TSUNAMI EMERGENCY PREPAREDNESS REPORT

Tsunamis

Tsunamis are a series of extremely long traveling ocean waves generated primarily by vertical movement on an earthquake fault occurring along the ocean floor. Tsunamis are often incorrectly referred to as tidal waves. However, underwater volcanic eruptions, marine landslides and even large meteorites can additionally generate tsunamis. Tsunamis can travel in the deep ocean at speeds exceeding 500 miles per hour. In the open ocean, tsunamis are not felt by ships or even seen by air because the wavelength is typically hundreds of miles long, with amplitude or height of only a few feet. However, locally generated tsunamis can be much shorter in wavelength but much higher in amplitude. Tsunamis travel much slower in shallow coastal waters where their wave heights increase. As a tsunami moves from the deep water of the open sea for shallow coastal waters, the height of the wave grows; however the total energy remains constant. Since the speed of the tsunami is related to the water depth, as the depth of the water decreases, the height of the wave grows. Offshore and coastal features can determine the size and impact of tsunami waves and will help to modify the tsunami as it approaches the coastline. The City's General Plan Public Safety Element states that, in comparison to many other areas of Southern California, the surrounding geography and the breakwater relatively protects Long Beach.

When a tsunami reaches the shore, it may appear as a rapidly rising or falling tide, a series of breaking waves or a bore (a steep, rapidly advancing wave with an almost vertical face). The time between successive wave crests varies from 5 to 90 minutes. The first wave is usually not the largest or most significant in the series. In addition, the first sign of a tsunami can actually be a withdrawal of water away from the shore. The water level on shore can rise many feet and the flooding of an area can extend inland, covering large expanses of land with water and debris. In extreme cases, tsunamis have been known to reach up to 100 feet maximum vertical height above sea level (run-up height) onshore. Risks from tsunamis include drowning, flooding, contamination of drinking water, fires from ruptured tanks or gas lines, and loss of vital community infrastructure.

Based on the historic record, the probability of a devastating tsunami striking the City of Long Beach is relatively low. In the last 200 years, fourteen tsunamis with waves higher than three feet have impacted the California coast with six of the fourteen causing considerable destruction. The worst tsunami to hit California during this period was from the 1964 Alaskan Earthquake that caused 12 deaths and approximately $17 million in damages in Crescent City in Northern California. If a tsunami should occur, the consequences could be significant due to property damage in the City's densely populated coastal region. Areas at the greatest risk are less than 25 feet above sea level and within one mile of the shoreline. The Hazard Mitigation Plan identifies the following areas that would suffer the most significant impact: the Port and commercial

facilities at or near sea level; the downtown Marina; Naples, the Peninsula, and Belmont Shore areas; coastal bridges and exposed infrastructure; and power plants near the shoreline (reference Attachment).

Detection and Notification Processes

The threat of a tsunami can be classified into two distinct categories. The first category is that of an earthquake somewhere along the Pacific Rim that would allow for three to five hours of warning, should a tsunami be generated by such an event. Such events are currently monitored. The other category is that of a near-shore event. Such an event would allow little or no warning. No local monitoring system currently exists for such an event, but experts are currently researching the benefit of a near-shore warning system. Educating and training local area residents to immediately evacuate from near-shore areas to higher ground following an earthquake or an off shore landslide would significantly reduce the potential for human loss.

The State of California currently maintains a Warning Center in the State Operating Center (SOC), located in Sacramento. This center is staffed 24/7 and monitors volcanic activity, earthquakes and tsunamis. Utilizing data from the United States Geological Survey (USGS), the National Weather Service and the Tsunami Warning Centers in Hawaii and Alaska, the SOC would be the key center for distributing information regarding the impact of a tsunami on the California coast. Should an event occur today, the State Warning Center would make emergency notifications utilizing several systems and methodologies. Those include:

- The Emergency Alert System (EAS)
  This system, when activated, advises the media of an impending event. This national system can be activated by the President of the United States for national emergencies, the Governor of the state for emergencies within that state, and by the highest elected official in a county for local emergencies. In Los Angeles County that authority is vested with the Los Angeles County Sheriff. This information would go directly to households via television and radio.

- The Emergency News Network (ENN)
  This system would be utilized to send out additional detailed information via media networks that do not meet the criteria of EAS.

