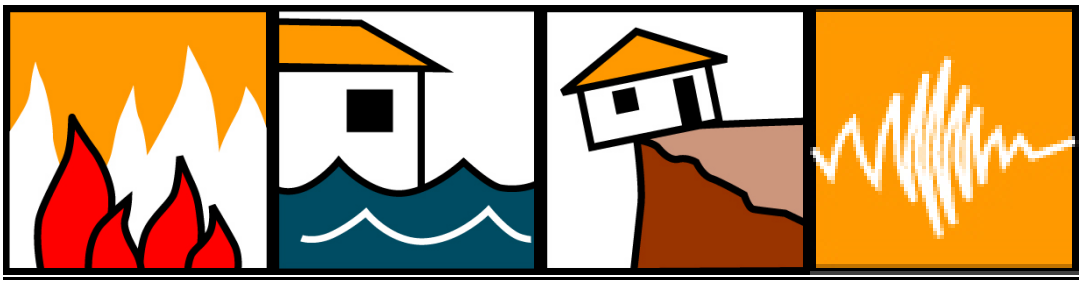
City of El Segundo

Multi-Hazard Mitigation Plan



Adopted by City Council on May 6, 2008

Prepared under contract with:
Emergency Planning Consultants
San Diego, California
Carolyn J. Harshman, President

Special Recognition

Special Thanks
Multi-Jurisdictional Hazard Mitigation Planning Team:

City of El Segundo

- Kevin Smith, Fire Chief - Planning Team Chair
- Eric Moore, Fire Battalion Chief
- Walt Krumbach, Police Lieutenant
- Jeff Robinson, Emergency Services Coordinator
- Bill Crowe, Assistant City Manager
- Steve Jones, Business Services Manager
- Dan Garcia, Assistant City Engineer
- Steve Finton, Director of Public Works/City Engineer
- Alexis Schopp, Assistant Planner

El Segundo Unified School District

- Geoff Yantz, Superintendent
- Mary Keener, Executive Director - Administrative Services
- Andy Cox, Supervisor of Maintenance

ACKNOWLEDGMENTS
City of El Segundo City Council

- Kelly McDowell, Mayor
- Eric Busch, Mayor Pro-Tem
- Don Brann, Councilmember
- Bill Fisher, Councilmember
- Carl Jacobson, Councilmember
- Jim Boulgarides, Former Councilmember

Mapping
Maps were acquired from City of El Segundo, the Los Angeles County All-Hazard Mitigation Plan, Federal Emergency Management Agency (FEMA), and other maps publicly available on the Internet.

Planning Guidance Materials
The Disaster Management Area Coordinators (DMAC) of Los Angeles County prepared planning guidance materials that were utilized by the City of El Segundo in preparing this Multi-Hazard Mitigation Plan. The guidance materials were based on the Clackamas County (Oregon) Mitigation Plan. The City appreciates the efforts of both DMAC and Clackamas County.

Consulting Services
Emergency Planning Consultants:

Project Management and Planning Services:	Carolyn J. Harshman, President
Planning Services:	Timothy W. Harshman, Assistant

LIST OF MITIGATION PLAN TABLES, FIGURES, MATRICES, MAPS, AND PHOTOS

Type	Title	Section
Table 7-4	Major Tornado-Like Events in the Vicinity of City of El Segundo	Section 7: Windstorm
Table 7-5	Beaufort Scale	Section 7: Windstorm
Table 8-1	Tsunami Events In California	Section 8: Tsunami
Figure 8-1	Potential Local Source Tsunami Regions along the Californian Coast	Section 8: Tsunami
Figure 8-2	Potential Distant Source Tsunami Regions for the Californian Coast	Section 8: Tsunami
Figure 8-3	Tsunami Formation	Section 8: Tsunami
Map 8-1	Tsunami Inundation Areas	Section 8: Tsunami
Table 9-1	Major Air Crashes near Los Angeles International Airport	Section 9: Technological and Human-Caused

Note: The maps in this plan were provided by the City of El Segundo, Los Angeles County All-Hazard Mitigation Plan, Federal Emergency Management Agency (FEMA), or were acquired from public Internet sources. Care was taken in the creation of the maps contained in this Plan, however they are provided "as is". The City of El Segundo cannot accept any responsibility for any errors, omissions or positional accuracy, and therefore, there are no warranties that accompany these products (the maps). Although information from land surveys may have been used in the creation of these products, in no way does this product represent or constitute a land survey. Users are cautioned to field verify information on this product before making any decisions.

