA UNTIL THE CITY ISSUES AN OFFICIAL NOTICE THAT IT IS SAFE TO RETURN.
- Stay alert for more information by tuning to 740AM or 106.9 FM on your radio, listening for the Outdoor Public Warning System Sirens, or following @SF_emergency on Twitter.

A tsunami is a series of powerful sea waves that can flood and damage shoreline areas. Tsunamis may also kill or injure people caught in the waves. Tsunami waves can last for many hours; the first wave is almost never the largest. Tsunamis also may cause powerful, unpredictable currents off beaches and in marinas and harbors, making it dangerous to be in those areas.

Again, a Tsunami Warning has been issued that includes San Francisco. Please take the steps listed above. The Department of Emergency Management will send out additional Alerts when more information is available.

**TSUNAMI WARNING ALERT SF - MORE THAN FOUR HOURS UNTIL ARRIVAL - Evacuation Evaluation in process**

**CCSF ALERT TEXT - TSUNAMI WARNING (MORE THAN FOUR HOURS UNTIL ARRIVAL - Evacuation Evaluation in process):**
National Tsunami Warning Center has placed San Francisco in a Tsunami Warning. PREPARE TO MOVE INLAND AWAY FROM SHORELINE AREAS. Check your email for more information NOW.

**CCSF ALERT EMAIL - TSUNAMI WARNING (MORE THAN FOUR HOURS UNTIL ARRIVAL - Evacuation Evaluation in process):**
Due to the Earthquake in _____ [location] at _____ [time of earthquake] on _____ [date], the National Tsunami Warning Center has issued a Tsunami Warning that includes San Francisco. A Tsunami Warning means ocean waves with the power to cause dangerous flooding are expected to impact San Francisco shoreline areas. Tsunami waves are expected to begin reaching San Francisco at _____ [ETA from NTWC], and may last for many hours.

The San Francisco Department of Emergency Management is assessing whether evacuation of shoreline areas is necessary. DEM will send out additional Alerts when more information is available. In the meantime, stay alert for more information by tuning to 740AM or 106.9 FM on your radio, by listening for the Outdoor Public Warning System Sirens, or by following @SF_emergency on Twitter.

A tsunami is a series of powerful sea waves that can flood and damage shoreline areas. Tsunamis may also kill or injure people caught in the waves. Tsunami waves can last for many hours; the first wave is almost never the largest. Tsunamis also may cause powerful, unpredictable currents off beaches and in marinas and harbors, making it dangerous to be in those areas.

Again, a Tsunami Warning has been issued that includes San Francisco. DEM will send out additional Alerts when more information is available. Please be alert for more information.

**TSUNAMI WARNING ALERT SF - MORE THAN FOUR HOURS UNTIL ARRIVAL - Mandatory Evacuation Ordered**

**ALERT SF TEXT - TSUNAMI WARNING (MORE THAN FOUR HOURS UNTIL ARRIVAL - Mandatory Evacuation Ordered):**
National Tsunami Warning Center has placed San Francisco in a Tsunami Warning. MOVE INLAND AWAY FROM SHORELINE AREAS NOW. Check your email for more information.

**ALERT SF EMAIL - TSUNAMI WARNING (MORE THAN FOUR HOURS UNTIL ARRIVAL - Mandatory Evacuation Ordered):**
Due to the Earthquake located in _____ [location] at _____ [time of earthquake] on _____ [date], the National Tsunami Warning Center has issued a Tsunami Warning that includes San Francisco. A Tsunami Warning means ocean waves with the power to cause dangerous flooding are expected to impact San Francisco shoreline areas. Tsunami waves are expected to begin reaching San Francisco at _____ [ETA from NTWC], and may last for many hours.

The Mayor of San Francisco has issued a ***Mandatory Evacuation Order*** to evacuate San Francisco shoreline areas. The San Francisco Department of Emergency Management advises you to ***IMMEDIATELY TAKE THE FOLLOWING STEPS:***

- IF YOU ARE WITHIN _____ [ONE/TWO/THREE] BLOCKS OF THE PACIFIC COAST, OR WITHIN _____ [THREE/FIVE] BLOCKS OF SAN FRANCISCO BAY:
- MOVE INLAND at least _____ [one-quarter/one-half] mile, or to a location that is at least 30 feet in elevation. See www.sf72.org for more evacuation information.
- IF YOU ARE LOCATED ON TREASURE ISLAND, MOVE _____ [INLAND AT LEAST ONE BLOCK FROM SHORELINE AREAS/TO YERBA BUENA ISLAND, to a location at least 20 feet in elevation] NOW. See www.sf72.org for more evacuation information.
- Move on foot when possible. Do not drive. Keep roads open and clear for emergency vehicles.
- If you are in the evacuation area and people near you need help to evacuate, offer to help them.
- IF YOU CANNOT SELF-EVACUATE, CALL 911 FOR EVACUATION ASSISTANCE NOW.
- If you are located in a safe area, STAY THERE.
- ONCE TSUNAMI WAVES BEGIN ARRIVING, FIRST RESPONDERS WILL NOT BE ABLE TO ASSIST PEOPLE WHO REMAIN IN EVACUATED AREAS.
- STAY OUT OF THE EVACUATION AREA UNTIL THE CITY ISSUES AN OFFICIAL NOTICE THAT IT IS SAFE TO RETURN.
- Remain alert for more information by tuning to 740AM or 106.9 FM on your radio, listening for the Outdoor Public Warning System Sirens, or following @SF_emergency on Twitter.

A tsunami is a series of powerful sea waves that can flood and damage shoreline areas. Tsunamis may also kill or injure people caught in the waves. Tsunami waves can last for many hours; the first wave is almost never the largest. Tsunamis also may cause powerful, unpredictable currents off beaches and in marinas and harbors, making it dangerous to be in those areas.

Again, a Tsunami Warning has been issued that includes San Francisco. Please take the steps listed above. The Department of Emergency Management will send out additional Alerts when more information is available.

**TSUNAMI WARNING CANCELLED - NO ADVISORY ISSUED - ALERT SF**

**ALERT SF TEXT - TSUNAMI WARNING CANCELLED - NO ADVISORY ISSUED:**
National Tsunami Warning Center has CANCELLED the Tsunami Warning for San Francisco. Check your email for more information.

**ALERT SF EMAIL - TSUNAMI WARNING CANCELLED - NO ADVISORY ISSUED:**

The National Tsunami Warning Center has cancelled the Tsunami Warning for San Francisco. [Add if included in NTWC cancellation message: A tsunami was generated but it is not a threat to San Francisco. Shoreline areas, marinas, and harbors may see small sea level changes and dangerous, unpredictable currents. Avoid going in the water for the next 12 hours.]

The San Francisco Department of Emergency Management will continue to watch the situation and will send out additional alerts if needed.

## D-2 Press Releases

**FOR IMMEDIATE RELEASE**
Date
Contact: Department of Emergency Management
415-558-2712, dempress@sfgov.org

***** PRESS RELEASE *****

**Tsunami Warning: Shoreline Areas of San Francisco**

San Francisco, CA –The National Tsunami Warning Center has issued a Tsunami Warning for shoreline areas of San Francisco as a result of the (Magnitude _____ earthquake) at _____ (location). Tsunami waves are expected to begin arriving here at _____ (ETA from NTWC). A tsunami is a series of powerful sea waves that can flood shoreline areas, causing great damage. Tsunamis may kill or injure people caught in the waves, which can last for many hours. The first wave is almost never the largest. Tsunamis also may cause powerful, unpredictable currents off beaches and in marinas and harbors, making it dangerous to be in those areas.

San Francisco Mayor _____ (name of Mayor) has ordered a Mandatory Evacuation from San Francisco shoreline areas. Anyone located within three blocks (one quarter mile) of the Pacific Ocean, or within five blocks (three-tenths of a mile) of San Francisco Bay **MUST IMMEDIATELY EVACUATE to a safe location at least one-half mile inland or at least 30 feet in elevation**. If you are not sure if you are located within the Tsunami Evacuation Area, visit www.sf72.org.

- If you are in the Evacuation Area you are asked to evacuate on foot if you are able. Do not drive. Keep roads open and clear for emergency vehicles.
- If you are in a safe area, STAY THERE.
- Bring only essential items: enough drinking water for one day, special food or medicine you need, a change of clothing, toiletries, baby supplies, money, and valuable papers.
- You may evacuate with your service animal, support animal, or household pet, but they must be on a leash or in a cage or carrier.
- Secure your home or business before you leave.
- Check on neighbors who may need help getting to safe place.
- Call 9-1-1 if you have a life-threatening emergency or you are not able to move inland or to higher ground.
- STAY OUT OF THE EVACUATION AREA UNTIL THE CITY ISSUES AN OFFICIAL NOTICE THAT IT IS SAFE TO RETURN.

**Violation of the Mandatory Evacuation Order is a misdemeanor punishable by a fine up to $1000, by imprisonment for up to six months, or by both. Remaining in the evacuation area places the safety of first responders and the community at risk.**

Assembly Areas for evacuees without a place to gather are listed below:

*[Not Provided]*

[Provide information on public transit for people who cannot self-evacuate when known.]
Until the Tsunami Warning is cancelled, stay alert for more information by listening for the City's Emergency sirens to sound, and tuning your radio to local emergency broadcast stations such as 740 AM or 106.9 FM. Information is also available at www.sf72.org or by following SF_emergency on Twitter.

- Communicate your status to others so they know you are okay by: Texting or e-mailing family members or your out-of-area contact with your status. Text messages are more likely to go through when phone lines are busy.
- Changing your voicemail greeting with your status.
- Posting your status on social media.

**Explanation of NOAA Tsunami Alert Bulletins:**

**Tsunami Warning** – Dangerous shoreline flooding is imminent or occurring. Full evacuation is suggested. Move to higher ground.

**Tsunami Advisory** – Strong, dangerous currents are imminent or occurring. Move away from shores, harbors, and marinas.

**Tsunami Watch** – A tsunami may impact the area. Stay alert for more information. May be upgraded to Warning or Advisory.

**Tsunami Information Statement** – Minor waves at most. No action suggested.

**For Media Inquiries:**
San Francisco has activated its Emergency Operations Center to coordinate and support tsunami response efforts. The Emergency Operations Center is located at 1011 Turk Street between Laguna and Gough Streets. For media inquiries, contact the Joint Information Center at 415-558-2712 or dempress@sfgov.org.

Press briefings will take place INSERT TIME, INTERVAL, and LOCATION INFORMATION.

###

**FOR IMMEDIATE RELEASE**
Date
Contact: Department of Emergency Management
415-558-2712, dempress@sfgov.org

***** PRESS RELEASE *****

**Tsunami Advisory: Shoreline Areas of San Francisco**

San Francisco, CA –The National Tsunami Warning Center has issued a Tsunami Advisory for shoreline areas of San Francisco as a result of the (Magnitude _____ earthquake) at _____(location). A Tsunami Advisory means that strong, dangerous currents are expected to affect San Francisco beaches, harbor and marina docks, and piers. Dangerous currents are expected to begin at (ETA from NTWC), and may last for many hours.

Until the Tsunami Advisory is cancelled, MOVE AWAY FROM BEACHES, HARBOR AND MARINA DOCKS, AND PIERS. Those with vessels in harbors, marinas, or the Port of San Francisco should consult the harbormaster or the US Coast Guard Captain of the Port before boarding or moving the vessel.

Tune your radio to local emergency broadcast stations such as 740 AM or 106.9 FM for further information. Information is also available at www.sf72.org or by following SF_emergency on Twitter.

**Explanation of NOAA Tsunami Alert Bulletins:**

**Tsunami Warning** – Dangerous flooding in shoreline areas is imminent or occurring. Full evacuation is suggested. Move to higher ground.

**Tsunami Advisory** – Strong tsunami currents are imminent or occurring. Move away from shores, harbors, and marinas.

**Tsunami Watch** - A tsunami may impact the area. Stay alert for more information. May be upgraded to Warning or Advisory.

**Tsunami Information Statement** – Minor waves at most. No action suggested.

**For Media Inquiries:**
San Francisco has activated its Emergency Operations Center to coordinate and support tsunami response efforts. The Emergency Operations Center is located at 1011 Turk Street between Laguna and Gough Streets. For media inquiries, contact the Joint Information Center at 415-558-2712 or dempress@sfgov.org.

Press briefings will take place INSERT TIME, INTERVAL, and LOCATION INFORMATION.

###

**FOR IMMEDIATE RELEASE**
Date:
Contact: Department of Emergency Management
415-558-2712, dempress@sfgov.org

***** PRESS RELEASE *****

**Tsunami Watch: Shoreline Areas of San Francisco**

San Francisco, CA –The National Tsunami Warning Center has issued a Tsunami Watch for shoreline areas of San Francisco, as a result of the (Magnitude _____ earthquake) at _____(location). A Tsunami Watch means a tsunami may occur causing waves with the power to flood or damage shoreline areas of San Francisco.

Tsunami waves, if generated, are expected to begin arriving here at (ETA from NTWC). A tsunami is a series of powerful sea waves that can flood shoreline areas, causing great damage. Tsunamis may kill or injure people caught in the waves. Tsunami waves can last for many hours. The first wave is almost never the largest wave. Tsunamis also may cause powerful, unpredictable currents off beaches and in marinas and harbors, making it dangerous to be in those areas.

Until the Tsunami Watch is cancelled, people located in shoreline areas of San Francisco are asked to make preparations to evacuate, and to remain alert for more information. Listen for the City's Emergency sirens to sound. Tune your radio to local emergency broadcast stations, such as 740 AM or 106.9 FM, for further information. Information is also available at www.sf72.org or by following SF_emergency on Twitter.

IF Evacuation Order is Given (see Tsunami Warning or Advisory for text).

Communicate your status so others know you are okay by doing the following:

- Text or e-mail for family members or your out-of-area contact to communicate your status. Text messages are more likely to go through when phone lines are busy.
- Change your voicemail greeting with your status.
- Post your status on social media.

**Explanation of NOAA Tsunami Alert Bulletins:**

**Tsunami Warning** – Widespread inundation is imminent or occurring. Full evacuation is suggested. Move to higher ground.

**Tsunami Advisory** – Strong currents are imminent or occurring. Move away from beaches, harbors, and marinas.

**Tsunami Watch** - A tsunami may impact the area. Stay alert for more information. May be upgraded to Warning or Advisory.

**Tsunami Information Statement** – Minor waves at most. No action suggested.

**For Media Inquiries:**
San Francisco has activated its Emergency Operations Center to coordinate and support response efforts. The Emergency Operations Center is located at 1011 Turk Street, between Laguna and Gough Streets. For media inquiries, contact the Joint Information Center at 415-558-2712 or dempress@sfgov.org.

Press briefings will take place INSERT TIME, INTERVAL, and LOCATION INFORMATION.

###

## D-3 DEM Short Messages

| MESSAGE TYPE/PURPOSE | AUDIENCE | INSTRUCTIONS | EMERGENCY ALERT SYSTEM/ WIRELESS EMERGENCY ALERTS (limit 90 characters) | OPWS - PACIFIC COAST SIDE | OPWS - BAY SIDE | TWITTER (limit 140 characters) | FACEBOOK/NEXTDOOR |
|---|---|---|---|---|---|---|---|
| **PRIMARY MESSAGES** | | | | | | | |
| **NTWC TSUNAMI WARNING ISSUED** | | | | | | | |
| ***Level 3 - Near-Source Tsunami -*** *NTWC puts SF in automatic Warning (tsunami not confirmed)* | *ALL* | *Send when evacuation needed and 10-15 minutes to arrival* | An earthquake has occurred. A tsunami may have been generated. Move to high ground NOW.<br>*83 characters* | Tsunami expected. Move to high ground NOW. | Tsunami expected. Move to high ground NOW. | #SanFrancisco Tsunami Warning: A local earthquake has occurred. A tsunami may have been generated. Move to high ground NOW. #SF<br>*126 characters* | Use Twitter message; spell out contracted words |
| ***Maximum Evacuation Level*** *- what to evacuate* | *MAINLAND SF - Pacific and Bay side* | *Send when evacuation needed or ordered* | SF Tsunami Warning: Move 3 blocks inland on Pacific Coast, 5 blocks inland on Bay side.<br>*87 characters* | Tsunami expected. Move to high ground NOW. | Tsunami expected. Move to high ground NOW. | Tsunami Warning for Shoreline Areas of #SanFrancisco. If near Pacific coast move 3 blocks inland. If near SFBay move 5 blocks inland. #SF<br>*137 characters* | A Tsunami Warning means dangerous flooding waves are imminent or occurring. If you are within three blocks of the Pacific Ocean, or within five blocks of the Bay, MOVE INLAND TO HIGH GROUND NOW. High ground means a location at least 30 feet in elevation. |
| ***Maximum Evacuation Level Pacific Side*** *- what to evacuate* | *MAINLAND SF - Pacific side ONLY* | *Send when evacuation needed or ordered* | Flooding Tsunami waves coming. If within 3 blocks of Pacific Ocean GO to high ground NOW.<br>*89 characters* | Tsunami expected. Move to high ground NOW. | | SF Tsunami Warning means flooding waves are coming or occurring. MOVE at least 3 blocks inland from Pacific Coast NOW. #SanFrancisco<br>*134 characters* | Use Twitter message; spell out contracted words |
| ***Maximum Evacuation Level*** *- what to evacuate* | *BAY SIDE only* | *Send when evacuation needed or ordered* | Flooding Tsunami waves coming. If within 5 blocks of SFBay MOVE to high ground NOW.<br>*83 characters* | | Tsunami expected. Move to high ground NOW. | #SF Tsunami Warning means flooding waves are coming or occurring. MOVE at least 5 blocks inland from #SanFranciscoBay NOW.<br>*122 characters* | Use Twitter message; spell out contracted words |

| MESSAGE TYPE/PURPOSE | AUDIENCE | INSTRUCTIONS | EMERGENCY ALERT SYSTEM/ WIRELESS EMERGENCY ALERTS (limit 90 characters) | OPWS - PACIFIC COAST SIDE | OPWS - BAY SIDE | TWITTER (limit 140 characters) | FACEBOOK/NEXTDOOR |
|---|---|---|---|---|---|---|---|
| ***Maximum Evacuation Level or Level 3 - More than 4 hours to arrival*** *- what to evacuate* | *TREASURE ISLAND* | *Send when evacuation needed or ordered, and more than four hours to arrival* | Flooding Tsunami waves coming. If on Treasure Island MOVE to Yerba Buena Island NOW.<br>*84 characters* | | Tsunami expected! MOVE to Yerba Buena Island NOW. | Tsunami Warning for Shoreline Areas of #SanFrancisco. If on #TreasureIsland move to #YerbaBuenaIsland NOW. #SF<br>*110 characters* | Use Twitter message; spell out contracted words |
| ***Maximum Evacuation Level or Level 3 - Less than 4 hours to arrival*** *- what to evacuate* | *TREASURE ISLAND* | *Send when evacuation needed or ordered, and less than four hours to arrival* | If you are on Treasure Island walk to high ground on Yerba Buena Island if you can.<br>*83 characters* | | Tsunami expected. Move to Yerba Buena Island NOW. | If you are on #SF Treasure Island walk to high ground on Yerba Buena Island if you're able to avoid traffic congestion! #SanFrancisco<br>*133 characters* | Use Twitter message; spell out contracted words |
| ***Maximum Evacuation Level - Evacuation Order issued*** *- what to evacuate* | *MAINLAND SF* | *Send when evacuation has been ordered by Mayor* | Tsunami Warning: Evacuation of SF shore areas ordered. EVACUATE to high ground NOW.<br>*87 characters* | Tsunami expected. Move to high ground NOW. | Tsunami expected. Move to high ground NOW. | #SF TsunamiWarning: Evacuation ordered. If near coast move 3 blocks inland to high ground NOW. If near Bay move 5 blocks inland NOW.<br>*132 characters* | A Tsunami Warning means dangerous flooding waves are imminent or occurring. The Mayor of San Francisco has ordered a Mandatory Evacuation of areas within three blocks of the Pacific Ocean, and within five blocks of the Bay. If you are in those areas, MOVE INLAND TO HIGH GROUND NOW. Move at least three blocks inland if you are near the Pacific Coast of San Francisco. Move at least five blocks inland if you are near San Francisco Bay. |
| ***Level 3 -*** *what to evacuate* | *PACIFIC SIDE* | *Send when evacuation needed or ordered* | Tsunami Warning: Flooding waves coming. MOVE one block inland NOW.<br>*71 characters* | Tsunami expected. Move one block inland NOW. | | #SanFrancisco Tsunami Warning means flooding waves are coming or occurring. MOVE at least 1 block inland from Pacific Coast NOW. #SF<br>*132 characters* | Use Twitter message; spell out contracted words |

| MESSAGE TYPE/PURPOSE | AUDIENCE | INSTRUCTIONS | EMERGENCY ALERT SYSTEM/ WIRELESS EMERGENCY ALERTS (limit 90 characters) | OPWS - PACIFIC COAST SIDE | OPWS - BAY SIDE | TWITTER (limit 140 characters) | FACEBOOK/NEXTDOOR |
|---|---|---|---|---|---|---|---|
| ***Level 3 -*** *what to evacuate* | *BAY SIDE* | *Send when evacuation needed or ordered* | Tsunami Warning: Flooding waves coming. MOVE one block inland NOW.<br>*71 characters* | | Tsunami expected. Move one block inland NOW. | #SanFrancisco Tsunami Warning means flooding waves are coming or occurring. MOVE at least 5 block inland from #SF Bay NOW.<br>*123 characters* | Use Twitter message; spell out contracted words |
| ***Level 3 -*** *what to evacuate* | *TREASURE ISLAND* | *Send when evacuation needed or ordered* | Tsunami Warning: Flooding waves coming. MOVE to Yerba Buena Island NOW.<br>*72 characters* | | Tsunami expected. Move to Yerba Buena Island NOW. | #SanFrancisco Tsunami Warning means flooding waves are coming or occurring. If you're on #TreasureIsland MOVE to #YerbaBuenaIsland NOW.<br>*135 characters* | Use Twitter message; spell out contracted words |
| ***Level 2 -*** *what to evacuate* | *MAINLAND SF & TREASURE ISLAND* | *Send when evacuation needed or ordered* | Tsunami Warning: Flooding waves coming. MOVE one block inland NOW.<br>*71 characters* | Tsunami expected. Move one block inland NOW. | Tsunami expected. Move one block inland NOW. | #SF Tsunami Warning means flooding waves are coming or occurring. MOVE at least 1 block inland from Pacific Coast or SFBay NOW.<br>*127 characters* | Use Twitter message; spell out contracted words |
| ***All Evacuation Levels - More than four hours to arrival*** *- Call 911 if you can't self-evacuate* | *MAINLAND SF - People with Disabilities/ Access or Functional Needs* | *Send when evacuation needed or ordered, and less than four hours to arrival* | If you are within 3 blocks of Pacific/5 blocks of SFBay & cannot self-evacuate call 911!<br>*88 characters* | | | If you are in #SF Tsunami Evacuation area within 3 blocks of Pacific Ocean or 5 blocks of SFBay & you cannot self-evacuate, call 911 NOW!<br>*138 characters* | Use Twitter message; spell out contracted words |
| ***Maximum Evacuation Level or Level 3*** *-* ***More than four hours to arrival*** *- Call 911 if you can't self-evacuate* | *TREASURE ISLAND - People with Disabilities/ Access or Functional Needs* | *Send when evacuation needed or ordered, and more than four hours to arrival* | Tsunami Warning: If you are on Treasure Island & cannot self-evacuate call 911!<br>*79 characters* | | | If you are on #SF #TreasureIsland and you cannot self-evacuate, call 911 NOW! #SanFrancisco<br>*91 characters* | Use Twitter message; spell out contracted words |