- Emergency Data Information Service (EDIS)
  This is the State of California system that broadcasts, via the Internet, emergency information such as Amber Alerts, weather emergencies, etc. A feature of EDIS is the ability to subscribe to the system and have it send emergency information, specific to this area, via E-Mail and/or pager.

- California Law Enforcement Telecommunications System (CLETS)
  This system sends alerts and warnings directly from the State to local law enforcement agencies. The City of Long Beach maintains CLETS system

terminals at two locations; one at the Emergency Communications and Operations Center and another at the records section at Police Headquarters.

Other systems of communications to the public exist and are available in the City of Long Beach. These systems include:

- National Weather Service Radio
  This system will send out any weather alerts and warning to any "weather radio". This type of system is used heavily in the Midwest for tornado warnings. This station is monitored by personnel in the City EOC and is available on all Fire Department radios.

- National Advisory, Warning and Alert System (NAWAS)
  This system is currently received by the Police Communications Center (PCC) via CLETS.

- E-Notify
  This local system allows residents and businesses to subscribe to the Internet notification process supplied by the City of Long Beach. It will supply ongoing information supplied through the City's Public Information Officer.

- Hometown Television (Channel 8)
  Long Beach has the ability to utilize this station to send out local and specific Long Beach information. Broadcasts can be done directly from the studios of the station, from correspondents in the field, or even from City Hall or the EOC to provide updates or community briefings.

- KKJZ (88.1 FM)
  KKJZ is part of the national EAS system. They have also agreed to distribute Long Beach specific information as requested by the City of Long Beach. This partnership is advertised on the City's web site, as well as in brochures distributed by the Police and Fire departments.

- California Integrated Seismic Network (CISN)
  CISN maintains a website that provides immediate updates on earthquakes and resulting situations including Tsunami information. It additionally provides capability to send out automatic notifications of alerts and warnings (www.CISN.org).

- Public address systems
  Other basic notification systems include the public address systems available in all Fire, Lifeguard, and Police vehicles, as well as Police helicopters and some Public Works and Parks, Recreation and Marine Department vehicles.

- Public Address System in the Marinas
  The Downtown and Alamitos Bay marinas have dedicated public address systems that are available during business hours through the harbormaster's offices. Marine patrol personnel can access the system for after hours notifications.

The City of Long Beach is currently researching the possibility of utilizing Homeland Security Grant funds to secure a pre-emptive telephone dialing system. A team of representatives from the Fire, Police, City Manager and Technology Services departments is conducting the study. This notification system would give the City the capability to alert residents and businesses of impending emergencies with specific information and follow-up directions. The exact cost of the system has not yet been determined.

The Los Angeles Operational Area also utilizes several processes to notify local governments. They include:

- Emergency Management Information System (EMIS)
  This system would ensure two-way communications between local governments and the Operational Area.

- Dialogic
  This pre-emptive dialing system is designed to notify emergency managers in each of the eighty-eight cities within Los Angeles County.

- Calls to all local law enforcement agencies by members of the Sheriff's Department.

The State Tsunami Task Force, the Los Angeles Operational Area Tsunami Task Force and the City of Long Beach are monitoring the possible allocation of federal funds towards alert and warning. There are currently two bills that have been introduced in the United States Senate that address tsunamis.

The first bill is S.34, introduced by Joseph Lieberman (D-Connecticut). It would allocate $30 million in fiscal year 2005 and $7.5 million yearly from 2006 through 2014 to enhance the capabilities of the Tsunami Warning System. The proposed system would greatly enhance the capabilities of the national system to monitor tsunami events by adding thirty-two deep-water buoys to the existing six in place off Alaska and Hawaii. Five of the new buoys would be deployed in the Atlantic, two in the Caribbean Sea, and the remaining twenty-five in the Pacific Ocean. This series of buoys would work in conjunction with gauges placed along coastal regions to provide accurate, detailed data. Interpreting this data will enable scientists to better determine the size, location, and direction of travel of tsunami events. This expanded system would greatly enhance alert and warning capabilities for potential events all around the Pacific Rim, including the Southern California region.

The second bill is S.50, introduced by Daniel Inouye (D-Hawaii). It would formally authorize the National Oceanic and Atmospheric Administration (NOAA) to establish, operate, and maintain a dependable national tsunami warning system that would provide maximum tsunami detection capability for the nation. The system would build on the model established in the Pacific, and provide for its repair, expansion and modernization by the close of calendar year 2007. The system would include four components: an expanded and upgraded detection and warning system, a federal-state tsunami hazard mitigation program, a tsunami research program, and a modernization and upgrade program. The bill would also direct NOAA to provide any necessary technical or other assistance to international efforts to establish regional systems in other parts of the world, including the Indian Ocean. The bill authorizes $35 million annually for six years and has considerable support in Congress.