City of El Segundo Multi-Hazard Mitigation Plan

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Part I: Mitigation Actions
EXECUTIVE SUMMARY: HAZARD MITIGATION ACTION PLAN

The City of El Segundo Multi-Hazard Mitigation Plan (Mitigation Plan) includes resources and information to assist City residents, public and private sector organizations, and others interested in participating in planning for natural, man-made, and technological hazards. The Mitigation Plan provides a list of activities that may assist City of El Segundo in reducing risk and preventing loss from future hazard events. The action items address multi-hazard issues, as well as activities for Earthquake, Flood, Windstorm, Tsunami, and Technological and Human-Caused Hazards.

How is the Plan Organized?

The Mitigation Plan contains a five-year action plan matrix, background on the purpose and methodology used to develop the mitigation plan, a profile of the City of El Segundo, sections on five hazards that occur within the City, and a number of appendices. All of the sections are described in detail in Section 1- Introduction.

Who Participated in Developing the Plan?

The City of El Segundo Mitigation Plan is the result of a collaborative planning effort between City of El Segundo citizens, public agencies, non-profit organizations, the private sector, and regional and state organizations. Public participation played a key role in development of goals and action items. A Multi-Jurisdictional Planning Team guided the process of developing the plan and consisted of the following representatives:

Multi-Jurisdictional Hazard Mitigation Planning Team
City of El Segundo
Kevin Smith, Fire Chief (Planning Team Chair)
Eric Moore, Fire Battalion Chief
Jeff Robinson, Emergency Services Coordinator
Bill Crowe, Assistant City Manager
Steve Jones, Business Services Manager
Alexis Schopp, Assistant Planner
Steve Finton, Director of Public Works/City Engineer
Dan Garcia, Assistant City Engineer
Walt Krumbach, Police Lieutenant
El Segundo Unified School District
Geoff Yantz, Superintendent
Mary Keener, Executive Director – Administrative Services
Andy Cox, Supervisor of Maintenance

Planning Team

The City of El Segundo's Fire Chief served as the Chair of the Planning Team. The Chair's responsibility including serving as the point of contact with the consultant, arranging for Planning Team meetings, gathering historical data, providing mapping and other reference materials for use by the Planning Team, and interfacing with City Council and City Manager's Office, as needed. In addition, the Chair facilitated necessary amendments and revisions to the MHMP as required by California Office of Emergency Services and the Federal Emergency Management Agency. The Planning Team met for a total of five times between May 29, 2007 and September 10, 2007. The outcome of those meetings included gathering of historical hazard data, identification of existing mitigation techniques, and creation of new mitigation techniques. In addition, the Team developed and distributed a "Levels of Concerns" questionnaire for the citizens of El Segundo. For future updates to the Multi-Hazard Mitigation Plan, consideration should be given to ensuring participation on the Planning Team for all departments with responsibilities identified in the Plan.

What is the Plan Mission?

The mission of the City of El Segundo Mitigation Plan is to promote sound public policy designed to protect citizens, critical facilities, infrastructure, private property, and the environment from natural, human-caused, and technological hazards. This can be achieved by increasing public awareness, documenting the resources for risk reduction and loss-prevention, and identifying activities to guide the City in creating a more sustainable community.

What are the Plan Goals?

The plan goals describe the overall direction that City of El Segundo can take to work toward mitigating risk from natural, human-caused, and technological hazards. The goals are stepping-stones between the broad direction of the mission statement and the specific recommendations outlined in the action items.

Protect Life and Property

Implement activities that assist in protecting lives by making homes, businesses, infrastructure, critical facilities, and other property more resistant to losses from natural, man-made, and technological hazards.

Improve hazard assessment information to make recommendations for avoiding new development in high hazard areas and encouraging preventative measures for existing development in areas vulnerable to natural, man-made, and technological hazards.

Enhance Public Awareness

Develop and implement education and outreach programs to increase public awareness of the risks associated with natural, human-caused, and technological hazards.

Provide information on tools; partnership opportunities, and funding resources to assist in implementing mitigation activities.