| MESSAGE TYPE/PURPOSE | AUDIENCE | INSTRUCTIONS | EMERGENCY ALERT SYSTEM/ WIRELESS EMERGENCY ALERTS (limit 90 characters) | OPWS - PACIFIC COAST SIDE | OPWS - BAY SIDE | TWITTER (limit 140 characters) | FACEBOOK/NEXTDOOR |
|---|---|---|---|---|---|---|---|
| ***All Evacuation Levels*** *- stay out of evacuated area until official "all clear"* | *ALL* | *Send when evacuation needed or ordered* | Until Tsunami Warning cancelled stay away from shore areas. Tsunami may last many hours.<br>*88 characters* | | | #SF Tsunami Warning: Stay out of evacuated areas until #SanFrancisco Officials issue notice it's safe to return. Danger may last many hours.<br>*140 characters* | Until you receive official notice from the City of San Francisco that the Tsunami Warning is cancelled, stay away from evacuated areas. Tsunami waves may last for many hours. The first wave is never the largest. |
| ***All Evacuation Levels*** *- 1st responders won't be able to help* | *ALL* | *Send when evacuation needed or ordered* | Once tsunami begins, first responders will not be able to help people in evacuated areas.<br>*89 characters* | | | #SF Tsunami Warning: Once Tsunami waves begin, 1st responders will not be able to help people in flooded areas. MOVE TO HIGH GROUND NOW!<br>*136 characters* | Use Twitter message; spell out contracted words |
| ***Warning Cancelled*** *- no inundation* | *ALL* | *Send when CCSF cancels Warning* | San Francisco Tsunami Warning cancelled. It is safe to return to evacuated areas.<br>*81 characters* | | | #SanFrancisco Tsunami Warning is cancelled. It is safe to return to evacuated areas. Avoid going in water for next 12 hours. #SF<br>*128 characters* | Use Twitter message; spell out contracted words |
| **NTWC TSUNAMI ADVISORY ISSUED** | | | | | | | |
| ***Advisory*** *- what to do* | *ALL* | *Send when evacuation needed or ordered* | San Francisco Tsunami Advisory: Move away from beaches, marina or harbor docks, piers.<br>*86 characters* | Tsunami currents expected. Move inland NOW. | Tsunami currents expected. Move inland NOW. | Tsunami Advisory for #SanFrancisco shore areas. Move away from beaches, harbor & marina docks, piers. Tune to 740AM for emergency info. #SF<br>*139 characters* | A Tsunami Advisory means dangerous currents are imminent or occurring. Move away from beaches, harbor and marina docks, and piers. |
| ***Advisory*** *- strong currents* | *ALL* | *Send when evacuation needed or ordered* | Strong Tsunami currents near shore. Move away from beaches, marina & harbor docks, piers.<br>*83 characters* | Tsunami currents expected. Move inland NOW. | Tsunami currents expected. Move inland NOW. | #SF Tsunami Advisory means dangerous currents occurring near shore. MOVE away from beaches, marina & harbor docks, piers NOW. #SanFrancisco<br>*139 characters* | Use Twitter message; spell out contracted words |

| MESSAGE TYPE/PURPOSE | AUDIENCE | INSTRUCTIONS | EMERGENCY ALERT SYSTEM/ WIRELESS EMERGENCY ALERTS (limit 90 characters) | OPWS - PACIFIC COAST SIDE | OPWS - BAY SIDE | TWITTER (limit 140 characters) | FACEBOOK/NEXTDOOR |
|---|---|---|---|---|---|---|---|
| ***Evacuation Level 1 -*** *Evacuation ordered* | *ALL* | *Send when evacuation ordered* | Strong Tsunami currents near shore. Evacuate beaches, marina/harbor docks, piers.<br>*87 characters* | Tsunami expected! Evacuate inland NOW. | Tsunami expected! Evacuate inland NOW. | #SF Tsunami Advisory: Mayor orders evacuation of #SanFrancisco beaches, marina and harbor docks, and piers. Move inland to safety NOW.<br>*134 characters* | Use Twitter message; spell out contracted words |
| ***Advisory -*** *stay out of evacuation area until official "all clear"* | *ALL* | *Send when evacuation needed or ordered* | Stay out of evacuated areas until you receive official notice it is safe to return.<br>*84 characters* | Tsunami currents expected. Move inland NOW. | Tsunami currents expected. Move inland NOW. | #SF Tsunami Advisory: Stay away from shore areas until #SanFrancisco Officials issue notice it's safe to return. Danger may last many hours.<br>*140 characters* | Use Twitter message; spell out contracted words |
| ***Advisory*** *- 1st responders won't be able to help* | *ALL* | *Send when evacuation needed or ordered* | Once tsunami begins, 1st responders will not be able to help people in evacuated areas.<br>*88 characters* | Tsunami currents expected. Move inland NOW. | Tsunami currents expected. Move inland NOW. | #SF Tsunami Advisory: Once Tsunami waves begin, 1st responders will not be able to help people in evacuated areas. MOVE INLAND NOW!<br>*131 characters* | Use Twitter message; spell out contracted words |
| ***Advisory Cancelled*** | *ALL* | *Send when CCSF cancels Advisory* | San Francisco Tsunami Advisory cancelled. It is safe to return to evacuated areas.<br>*82 characters* | | | #SanFrancisco Tsunami Advisory is cancelled. It is safe to return to evacuated areas. Avoid going in water for next 12 hours. #SF<br>*129 characters* | Use Twitter message; spell out contracted words |
| **NTWC TSUNAMI WATCH ISSUED** | | | | | | | |
| ***Watch -*** *what to do* | *ALL* | *Send when Watch is issued* | San Francisco Tsunami Watch. Flooding waves possible. Tune to 740 AM for information.<br>*85 characters* | Tsunami Watch for SF. Tune radio to 740 AM. | Tsunami Watch for SF. Tune radio to 740 AM. | Tsunami Watch for shoreline areas of #SanFrancisco. Flooding waves possible. Tune to 740AM/106.9FM for more information. #SF<br>*124 characters* | A Tsunami Watch means a potential tsunami may impact shoreline areas of San Francisco. A Tsunami Watch may be upgraded to a Tsunami Warning or |

| MESSAGE TYPE/PURPOSE | AUDIENCE | INSTRUCTIONS | EMERGENCY ALERT SYSTEM/ WIRELESS EMERGENCY ALERTS (limit 90 characters) | OPWS - PACIFIC COAST SIDE | OPWS - BAY SIDE | TWITTER (limit 140 characters) | FACEBOOK/NEXTDOOR |
|---|---|---|---|---|---|---|---|
| | | | | | | | Advisory. Stay alert for more information by tuning your radio to 740 AM. |
| ***Watch*** *- what to do* | *ALL* | *Send when Watch is issued* | Tsunami Watch means flooding waves MAY impact San Francisco. Tune to 740 AM for more info.<br>*90 characters* | Tsunami Watch for SF. Tune radio to 740 AM. | Tsunami Watch for SF. Tune radio to 740 AM. | #SanFrancisco Tsunami Watch means flooding waves may impact #SF. Stay alert for more information. Tune radio to 740AM NOW.<br>*122 Characters* | Use Twitter message; spell out contracted words |
| ***Watch Cancelled*** | *ALL* | *Send when CCSF cancels Watch* | San Francisco Tsunami Watch cancelled. Tune radio to 740 AM for more information.<br>*81 characters* | | | #SanFrancisco Tsunami Watch is cancelled. Avoid going in water for next 12 hours. Tune radio to 740 AM for more information. #SF<br>*128 characters* | Use Twitter message; spell out contracted words |
| **ADDITIONAL INSTRUCTIONAL MESSAGES** | | | | | | | |
| ***Calling 911 vs. 311*** | *ALL* | *Send as needed* | | | | Call 911 if you are in danger/have life-threatening emergency. For nonemergency, call 311, use SF311app, or tweet request to @SF311 #SF<br>*136 characters* | Use Twitter message; spell out contracted words |
| ***Let people know your status*** | *ALL* | *Send as needed* | | | | If you are okay let people know by text, email, social media, changing voicemail, or call your out-of-area contact. #SF #SanFrancisco<br>*133 characters* | Use Twitter message; spell out contracted words |
| ***Check on neighbors*** | *ALL* | *Send as needed* | | | | Check on your neighbors if it is safe to do so. They may need assistance. #SF #SanFrancisco<br>*91 characters* | Use Twitter message; spell out contracted words |

| MESSAGE TYPE/PURPOSE | AUDIENCE | INSTRUCTIONS | EMERGENCY ALERT SYSTEM/ WIRELESS EMERGENCY ALERTS (limit 90 characters) | OPWS - PACIFIC COAST SIDE | OPWS - BAY SIDE | TWITTER (limit 140 characters) | FACEBOOK/NEXTDOOR |
|---|---|---|---|---|---|---|---|
| ***SF72 updates*** | *ALL* | *Send as needed* | | | | #SF status map & updates avail: www.sf72.org. Check for road conditions, shelter info, and official updates. #SanFrancisco<br><br>*122 characters* | SF Status map & updates available at www.sf72.org. Check for road conditions, shelter info, and other official updates. |
| ***Shelter Information*** | *ALL* | *Send as needed* | | | | If your #SanFrancisco home or workplace is unsafe, see Emergency Shelter information at www.sf72.org #SF<br><br>*104 characters* | Please remain at your home or workplace if it is safe to do so, as you will be more comfortable. If your home or workplace is unsafe and you do not have an alternative, evacuate to emergency shelters located at INSERT LOCATIONS. For more information visit www.sf72.org. |
| ***Boil Water Notice issued*** | *ALL* | *Send as needed* | SF BoilWaterNotice: Boil H2O 3-5mins. When cool pour back&forth btw 2 clean containers.<br><br>*87 characters* | | | #SFBoilWaterNotice: Boil water for 3-5mins. After water cools, pour back & forth between two clean containers. http://www.sfwater.org/index.aspx?page=539<br><br>*[Note: Use Hootsuite or Tiny URL to shorten link.]*<br><br>*111 characters without link* | Boil/Treat Water Notice:<br>To treat water by disinfecting it:<br>- Use regular household bleach, not the "scented," “ultra,” or “color safe” kind.<br>- Add 8 drops of bleach per gallon of water.<br>- Shake or stir, then let it stand for 30 minutes.<br>A slight chlorine taste or smell is normal.<br>To treat water by boiling it:<br>- Bring pot-full of water to a rolling boil<br>- Boil for 3 to 5 minutes to kill bacteria.<br>- After the water cools, put it in a sealed container and shake it. Shaking adds oxygen back to the water and improves taste<br>More information on boiling or treating water: http://www.sfwater.org/index.aspx?page=539 |

| MESSAGE TYPE/PURPOSE | AUDIENCE | INSTRUCTIONS | EMERGENCY ALERT SYSTEM/ WIRELESS EMERGENCY ALERTS (limit 90 characters) | OPWS - PACIFIC COAST SIDE | OPWS - BAY SIDE | TWITTER (limit 140 characters) | FACEBOOK/NEXTDOOR |
|---|---|---|---|---|---|---|---|
| ***Gas leak/Down electrical wire*** | *ALL* | *Send as needed* | | | | If you smell gas or see downed power line, LEAVE AREA IMMEDIATELY then call 911 & PG&E @ 800-743-5000 #SF #SanFrancisco<br>*119 characters* | Use Twitter message; spell out contracted words |

# Appendix E: Memorandum of Understanding Between SFPD, GGNRA, and SFMNHP

# MEMORANDUM OF UNDERSTANDING
# BETWEEN
# THE CHIEF, SAN FRANCISCO POLICE DEPARTMENT,
# AND
# THE CHIEF, UNITED STATES PARK POLICE,
# AND
# THE SUPERINTENDENT
# OF
# GOLDEN GATE NATIONAL RECREATION AREA
# AND
# SAN FRANCISCO MARITIME NATIONAL HISTORIC PARK

This agreement is by and between the Chief, San Francisco Police Department, and the Chief, United States Park Police, and the Superintendents, Golden Gate National Recreation Area and San Francisco Maritime National Historic Park.

## WITNESSETH:

**WHEREAS,** pursuant to 16 U.S.C. 1A-6(b), as amended, the National Park Service (hereinafter known as the NPS) and the United States Park Police (hereafter known as the USPP), have NPS Commissioned Park Rangers and USPP Officers (hereafter collectively known as NPS Law Enforcement Personnel) with certain law enforcement authority on Federal parkland within the boundaries of Golden Gate National Recreation Area and the San Francisco National Maritime Historic Park located in the City and County of San Francisco; and

**WHEREAS,** the City and County of San Francisco, (hereinafter known as the City and County), maintains a law enforcement Agency known as the San Francisco Police Department in the City and County of San Francisco (hereafter known as SFPD); and,

**WHEREAS,** 16 U.S.C., Section 1a-6(c)(1), authorizes the Secretary of the Interior to designate law enforcement personnel of any State or political subdivision thereof, when deemed economical and in the public interest and with the concurrence of the agency, to act as special police officers in the areas of the National Park System;

**WHERAS,** 16 U.S.C. 1b (1), authorizes the Secretary of the Interior, in order to facilitate the administration of the National Park System, to provide "emergency assistance" outside of the National Park System, which includes the rendering of emergency rescue, fire fighting and cooperative assistance to nearby law enforcement and fire prevention agencies and for related purposes," and

**WHEREAS,** the California Penal Code, Section 830.8(a)-(c), 830.6(c) and 837 provides that Federal law enforcement officers and National Park Rangers may exercise certain arrest powers, and that whenever a person is summoned to the aide of any uniformed peace officer that the summoned person is vested with the powers of the summoning peace officer or that are otherwise reasonably necessary to properly assist the officer, and certain citizen arrest authority; and

**WHEREAS**, the City and County and the NPS have determined that the provision of law enforcement across jurisdictional boundaries in certain circumstances will increase the ability of the City and County and the NPS to protect the safety and promote the general welfare of the public; and

**WHEREAS**, the parties desire to set forth in writing the understanding reached between them concerning assistance to be rendered by each party named herein;

**NOW THEREFORE**, in consideration of the mutual rights and obligations herein, the parties agree to the following:

1. As detailed in this Memorandum of Understanding, when either SFPD or NPS Law Enforcement Personnel requests the assistance of the other, the other party is authorized to render assistance and shall attempt to do so subject to the availability of personnel and resources, with due consideration to circumstances in both the requesting and assisting jurisdictions. Normally all requests for assistance, including minor instances originated by SFPD or NPS Law Enforcement Personnel, will be channeled through the police communications center of each agency.

2. The SFPD, without regard to the boundaries of the City and County of San Francisco or of the National Park System in the State of California, will take immediate police action in areas within the jurisdiction of the NPS, pending the arrival of the NPS Law Enforcement Personnel, when necessary to:
   a. Protect and preserve human life.
   b. Assist an officer in trouble.
   c. Assist at emergency or accident scenes.
   d. Assist at crime scenes.

3. Pursuant to 16 U.S.C. 1b(1), and NPS RM-9 Chapter 1-5 2.2 (March 2000), the NPS Law Enforcement Personnel, without regard to the boundaries of the City and County of San Francisco, will take immediate police action in areas within the jurisdiction of the SFPD, pending the arrival of the SFPD, whenever incidents listed below occur:

   a. Emergency responses such as life or death incidents, serious injury/fatality accidents/incident scenes, crime scenes involving the protection of human life, office in trouble, threat(s) to health or safety of the public;
   b. Emergency or law enforcement incidents directly affecting visitor safety or resource protection;
   c. Probable cause felonies and felonies committed in the presence of and observed by NPS Law Enforcement Personnel;

d. Misdemeanors committed in the presence of NPS Law Enforcement Personnel that present an immediate threat to the health and safety of the public."

4. The SFPD and NPS Law Enforcement Personnel may each maintain fresh pursuit of suspects into the jurisdiction of the other agency in the State of California.

5. In all cases in which assistance is requested, in which emergency assistance is provided by the first officers/rangers on the scene, or in which officers/rangers are engaged in fresh pursuit, as stated in paragraphs 1, 2, and 3 above, the officers/rangers of each police force shall, while in the jurisdiction of the other agency, have the same police and peace officer powers of the officers/rangers of the agency having primary jurisdiction.

6. The on-the-scene commanding police officer/ranger of the agency receiving assistance shall be in command of all officers/rangers and employees of the assisting agency while in the receiving agency's territorial jurisdiction. The on-the-scene commander shall exercise command and direction of the officers/rangers of the assisting agency only through the highest ranking assisting agency officer/ranger present at the scene.

7. Police/ranger reports prepared by the SFPD or NPS Law Enforcement Personnel concerning incidents that occurred in the other agency's jurisdiction shall be made available to the other agency on request in accordance with applicable laws.

8. Following a significant crime or similar occurrence, the technical expertise of either the SFPD or NPS Law Enforcement Personnel may be made available to the other agency at the request of a supervisory officer/ranger.

9. The intent of this agreement is the full cooperation between SFPD and NPS Law Enforcement Personnel to ensure the maintenance of good order and law enforcement with the City and County of San Francisco and the National Park Service areas of the Golden Gate National Recreation Area and the San Francisco National Maritime Historic Park in any situation requiring police assistance beyond the capacity of the requesting agency.

10. The cost of furnishing services described herein shall be borne by the agency furnishing such services and no claims for reimbursement shall be made.

11. Each party, to the extent permitted by law, shall be responsible for any injury, death or loss of property resulting the negligent or wrongful act or omission of its employees while within the scope of this Memorandum of Understanding.

12. The parties shall abide by the provisions of Executive Order 11246, as amended, shall be in compliance with the requirement of Title VI of the Civil Rights Act of 1964, as amended (78 Stat. 252; 42 U.S.C. § 200d et seq.(1994 & Supp. I 1995);

3

Title V, Section 504 of the Rehabilitation Act of 1973 (87 Stat. 394, 29 U.S.C. § 794 (1994), as amended), the Age Discrimination Act of 1975 as amended (89 Stat. 728; 42 U.S.C. § 6101 et seq. (1994) and with all other Federal laws and regulation prohibiting discrimination on grounds of race, color, national origin, disability, religion, or sex, in employment and in providing of facilities an services to the public.

13. Pursuant to the Anti-Deficiency Act, 31 U.S.C. § 1341 (a) (1) (1994), nothing herein contained shall be construed as binding the United States to expend in any one fiscal year any sum in excess of appropriations made by Congress for this purpose, or to involve the United States in any contract or other obligation for the further expenditure of money in excess of such appropriations.

14. Pursuant to 41 U.S.C. § 22, Interest of Member of Congress, (1994), "No Member of Congress shall be admitted to any share or part of any contract or agreement made, entered into, or accepted by or on behalf of the United States, or to any benefit to arise thereupon."

15. The parties shall abide by the provisions of 18 U.S.C. § 1913 Lobbying with Appropriated Moneys, (1994), which states:

> No part of the money appropriated by any enactment of Congress shall, in the absence of express authorization by Congress, be used directly or indirectly to pay for any personal service, advertisement, telegram, telephone, letter, printed or written matter, or other device, intended or designed to influence in any manner a Member of Congress, to favor or opposed, by vote or otherwise, any legislation or appropriation by Congress, whether before or after the introduction of any bill or resolution proposing such legislation or appropriation; but this shall not prevent officers or employees of the United States or of its departments or agencies from communication to Members of Congress, through the proper official channels, requests for legislation or appropriations which they deem necessary for the efficient conduct of the public business.
>
> Whoever, being an officer or employee of the United States or of any department or agency thereof, violates or attempts to violate this section, shall be fined under this title or imprisoned not more than one year, or both; and after notice and hearing by the superior officer vested with the power of removing him shall be removed from office or employment.

16. This agreement shall remain in effect for an unspecified period unless terminated by either party. Said agreement may be terminated or modified by either party upon thirty (30) days written notice to the other party.

IN WITNESSETH WHEREOF, the parties hereto have executed this agreement.

By: _____ 1-29-07
Superintendent
Golden Gate National Recreation Area
Date

By: _____ 2.27.07
Superintendent
San Francisco Maritime National Historic Park
Date

By: _____ 1-23-07
Chief
United States Park Police
Date

By: _____ 11-21-06
Chief,
San Francisco Police Department
Date

5

GAVIN NEWSOM
MAYOR

POLICE DEPARTMENT
CITY AND COUNTY OF SAN FRANCISCO
THOMAS J. CAHILL HALL OF JUSTICE
850 BRYANT STREET
SAN FRANCISCO, CALIFORNIA 94103-4603

HEATHER J. FONG
CHIEF OF POLICE

March 31, 2006

Major Gerald F. McCarthy
Commander, U.S. Park Police
Golden Gate National Recreation Area
Fort Mason
San Francisco, CA 94123

NOTICE OF CONSENT

**WHEREAS**, Section 830.8(b) of the California Penal Code provides that "[d]uly authorized federal employees who comply with the training requirements set forth in Section 832 are peace officers when they are engaged in enforcing applicable state or local laws on property owned or possessed by the United States government, or on any street, sidewalk, or property adjacent thereto, and with the written consent of the sheriff or the chief of police, respectively, in whose jurisdiction the property is situated;" and

**WHEREAS**, parts of the Golden Gate National Recreation Area are located within the political boundaries of the City and County of San Francisco; and therefore, within the jurisdiction of the Chief of Police of the San Francisco Police Department.