Additionally, the scientific community is working with federal, state and local governments to identify the best method of early warning for locally generated or near shore events. The University of Southern California Tsunami Center will be making recommendations to both the Los Angeles Operational Area Task Force and the recently established Los Angeles City Taskforce. One system being proposed would include the installation of sound detection devices called "hydrophones". These hydrophones would be placed off shore to establish a near-shore warning system. However, more in depth study is needed before any decisions are made regarding this system as the actual benefit and overall system costs have not yet been determined.

The City of Long Beach presently utilizes maps that were developed for the Disaster Mitigation Plan that identified potential inundation areas within the City. USGS scientists are also developing models for worse case scenario run-ups of water for the west facing beaches of Los Angeles County from Ventura County line south to Palos Verdes. Models for south facing beaches from Palos Verdes down to the Orange County border, including Long Beach, are expected to be completed in the near future. When the updated USGS run-up maps are completed, they will be overlaid with our present maps to further identify any possible inundation zones. That information will then be incorporated into our response plan to create a flooding and water surge scenario.

In the months since the catastrophic Indonesian tsunami, the L.A. Operational Area Tsunami Task force has convened and refocused its efforts to identify impact areas, review alert and warning systems, and to establish clearly defined evacuation routes with signage. The Task Force recently agreed to implement a standard tsunami signage using the State of Oregon's plan as a template for establishing major evacuation routes. Exact costs for proper signage have yet to be determined.

Evacuation Procedures

The Police Department has overall responsibility for evacuations after City officials determine an emergency exists. Once notified of an event, Police Department officials will implement established coastal evacuation and isolation plans. These plans will

facilitate the flow of pedestrian and vehicular traffic along designated evacuation routes; prevent pedestrian and vehicular ingress into the area; and ensure that emergency vehicle access routes remain open. Furthermore, these plans will facilitate coordination between City departments, while increasing the effectiveness of the overall operation.

Once a plan is implemented, operational officials may impose voluntary or mandatory evacuation orders whenever there is a menace to public health or safety. After meeting certain criteria, the Emergency Services Act and California Penal Code give law enforcement personnel the ability to prevent entry into disaster or potential disaster areas. However, police personnel can only enforce mandatory evacuations by making an arrest of someone who refuses to evacuate. Initially, responding officers will staff critical locations to prevent gridlock, and facilitate the movement of pedestrian and vehicular traffic in a northerly direction. When practical, barricades, cones and portable message boards will be used. Ideally, traffic must be prevented from entering the impacted area and directed as far north as staffing will allow.

If an event occurs, many residents may elect, or be forced to flee the area on foot. If a large number of pedestrians are present, certain streets can be selected and used as a pedestrian evacuation route. Southbound lanes can also be utilized if traffic allows. If available, Long Beach Transit, water vessels, and the Metro Link may be used to evacuate citizens. Additionally, shutting off and isolating utilities into the affected areas will be closely monitored and conducted by appropriate personnel.

With seven miles of oceanfront, and the potential for a near-shore event with little or no warning, self-evacuations may be required. In the event of any major earthquake activity near the shoreline, citizens should monitor their radios and televisions for tsunami warnings. Individuals in low-lying, tsunami exposed areas may need to move to higher ground until an "all clear" is determined. In the event of a large-scale evacuation, The Parks, Recreation, and Marine Department would coordinate with the American Red Cross to provide emergency shelter for evacuees.

Public Education

The Fire Department's Community Emergency Response Team (CERT) Program is a 6-week, 22-hour course that includes curriculum on natural hazards. Included in the training is a section on tsunamis and their impact on local communities. The Fire Department has trained over 2,000 residents in CERT since 1992. The Police Department also has an extremely active Neighborhood Watch program. Both programs prepare residents to help themselves in the event of emergencies and natural disasters.

An informational video is being developed that can be shown at community meetings and on Hometown Television as a Public Safety Announcement (PSA). This video is currently in pre-production and will be made by Fire in partnership with the Police, Public Works and Harbor departments.