Preserve Natural Systems

Support management and land use planning practices with hazard mitigation to protect life.

Preserve, rehabilitate, and enhance natural systems to serve hazard mitigation functions.

Encourage Partnerships and Implementation

Strengthen communication and coordinate participation with public agencies, citizens, non-profit organizations, business, and industry to support implementation.

Encourage leadership within the City and public organizations to prioritize and implement local and regional hazard mitigation activities.

Strengthen Emergency Services

Establish policy to ensure mitigation projects for critical facilities, services, and infrastructure.

Strengthen emergency operations by increasing collaboration and coordination among public agencies, non-profit organizations, business, and industry.

Coordinate and integrate hazard mitigation activities, where appropriate, with emergency operations plans and procedures.

How are the Action Items Organized?

The action items are a listing of activities in which City agencies and citizens can be engaged to reduce risk. Each action item includes an estimate of the timeline for implementation. Short-term action items are activities that the City may implement with existing resources and authorities within one to two years. Long-term action items may require new or additional resources or authorities, and may take between one and five years (or more) to implement.

The action items are organized within the following matrix, which lists all of the multi-hazard and hazard-specific action items included in the mitigation plan. Data collection and research and the public participation process resulted in the development of these action items (see Appendix B: Public Participation). The matrix includes the following information for each action item:

Funding Source. The action items can be funded through a variety of sources, possibly including: operating budget/general fund, development fees, Community Development Block Grant (CDBG), Hazard Mitigation Grant Program (HMGP), other Grants, private funding, Capital Improvement Plan, and other funding opportunities.

Coordinating Organization. The Mitigation Actions Matrix assigns primary responsibility for each of the action items. The hierarchies of the assignments vary – some are positions, others departments, and other committees. No matter, the primary responsibility for implementing the action items falls to the entity shown as the "Coordinating Organization". The coordinating organization is the agency with regulatory responsibility to address hazards, or that is willing and able to organize resources, find appropriate funding, or oversee activity implementation, monitoring, and

evaluation. Coordinating organizations may include local, county, or regional agencies that are capable of or responsible for implementing activities and programs.

Plan Goals Addressed. The plan goals addressed by each action item are included as a way to monitor and evaluate how well the mitigation plan is achieving its goals once implementation begins. The plan goals are organized into the following five areas:

Protect Life and Property
Public Awareness
Natural Systems
Partnerships and Implementation
Emergency Services

How Will the Plan be Implemented, Monitored, and Evaluated?

The Plan Maintenance Section of this document details the formal process that will ensure that the City of El Segundo Mitigation Plan remains an active and relevant document. The plan maintenance process includes a schedule for monitoring and evaluating the Plan annually and producing a plan revision every five years. This section describes how the City will integrate public participation throughout the plan maintenance process. Finally, this section includes an explanation of how the City of El Segundo intends to incorporate the mitigation strategies outlined in this Plan into existing planning mechanisms such as the City's General Plan, Capital Improvement Plans, and Building and Safety Codes.

Plan Adoption

Adoption of the Mitigation Plan by the City's governing body is one of the prime requirements for approval of the plan. Once the plan is completed, the City Council will be responsible for adopting the City of El Segundo Mitigation Plan. The governing body has the responsibility and authority to promote sound public policy regarding hazards. The local agency governing body will have the authority to periodically update the plan as it is revised to meet changes in the hazard risks and exposures in the City. The approved Mitigation Plan will be significant in the future growth and development of the City.

Coordinating Body

The City of El Segundo Hazard Mitigation Advisory Committee (Committee) will be responsible for coordinating implementation of Plan action items and undertaking the formal review process. The City Council will assign the existing Hazard Mitigation Planning Team to perform the duties of the Committee. It will be within the Committee's authority to delegate responsibility for Plan maintenance and implementation to the Hazard Mitigation Planning Team (authors of the Plan).

Convener

The City Council will adopt the City of El Segundo Mitigation Plan and the Hazard Mitigation Advisory Committee will take responsibility for plan maintenance and implementation. The Chair of the City's Hazard Mitigation Planning Team (Fire Chief Kevin Smith), will serve as a convener to facilitate the Committee meetings, and will assign tasks such as updating and presenting the Plan to the members of the Committee. Plan implementation and evaluation will be a shared responsibility among all of the Committee members.