**NOW, THEREFORE, LET IT BE KNOWN THAT** I hereby consent that any peace officer of the United States Park Police of the National Park Service, as defined by California Penal Code Section 830.8(b), shall have the authority of a peace officer as limited by the terms of Section 830.8(b) at all times within the political subdivision for which I can give consent.

This consent shall be valid until revoked or amended by the San Francisco Police Department.

HEATHER J. FONG
Chief of Police

# Appendix F: Preliminary SFPD Traffic Control Plan

[Not Provided]

# Appendix G: Tentative Shuttle Routes for Tsunami Evacuation Support

[Not Provided]

# Appendix H: TIDA Treasure Island Emergency Response Plan Evacuation Annex

## 1.1 Treasure/Yerba Buena Islands Emergency Response Plan - Evacuation Annex v. November 2015

### 1.1.1 Purpose

This annex defines the process and defines the coordinating and supporting City and County of San Francisco (CCSF) departments that are involved in the full or partial evacuation of Treasure and Yerba Buena Islands.

### 1.1.2 Scope

During emergency scenarios, the Mayor of San Francisco is responsible ordering an evacuation of the City of San Francisco (City) or of specific geographic areas within the City to include Treasure and Yerba Buena Islands. This decision is made by the Mayor with guidance from the Department of Emergency Management (DEM) Executive Director, the San Francisco Police and Fire Chiefs, and other CCSF officials.

Based on the specific incident, the DEM Executive Director will make a recommendation to the Mayor regarding whether to order a complete evacuation of the City or a partial evacuation limited to certain neighborhoods within the City. When partial evacuation is an option, DEM will provide the Mayor with recommended evacuation area boundaries for a partial evacuation.

Once the evacuation area is defined and an evacuation order is issued, the CCSF Emergency Operations Center (EOC) coordinates and supports CCSF multi-departmental execution of the evacuation and, as necessary, temporary sheltering of those evacuated. As a neighborhood of the City, evacuation of Treasure and Yerba Buena Islands, if ordered, would be executed in accordance with the CCSF Emergency Response Plan's (CCSF ERP), guided by the ERP's Emergency Support Function (ESF) Annexes, including but not limited to "ESF 1-Transportation" and "ESF 6 – Care Housing and Human Services". The San Francisco Police Department will act as the lead City agency in implementing the evacuation of the public from designated evacuation areas.

Tsunami-specific evacuation and response concepts are addressed in the CCSF ERP's Tsunami Response Annex, dated x/x/2015 and available on-line at: http://www.sfdem.org

### 1.1.3 Assumptions

- A regional event may isolate Treasure and Yerba Buena Islands—vehicular access to the islands is restricted to the Bay Bridge—and disrupt CCSF evacuation planning and execution.
- A regional event may result in the activation of the CCSF EOC and one or more DOCs of CCSF departments with operations on Treasure and Yerba Buena Islands.
- Initial response actions on Treasure and Yerba Buena Islands depend on the availability of CCSF department staff on the islands and the time of the event.
- Treasure and Yerba Buena Islands do not have sufficient existing on-site resources to support shelters or medical care for more than 72 hours.

- At present, there is no ferry or water taxi services to Treasure Island. Pier 1 on Treasure Island might serve as a location where rescue vessels could dock. However, it currently lacks a permanent docking structure to allow for accessible passenger boarding of ferries or other vessels.
- Evacuation of Treasure and Yerba Buena Islands, or portions thereof, may be required in response to, but not limited to, the following incidents:
  - Seismic event causing widespread structural damage to the Treasure Island residential housing portfolio.
  - Seismic event causing widespread damage to the Treasure Island utility systems.
  - Near-source or far-source tsunami event.
  - Public health emergency.

## 1.1.4 Types of Evacuation

### 1.1.4.1 *MANDATORY*

When the Mayor orders a "Mandatory" evacuation, the order requires the public to leave the area to be evacuated to protect life, safety, or the general welfare of the population during the emergency. Issuing a Mandatory evacuation order emphasizes the urgency and seriousness of the situation, and increases the likelihood that people will comply with the order.

In enforcing a mandatory evacuation order, SFPD and supporting officers may encounter unaccompanied minors (age 17 and under) and people with dementia or cognitive limitations that leave them unable to understand or to comply with a mandatory evacuation order. In the absence of a parent, guardian, or other person who can legally make decisions for such persons, law enforcement officers carrying out the evacuation will determine, on a case-by-case basis, whether to forcibly remove the person from the evacuation area if they refuse to abide by the evacuation order. When a minor or a person with dementia or cognitive limitations is accompanied by a parent, guardian, or other person who is legally empowered to make decisions for them, and the parent, guardian, or other person refuses to evacuate, the law enforcement officers will not forcibly remove the minor or person with dementia or cognitive limitations.

### *1.1.4.2 VOLUNTARY*

When the Mayor orders a "Voluntary" evacuation, the order recommends but does not require evacuation of the public from the designated evacuation area.

## 1.1.5 Modes of Evacuation

### *1.1.5.1 SELF-EVACUATION*

"Self-evacuation" is defined as an individual transporting themselves out of the evacuation area by their own means and is CCSF's primary, preferred mode of transportation for those located inside the evacuation area. In the event of an evacuation of all or a portion of Treasure or Yerba Buena Islands, residents who have the ability to self-evacuate off the Islands using their

own personal automobiles should plan to do so and should seek to assist their housemates and neighbors in doing so as much as possible.

DUE TO TREASURE AND YERBA BUENA ISLAND'S ISOLATED LOCATION AND RELIANCE ON THE BAY BRIDGE, SELF-EVACUATION BY FOOT IS NOT A VIABLE OPTION FOR MOST ON-ISLAND EVACUATION SCENARIOS. PEOPLE WHO ARE UNABLE TO SELF-EVACUATE FROM THE ISLANDS, INCLUDING PEOPLE WITH DISABILITIES, WILL NEED TRANSPORTATION ASSISTANCE TO MOVE TO AREAS OF SAFETY.

#### *1.1.5.2 EVACUATION OF RESIDENTS WHO CANNOT SELF-EVACUATE*

People with disabilities include those who have mobility, visual, hearing, speech, or cognitive functional limitations, will likely require assistance evacuating off Treasure or Yerba Buena Islands. At the field level, the San Francisco Fire Department (SFFD) will serve as the lead department in coordinating the transportation of people with disabilities who require evacuation assistance.

CCSF departments supporting the SFFD in meeting this responsibility include the Mayor's Office on Disability, the San Francisco Municipal Transportation Agency (MTA) Accessible Services Division, and MTA Accessible Services. A Movement Control Group may be established at the MTA DOC to handle the tactical aspects involved with supporting the evacuation of those who cannot self-evacuate. In addition, volunteers from the SFFD's Neighborhood Emergency Response Team (NERT) may be activated by the SFFD to provide additional support to the SFFD in assisting those who are unable to self-evacuate.

#### *1.1.5.3 ADDITIONAL CCSF TRANSPORTATION RESOURCES SUPPORTING EVACUATION*

Upon issuance of an evacuation order, mass transit resources will be deployed to facilitate moving those who cannot self-evacuate out of the evacuation area. In the CCSF EOC, the Operations Support Section Transportation Branch is tasked with overseeing and coordinating the use of mass transit resources to move those who cannot self-evacuate out of the evacuation area. A Movement Control Group may be established at the MTA DOC to handle the tactical aspects involved with supporting the evacuation of those who cannot self-evacuate. Whenever possible, the MUNI 25 route will be used to move people who need assistance out of the evacuation area.

Authority to close or to maintain open the Bay Bridge and the on- and off-ramps leading from the Bridge to Yerba Buena Island belongs to the California Department of Transportation, or "Caltrans". The California Highway Patrol (CHP) is the agency charged with maintaining open or closing the Bay Bridge, and the on- and off- ramps leading from the Bridge to Yerba Buena Island and Treasure Island. During an emergency incident, Caltrans may need to close the Bay Bridge Toll Plaza to traffic, which would prevent westbound vehicle access to Yerba Buena or Treasure Island from the East Bay.

#### *1.1.5.3 EVACUATION OF PETS AND SERVICE ANIMALS*

People evacuating TI/YBI shall be allowed to evacuate with their household pets or service animals. San Francisco Department of Animal Care and Control (ACC) will coordinate shelters to house and care for displaced household pets, and will provide assistance to shelters with people with disabilities and their service, support, or assistance animals. Volunteers from the

San Francisco Disaster Animal Rescue Team, the California Veterinary Medical Association, and non-profit animal groups may support ACC pet shelter activities.

Household pet sheltering and care may occur at temporary shelters that are co-located with shelters for displaced people, or may occur at an existing ACC facility, or both, depending on the situation. Whenever possible, CCSF will locate household pet shelters close to human shelters. Owners will be expected to provide feeding, watering, exercise, and other care to their pets during the time they are sheltered.

#### *1.1.5.4 VERTICAL EVACUATION*

In incidents when there is not enough time to fully evacuate an area, such as a near-source tsunami, "vertical evacuation", or moving to higher ground, is an option for immediate preservation of life but should be considered a last resort. Unless structures have been pre-identified, inspected by qualified building engineers, and found able to withstand stress forces, such as those caused by an inundating tsunami wave, they cannot be safely relied on as a vertical evacuation refuge.

### 1.1.6 Post-Evacuation Sheltering

When CCSF issues an evacuation order requiring public evacuation within San Francisco, including of Treasure and Yerba Buena Islands, the EOC Operations Support Section, Health and Human Services Branch, Mass Care Group will work with the Human Services Agency DOC, the American Red Cross of the Bay Area, the Salvation Army, and other mass care providers to coordinate identification, set up and management of a number of facilities within San Francisco, or the surrounding areas if necessary due to the scope of the incident, to support the evacuation of people from the evacuation area.

Such CCSF facilities shall be used for temporary sheltering of residents and others evacuated from Treasure and Yerba Buena Islands. Whenever possible, CCSF will locate household pet shelters close to human shelters. Owners will be expected to provide feeding, watering, exercise, and other care to their pets during the time they are sheltered.

The Treasure Island Residential Property Managers shall work with their tenants to identify longer-term shelter and temporary housing for evacuated residents as necessary once City-supported evacuation and shelter facilities are demobilized. In the event that only a portion of Treasure or Yerba Buena Islands are evacuated, the City and TIDA shall prioritize establishing such shelter facilities on-Island.

### 1.1.7 TIDA Role in Evacuation

During a full or partial evacuation of Treasure and Yerba Buena Islands, TIDA shall support CCSF on-Island evacuation activities as follows: (*Partial List. Further discussion of TIDA capabilities is found in the TI/YBI Emergency Response Plan document*)

- Activate the TIDA Incident Command Post to support City evacuation operations and liaison with on-Island City Incident Commander, the General Services Agency DOC and the CCSF EOC.

- Staff the TIDA Seat at the CCSF EOC Operations Support Section, Community Branch when requested by CCSF DEM.
- Support and assist CCSF Public Information distribution on-Island regarding evacuation routes, pick-up points, off-Island Shelter Facilities, and other vital information pertinent to the evacuation operation.
- Manage TIDA incident-specific departmental and employee-related responsibilities related to the evacuation, including re-location of departmental assets, vehicles and employees as necessary.
- Liaison with on-Island stakeholders including:
  - Treasure Island Residential Property Managers
  - Treasure Island Commercial Tenants
  - Treasure Island Master Developer, Consultants and Contractors
  - Yerba Buena Island-based transportation infrastructure construction projects
  - Treasure Island-based Community Serving Organizations
  - Treasure Island Job Corps Campus
  - United States Navy Caretaker Site Office and USN contractors
  - United States Coast Guard, Sector SF

### 1.1.8 Document References

- CCSF ERP Document
  - CCSF ESF – 1
  - CCSF ESF – 6
  - Tsunami Annex
- TI/YBI Emergency Response Plan

# Appendix I: Sample CCSF Tsunami Re-Entry Plan

# CITY AND COUNTY OF SAN FRANCISCO
# TSUNAMI EVACUATION RE-ENTRY PLAN

## I. PURPOSE

This plan outlines protocols for City and County of San Francisco (CCSF) departments and partner agencies in implementing a re-entry process for the safe and effective return of emergency responders, critical service providers, residents, and businesses following a tsunami incident requiring evacuation of areas of San Francisco.

## II. SITUATION

A. CCSF may experience a distant- or near-source tsunami that results in the issuance of (1) a Proclamation of Local Emergency under the California Emergency Services Act, and (2) a Mandatory Evacuation Order for all or a portion of the tsunami inundation area shown in the 2009 State Tsunami Inundation Area Map for San Francisco, as drawn to streets for ease of implementation.

B. Once an evacuation has been ordered as a result of a Tsunami Warning or Advisory, the immediate or simultaneous return of individual and business evacuees may not be feasible due to post-event conditions and the need to: (1) ensure the safety of returning evacuees, (2) restore critical infrastructure, (3) protect homes and businesses within the evacuation area, and (4) stabilize and prepare the evacuated area for the return of residents and businesses.

C. 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.

D. The decision on when to allow field responders, residents, and businesses to re-enter the tsunami evacuation area will be made by the Mayor, in consultation with the Mayor determines, in consultation with the Executive Director of the San Francisco Department of Emergency Management (DEM), Police and Fire officials, state and federal tsunami experts, and Unified Command.

E. Evacuated areas will remain closed to the public until the Mayor determines that (1) the threat of a tsunami no longer exists, (2) allowing the public to re-enter evacuated areas will not pose a safety or health risk to returning evacuees, and (3) critical infrastructure needed to support public re-entry has been restored.

F. Once field responders perform a safety assessment of evacuated areas, the Mayor will determine if unrestricted re-entry is possible, or if a phased re-entry into the evacuation area is necessary. In an unrestricted re-entry process, residents and businesses are allowed to return simultaneously after their identities are verified at area security checkpoints. In a phased re-entry process, residents and businesses are allowed to return only to those areas deemed safe after debris has been removed, buildings have been inspected and determined to be safe, and utilities and other critical services have been restored.

G. Factors to consider in determining whether to order a phased re-entry include road access; whether fire, search and rescue, debris removal, or other life safety activities are ongoing, and their expected duration; the presence of hazardous materials, debris, standing water, or other life safety or health hazards; the availability of utilities and other critical services; impending weather threats; and area security as determined by local law enforcement officials.

H. If conditions allow, the Mayor may order the implementation of a temporary entry or "look and leave" policy under which residents or business owners may temporarily visit their properties to assess damage before CCSF fully lifts the Mandatory Evacuation Order. If a Look and Leave period is implemented, strict time frames will be announced for the residents to enter and leave.

I. The Mayor, pursuant to his or her emergency powers, may authorize a credentialing process in addition to those stated in this plan as necessary and appropriate, to facilitate re-entry of field response personnel, the public, and businesses into the evacuation area.

J. Checkpoints will be established by the San Francisco Police Department (SFPD) at the outer perimeter of the evacuation area. San Francisco Municipal Transportation Authority (SFMTA) Traffic Control personnel will assist the SFPD in identifying locations for checkpoints at major intersections to prevent the unauthorized entry of persons or vehicles into evacuated areas, and to ensure the movement of traffic outside evacuated areas. Police may request the assistance of additional CCSF or other law enforcement personnel to help staff the checkpoints.

K. Streets and sidewalks leading into evacuated areas may be barricaded with CCSF vehicles, concrete highway dividers, or other large barriers to prevent unauthorized entry.

L. The lead CCSF department for purposes of implementing this Re-Entry Plan will be the SFPD, with support from the SFMTA, the San Francisco Sheriff's Department, and San Francisco Public Works.

M. CCSF will:

1. Identify and provide appropriate re-entry credentials to all contractors and subcontractors whose services or products may be required by CCSF immediately after a disaster, along with their qualified personnel, based on the criteria described in this plan.
2. Identify and provide appropriate re-entry credentials to qualified public entities, agencies, and emergency responders, along with their qualified emergency contractors and subcontractors, based on the criteria described in this plan.
3. Implement a credentialing application and distribution process for other qualified businesses, groups, and individuals, based on the criteria described in this plan.
4. Coordinate with regional, state, and federal partners, and with business and non-profit partners, to ensure effective plan implementation.

N. The CCSF EOC Joint Information Section will coordinate the issuance of public information to notify evacuees when it is safe to return to residences and businesses. Notifications will be issued through traditional media, social media, and other available methods, and will be accessible to persons with disabilities and persons with access and functional needs. Messaging will include information on the progress of debris clean-up, the areas deemed safe, requirements for re-entry, identification procedures, location of area security checkpoints, safety information, and residence or business clean-up and reconstruction information.

**III. ACCESS LEVELS**

This plan provides for three re-entry access levels. Each level includes the level or levels preceding it. The SFPD or Unified Command may combine levels or make other necessary changes in this plan based on the situation, on safety issues presented, and on the City's needs.

A. Access Level 1: Emergency Response

1. During Level 1 access, local, state, and federal emergency responders will have unrestricted access to the evacuation area to conduct search and rescue, fire suppression, medical response, hazardous material, and other life safety and incident stabilization efforts, and security operations.
2. For purposes of this plan, "emergency responders" include local, state, and federal law enforcement, fire services, emergency medical services, and emergency management personnel; National Guard or active military forces; Urban Search and Rescue Teams registered with the state and with CCSF; logistics personnel required to support on-going emergency operations or to support field personnel; maritime emergency responders; and those agencies and organizations designated by Unified Command as critical for emergency response.
3. Local, state, and federal emergency responders will be required to have a valid, department- or agency-issued picture identification card and a driver's license in order to enter the evacuation area. All other qualified emergency responders not traveling in recognized emergency-responder vehicles will be issued CCSF re-entry placards and must carry agency-issued photo identification and valid driver's license.
4. During Level 1 access, no personal vehicles will be allowed to enter evacuated areas. Only emergency vehicles and vehicles used in critical service restoration will be permitted access.

B. Access Level 2: Critical Infrastructure Service Providers

1. Once the Mayor determines that Level 1 personnel have reduced the danger to public safety in evacuated areas, relief workers, contracted security officers, healthcare personnel, business owners and their essential business staff, insurance adjusters, and any other persons authorized by the SFPD or Unified Command to provide services to reduce economic loss will be permitted entry.

2. Level 2 personnel include San Francisco Department of Public Health inspectors, Animal Care and Control, insurance adjusters, telephone, cable television, and authorized Non-Government Organizations such as the American Red Cross and The Salvation Army.
3. Level 2 personnel will be required to have a valid, department-, agency-, or employer-issued picture identification card and a driver's license in order to enter the evacuation area. All other Level 2 personnel not traveling in recognized vehicles will be issued CCSF re-entry placards and must carry agency-issued photo identification and valid driver's license.
4. During Level 2 access, no personal vehicles will be allowed to enter evacuated areas. Only official vehicles and vehicles used in service restoration will be permitted access.
5. Entities found to be issuing credentials to non-employees or to non-essential employees will be subject to suspension of their re-entry privileges and to fines and penalties in accordance with law.

C. Access Level 3: Residents

1. Once the Mayor determines that it is safe to allow residents to re-enter evacuated areas as provided in II.D above, residents of evacuated areas will be allowed access to areas that have been deemed safe by CCSF officials.
2. All residents must show the proper identification and documentation in order to enter evacuated areas. Proper identification for residents to gain access includes a current driver's license, a current passport, utility bill, property tax documents, vehicle registration, or any two pieces of identification that list the resident's name and address within the evacuation area.

# Appendix J: CCSF Tsunami Essential Elements of Information

## CCSF Tsunami Essential Elements of Information

| EEI TYPE | INFORMATION NEEDED |
|---|---|
| Incident Information | Generating event - Earthquake<br>– Location<br>– Magnitude<br>– Near-source/Distant-source<br>Generating event - Non-earthquake (may not be covered by NTWC) |
| | National Tsunami Warning Center (NTWC) tsunami bulletin type:<br>– Warning<br>– Advisory<br>– Watch |
| | NTWC forecasted tsunami information:<br>– Time of tsunami arrival<br>o Less than four hours to arrival<br>o More than four hours to arrival<br>o 30 minutes before arrival time (when pre-arrival response must end and responders must evacuate)<br>– Tsunami amplitude (wave height)<br>– Expected duration of tsunami impacts<br>– Forecasted speed of tsunami currents |
| | NOAA forecasted (normal) tide conditions:<br>– For first five hours after tsunami arrival<br>– For duration of tsunami<br>– Time of highest tide |
| | Cal OES/NWS-Monterey Tsunami Evacuation Information:<br>– FASTER Tsunami Flood Value<br>– State-recommended Tsunami Evacuation Plan level<br>– State-recommended Maritime Response Plan level |
| | Weather impacts during incident, including:<br>– Wind<br>– Rain<br>– Temperatures |
| Evacuation | Evacuation Level (see DEM Duty Officer Tsunami Action Sheet)<br>– Level 1<br>– Level 2<br>– Level 3<br>– Maximum evacuation level<br>– Not needed |
| | Authority to order and enforce evacuation includes:<br>– Local disaster proclamation under California Emergency Services Act (CESA): Broadest authority and immunity (see Tsunami Annex for guidance & forms)<br>– California Penal Code 409.5 (does not clearly cover evacuation; law enforcement authority)<br>– Mandatory order must be:<br>o Preceded by Local Emergency Proclamation under CESA<br>o In writing and publicized |
| | Public Alert & Warning (see Tsunami Annex for guidance)<br>– Providers<br>o DEM Duty Officer<br>o Joint Information Section (JIS) |

| EEI TYPE | INFORMATION NEEDED |
|---|---|
| Evacuation (cont'd) | o SF311<br>– Methods<br>o AlertSF<br>o OPWS<br>o EAS<br>o WEA<br>o Social media (Twitter, Facebook, etc.)<br>o Door-to-door, if time permits (SFPD, SFFD, PW) |
| | Partner Notification<br>– CCSFAlert (DEM Duty Officer)<br>– Notice to NPS-GGNRA (911), State Parks, USCG, WETA, CHP, Caltrans |
| | Evacuation assistance for PWD / PWAFN (SFFD, SFPD, MTA)<br>– If time permits<br>– SFFD is lead agency, with assistance by SFMTA and SFPD<br>– 911 fields calls from people in inundation who cannot self-evacuate<br>– List of Lists - List of PWD/PWAFN service providers |
| | Time for field responders to evacuate inundation area:<br>– No less than 30 minutes before projected first wave.<br>– Warning notices to CCSF Depts./ Partners:<br>o 1.5 hour notice<br>o 1 hour notice<br>o 0.5 hour notice<br>o "Get out now" notice |
| Re-Entry | Safety determination<br>– If no flooding tsunami waves occurred: When NTWC cancels Warning or Advisory<br>– If flooding waves occurred: Two hours since last inundating wave<br>– Beaches, harbors, marinas may need to remain closed due to dangerous currents for 12 hours/ full tidal cycle after NTWC cancels Advisory or Warning<br>Overflight by helicopter or UAV to verify whether flooding/other damage occurred |
| | Official issuance of notice that Field Responder re-entry is safe (allowing field responders to re-enter inundated or impacted areas)<br>– At least two hours after last wave<br>– Verified to be safe by qualified professionals<br>– Area security needs<br>– Traffic control |
| | Issuance of Evacuation All-Clear<br>– Time for issuance<br>– Type of Re-entry<br>o Phased<br>o Non-phased<br>– Area security needs<br>– Traffic control |

# Appendix K: National Tsunami Warning System

# Appendix K: National Tsunami Warning System

San Francisco is within the area of responsibility of the National Tsunami Warning Center (NTWC), which is part of the National Oceanic and Atmospheric Administration (NOAA), National Weather Service (NWS). The NTWC's mission is to provide accurate, timely tsunami bulletins to locations within its area of responsibility. When an earthquake activates the NTWC's alarm system, the NTWC performs an investigation that includes location, analysis, and characterization of the earthquake; analysis and review of sea level data; and issuance of tsunami information to appropriate emergency management officials.