In addition, public information brochures are being developed specific to Long Beach that will incorporate safety rules for residents and businesses such as:

- ✓ Be aware: know your surroundings and your potential risks.
- ✓ Be prepared: maintain emergency supplies and have an evacuation plan.
- ✓ Be prepared to move to higher ground. If you evacuate, have a plan of where to meet other family members.
- ✓ Never go down to the beach to watch for a tsunami.
- ✓ A tsunami is not a single wave, but a series of waves. Stay out of danger until authorities issue an "All Clear".
- ✓ Listen to local media and emergency officials for further instructions.

The Long Beach Fire Ambassadors, volunteer citizens assisting the Fire Department, conduct our Fire Safety House Program. This program reaches out to third grade classes in the Long Beach Unified School District. The Ambassadors, along with on-duty Firefighters, visit the schools to conduct Fire, Safety, and Earthquake preparedness training. A tsunami component is being developed that will be incorporated into the program.

City Emergency Plan

In the event of an emergency situation resulting from a tsunami, initial response will be from on-duty resources in the City's Fire, Police and Public Works departments. Fire Department personnel will immediately operate under a mode similar to earthquake response. This includes moving emergency equipment out of structures, surveying districts, and re-positioning for response. The Marine Safety Division rescue boats will be staged off shore. The Marine Division will also assist in the safe evacuation of beach and marina areas, assist in securing access to those areas, perform rescues and medical treatment as needed, and assess coastal and structural damage. A unified command post will be established to manage field operations and department operation centers (DOC's) will be activated in accordance with the Standardized Emergency Management System (SEMS).

In the event of a tsunami, the City's Emergency Operations Center (EOC) at Spring Street and Redondo Avenue will be activated. The level of activation will be contingent upon the impact or potential impact of the tsunami. Following are the EOC activation levels:

Level I

Level I is for a minor or moderate incident that can be resolved with local resources. Only the Emergency Services Coordinator and staff respond to the EOC and prepare for a possible activation.

Level II

The EOC is activated at Level II for a moderate to severe emergency. Instances include severe weather conditions, a major hazardous materials incident, and civil disturbance. Mutual Aid is often required. The EOC is initially staffed with only pre-identified emergency management personnel. Those responding include the City Manager, Fire Chief, Police Chief, Public Works director, City Clerk, and the Emergency Services Coordinator. Other department personnel will be requested as needed. The EOC utilizes the Incident Command System (ICS) to manage the emergency.

Level III

Level III is a full activation of the EOC that will occur during major disasters of any nature. These incidents may deplete local resources as well as area-wide resources that will necessitate operational area, State and possibly Federal assistance. Generally, a local emergency and state of emergency is proclaimed. Designated department heads and assigned personnel are immediately notified to staff the EOC. The Emergency Services Coordinator ensures that the alert has been issued and that each emergency and support function at the EOC is staffed. Elected officials are asked to report to City Hall or their district office if possible. During activation, elected officials will be updated at their offices on a regular basis with briefings by the EOC Manager through the City Public Information Office.

The EOC will manage the event to maximize aid, assistance and effective recovery of the City and its residents from the initial state of emergency to the eventual return to normalcy.

Conclusion

The City will continue to utilize the existing Hazard Mitigation Planning Guide as a foundational document toward mitigating the affects of a tsunami. This document was recently completed, contains up to date information, and has been reviewed by the State of California. It is currently at the Federal level awaiting final approval. Utilization of this document, which dedicates sections to earthquakes and tsunamis, may allow for federal grants.

The City will also draw on its interdepartmental Disaster Committee to coordinate the on-going process of reviewing, planning, and development of the Tsunami Emergency

Operations Plan. This committee, comprised of representatives from all City departments, will provide a coordinated approach for final development of a plan that identifies the tsunami threat, notification systems, response, and mitigation efforts related to tsunami events. It is important to note that funding for planning, training, signage and educational programs will be critical to the success of this process. The Fire Department will continue to aggressively pursue grant funding specifically for the purpose of tsunami events and other disasters that could affect Long Beach.

Long Beach Fire Department staff will continue to participate in the Los Angeles Operational Area Tsunami Task Force. This will include a review and update of the interim regional and local plans that were developed in 1999, as well as the inclusion of a specific section on tsunamis in the updated Emergency Operations Plan.

Finally, even though the City has detailed plans in place for response, mitigation, and recovery, more work needs to be done, especially in the area of All Hazards planning and exercises. In order to create a more comprehensive early warning network, a well-coordinated federal, state and regional approach is needed to fully protect Long Beach residents.