Implementation through Existing Programs

City of El Segundo addresses statewide planning goals and legislative requirements through its General Plan, Capital Improvement Plans, and City Building and Safety Codes. The Mitigation Plan provides a series of recommendations that are closely related to the goals and objectives of existing planning programs. The City of El Segundo will have the opportunity to implement recommended mitigation action items through existing programs and procedures.

Economic Analysis of Mitigation Projects

At the Hazard Mitigation Advisory Committee's first meeting, the Committee will utilize the STAPLEE Tool (Plan Maintenance – Table 2-1) as a guide in implementing the Mitigation Plan.

The Federal Emergency Management Agency's approaches to identify costs and benefits associated with hazard mitigation strategies or projects fall into two general categories: benefit/cost analysis and cost-effectiveness analysis. Conducting benefit/cost analysis for a mitigation activity can assist communities in determining whether a project is worth undertaking now, in order to avoid disaster-related damages later. Cost-effectiveness analysis evaluates how best to spend a given amount of money to achieve a specific goal. Determining the economic feasibility of mitigating hazards can provide decision makers with an understanding of the potential benefits and costs of an activity, as well as a basis upon which to compare alternative projects.

Formal Review Process

The City of El Segundo Mitigation Plan will be evaluated on an annual basis to determine the effectiveness of programs, and to reflect changes in land development or programs that may affect mitigation priorities. The evaluation process includes a firm schedule and timeline, and identifies the agencies and organizations participating in plan evaluation. The convener will be responsible for contacting the Hazard Mitigation Advisory Committee members and organizing the annual meeting. Committee members will be responsible for monitoring and evaluating the progress of the mitigation strategies in the Plan.

Continued Public Involvement

The City of El Segundo is dedicated to involving the public directly in the continual review and updates to the Mitigation Plan. Copies of the plan will be available at El Segundo Fire Department – Station #1 at 314 Main Street and El Segundo Library at 111 W. Mariposa Avenue.

Table 1 – Mitigation Actions Matrix

Hazard	Action Item	Funding Source	Coordinating Organization	Timeline	Plan Goals Addressed				
					Protect Life and Property	Public Awareness	Natural Systems	Partnerships and Implementation	Emergency Services
Multi-Hazard Action Items									
MH-1	Integrate the goals and action items from the El Segundo Multi-Hazard Mitigation Plan (Mitigation Plan) into existing regulatory documents and programs, where appropriate.	General Fund	Emergency Services Division (ESD)	1 year	X	X	X	X	X
MH-2	Conduct a detailed vulnerability assessment in the future in order to accurately identify the extent of damages to vulnerable buildings, infrastructure, and critical facilities.	General Fund	Planning, Building, and Safety (PBS), Public Works (PW), Emergency Services Division (ESD)	Ongoing	X			X	
MH-3	Identify and pursue funding opportunities to develop and implement local mitigation activities.	General Fund	ESD, Fire Department (FD), Police Department (PD), PW, PBS, CM	Ongoing	X	X	X	X	X

Hazard	Action Item	Funding Source	Coordinating Organization	Timeline	Plan Goals Addressed				
					Protect Life and Property	Public Awareness	Natural Systems	Partnerships and Implementation	Emergency Services
MH-4	Establish a formal role for the El Segundo Hazard Mitigation Advisory Committee to develop a sustainable process for implementing, monitoring, and evaluating citywide mitigation activities.	General Fund	FD	Ongoing	X	X	X	X	X
MH-5	Develop public and private partnerships to foster hazard mitigation program coordination and collaboration in the City of El Segundo.	General Fund	FD	Ongoing	X	X	X	X	X
MH-6	Develop inventories of at-risk buildings and infrastructure and prioritize mitigation projects.	General Fund	FD, PBS, PW	Ongoing	X	X	X	X	X
MH-7	Develop, enhance, and implement education programs aimed at mitigating all hazards, and reducing the risk to citizens, public agencies, private property owners, businesses, and schools.	General Fund	ESD, FD	Ongoing	X	X		X	X
MH-8	Establish a policy to ensure mitigation projects are in place to safeguard critical facilities.	General Fund	PW, ESD	Ongoing	X			X	X
MH-9	Partner with other organizations and agencies with similar goals to promote building codes that are more disaster resistant at the local level.	General Fund	PBS, FD	Ongoing	X			X	X
MH-10	Adoption of International Building Code by the City.	General Fund	PBS, FD	Adopted 1/1/08	X			X	X
MH-11	Ensure compliance to rebuilding in conformance with applicable codes, specifications, and	General Fund	PBS, FD	Ongoing	X			X	X