NOTE: The National Tsunami Warning System is not set up to respond to tsunamis generated by submarine landslides that occur with little to no seismic energy release (NTWC, Tsunami FAQ).

## K-1 NTWC Tsunami Bulletins

When an earthquake occurs that requires activation of the National Tsunami Warning System, the NTWC will issue tsunami bulletins as appropriate. The tsunami bulletin products issued by the NTWC are described below.

**Tsunami Warning:**

- Issued when a tsunami over 1 meter (3.28 feet) in amplitude, with the potential to cause widespread inundation, is imminent, expected, or occurring.
- Indicates that dangerous coastal flooding and powerful currents are possible and may continue for several hours after initial arrival.
- Alerts emergency management officials to take action for the entire tsunami hazard zone. Appropriate actions may include evacuation of low-lying coastal areas and repositioning of ships to deep water if there is time to safely do so.
- Initial Warnings are normally based only on seismic information.
- NTWC may update, adjust geographically, downgrade, or cancel Warnings.

**Tsunami Advisory:**

- Issued when a tsunami in the range of 0.3 to 1 meter (1 to 3.28 feet), with the potential to generate strong currents or waves dangerous to those in or very near the water, is imminent, expected, or occurring.
- Threat may continue for several hours after initial arrival, but significant inundation is not expected.
- Appropriate actions to be taken by local officials may include closing beaches, evacuating harbors and marinas, and the repositioning of ships to deep water if there is time to safely do so.
- NTWC may update Advisory to continue or cancel it, to expand or contract affected areas, or to upgrade to a Warning.

**Tsunami Watch:**

- Issued to alert emergency management officials and the public of an event that may later impact the watch area.
- Tsunami impact is normally at least three hours away for areas placed within a Tsunami Watch.
- Emergency management officials and the public in a watch area should prepare to take action.
- Normally issued based on seismic information without confirmation that a destructive tsunami is underway.
- NTWC may upgrade the Watch to a Warning or Advisory, or may cancel it, based on updated information and analysis.

**Tsunami Information Statement:**

- Typically indicates there is no threat of a destructive tsunami, to prevent unnecessary evacuation, as the earthquake may have been felt in coastal areas.
- May be issued to inform emergency managers and the public that an earthquake has occurred, or that a tsunami Warning, Watch, or Advisory has been issued for another location.
- May caution about the possibility of destructive local tsunamis if applicable.
- Not normally updated. NTWC may reissue an information statement with additional information, or may issue a Watch, Advisory, or Warning for the area after analysis or updated information becomes available.

**Bulletin Contents:**

NTWC Warning, Advisory, and Watch bulletins typically include:

- A forecast of probable tsunami initial wave arrival times at specific locations within the bulletin area;
- Expected maximum tsunami wave heights; and
- An approximate duration of tsunami wave activity.

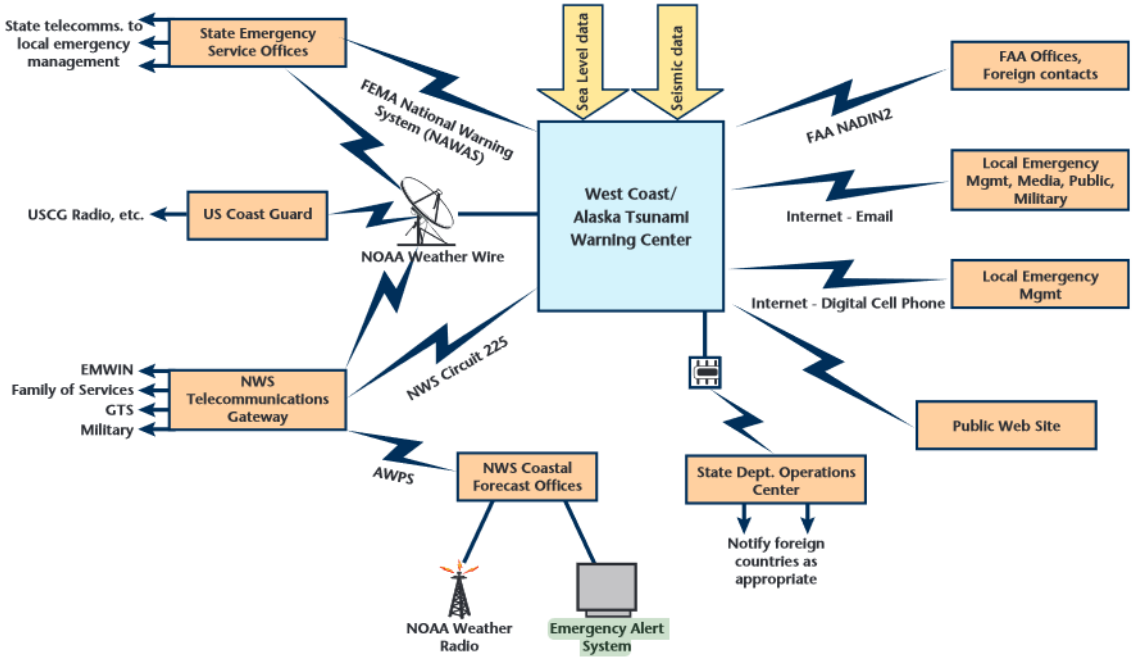
Arrival times and heights are estimates based on historical or observed data from NTWC monitoring systems. The NTWC issues follow-up messages with updated information as the event registers, or fails to register, on tide gauges and on deep ocean tsunami detector buoys, also known as Deep-ocean Assessment and Reporting of Tsunamis (DART).

## K-2 NTWC Dissemination of Tsunami Bulletins

The NTWC disseminates tsunami messages to the California Governor's Office of Emergency Services (Cal OES), and to other state and federal emergency management agencies, using the Federal Emergency Management Agency (FEMA) National Warning System and the NOAA Weather Wire. The NTWC also sends its messages to coastal NWS Forecast Offices; San Francisco is in the area served by the San Francisco/Monterey Bay Area Weather Forecast Office in Monterey, California. In addition, NOAA issues tsunami messages to emergency

managers and to the public through its NOAA Weather Radio, and through social media outlets such as Twitter. For a diagram of NTWC's message communications, see Figure K-1, below.

**Figure K-1: NTWC Message Communications**




Source: NOAA/NWS/NTWC (2014). *User's Guide for the Tsunami Warning System in the U.S. National Tsunami Warning Center Area-of-Responsibility*. Retrieved from http://wcatwc.arh.noaa.gov/operations/opsmanual.pdf

## K-3 NTWC Cancellation of Tsunami Advisory or Warning

The NTWC will issue a message cancelling a Tsunami Advisory or Warning when:

- Evaluation of sea level data confirms that a destructive tsunami will not impact an area; or
- After a destructive tsunami occurs, data indicates the threat has subsided to nondestructive levels.

If a destructive tsunami occurs, the NTWC will provide guidance to CCSF officials regarding when they can consider the threat to have ended based on local conditions. However, CCSF emergency management officials have responsibility for issuing an "all-clear" notice indicating that it is safe for field responders or for the public to re-enter evacuated areas in San Francisco. The NTWC does not issue all clear messages, because local shoreline and bathymetric features can result in wide variations in tsunami wave action in local areas. For further discussion of issuance of public "all clear" notices, see Section 3.5.6.3.

## K-4 NTWC Dissemination of Tsunami Bulletins

The NTWC disseminates tsunami messages to the California Governor's Office of Emergency Services (Cal OES), and to other state and federal emergency management agencies, using the Federal Emergency Management Agency (FEMA) National Warning System and the NOAA

Weather Wire. The NTWC also sends its messages to coastal NWS Forecast Offices; San Francisco is in the area served by the San Francisco/Monterey Bay Area Weather Forecast Office in Monterey, California. In addition, NOAA issues tsunami messages to emergency managers and to the public through its NOAA Weather Radio, and through social media outlets such as Twitter. For a diagram of NTWC's message communications, see Figure K-1, above.

## K-5 NTWC Cancellation of Tsunami Advisory or Warning

The NTWC will issue a message cancelling a Tsunami Advisory or Warning when:

- Evaluation of sea level data confirms that a destructive tsunami will not impact an area; or
- After a destructive tsunami occurs, data indicates the threat has subsided to nondestructive levels.

If a destructive tsunami occurs, the NTWC will provide guidance to CCSF officials regarding when they can consider the threat to have ended based on local conditions. However, CCSF emergency management officials have responsibility for issuing an "all-clear" notice indicating that it is safe for field responders or for the public to re-enter evacuated areas in San Francisco. The NTWC does not issue all clear messages, because local shoreline and bathymetric features can result in wide variations in tsunami wave action in local areas. For further discussion of issuance of public "all clear" notices, see Section 3.5.6.3.

## K-6 State Dissemination of Tsunami Bulletins

Cal OES' 24/7 operations center, the California State Warning Center, is the agency that serves as California's "Warning Point" for dissemination of NTWC tsunami bulletins. In this capacity, the State Warning Center's primary duties are to:

- Receive tsunami bulletins from the NTWC.
- Relay those bulletins to potentially-impacted Operational Areas or counties.
- Act as an ongoing liaison between the NTWC and potentially-impacted California counties.

The State Warning Center relays NTWC bulletins to California coastal counties using the California Warning and Alerting System, the California Law Enforcement Telecommunications System, and the EAS. In addition, the State Warning Center notifies Cal OES Regional Duty Officers and Cal OES Earthquake and Tsunami Coordinators in potentially-impacted areas of the issuance of a NTWC tsunami bulletin. Cal OES Regional Duty Officers will verify that counties, unincorporated areas, and special districts within their area of responsibility have received the NTWC tsunami bulletins relayed by the State Warning Center.

NOTE: The State Warning Center is only authorized to communicate original NTWC tsunami bulletins. It does not perform threat analysis, nor does it provide advice to local governments regarding local response measures.

# Appendix L: CCSF Tsunami Evacuation Facilities

*Not Provided*

# Appendix M: Credible Historical Tsunamis Producing Run-Up in San Francisco

## Appendix M: Credible Historical Tsunamis Producing Run-Up in San Francisco

| SOURCE LOCATION INFORMATION | | | | | | | | | | | RUN-UP LOCATION INFORMATION | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| EVENT ID | YEAR | MONTH | DAY | VALIDITY | CAUSE | MAGNI-TUDE | SOURCE COUNTRY | NAME | LATITUDE | LONGI-TUDE | RUNUP LOCATION | LATITUDE | LONGI-TUDE | DISTANCE FROM SOURCE (km) | TRAVEL TIME HOURS | TRAVEL TIME MINUTES | MAX WATER HEIGHT | MEASURE TYPE | PERIOD | FIRST MOTION |
| | 1854 | 10 | 4 | 3 | Unknown | | USA | N. California | | | | | | | | | 0.03 | Tide Gauge | | |
| 835 | 1854 | 12 | 23 | 4 | EQ | 8.3 Mfa | Japan | Enshunada Sea | 34 | 137.9 | San Francisco, CA | 37.807 | -122.47 | 8511 | 12 | 12 | 0.1 | Tide Gauge | 35 | |
| 837 | 1854 | 12 | 24 | 4 | EQ | 8.4 Mfa | Japan | Nankaido | 33.1 | 135 | San Francisco, CA | 37.807 | -122.47 | 8785 | 13 | 55 | 0.11 | Tide Gauge | | |
| 864 | 1856 | 8 | 23 | 4 | EQ | 8.0 Ms | Japan | SE. Hokkaido Island | 40.5 | 143.5 | San Francisco, CA | 37.807 | -122.47 | 7692 | | | 0.03 | Tide Gauge | 37 | |
| 971 | 1868 | 4 | 3 | 4 | VOL | 7.9 Mfa | USA | Mauna Loa, HI | 19.475 | -155.608 | San Francisco, CA | 37.807 | -122.47 | 3818 | | | 0.05 | Tide Gauge | 40 | |
| 983 | 1868 | 8 | 13 | 4 | EQ | 8.5 Ms | Chile | Northern Chile | -18.6 | -71 | San Francisco, CA | 37.807 | -122.47 | 8262 | 12 | | 0.3 | Tide Gauge | 21 | |
| 993 | 1868 | 10 | 21 | 3 | EQ | 6.8 ML | USA | N. California | 37.7 | -122.1 | San Francisco Bay, CA | 37.71 | -122.27 | 15 | | | 4.5 | Eyewitness | | R |
| 1040 | 1872 | 8 | 23 | 4 | EQ | | USA | Fox Islands, Aleutian Islands, AK | 52.2 | -168.5 | San Francisco, CA | 37.807 | -122.47 | 3877 | | | 0.08 | Tide Gauge | | |
| 1075 | 1877 | 5 | 10 | 4 | EQ | 8.3 Ms | Chile | Northern Chile | -21.5 | -70.5 | San Francisco, CA | 37.807 | -122.47 | 8543 | 13 | 5 | 0.18 | Tide Gauge | | F |
| 1234 | 1896 | 6 | 15 | 4 | EQ | 8.3 Mw | Japan | Sanriku | 39.5 | 144 | San Francisco, CA | 37.807 | -122.47 | 7716 | 10 | 36 | 0.2 | Eyewitness | 20 | |
| 1331 | 1906 | 1 | 31 | 4 | EQ | 8.6 Mw | Ecuador | Off Coast | 1 | -81.5 | San Francisco, CA | 37.807 | -122.47 | 5852 | | | 0.06 | Tide Gauge | | |
| 1333 | 1906 | 4 | 18 | 4 | EQ | 7.9 Mw | USA | N. California | 37.7 | -122.5 | San Francisco, CA | 37.807 | -122.47 | 12 | 0 | 9 | 0.1 | Tide Gauge | 16 | F |
| 1339 | 1906 | 8 | 17 | 3 | EQ | 8.2 Mw | Chile | Central Chile | -33 | -72 | San Francisco, CA | 37.807 | -122.47 | 9449 | 15 | 0 | 0.04 | Tide Gauge | 28 | |
| 1444 | 1917 | 5 | 1 | 4 | EQ | 8.0 Ms | New Zealand | Kermadec Islands | -29.2 | -177 | San Francisco, CA | 37.807 | -122.47 | 9365 | 12 | 33 | 0.1 | Tide Gauge | 20 | |
| 1446 | 1917 | 6 | 26 | 4 | EQ | 8.3 Ms | Samoa | Samoa ISLANDS | -15.5 | -173 | San Francisco, CA | 37.807 | -122.47 | 7934 | 11 | 12 | 0.04 | Tide Gauge | 17 | |
| 1457 | 1918 | 9 | 7 | 4 | EQ | 8.3 Ms | Russia | S. Kuril Islands | 45.5 | 151.5 | San Francisco, CA | 37.807 | -122.47 | 6852 | 9 | 9 | 0.03 | Tide Gauge | 14 | R |
| 1460 | 1918 | 11 | 8 | 4 | EQ | 7.8 Ms | Russia | S. Kuril Islands | 45.5 | 151.5 | San Francisco, CA | 37.807 | -122.47 | 6902 | 9 | 37 | 0.03 | Tide Gauge | | |
| 1505 | 1922 | 11 | 11 | 4 | EQ | 8.7 Mw | Chile | Northern Chile | -28.553 | -70.755 | San Francisco, CA | 37.807 | -122.47 | 9134 | 13 | 42 | 0.18 | Tide Gauge | 30 | R |
| 1508 | 1923 | 2 | 3 | 4 | EQ | 8.3 Mw | Russia | Kamchatka | 54 | 161 | San Francisco, CA | 37.807 | -122.47 | 5877 | 8 | 31 | 0.1 | Tide Gauge | 16 | R |
| 1517 | 1923 | 4 | 13 | 4 | EQ | 7.2 Ms | Russia | Kamchatka | 56.5 | 162.5 | San Francisco, CA | 37.807 | -122.47 | 5718 | 9 | 24 | 0.15 | Tide Gauge | 20.75 | F |
| 1585 | 1927 | 11 | 4 | 4 | EQ | 7.3 Mw | USA | S. California | 34.813 | -120.774 | San Francisco, CA | 37.807 | -122.47 | 366 | 1 | 9 | 0.02 | Tide Gauge | 12 | R |
| 1605 | 1928 | 6 | 16 | 4 | EQ | 7.7 Mw | Mexico | S. Mexico | 16.028 | -97.036 | San Francisco, CA | 37.807 | -122.47 | 3474 | | | 0.1 | Tide Gauge | | |
| 1613 | 1929 | 3 | 7 | 4 | EQ | 7.8 Mw | USA | Fox Islands, Aleutian Islands, AK | 50.88 | -169.71 | San Francisco, CA | 37.807 | -122.47 | 3950 | 5 | 59 | 0.02 | Tide Gauge | 15 | |