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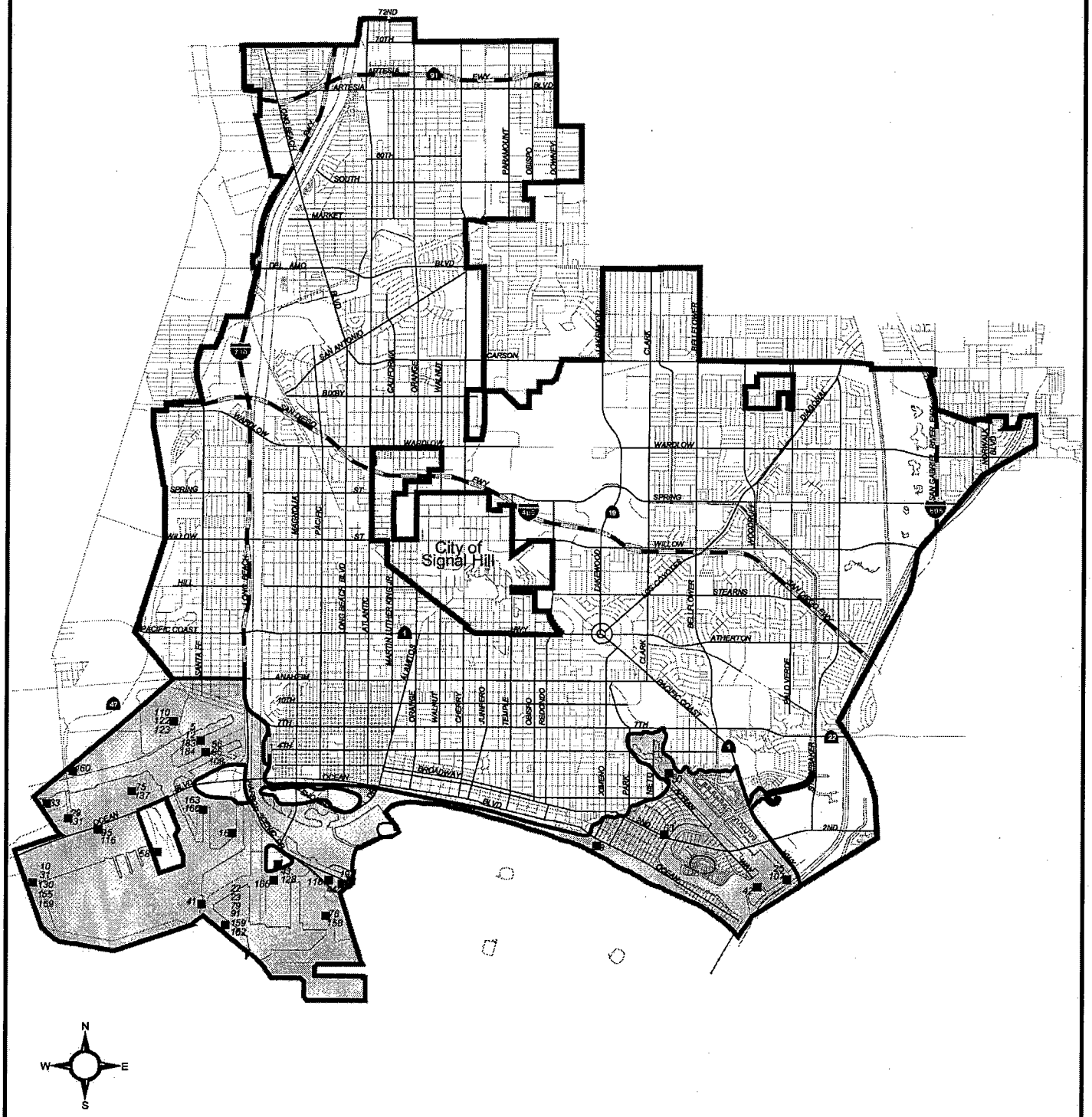

City of Long Beach California

Critical & Essential Facilities Tsunami Hazard Area

Legend

- Critical & Essential Facilities
- Long Beach Major Streets
- Freeways
- Streets
- Areas susceptible to Tsunami run-up and Harbor/Channel areas susceptible to seiche and strong currents
- City of Long Beach Boundary

City of Long Beach Department of Technology Services GIS tsunami_criticalfac.apr 9/23/04