Hazard	Action Item	Funding Source	Coordinating Organization	Timeline	Plan Goals Addressed				
					Protect Life and Property	Public Awareness	Natural Systems	Partnerships and Implementation	Emergency Services
	standards.								
MH-12	Ensure that repairs or construction funded by Federal disaster assistance conform to applicable codes and standards.	General Fund	PBS, FD	Ongoing	X			X	X
MH-13	Review current building codes and standards to determine adequacy for disaster restoration of properties.	General Fund	PBS, FD	Ongoing	X			X	X
MH-14	Coordinate and integrate hazard mitigation activities, where appropriate, with emergency operations plans and procedures.	General Fund	ESD, FD, PD, PW	Ongoing	X	X	X	X	X
MH-15	Establish measurable standards to evaluate mitigation policies and programs and provide a mechanism to update and revise the mitigation plan.	General Fund	ESD	Ongoing	X	X	X	X	X
MH-16	Establish clear roles for participants of the committee, meeting regularly to pursue and evaluate implementation of mitigation strategies.	General Fund	FD	Ongoing	X	X	X	X	X
MH-17	Strengthen emergency operations by increasing collaboration and coordination among public agencies, non-profit organizations, business, and industry.	General Fund	ESD, PD, FD	Ongoing	X	X	X	X	X

Hazard	Action Item	Funding Source	Coordinating Organization	Timeline	Plan Goals Addressed				
					Protect Life and Property	Public Awareness	Natural Systems	Partnerships and Implementation	Emergency Services
MH-18	Develop a Preliminary Damage Assessment (PDA) process and review PDA data to identify planning concerns.	General Fund	PBS	Ongoing	X			X	X
MH-19	Compile a directory of out-of-area contractors to help with repairs/reconstruction so that restoration occurs in a timely manner.	General Fund	ESD, PW	Ongoing	X			X	X
MH-20	Conduct a study to determine sufficient information to identify disaster-prone areas such as floodplains, earthquake fault lines, storm surge zones, etc.	General Fund	ESD, PBS, PW	Ongoing	X		X	X	X
MH-21	Install, improve, and maintain back-up power in critical facilities.	General Fund	PW	Ongoing	X			X	X
MH-22	Provide additional sheltering facilities.	General Fund	ESD, Recreation and Parks (R&P)	Ongoing	X			X	X
MH-23	Create a database with information to track the status of repair or reconstruction of City facilities.	General Fund	PBS, PW	Ongoing	X			X	X
MH-24	Update the Mitigation Plan based on new information on a regular basis.	General Fund	ESD, FD	Ongoing	X			X	X
MH-25	Determine how, when, and under what circumstances government will demolish structures.	General Fund	PBS, FD	Ongoing	X			X	X

Hazard	Action Item	Funding Source	Coordinating Organization	Timeline	Plan Goals Addressed				
					Protect Life and Property	Public Awareness	Natural Systems	Partnerships and Implementation	Emergency Services
MH-26	Determine which structures and/or facilities that will not be allowed to be repaired or reconstructed.	General Fund	PBS, FD	Ongoing	X			X	X
MH-27	Provide technical assistance to help the community develop disaster management operations capabilities.	General Fund	ESD, PD, FD	Ongoing	X	X		X	X
MH-28	Encourage the development of mutual aid systems at the local level, including the Emergency Management Assistance Compact.	General Fund	ESD, PD, FD	Ongoing	X			X	X
MH-29	Conduct interim planning to locate, set up, and manage temporary sites where government functions can continue their operations during recovery.	General Fund	City Manager's Office (CM)	Ongoing	X			X	X
MH-30	Allocate City resources and assistance to mitigation projects when possible.	General Fund	CM, City Council (CC)	Ongoing	X			X	X
MH-31	Identify all organizations within the jurisdiction that have programs or interests in hazard mitigation.	General Fund	ESD	Ongoing	X			X	X
MH-32	Involve private businesses throughout the City in mitigation planning.	General Fund	ESD, FD, PD	Ongoing	X	X		X	X
MH-33	Develop a database that identifies each property that has received damage due to hazards identified within this mitigation plan. The database should	General Fund	ESD, PBS, Information Services (IS),	Ongoing	X	X		X	X