| SOURCE LOCATION INFORMATION | | | | | | | | | | | RUN-UP LOCATION INFORMATION | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| EVENT ID | YEAR | MONTH | DAY | VALIDITY | CAUSE | MAGNI-TUDE | SOURCE COUNTRY | NAME | LATITUDE | LONGI-TUDE | RUNUP LOCATION | LATITUDE | LONGI-TUDE | DISTANCE FROM SOURCE (km) | TRAVEL TIME HOURS | TRAVEL TIME MINUTES | MAX WATER HEIGHT | MEASURE TYPE | PERIOD | FIRST MOTION |
| 1645 | 1931 | 10 | 3 | 4 | EQ | 7.8 Mw | Solomon Islands | San Cristobal Island | -10.932 | 161.016 | San Francisco, Presidio, CA | 37.807 | -122.47 | 9598 | | | 0.03 | Tide Gauge | | |
| 1661 | 1933 | 3 | 2 | 4 | EQ | 8.4 Mw | Japan | Sanriku | 39.1 | 144.7 | San Francisco, CA | 37.807 | -122.47 | 7689 | 10 | 30 | 0.07 | Tide Gauge | 12 | |
| 1752 | 1943 | 4 | 6 | 4 | EQ | 8.2 Mw | Chile | Central Chile | -30.75 | -72 | San Francisco, CA | 37.807 | -122.47 | 9252 | | | 0.03 | Tide Gauge | | |
| 1756 | 1944 | 12 | 7 | 4 | EQ | 8.1 Mw | Japan | Off Southeast Coast KII Peninsula | 34 | 137.1 | San Francisco, CA | 37.807 | -122.47 | 8570 | | | 0.02 | Tide Gauge | | |
| 1762 | 1946 | 4 | 1 | 4 | EQ | 8.6 Mw | USA | Unimak Island, AK | 53.492 | -162.832 | San Francisco, Hunters Point, CA | 37.724 | -122.37 | 3538 | 5 | 43 | 0.08 | Tide Gauge | 15 | R |
| 1762 | 1946 | 4 | 1 | 4 | EQ | 8.6 Mw | USA | Unimak Island, AK | 53.492 | -162.832 | San Francisco, Presidio, CA | 37.807 | -122.47 | 3525 | 5 | 31 | 0.26 | Tide Gauge | 15 | |
| 1770 | 1946 | 12 | 20 | 4 | EQ | 8.1 Mw | Japan | Honshu: S Coast | 33 | 135.6 | San Francisco, CA | 37.807 | -122.47 | 8748 | | | 0.05 | Tide Gauge | 12 | |
| 1817 | 1952 | 3 | 4 | 4 | EQ | 8.1 Mw | Japan | SE. Hokkaido Island | 42.15 | 143.85 | San Francisco, CA | 37.807 | -122.47 | 7569 | | | 0.02 | Tide Gauge | 27 | |
| 1829 | 1952 | 11 | 4 | 4 | EQ | 9.0 Mw | Russia | Kamchatka | 52.75 | 159.5 | San Francisco, CA | 37.807 | -122.47 | 6012 | 8 | 32 | 0.54 | Tide Gauge | | R |
| 1829 | 1952 | 11 | 4 | 4 | EQ | 9.0 Mw | Russia | Kamchatka | 52.75 | 159.5 | San Francisco, Hunters Point, CA | 37.72 | -122.37 | 6024 | 9 | 0 | 0.18 | Tide Gauge | | R |
| 1867 | 1957 | 3 | 9 | 4 | EQ | 8.6 Mw | USA | Andreanof Islands, AK | 51.292 | -175.629 | San Francisco, CA | 37.807 | -122.47 | 4364 | 5 | 54 | 0.26 | Tide Gauge | 11 | |
| 1884 | 1958 | 11 | 6 | 4 | EQ & LS | 8.3 Mw | USA | SE. Alaska, AK | 58.34 | -136.52 | San Francisco, CA | 37.807 | -122.47 | 7109 | | | 0.2 | Tide Gauge | | |
| 1902 | 1960 | 5 | 22 | 4 | EQ | 9.5 Mw | Chile | Central Chile | -39.500 | -74.500 | San Francisco, CA | 37.807 | -122.47 | 9894 | 15 | 2 | 0.46 | Tide Gauge | 72 | R |
| 1947 | 1963 | 10 | 13 | 4 | EQ | 8.5 Mw | Russia | S. Kuril Islands | 44.772 | 149.798 | San Francisco, CA | 37.807 | -122.47 | 7008 | | | 0.1 | Tide Gauge | | |
| 1954 | 1964 | 3 | 28 | 4 | EQ | 9.2 Mw | USA | Prince William Sound, AK | 61.017 | -147.648 | San Francisco, CA | 37.807 | -122.47 | 3118 | 5 | 6 | 1.13 | Tide Gauge | 39 | R |
| 1964 | 1965 | 2 | 4 | 4 | EQ | 8.7 Mw | USA | Rat Islands, Aleutian Islands, AK | 51.29 | 178.55 | San Francisco, CA | 37.807 | -122.47 | 4768 | | | 0.1 | Tide Gauge | | |
| 1982 | 1966 | 10 | 17 | 4 | EQ | 8.1 Mw | Peru | Central Peru | -10.748 | -78.638 | San Francisco, CA | 37.807 | -122.47 | 7067 | 10 | 6 | 0.1 | Tide Gauge | 33 | |
| 2000 | 1968 | 5 | 16 | 4 | EQ | 8.2 Mw | Japan | Off East Coast Of Honshu Island | 40.800 | 143.200 | San Francisco, CA | 37.807 | -122.47 | 7695 | | | 0.1 | Tide Gauge | | |
| 2080 | 1975 | 11 | 29 | 4 | EQ & LS | 7.7 Mw | USA | Hawaii | 19.451 | -155.033 | San Francisco, CA | 37.807 | -122.47 | 3748 | | | 0.06 | Tide Gauge | | |
| 2179 | 1987 | 11 | 30 | 4 | EQ | 7.9 Mw | USA | Gulf of Alaska, AK | 58.679 | -142.786 | San Francisco, CA | 37.807 | -122.47 | 2743 | 4 | 50 | 0.05 | Tide Gauge | | |
| 2263 | 1996 | 6 | 10 | 4 | EQ | 7.9 Mw | USA | Andreanof Islands, AK | 51.564 | -177.632 | San Francisco, CA | 37.807 | -122.47 | 4502 | | | 0.02 | Tide Gauge | | |
| 2373 | 2001 | 6 | 23 | 4 | EQ | 8.4 Mw | Peru | S. Peru | -16.265 | -73.641 | San Francisco, CA | 37.807 | -122.47 | 7883 | | | 0.04 | Tide Gauge | | |
| 2406 | 2003 | 9 | 25 | 4 | EQ | 8.3 Mw | Japan | Hokkaido Island | 41.815 | 143.91 | San Francisco, CA | 37.807 | -122.47 | 7585 | 10 | 25 | 0.03 | Tide Gauge | | |
| 2439 | 2004 | 12 | 26 | 4 | EQ | 9.1 Mw | Indonesia | Off W. Coast Of Sumatra | 3.295 | 95.982 | San Francisco, CA | 37.807 | -122.47 | 13973 | | | 0.08 | Tide Gauge | 60 | |
| 2749 | 2006 | 5 | 3 | 4 | EQ | 8.0 Mw | Tonga | Tonga | -20.187 | -174.123 | San Francisco, CA | 37.807 | -122.47 | 8410 | 11 | 38 | 0.05 | Tide Gauge | 6 | |

| SOURCE LOCATION INFORMATION | | | | | | | | | | | RUN-UP LOCATION INFORMATION | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| EVENT ID | YEAR | MONTH | DAY | VALIDITY | CAUSE | MAGNI-TUDE | SOURCE COUNTRY | NAME | LATITUDE | LONGI-TUDE | RUNUP LOCATION | LATITUDE | LONGI-TUDE | DISTANCE FROM SOURCE (km) | TRAVEL TIME HOURS | TRAVEL TIME MINUTES | MAX WATER HEIGHT | MEASURE TYPE | PERIOD | FIRST MOTION |
| 3016 | 2006 | 11 | 15 | 4 | EQ | 8.3 Mw | Russia | S. Kuril Islands | 46.592 | 153.266 | San Francisco, CA | 37.807 | -122.47 | 6677 | 9 | 6 | 0.16 | Tide Gauge | | |
| 3019 | 2007 | 1 | 13 | 4 | EQ | 8.1 Mw | Russia | S. Kuril Islands | 46.243 | 154.524 | San Francisco, CA | 37.807 | -122.47 | 6605 | | | 0.05 | Tide Gauge | | |
| 4440 | 2009 | 9 | 29 | 4 | EQ | 8.0 Mw | Samoa | Samoa Islands | -15.489 | -172.095 | San Francisco, CA | 37.807 | -122.47 | 7871 | 11 | 0 | 0.1 | Tide Gauge | | R |
| 4682 | 2010 | 2 | 27 | 4 | EQ | 8.8 Mw | Chile | Off Southern Coast | -36.122 | -72.898 | San Francisco, CA | 37.807 | -122.47 | 9675 | 14 | 46 | 0.32 | Tide Gauge | | R |
| 5413 | 2011 | 3 | 11 | 4 | EQ | 9.0 Mw | Japan | Honshu Island | 38.297 | 142.373 | San Francisco, CA | 37.807 | -122.47 | 7907 | | | 0.62 | Tide Gauge | | R |
| 5467 | 2012 | 10 | 28 | 4 | EQ | 7.7 Mw | Canada | British Columbia | 52.788 | -132.101 | San Francisco, CA | 37.807 | -122.47 | 1825 | 3 | 48 | 0.14 | Tide Gauge | | R |
| 5557 | 2014 | 4 | 1 | 4 | EQ | 8.2 Mw | Chile | Northern Chile | -19.642 | -70.817 | San Francisco, CA | 37.807 | -122.47 | 8363 | 13 | 15 | 0.05 | Tide Gauge | | R |
| 5590 | 2015 | 9 | 16 | 4 | EQ | 8.3 Mw | Chile | Chile: Central | -31.573 | -71.674 | San Francisco, CA | 37.807 | -122.47 | 9343 | 14 | 21 | 0.12 | Tide Gauge | | R |

SOURCE: National Geophysical Data Center / World Data Service (NGDC/WDS): Global Historical Tsunami Database. National Geophysical Data Center, NOAA. doi:10.7289/V5PN93H7, accessed November 2, 2015.

Near-source tsunami: Less than 1000 km (621 mi) from event source.
Same source event
R First Motion: Recede
F First Motion: Flood

Magnitude
Mfa Felt-Area Magnitude
ML Local Magnitude (commonly referred to as Richter magnitude)
Ms Surface-Wave Magnitude
Mw Moment Magnitude

Maximum water height above sea level in meters. If run-up measurement type was a:
Tide Gauge - half of the maximum height (minus the normal tide) of a tsunami wave recorded at the coast by a tide gauge.
Deep Ocean Gauge - half of the maximum height (minus the normal tide) of a tsunami wave recorded in the open ocean by a seafloor bottom pressure recording system.

**NOTE:** None of the tsunamis listed above produced inundation within CCSF.

# Appendix N: CCSF-Owned Facilities and Infrastructure in Tsunami Inundation Area

[Not Provided]

# Appendix O: San Francisco Tsunami Outreach Plan

# SAN FRANCISCO TSUNAMI PREPAREDNESS OUTREACH AND COMMUNICATIONS PLAN

## Background

The San Francisco Department of Emergency Management is updating San Francisco's Tsunami Annex. The plan focuses on the City's response actions to tsunami-related advisories, Watches, Warnings or Events. The plan establishes guidelines under which San Francisco will operate, when notified of tsunami-related event. San Francisco's 2016 Tsunami Annex is scheduled for approval by August 2016.

## Purpose

The purpose of this document is to plan, organize, and describe opportunities to provide tsunami awareness and preparedness education to the public.

## Goals

1. Provide the public, especially those living and working within a tsunami inundation zone, with information they need to properly plan and prepare for a tsunami-related event in San Francisco.
2. Develop messaging and materials that are accessible to all populations.
3. Establish opportunities for sustained education and engagement.

## Core Message

San Francisco plans and prepares for all emergencies including tsunamis. Our City's tsunami risk includes neighborhoods along both the ocean and the bay. Prepare yourself by knowing what do, gathering supplies, and planning.

## Key Messages

- San Francisco plans and prepares for all emergencies including tsunamis.
    - The San Francisco Department of Emergency Management is updating San Francisco's Tsunami Response Plan.
    - The plan focuses on the City's response actions to tsunami-related advisories, Watches, Warnings or Events.
    - The plan establishes guidelines under which San Francisco will operate, when notified of tsunami-related event.
- Our City's tsunami risk includes neighborhoods along both the ocean and the bay.
    - Since 1850, over fifty tsunamis have been recorded or observed in the San Francisco Bay.
    - The 2011 Tohoku Earthquake and Tsunami registered three to four foot waves in parts of the bay and resulted in $100 million in damage statewide.
- Prepare yourself by knowing what do, gathering supplies, and planning.
    - In the event of a tsunami, the most important thing to remember is to move inland and to higher ground. If you're by the coast, follow the blue tsunami evacuation route signs.

- Prepare a go bag. A good rule thumb is to have 3 days' worth of supplies. You'll be surprised at how much you already have.
- A little bit of planning can go a long way to help you and your loved ones safely respond to any disaster. When you have to act fast, having a plan that you've practiced is the key.

## Target Audiences

- General public with a focus on those that live and work within a tsunami inundation zone.
- Residents of Treasure Island
- People with disabilities and access and functional needs.

## Digital Communications

- Website: www.sf72.org
  *Explore the development and placement of tsunami specific information on SFDEM's preparedness website www.sf72.org.*
- Social Media: Education and Preparedness Messages
  *Develop and post social media content related to tsunami education throughout the year. Increase frequency of messaging during National Tsunami Preparedness Week, National Preparedness Month, and during the launch of tsunami-specific announcements, events, or initiatives.*

## Community Outreach

- Citizen Corps
  *Schedule discussion of Tsunami Response Plan and/or tsunami themed discussion at a Citizen Corps meeting.*
- Community Meetings
  *Explore community outreach opportunities with partner organizations such as the Resilient Neighborhoods program, the Interfaith Council, or NERT.*
- Board of Supervisors
  *Engage the Board of Supervisors on opportunities to conduct outreach in their districts.*
- Emergency Plans: Open House
  *Explore the possibility of hosting a community open house focused on the City's emergency plans including the Tsunami Annex.*
- Community and Education Centers, Senior Center, and Library Display during through July (Tsunami Preparedness Week).
  *Explore placement of Tsunami education materials and displays in public facilities.*

## Partnerships

- Treasure Island Development Authority (TIDA)

*Work with TIDA to develop specially-developed messaging and outreach for Treasure Island residents and workers concerning the Island's limited ingress and egress, and what they should do in the event of a distant- or near-source tsunami.*

- Mayor's Office on Disability (MOD)
  *Work with the Mayor's Office on Disability to develop an outreach program for People with Disabilities and Access and Functional Needs who live or work in tsunami inundation areas regarding how they can best prepare for a distant- or near-source tsunami.*
- Public Health (DPH)
  *Work with DPH to develop an outreach program for licensed residential, rehabilitation, and other group care facilities in the inundation area to help them develop evacuation plans for transporting persons under their care using their own resources*.

## Traditional Media

- Press release, one-pager, media advisory on New Tsunami Plan and Evacuation Signs
- Reach out to print, TV, and radio media sources day before event for coverage.

## Outreach Materials

- Tsunami Education Insert for SF72 Portfolio
- Direct Mail/Door Hangers for Tsunami Inundation Area
- Display for Open House
- FAQ/Fact Sheet for Public Meetings

# Appendix P: Tsunami Maritime Response Playbook for San Francisco

**NOTE:** This Appendix contains a condensed version of the State Tsunami Maritime Response Playbook for San Francisco that has been adopted for use in CCSF. Representatives from the Port of San Francisco, San Francisco Recreation and Parks, San Francisco Department of Emergency Management, United States Coast Guard, and the Water Emergency Transportation Authority will hold meetings beginning in fall 2016 to add additional local information to the Evacuation Plans in the Maritime Response Playbook. This Appendix will be updated once the revised version is available.

# California Maritime Tsunami Response Playbook

[Combined, Excerpted version]

# City and County of San Francisco

## North and East

**2015-SF-01**

**2015-SF-02**

**DURING AN EMERGENCY, USE THE "QUICK REFERENCE" SHEET ON PAGES 31-32.**

For the expanded Playbook format, use directions on pages 6-7.

Source: California Maritime Tsunami Response Playbook No. 2015-SF-01
California Maritime Tsunami Response Playbook No. 2015-SF-02

California Geological Survey
California Governor's Office of Emergency Services
University of Southern California
Humboldt State University
National Oceanic and Atmospheric Administration

Funded by the Federal Emergency Management Agency and the National Tsunami Hazard Mitigation Program

FEMA

THE NATIONAL TSUNAMI HAZARD MITIGATION PROGRAM (U.S.)

## Table of Contents: Tsunami Maritime Response Playbook for San Francisco

**Page 2: Purpose and Use**
**Page 3: Tsunami Hazards and Tsunami Alert Levels**
**Page 4: General Response Recommendations**
**Page 5: Forecast Amplitude vs. FASTER Value; Current Speed-Harbor Damage Relationship**
**Page 6-7: Expanded Response Reference Pages - North & East**
**Page 8-27: Maritime Tsunami Response Plans and Maps**
**Page 28: Offshore Evacuation Map**
**Page 29-30: Onshore Evacuation Maps**
**Page 31-32: QUICK REFERENCE PAGES for Maritime Response Activities - North & East**

**PURPOSE:** The Maritime Tsunami Response Playbook was intended to help the maritime community prepare and plan for, and respond to, strong currents and damage from future tsunamis. It was developed by the California Tsunami Program with assistance from the maritime community, and with principle funding from FEMA. This version was condensed from the original versions prepared by the State. It includes excerpts from both the San Francisco North and East Playbooks.

**USE:** When a tsunami incident occurs, follow the steps outlined in the Quick Reference guide on pages 31 - 32 if not familiar with the Playbook. Follow the Expanded Reference guide on pages 6 - 7 if more detailed information is desired.

- The harbormaster or emergency manager should fill out information about the source earthquake and tsunami on pages 6 - 7. This information can be obtained from the tsunami alert message from the National Tsunami Warning Center (NTWC); from the San Francisco Department of Emergency Management (SFDEM); or from the National Weather Service (NWS), Monterey Forecast Office.
- Keep in mind that this information can change during the first hour or two after the earthquake occurs.
- **Prior to arrival of a distant-source tsunami, the State of California or NWS will recommend a minimum Playbook Response Plan for use by the port or harbor,** based on tsunami forecast amplitude (tsunami wave height) provided by the NTWC.
- Use the table on pages 31 - 32 to determine the associated, recommended Playbook scenario and response plan on pages 8 - 27, and follow the instructions for that scenario.
- Each scenario may be accompanied by a digital file indicating the response and evacuation plans. This information can be shared during an emergency with responders in the field.

**DURING AN EMERGENCY, USE THE "QUICK REFERENCE" ON PAGE 31 - 32 TO GATHER INFORMATION FOR RESPONSE ACTIVITIES.**

**TSUNAMI HAZARDS that may directly affect boats and boaters include:**

- Sudden water-level fluctuations where docks and boats:
  - Hit bottom (ground) as water level drops.
  - Overtop piles as water level rises.
- Strong and unpredictable currents, especially where there are narrow entrances or openings, or other narrow parts of the harbor.
- Tsunami bores and amplified waves, which may swamp boats and damage docks.
- Eddies or whirlpools that cause boats to lose control.
- Drag on deep-draught boats, which may damage the docks they are moored to.
- Collisions with other boats, with docks, and with debris in the water.
- Dangerous tsunami conditions can last many hours after first wave arrival, causing problems for inexperienced and unprepared boaters who take their boats offshore.

**TSUNAMI ALERT BULLETINS**

During tsunami alerts, the National Tsunami Warning Center (NTWC) issues tsunami "bulletins" to state and local jurisdictions. The NTWC issue four types of bulletins (from least to greatest significance):

**Tsunami Information Statement** - Issued when an earthquake has occurred, or a tsunami Watch, Advisory, or Warning has been issued elsewhere.

**Tsunami Watch** - Issued when an event occurs that may later impact the Watch area shoreline. The NTWC may upgrade a Watch to an Advisory or Warning, or may cancel the Watch, based on updated information and analysis.

**Tsunami Advisory** - Issued when a tsunami may cause strong currents or waves dangerous to those in or near the water. Typically issued when forecasted tsunami amplitudes are between 0.3 meter and 1 meter (1 foot and 3 feet) above existing tidal conditions. Beach and harbor areas could see rapid, moderate tidal changes and strong currents.

**Tsunami Warning** - Issued when a tsunami with significant widespread inundation is imminent or expected. The NTWC typically issues Warnings when forecasted tsunami amplitudes are equal to or greater than 1 meter (3 feet). Coastal communities are advised to evacuate people from low-lying areas identified as vulnerable to tsunamis.

## ACTIONABLE TSUNAMI ALERT LEVELS

There are two actionable NTWC Tsunami Alert levels for maritime communities: **Tsunami Advisories** and **Tsunami Warnings**. Actions to take depend on the Alert level and on the forecasted tsunami wave height or amplitude for a particular harbor. It is important to provide clear, consistent directions to the entire boating community and to waterfront or pier operators and businesses.

## GENERAL RECOMMENDATIONS

**If there is not enough time to use the Expanded Response Guide in this Playbook, consider taking the following general actions for Tsunami Warning or Advisory level events:**

## GENERAL WARNING-LEVEL RECOMMENDATIONS

**Complete the activities below at least 30 minutes before forecasted tsunami arrival:**

- Shut off fuel to fuel docks, and shut off electrical and water services to all docks.
- Secure and strengthen mooring lines throughout the harbor, specifically in areas near the entrance or near narrow areas in the harbor.
- Evacuate the public and harbor personnel from all structures and vessels in the water, and from all landward areas identified in the tsunami evacuation area (page 29-30).
- Do not allow the public to re-enter tsunami evacuation area until an official "all clear" message is provided by local emergency managers.
- Follow instructions for an Advisory if the Warning is downgraded to Advisory level.

## GENERAL ADVISORY-LEVEL RECOMMENDATIONS

**Complete the activities below at least 30 minutes before forecasted tsunami arrival:**

- Shut off fuel to fuel docks, and shut off electrical and water services to all docks.
- Secure and strengthen mooring lines throughout the harbor, specifically in areas near the entrance or near narrow areas in the harbor.
- Evacuate the public from all structures and vessels in the water.
- Coordinate with local law enforcement to limit public access to waterfront areas.
- While the Tsunami Advisory is active, all personnel working on or near the water should wear personal flotation devices.
- Do not allow the public to re-enter structures and vessels in the water until local emergency managers issue an official "all clear" message.

## DIFFERENCE BETWEEN FORECAST TSUNAMI AMPLITUDE (WAVE HEIGHT) AND FASTER TSUNAMI FLOOD HEIGHT

**Forecast Tsunami Amplitude/Wave Height:** Within two hours after an earthquake generating a tsunami, the NTWC will provide an estimate or forecast of the potential amplitude (wave height) of the tsunami for locations on the California coast. Amplitude is the height of the tsunami above existing ocean conditions; it helps determine the official Tsunami Alert level for each region.

**The NTWC forecast tsunami amplitude is used on page 6-7 or page 31-32 to determine which Maritime Response Plan is recommended for use in the incident.**

**FASTER Analytical Tool:** To determine the full impact of tsunami inundation, other variables such as tidal and storm conditions must be considered. The FASTER analytical tool incorporates these variables to determine the tsunami flood level. A simplified version of the FASTER calculation is shown at right.

**The State or NWS will provide the FASTER Flood Value to the maritime community during a tsunami event.** Use it on pages 6 - 7 to determine if piles will be overtopped and inundation of dry land will occur.

**FASTER Formula**

**FA:** **Forecasted Amplitude** (wave height) from NTWC

\+

**S:** **Storm** surge or existing ocean conditions

\+

**T:** Maximum **tidal** height (first 5 hours of tsunami)

\+

**E:** Forecast **error** potential (FA x 30%)

\+

**R:** Site-amplified **run-up** potential (if inundation is expected)

---

= **Maximum tsunami run-up height (Playbook elevation line)**

## RELATIONSHIP BETWEEN TSUNAMI CURRENT SPEED AND HARBOR DAMAGE:

Analysis of recent tsunami damage indicates a relationship between current speed and harbor damage. The Damage Index to the right indicates the following relationship (see color codes below for blue, yellow, and red areas and on current threshold maps):

**CURRENTS = DAMAGE**

**0-3 knots = No Damage**

**3-6 knots = Minor/Moderate Damage**

**6-9 knots = Moderate/Major Damage**

**> 9 knots = Major/Complete Damage**

| DAMAGE INDEX | DAMAGE TYPE |
|---|---|
| 0 | No damage |
| 1 | Small buoys moved |
| 2 | 1-2 docks or small boats damaged; large buoys moved |
| 3 | Moderate dock or boat damage; mid-sized vessels off moorings |
| 4 | Major dock or boat damage; large vessels off moorings |
| 5 | Complete destruction |

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# Expanded Reference Information for Determining Maritime Response Activities - *North CCSF*

**When the NTWC issues a tsunami alert, fill out the information in Step 1 below. Cal OES/NOAA will recommend a MINIMUM Playbook Response Plan for each maritime community, and a FASTER number to determine the potential for piles to be overtopped during the tsunami.**

**Step 1:** Obtain information about the earthquake and tsunami from **NTWC**, NOAA-NWS-Monterey, or San Francisco DEM:

Earthquake location: _____

Earthquake magnitude: _____

Tsunami Alert level (circle one) WATCH ADVISORY WARNING

***Forecasted tsunami amplitude/wave height _____ (compare with Peak Amplitude in Step 2)***

Forecasted tsunami arrival time: _____

FASTER tsunami run-up value in first 5 hours: _____

FASTER tsunami run-up value at highest tide: _____

Height of shortest pilings above Mean Sea Level: _____

Elevation of lowest land above Mean Sea Level: _____

***Compare FASTER value to pile heights and lowest land to determine if they will be overtopped.***

**Step 2 North:** Compare and match the forecasted tsunami amplitude/wave height in Step 1 to "Peak Amplitude" in the table below (red box). Refer to the associated Reference page to determine actions for securing vessels and repositioning ships away from areas where damage is expected to safe areas within San Francisco Bay or offshore (page 28).

| PEAK AMPLITUDE (in meters above existing conditions) | PEAK VELOCITY IN HARBOR (in knots) | LIKELY TSUNAMI ALERT LEVEL | PLAYBOOK PLAN LETTER | REFERENCE PAGES |
|---|---|---|---|---|
| < 0.2 | | Advisory | no action | NA |
| 0.5 | 2 | Advisory | A | page 8 - 9 |
| 0.7 | 3 | Advisory | B | page 12 - 13 |
| 1.0 | 4 | Warning | C | page 16 - 17 |
| 1.2 | 4 | Warning | D | page 20 - 21 |
| 2.5 + | 9 | Warning | E | page 24 - 25 |

# Expanded Reference Information for Determining Maritime Response Activities - *East CCSF*

**When the NTWC issues a tsunami alert, fill out the information in Step 1 below. Cal OES/NOAA will recommend a MINIMUM Playbook Response Plan for each maritime community, and a FASTER number to determine the potential for piles to be overtopped during the tsunami.**

**Step 1:** Obtain information about the earthquake and tsunami from **NTWC**, NOAA-NWS-Monterey, or San Francisco DEM:

Earthquake location: _____

Earthquake magnitude: _____

Tsunami Alert level (circle one) WATCH ADVISORY WARNING

***Forecasted tsunami amplitude/wave height _____ (compare with Peak Amplitude in Step 2)***

Forecasted tsunami arrival time: _____

Obtain FASTER tsunami run-up value in first 5 hours: _____

Obtain FASTER tsunami run-up value at highest tide: _____

Height of shortest pilings above Mean Sea Level: _____

Elevation of lowest land above Mean Sea Level: _____

***Compare FASTER value to pile heights and lowest land to determine if they will be overtopped.***

**Step 2 East:** Compare and match the forecasted tsunami amplitude/wave height in Step 1 to "Peak Amplitude" in the table below (red box). Refer to the associated Reference page to determine actions for securing vessels and repositioning ships away from areas where damage is expected to safe areas within San Francisco Bay or offshore (page 28).

| **PEAK AMPLITUDE** (in meters above existing conditions) | **PEAK VELOCITY IN HARBOR** (in knots) | **LIKELY TSUNAMI ALERT LEVEL** | **PLAYBOOK PLAN LETTER** | **REFERENCE PAGES** |
|---|---|---|---|---|
| < 0.2 | | Advisory | no action | NA |
| 0.4 | 2 | Advisory | A | page 10 - 11 |
| 0.6 | 3 | Advisory | B | page 14 - 15 |
| 0.8 | 4 | Advisory | C | page 18 - 19 |
| 1.1 | 4 | Warning | D | page 22 - 23 |
| 1.7 + | 6 | Warning | E | page 26 - 27 |

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# Playbook Plan A - North
## (based on 2010 M8.8 Chile Event)

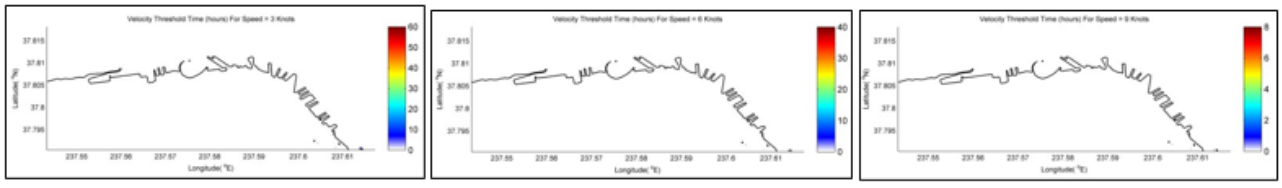
Background Information:
Alert level = Advisory
Peak Amplitude =0.5 meters
Peak Velocity = 2 knots
Projected duration of strong currents (see location map below):
3-6 knots = 0 hrs; 6-9 knots = 0 hrs; >9 knots = 0 hrs

Specific Instructions:

- Follow general guidance for Advisory-level tsunamis (Page 5)
- Strong currents and potential scour are expected in areas identified in blue or yellow on the map to the right. Consider relocating vessels located within 100 meters (300 feet) of these areas.
- Specific areas where vessels should be relocated and docks secured:
  - Vessels can be moved to non-blue areas of the map.
  - (complete with maritime community input)

Safe areas for repositioning vessels within the northern San Francisco maritime community:
(complete with maritime community input)

**Time thresholds for currents >3 knots.....>6 knots.....>9 knots**
(Colors below represent HOURS of potential activity for blue, yellow, and red zones on opposite page)



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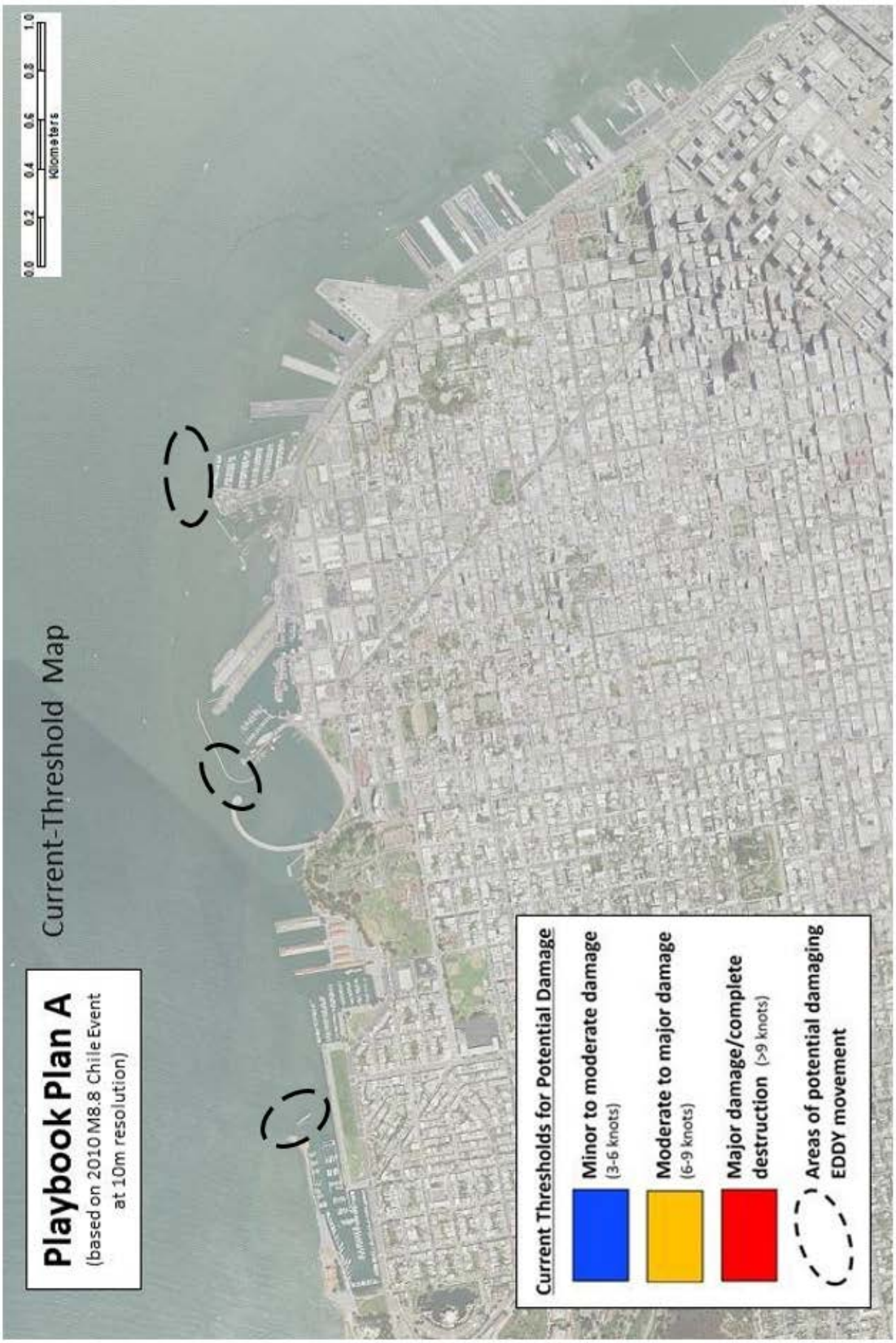
Playbook Plan A
(based on 2010 M8.8 Chile Event at 10m resolution)
Current-Threshold Map
0.0 0.2 0.4 0.6 0.8 1.0
Kilometers
Current Thresholds for Potential Damage
Minor to moderate damage (3-6 knots)
Moderate to major damage (6-9 knots)
Major damage/complete destruction (>9 knots)
Areas of potential damaging EDDY movement

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# Playbook Plan A - East

## (based on 2010 M8.8 Chile Event)

Background Information:
Alert level = Advisory
Peak Amplitude = 0.4 meters
Peak Velocity = 2 knots
Projected duration of strong currents (see location map below):
3-6 knots = 0 hrs; 6-9 knots = 0 hrs; >9 knots = 0 hrs

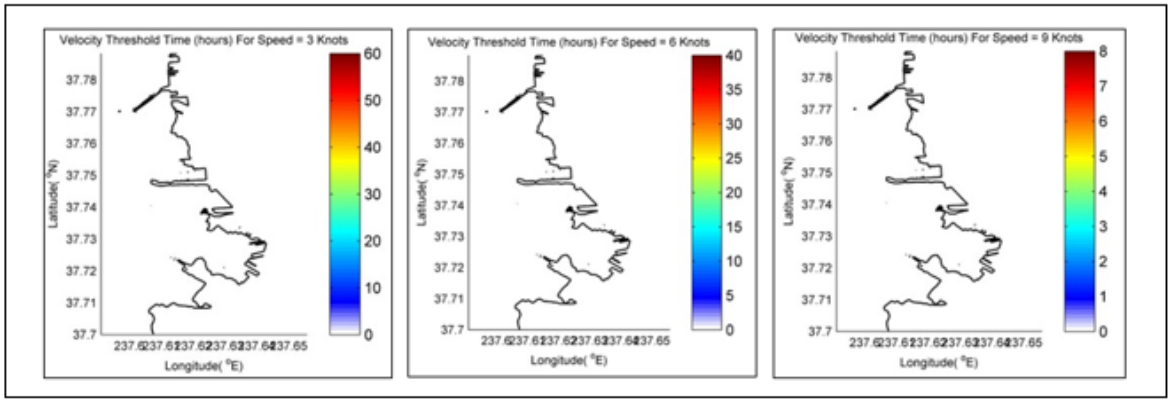
Specific Instructions:

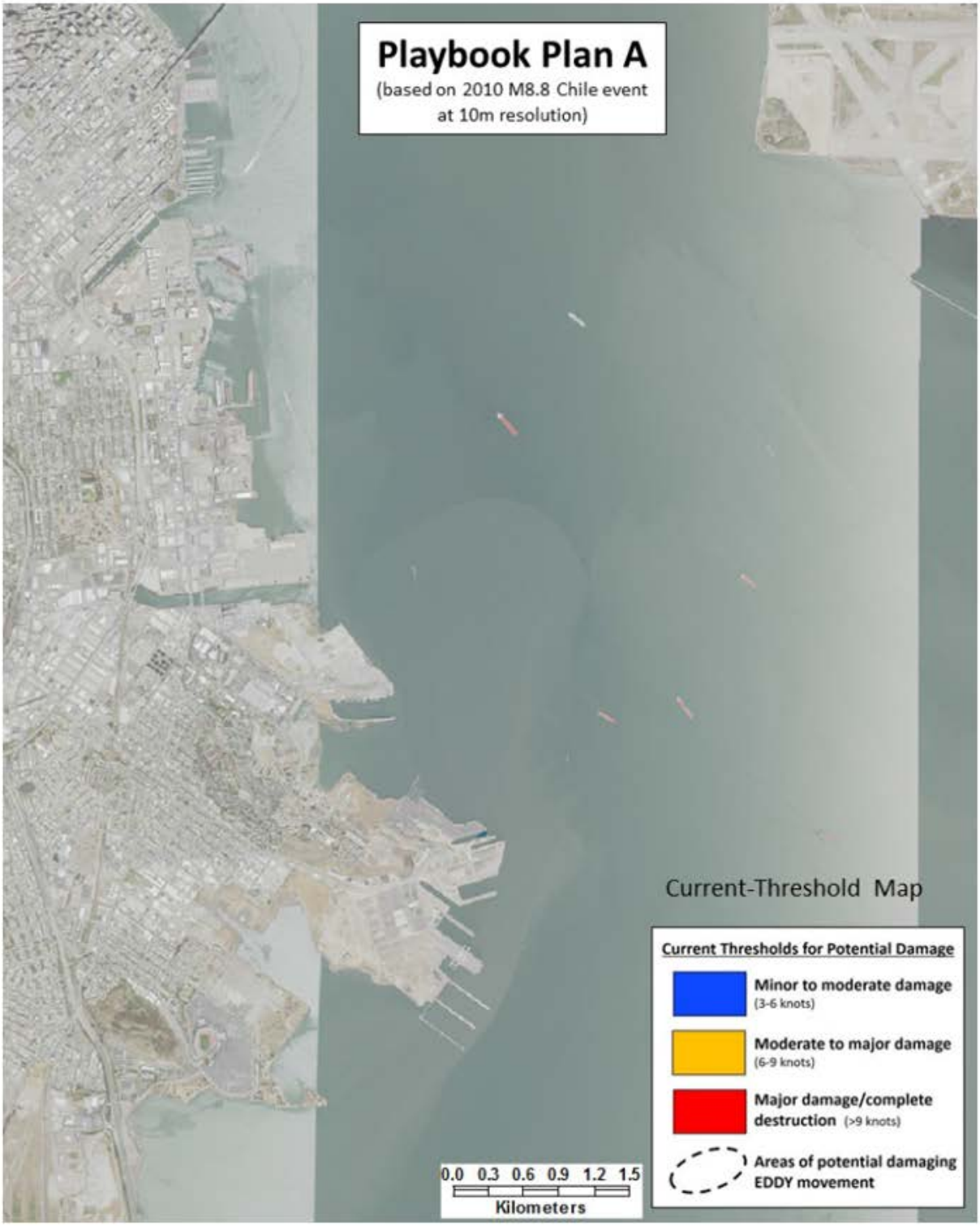
- Follow general guidance for Advisory-level tsunamis (page 5)
- Strong currents and potential scour are expected in areas identified in blue or yellow on the map to the right. Consider relocating vessels located within 100 meters (300 feet) of these areas.
- Specific areas where vessels should be relocated and docks secured:
  - Vessels can be moved to non-blue areas of the map.
  - … (complete with maritime community input)

Safe areas for repositioning vessels within the eastern San Francisco maritime community:

- (complete with maritime community input)

**Time thresholds for currents >3 knots.....>6 knots.....>9 knots**
(Colors below represent HOURS of potential activity for blue, yellow, and red zones on opposite page)




Playbook Plan A
(based on 2010 M8.8 Chile event
at 10m resolution)
Current-Threshold Map
Current Thresholds for Potential Damage
Minor to moderate damage
(3-6 knots)
Moderate to major damage
(6-9 knots)
Major damage/complete
destruction (>9 knots)
Areas of potential damaging
EDDY movement
0.0 0.3 0.6 0.9 1.2 1.5
Kilometers

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# Playbook Plan B - North

## (based on 2011 M9 Japan Event)

Background Information:
Alert level = Advisory
Peak Amplitude = 0.7 meters
Peak Velocity = 3 knots
Projected duration of strong currents (see location map below):
3-6 knots = 10 hrs; 6-9 knots = 0 hrs; >9 knots = 0 hrs

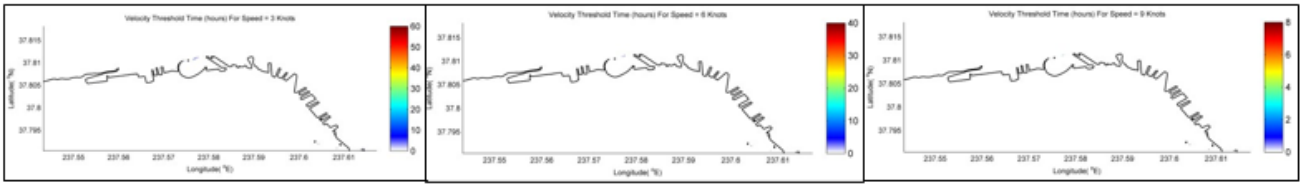
Specific Instructions:

- Follow general guidance for Advisory-level tsunamis (Page 5)
- Strong currents and potential scour are expected in areas identified in blue-yellow-red on the map to the right. Consider relocating vessels located within 100 meters (300 feet) of these areas.
- Specific areas where vessels should be relocated and docks secured:
  - Vessels can be moved to non-blue areas of the map.
  - … (complete with maritime community input)

Safe areas for repositioning vessels within the northern San Francisco maritime community:

- … (complete with maritime community input)

**Time thresholds for currents >3 knots……..>6 knots……..>9 knots**
(Colors below represent HOURS of potential activity for blue, yellow, and red zones on opposite page)



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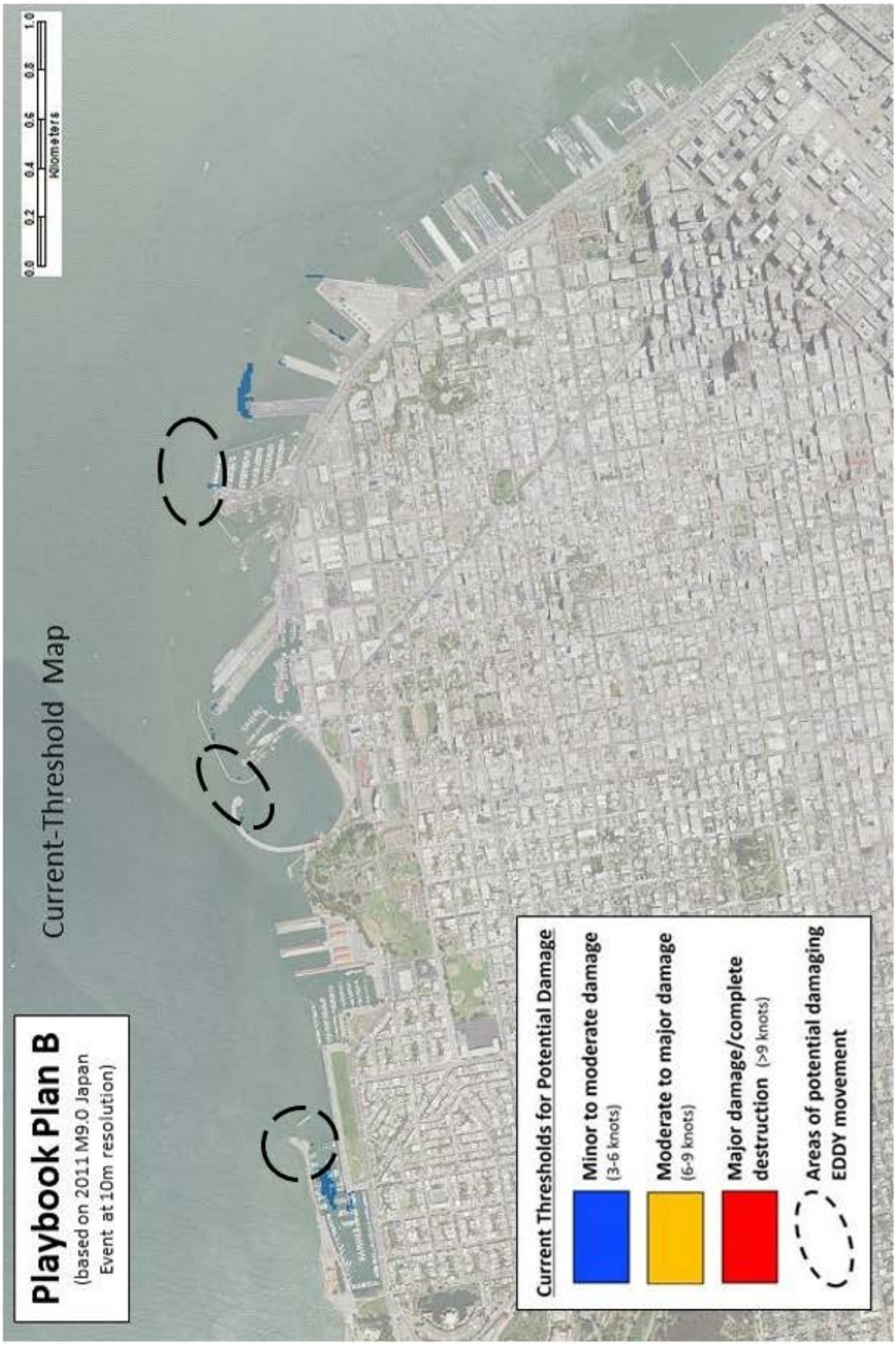
Playbook Plan B
(based on 2011 M9.0 Japan Event at 10m resolution)
Current-Threshold Map
Current Thresholds for Potential Damage
Minor to moderate damage (3-6 knots)
Moderate to major damage (6-9 knots)
Major damage/complete destruction (>9 knots)
Areas of potential damaging EDDY movement
Kilometers
0.0 0.2 0.4 0.6 0.8 1.0

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# Playbook Plan B - East
## (based on 2011 M9 Japan Event)

Background Information:
Alert level = Advisory
Peak Amplitude = 0.6 meters
Peak Velocity = 3 knots
Projected duration of strong currents (see location map below):
3-6 knots = 5 hrs; 6-9 knots = 0 hrs; >9 knots = 0 hrs