Hazard	Action Item	Funding Source	Coordinating Organization	Timeline	Plan Goals Addressed				
					Protect Life and Property	Public Awareness	Natural Systems	Partnerships and Implementation	Emergency Services
	also include a tax identification number of the property, a description of the property damage, the value of damage, and links to photographs of the damage. Developing this database will allow the community to easily identify properties at high risk of damage from certain hazards as well as properties that receive repetitive damage from multiple hazards. In an effort to gain historical information the community shall send a survey to all residents requesting information that should be included in the database.		Finance						
MH-34	Engage the private sector to contribute to disaster preparedness and loss reduction at the local level.	General Fund	ESD	Ongoing	X	X		X	X
MH-35	Write and administer appropriate grants to enhance all agencies/departments' incident response capabilities.	General Fund	PD, ESD, FD, PW	Ongoing	X			X	X
MH-36	Promote hazard mitigation as a public value in recognition of its importance to the health, safety, and welfare of the population.	General Fund	CM, CC	Ongoing		X			
MH-37	Promote public education to increase awareness of hazards and opportunities for mitigation.	General Fund	PD, FD, ESD	Ongoing	X	X			
MH-38	Post the City's Hazard Mitigation Plan on the	General	IS, FD, CM	Ongoing	X	X			

Hazard	Action Item	Funding Source	Coordinating Organization	Timeline	Plan Goals Addressed				
					Protect Life and Property	Public Awareness	Natural Systems	Partnerships and Implementation	Emergency Services
	website.	Fund							
MH-39	Create 30 second commercials on mitigation steps and strategies and disaster preparedness tips to be shown on the local cable access channels.	General Fund	Cable TV, CM, CC	Ongoing	X	X		X	X
MH-40	Distribute FEMA's Emergency Management Guide for Businesses and Industry and Preparing Your Business for the Unthinkable brochure to the Chamber of Commerce.	General Fund	Business Services, ESD	As needed	X	X		X	X
MH-41	Advertise the availability of emergency management materials on the City's website.	General Fund	IS, CM, CC, FD, ESD	Ongoing	X	X			X
MH-42	Utilize the media for the distribution and publication of hazard information.	General Fund	Cable TV, CM, CC	As needed		X		X	X
MH-43	Create a public speaking series on hazard related topics.	General Fund	FD, PD, ESD	As needed		X			X
MH-44	Update the City's website to provide additional hazard related information that is easily accessible.	General Fund	IS, ESD	As needed		X			X
MH-45	The State and County Office of Emergency Services websites have information about disaster preparedness and related links. Expand and update links to those websites as needed and as appropriate.	General Fund	IS, FD, PD, ESD	As needed		X			X

Hazard	Action Item	Funding Source	Coordinating Organization	Timeline	Plan Goals Addressed				
					Protect Life and Property	Public Awareness	Natural Systems	Partnerships and Implementation	Emergency Services
MH-46	Utilize the City's website, press releases, local media and public displays to advertise agencies such as the American Red Cross, Community Emergency Response Training, the Local Emergency Planning Committee, Volunteer Organizations Active in Disaster etc.	General Fund	IS, Cable TV, CM, CC, ESD	As needed	X	X		X	X
MH-47	Work with the American Red Cross, Board of Education, and churches towards upgrading all shelter resources.	General Fund	R&P, FD	As needed				X	
MH-48	Meet with local officials and major employers encouraging the creation of resource centers in their respective lobbies.	General Fund	CM, FD, ESD	Ongoing	X	X			X
MH-49	Identify and prioritize needs for additional shelter supplies to include but not limited to additional cots, blankets and shelter kits.	General Fund	R&P, ESD	As needed	X				X
MH-50	Develop and promote a communications plan to recruit and train more volunteers for sheltering assistance.	General Fund	R&P, ESD	As needed	X				X
MH-51	Conduct full-scale exercises that include evaluation tools that will identify critical performance expectations every three years.	General Fund	All City Departments	Every other year	X	X			X
MH-52	Conduct annual tabletop disaster exercises with	General	FD, PD, CM,	Annual	X				X