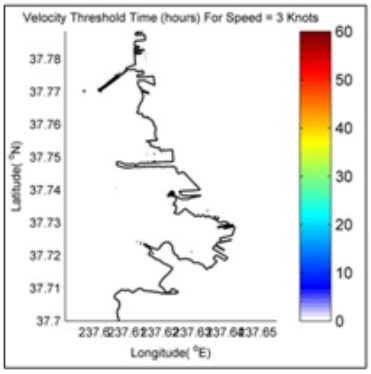
Specific Instructions:

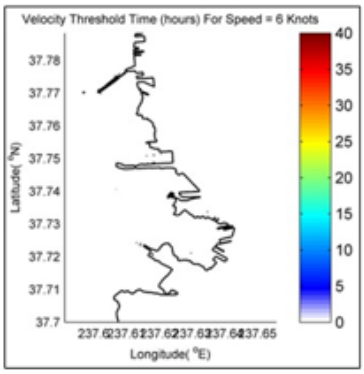
- Follow general guidance for Advisory-level tsunamis (Page 5)
- Strong currents and potential scour are expected in areas identified in blue-yellow-red on the map to the right. Consider relocating vessels located within 100 meters (300 feet) of these areas.
- Specific areas where vessels should be relocated and docks secured:
  - Vessels can be moved to non-blue areas of the map.
  - … (complete with maritime community input)

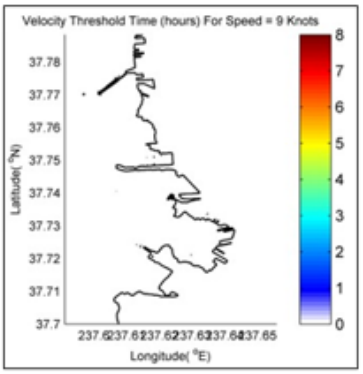
Safe areas for repositioning vessels within the northern San Francisco maritime community:

- … (complete with maritime community input)

**Time thresholds for currents >3 knots……>6 knots……>9 knots**
(Colors below represent HOURS of potential activity for blue, yellow, and red zones on opposite page)



Playbook Plan B
(based on 2011 M9 Japan event at 10m resolution)
Current-Threshold Map
Current Thresholds for Potential Damage
Minor to moderate damage (3-6 knots)
Moderate to major damage (6-9 knots)
Major damage/complete destruction (>9 knots)
Areas of potential damaging EDDY movement
0.0 0.3 0.6 0.9 1.2 1.5
Kilometers

# Playbook Plan C - North

## (based on M9.4 North Chile Scenario)

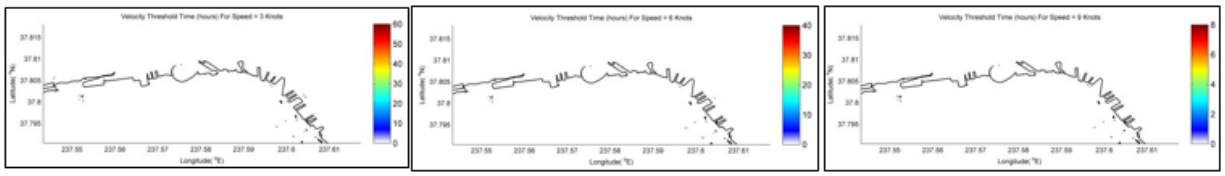
Background Information:
Alert level = Warning
Peak Amplitude = 1.0 meters
Peak Velocity = 4 knots
Projected duration of strong currents (see location map below):
3-6 knots = 15 hrs; 6-9 knots = 0 hrs; >9 knots = 0 hrs

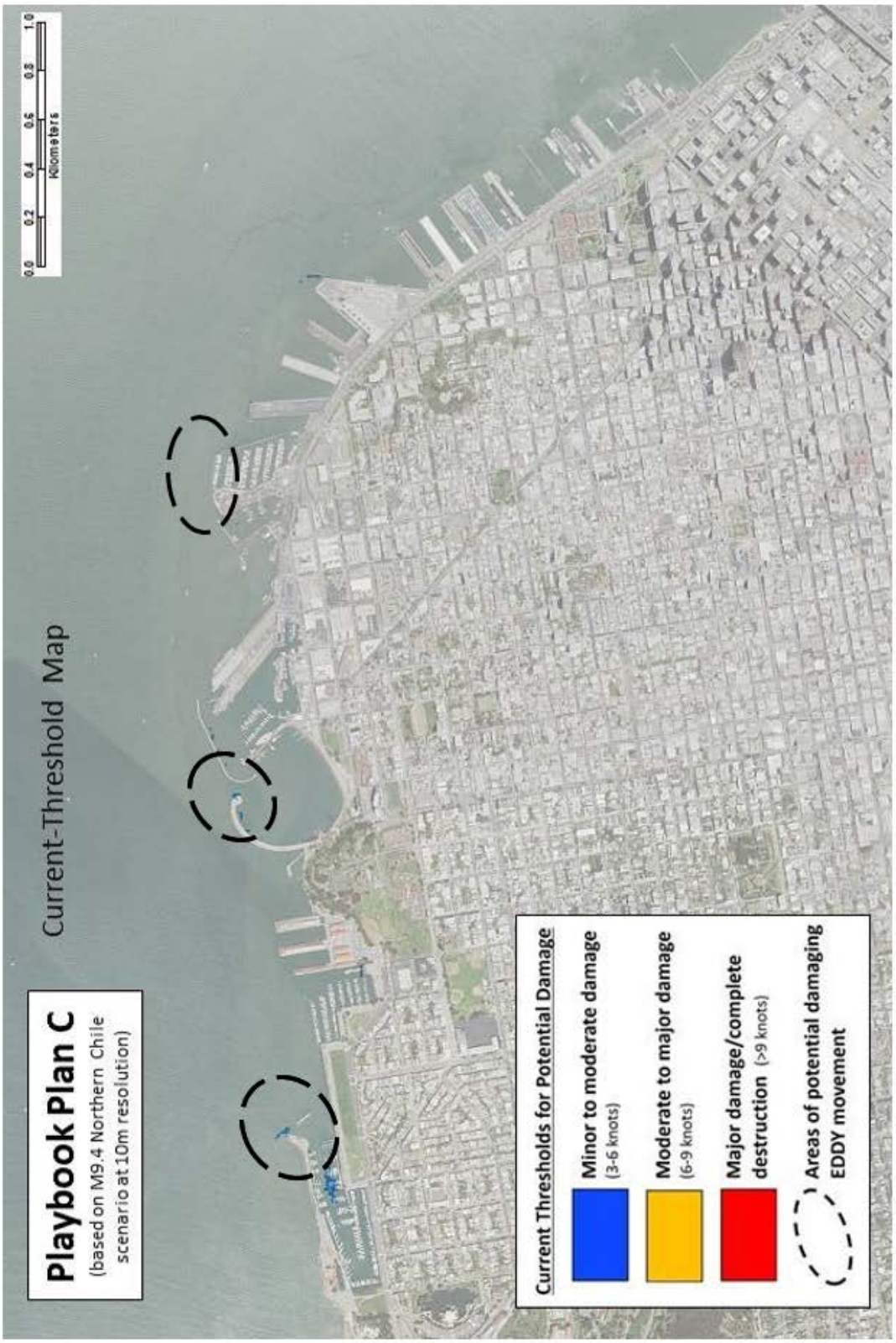
Specific Instructions:

- Follow general guidance for Warning-level tsunamis (Page 5)
- **Inundation of dry land may occur in this scenario.**
- Strong currents and potential scour are expected in areas identified in blue, yellow, or red on the map below. Consider relocating vessels located within 100 meters (300 feet) of these areas.
- Specific areas where vessels should be relocated from and docks secured:
  - Vessels can be moved to non-blue areas of San Francisco Bay.
  - … (complete with maritime community input)

Safe areas for repositioning vessels in the northern San Francisco maritime community:
… (complete with maritime community input)

**Time thresholds for currents >3 knots……..>6 knots……..>9 knots**
(Colors below represent HOURS of potential activity for blue, yellow, and red zones on map below)




Playbook Plan C
(based on M9.4 Northern Chile scenario at 10m resolution)
Current-Threshold Map
Current Thresholds for Potential Damage
Minor to moderate damage (3-6 knots)
Moderate to major damage (6-9 knots)
Major damage/complete destruction (>9 knots)
Areas of potential damaging EDDY movement
0.0 0.2 0.4 0.6 0.8 1.0
Kilometers

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# Playbook Plan C - East
## (based on M9 Cascadia Scenario)

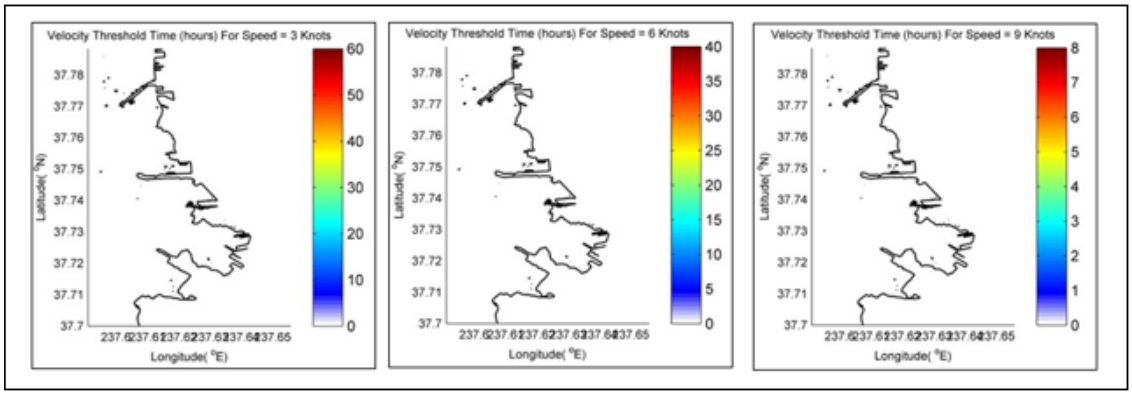
Background Information:
Alert level = Warning
Peak Amplitude = 0.8 meters
Peak Velocity = 4 knots
Projected duration of strong currents (see location map below):
3-6 knots = 8 hrs; 6-9 knots = 0 hrs; >9 knots = 0 hrs

Specific Instructions:

- Follow general guidance for Warning-level tsunamis (Page 5)
- **Inundation of dry land may occur in this scenario.**
- Strong currents and potential scour are expected in areas identified in blue, yellow, or red on the map below. Consider relocating vessels located within 100 meters (300 feet) of these areas.
- Specific areas where vessels should be relocated from and docks secured:
  - Vessels can be moved to non-blue areas of San Francisco Bay.
  - … (complete with maritime community input)

Safe areas for repositioning vessels in the northern San Francisco maritime community:
… (complete with maritime community input)

**Time thresholds for currents >3 knots……..>6 knots……..>9 knots**
(Colors below represent HOURS of potential activity for blue, yellow, and red zones on map below)



Playbook Plan C
(based on M9 Cascadia scenario at 10m resolution)
Current-Threshold Map
Current Thresholds for Potential Damage
Minor to moderate damage (3-6 knots)
Moderate to major damage (6-9 knots)
Major damage/complete destruction (>9 knots)
Areas of potential damaging EDDY movement
0.0 0.3 0.6 0.9 1.2 1.5
Kilometers

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# Playbook Plan D - North
## (based on M9 Cascadia Scenario)

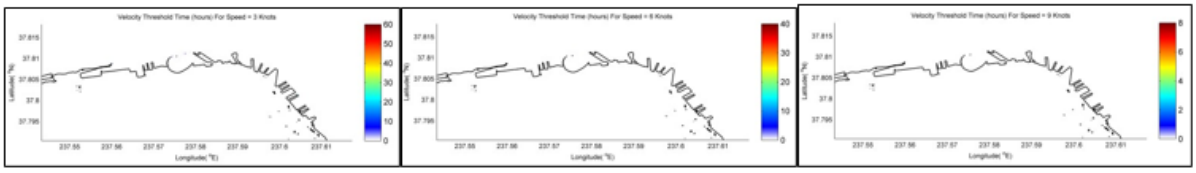
Background Information:
Alert level = Warning
Peak Amplitude = 1.2 meters
Peak Velocity = 4 knots
Projected duration of strong currents (see location maps below):
3-6 knots = 20 hrs; 6-9 knots = 0 hrs; >9 knots = 0 hrs

Specific Instructions:

- Follow general guidance for Warning-level tsunamis (Page 5)
- **Inundation of dry land may occur in this scenario**
- Strong currents and potential scour are expected in areas identified in blue, yellow, or red on the map to the right. Consider relocating vessels located within 100 meters (300 feet) of these areas.
- Specific areas where vessels should be relocated from and docks secured: (complete with maritime community input)

Safe areas for repositioning vessels within the northern San Francisco maritime community:
(complete with maritime community input)

**Time thresholds for currents >3 knots.....>6 knots.....>9 knots**
(Colors below represent HOURS of potential activity for blue, yellow, and red zones on opposite page)



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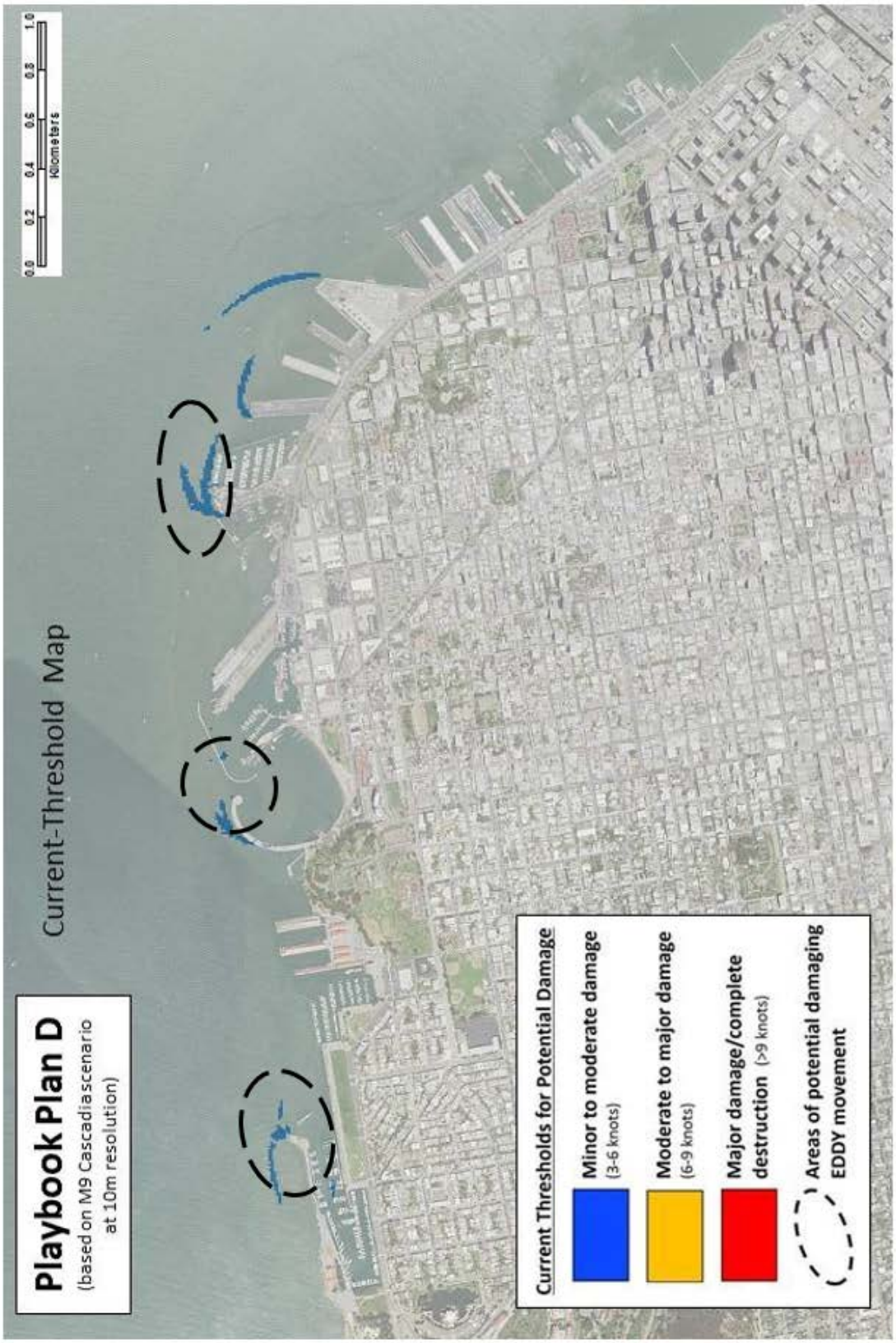

Playbook Plan D
(based on M9 Cascadia scenario
at 10m resolution)
Current-Threshold Map
Current Thresholds for Potential Damage
Minor to moderate damage
(3-6 knots)
Moderate to major damage
(6-9 knots)
Major damage/complete
destruction (>9 knots)
Areas of potential damaging
EDDY movement
0.0 0.2 0.4 0.6 0.8 1.0
Kilometers

21

# Playbook Plan D - East

## (based on M9.4 North Chile Scenario)

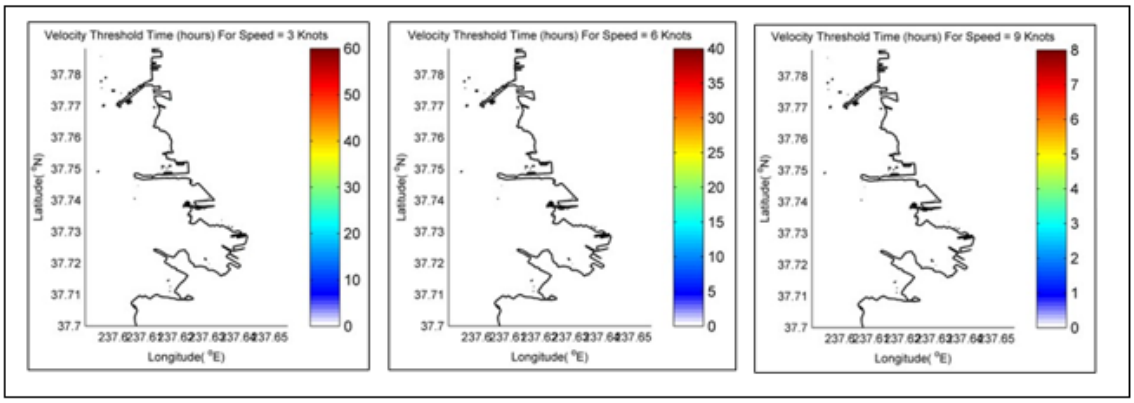
Background Information:
Alert level = Warning
Peak Amplitude = 1.1 meters
Peak Velocity = 4 knots
Projected duration of strong currents (see location maps below):
3-6 knots = 10 hrs; 6-9 knots = 0 hrs; >9 knots = 0 hrs

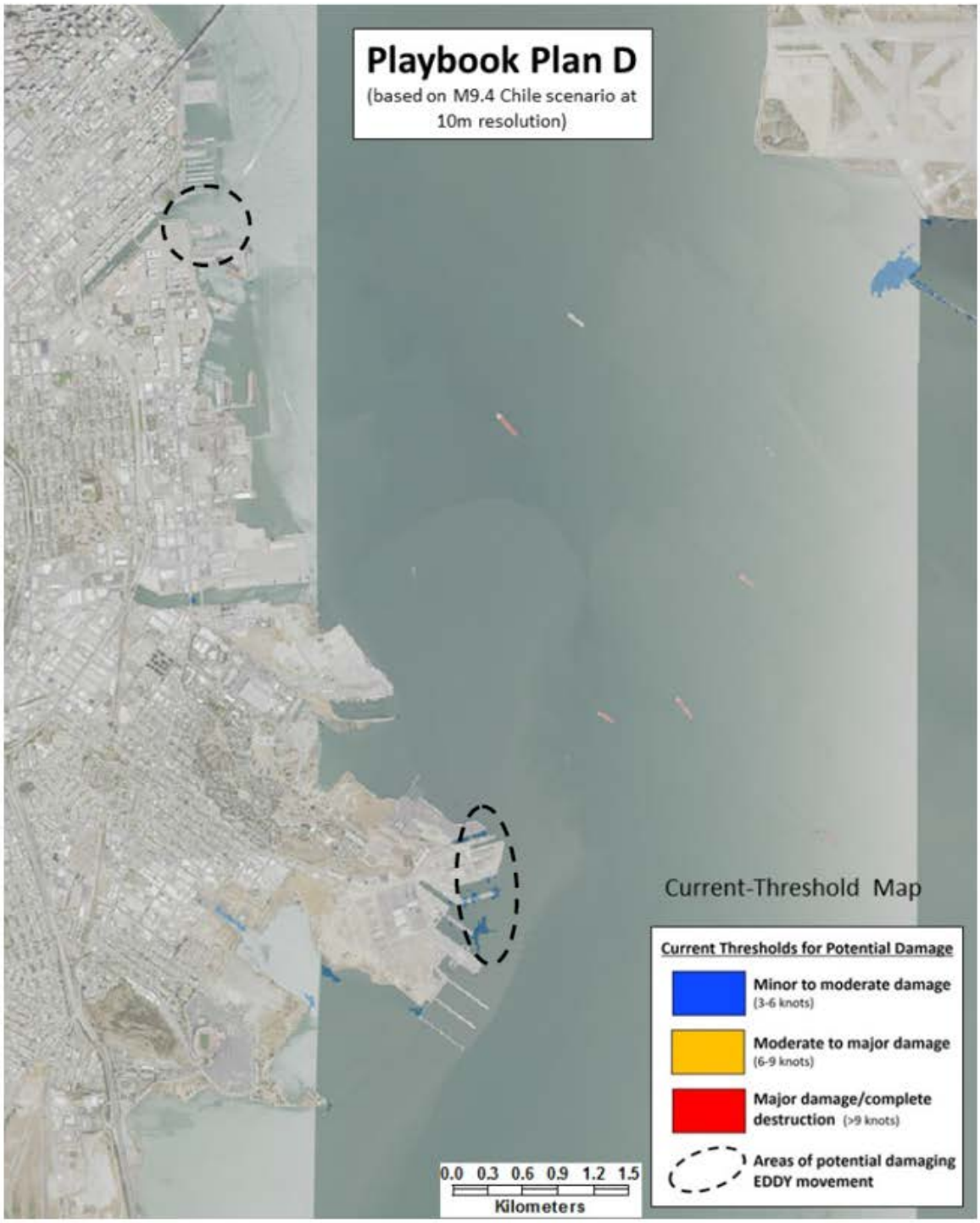
Specific Instructions:

- Follow general guidance for Warning-level tsunamis (Page 5)
- **Inundation of dry land may occur in this scenario**
- Strong currents and potential scour are expected in areas identified in blue, yellow, or red on the map to the right. Consider relocating vessels located within 100 meters (300 feet) of these areas.
- Specific areas where vessels should be relocated from and docks secured: (complete with maritime community input)

Safe areas for repositioning vessels within the northern San Francisco maritime community:
(complete with maritime community input)

**Time thresholds for currents >3 knots.....>6 knots.....>9 knots**
(Colors below represent HOURS of potential activity for blue, yellow, and red zones on opposite page)




Playbook Plan D
(based on M9.4 Chile scenario at 10m resolution)
Current-Threshold Map
Current Thresholds for Potential Damage
Minor to moderate damage (3-6 knots)
Moderate to major damage (6-9 knots)
Major damage/complete destruction (>9 knots)
Areas of potential damaging EDDY movement
0.0 0.3 0.6 0.9 1.2 1.5
Kilometers

# Playbook Plan E - North

## (based on M9.2 Eastern Aleutian-Alaska Scenario)

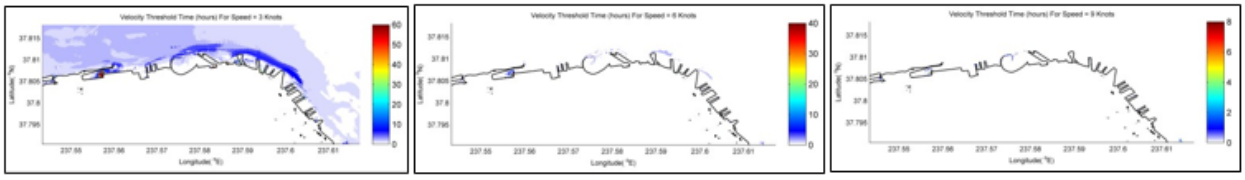
Background Information:
Alert level = Warning
Peak Amplitude = 2.5+ meters
Peak Velocity = 9 knots
Projected duration of strong currents (see location maps below):
3-6 knots = 40 hrs; 6-9 knots = 10 hrs; >9 knots = 5 hrs

Specific Instructions:

- Follow general guidance for Warning-level tsunamis (Page 5)
- **Inundation of dry land will likely occur in this scenario**
- Strong currents and potential scour are expected in areas identified in blue, yellow, and red on the map below. Consider relocating vessels located within 100 meters (300 feet) of these areas.
- Specific areas where vessels should be relocated from and docks secured: (complete with maritime community input)

Safe areas for repositioning vessels within the northern San Francisco maritime community:
(complete with maritime community input)

**Time thresholds for currents >3 knots.....>6 knots.....>9 knots**
(Colors below represent HOURS of potential activity for blue, yellow, and red zones on opposite page)



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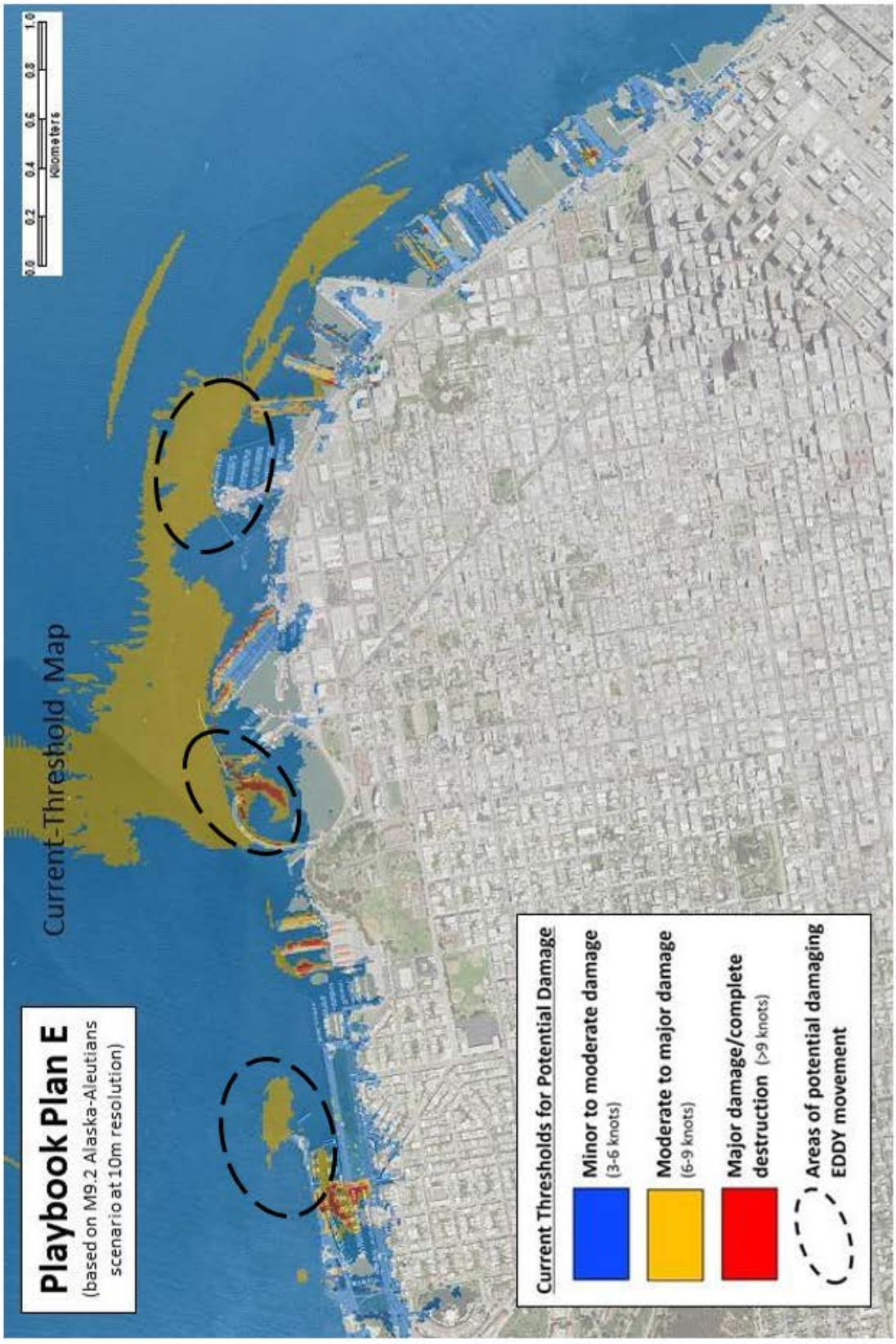

Playbook Plan E
(based on M9.2 Alaska-Aleutians scenario at 10m resolution)
Current-Threshold Map
Current Thresholds for Potential Damage
Minor to moderate damage (3-6 knots)
Moderate to major damage (6-9 knots)
Major damage/complete destruction (>9 knots)
Areas of potential damaging EDDY movement
0.0 0.2 0.4 0.6 0.8 1.0
Kilometers

25

# Playbook Plan E - East

## (based on M9.2 Eastern Aleutian-Alaska Scenario)

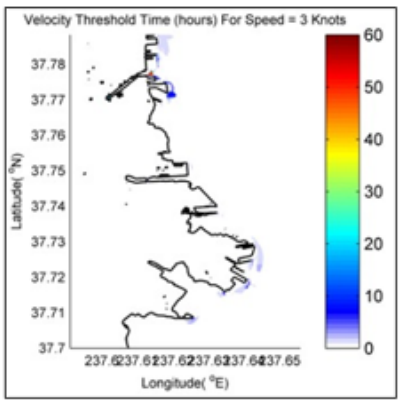
Background Information:
Alert level = Warning
Peak Amplitude = 1.7+ meters
Peak Velocity = 6 knots
Projected duration of strong currents (see location maps below):
3-6 knots = 20 hrs; 6-9 knots = 3 hrs; >9 knots = 0 hrs

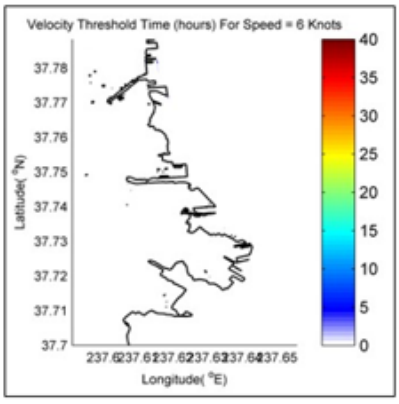
Specific Instructions:

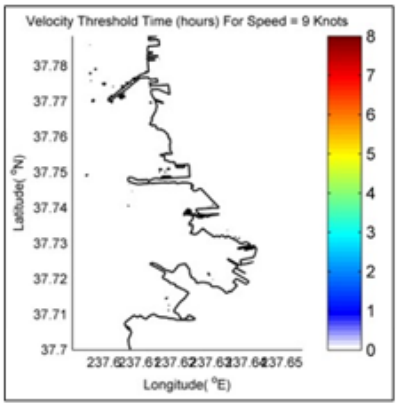
- Follow general guidance for Warning-level tsunamis (page 5)
- **Inundation of dry land will likely occur in this scenario**
- Strong currents and potential scour are expected in areas identified in blue, yellow, and red on the map below. Consider relocating vessels located within 100 meters (300 feet) of these areas.
- Specific areas where vessels should be relocated from and docks secured: (complete with maritime community input)

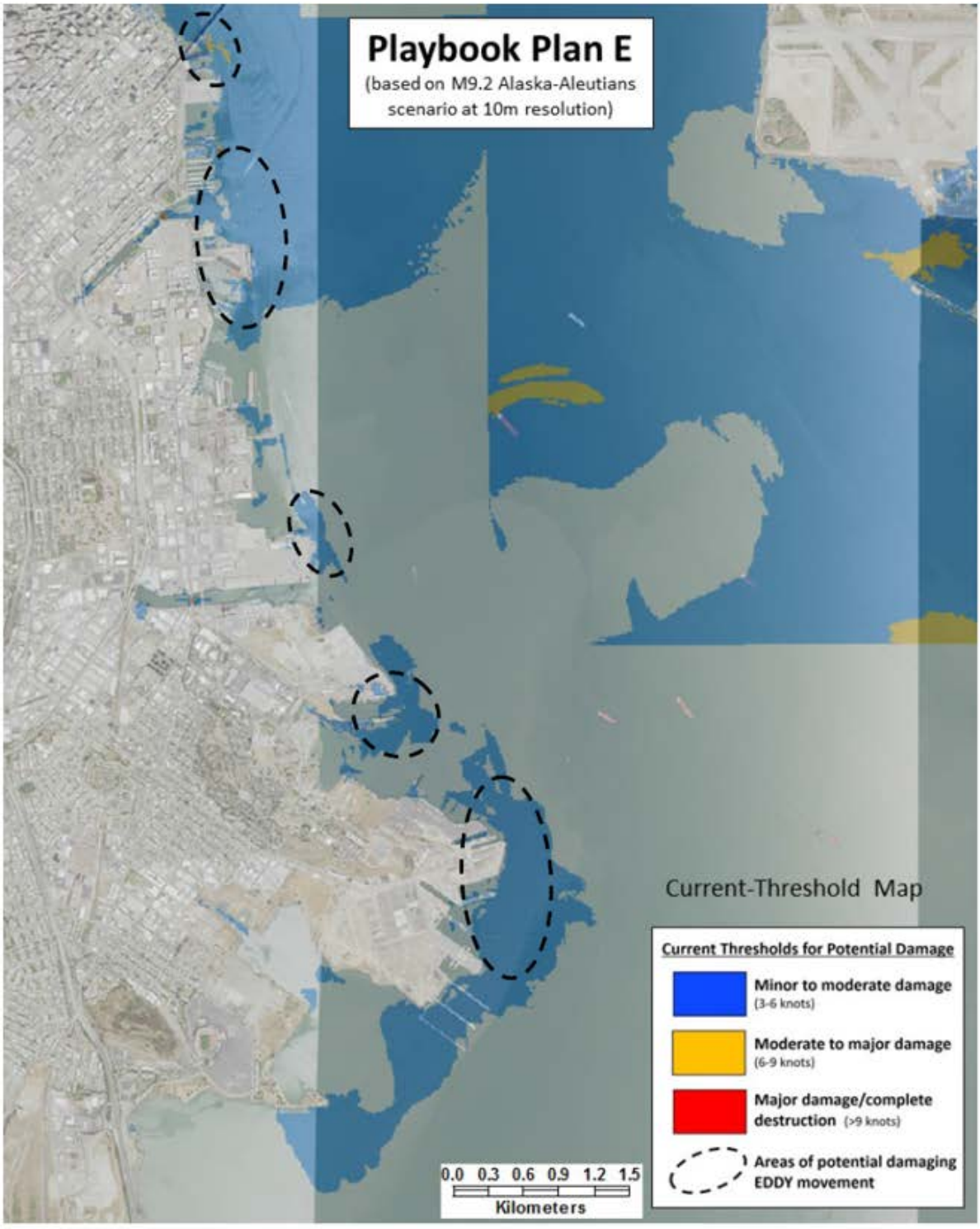
Safe areas for repositioning vessels within the northern San Francisco maritime community:
(complete with maritime community input)

**Time thresholds for currents >3 knots.....>6 knots.....>9 knots**
(Colors below represent HOURS of potential activity for blue, yellow, and red zones on opposite page)



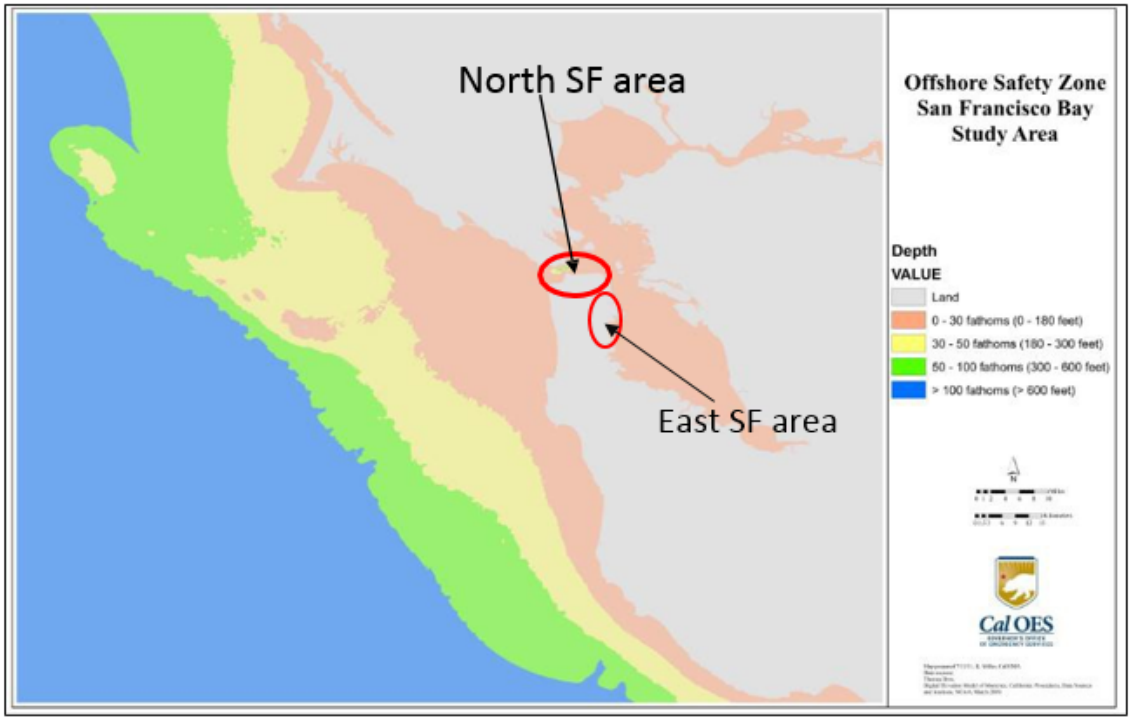

Playbook Plan E
(based on M9.2 Alaska-Aleutians scenario at 10m resolution)
Current-Threshold Map
Current Thresholds for Potential Damage
Minor to moderate damage (3-6 knots)
Moderate to major damage (6-9 knots)
Major damage/complete destruction (>9 knots)
Areas of potential damaging EDDY movement
0.0 0.3 0.6 0.9 1.2 1.5
Kilometers

## PLAN FOR OFFSHORE EVACUATION OF BOATS

**NOTE: The safety of the boating public should outweigh the benefit of saving boats and harbor property during a tsunami.**

- For most harbors in California, it is safer to keep boats docked during a tsunami because most tsunamis are relatively small.
- On the rare occasion when a large, damaging tsunami and associated strong currents are expected and there are no safe areas inside the harbor, the boat owner may consider taking his/her boat offshore.
- A number of factors should be considered before recommending that boats evacuate offshore prior to arrival of the tsunami, including:
  - The SIZE of the tsunami;
  - If there is sufficient TIME to transit outside the Bay beyond the 30 fathom (180 feet) depth, which is believed to be a safe depth for boats during distant source tsunamis (see map below).
  - If the boat and its captain are PREPARED to stay at sea over 24 hours.
  - WEATHER at sea could be as dangerous as the tsunami itself.
  - If significant damage occurs within the harbor, boaters should have enough FUEL AND SUPPLIES to travel to an undamaged harbor.

**For trailer boat owners:** Expect congested boat ramps and remember that you have to get your boat to the trailer, out of the water, and out of the tsunami zone before the tsunami arrives.



## TSUNAMI EVACUATION LINE MAP FOR SAN FRANCISCO

The tsunami evacuation maps below were prepared to assist CCSF in identifying its tsunami hazard and safe areas to evacuate to. They are intended for local tsunami evacuation planning. The red line on the maps represents the maximum tsunami evacuation area drawn to streets and roads. It was determined from a number of realistic tsunami scenarios. People uphill or inland from these areas should be safe during any tsunami.

**These maps should be used for evacuation from a Warning-level tsunami event unless otherwise directed by the San Francisco emergency management officials.**

For digital copies of tsunami inundation maps for other portions of California, visit http://www.tsunami.ca.gov

CCSF East
San Francisco
Turk St
Market St
6th St
4th St
3rd St
Fell St
Central Fwy
101
Valencia St
Guerrero St
S Van Ness Ave
Folsom St
Southern Embarcadero Fwy
Cesar Chavez St
Mission St
Oakdale Ave
Alemany Blvd
San Bruno Ave
Mansell St
Geneva Ave
5209 ft
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# Quick Reference Page for Determining Maritime Tsunami Response Activities for *CCSF-North*

**Step 1:** Obtain basic information about the earthquake and tsunami from National Tsunami Warning Center (NTWC), National Weather Service-Monterey office, or San Francisco Department of Emergency Management (SFDEM).

Earthquake location: _____

Earthquake magnitude: _____

Tsunami Alert level (circle one): WATCH ADVISORY WARNING

Closest forecasted tsunami amplitude/wave height: _____

Forecasted tsunami arrival time: _____

**NOTE: Tsunami Alert Level may change in first couple hours after the earthquake. A WATCH may be upgraded to an ADVISORY or a WARNING.**

**Step 2 North:** Tsunami evacuation and response depend on the amount of time before tsunami arrival. Four hours is considered the threshold time needed for an officially-conducted evacuation. As a quick reference, the State offers the following guidance:

**If less than four hours before tsunami arrival:**

- ADVISORY - Evacuate beaches, harbor docks, and piers.
- WARNING - Evacuate maximum on-land evacuation zone, or follow guidance provided by SFDEM.

**If more than four hours before tsunami arrival, use the State/NWS recommended Playbook Plan**, based on the Forecast Amplitude from Step 1, as "Peak Amplitude" in the table to the right to identify the response plan to use.

| PEAK AMPLITUDE IN BAY (in meters, above existing conditions) | SCENARIO PLAYBOOK PLAN LETTER | PLAYBOOK REFERENCE PAGES |
|---|---|---|
| < 0.2 | No action | |
| 0.5 | A | Pages 8 - 9 |
| 0.7 | B | Pages 12 - 13 |
| 1.0 | C | Pages 16 - 17 |
| 1.2 | D | Pages 20 - 21 |
| 2.5 + | E | Pages 24 - 25 |

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# Quick Reference Page for Determining Maritime Tsunami Response Activities for *CCSF-East*

**Step 1:** Obtain basic information about the earthquake and tsunami from National Tsunami Warning Center (NTWC), National Weather Service-Monterey office, or San Francisco Department of Emergency Management (SFDEM).

Earthquake location: _____

Earthquake magnitude: _____

Tsunami Alert level (circle one): WATCH ADVISORY WARNING

Closest forecasted tsunami amplitude/wave height: _____

Forecasted tsunami arrival time: _____

**NOTE: Tsunami Alert Level may change in first couple hours after the earthquake. A WATCH may be upgraded to an ADVISORY or a WARNING.**

**Step 2 East:** Tsunami evacuation and response depend on the amount of time before tsunami arrival. Four hours is considered the threshold time needed for an officially-conducted evacuation. As a quick reference, the State offers the following guidance:

**If less than four hours before tsunami arrival:**

- ADVISORY - Evacuate beaches, harbor docks, and piers.
- WARNING - Evacuate maximum on-land evacuation zone, or follow guidance provided by SFDEM.

**If more than four hours before tsunami arrival, use the State/NWS recommended Playbook Plan**, based on the Forecast Amplitude from Step 1, as "Peak Amplitude" in the table to the right to identify the response plan to use.

| PEAK AMPLITUDE IN BAY (in meters, above existing conditions) | SCENARIO PLAYBOOK PLAN LETTER | PLAYBOOK REFERENCE PAGES |
|---|---|---|
| < 0.2 | No action | |
| 0.4 | A | Pages 10 - 11 |
| 0.6 | B | Pages 14 - 15 |
| 0.8 | C | Pages 18 - 19 |
| 1.1 | D | Pages 22 - 23 |
| 1.7 + | E | Pages 26 - 27 |

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