Hazard	Action Item	Funding Source	Coordinating Organization	Timeline	Plan Goals Addressed				
					Protect Life and Property	Public Awareness	Natural Systems	Partnerships and Implementation	Emergency Services
	local law enforcement, emergency managers, city officials, and other disaster response agencies.	Fund	ESD						
MH-53	Teach CERT classes to interested citizens in the City to assist their neighbors during emergencies. This course will be taught throughout the City utilizing the City's Firefighters.	General Fund	FD	Annual	X	X		X	X
MH-54	Train EMS, firefighters, law enforcement, public works, healthcare providers and other support personnel in unified command using the Incident Command System (ICS) model. By understanding the role of each discipline will result in a cohesive performance of their assigned tasks yielding an overall emergency response that is not only effective, but rapid with optimal outcome.	General Fund	FD, PD, ESD	Ongoing	X			X	X
MH-55	Promote CERT through the Chamber of Commerce to gain business participation.	General Fund	FD, ESD	Ongoing	X			X	X
MH-56	Develop and deliver information to all residents, through community groups and/or publications, information on how to shelter in place and when it is appropriate to do so.	General Fund	FD, PD, R&P	Annual	X	X			X
MH-57	Publicize FEMA's Emergency Management Institute independent study courses available to the	General Fund	CM, CC, IS, Cable TV, ESD	As needed	X	X		X	X

Hazard	Action Item	Funding Source	Coordinating Organization	Timeline	Plan Goals Addressed				
					Protect Life and Property	Public Awareness	Natural Systems	Partnerships and Implementation	Emergency Services
	public to include but not limited to Emergency Preparedness USA, Hazardous Material: Citizen Orientation, Animals in Disaster, Disaster Mitigation for Homeowners, etc.								
MH-58	Develop list of available training opportunities and to distribute the list to all local emergency responders.	General Fund	FD, PD	As needed					X
MH-59	Review Capital Improvement Plans to ensure that programmed infrastructure improvements are not in high hazard areas.	General Fund	PW, PBS	Annual			X		X
MH-60	Planning, Building and Safety Department will review the General Plan to ensure that designated growth areas are not in high hazard areas identified in this plan.	General Fund	PC, PBS, CC, CM	As needed	X		X		
MH-61	Planning, Building and Safety Department will review regulations pertaining to the jurisdiction to make sure that adequate zoning regulations are in place to reduce future development in high hazard areas in their jurisdiction.	General Fund	PBS, Planning Commission (PC)	As needed	X		X		X

Hazard	Action Item	Funding Source	Coordinating Organization	Timeline	Plan Goals Addressed				
					Protect Life and Property	Public Awareness	Natural Systems	Partnerships and Implementation	Emergency Services
MH-62	Establish an offsite Emergency Communications Center (ECC) and Emergency Operations Center (EOC). In the event the primary sites must be vacated, the off-site back-up centers can be rapidly mobilized in a secured facility. Both centers will duplicate the primary points of operation.	General Fund or Seek Grant Funds	CC, FD, PD, CM, IS	Ongoing	X				X
MH-63	Continue collection of MSDS reports from City facilities to enhance and prepare emergency responders in the event of an incident at these facilities.	General Fund	FD	Ongoing	X			X	X
MH-64	Establish and maintain a functional Emergency Operations Center.	General Fund	PD, FD, IS, ESD	Ongoing	X				X
MH-65	Ensure training and exercise standards are maintained as established in NIMS, National Incident Management System and SEMS, Standardized Emergency Management System.	General Fund	CM, CC, FD, ESD	Ongoing	X				X
MH-66	Develop and complete a baseline survey to gather perceptions of private citizens and the business community regarding hazard risks and identify mitigation needs.	General Fund	FD, PD	Annual		X			X
MH-67	Identify opportunities for partnering with citizens,	General	FD, PD, ESD	Ongoing				X	X

Hazard	Action Item	Funding Source	Coordinating Organization	Timeline	Plan Goals Addressed				
					Protect Life and Property	Public Awareness	Natural Systems	Partnerships and Implementation	Emergency Services
	private contractors, and other jurisdictions to increase availability of equipment and manpower for efficiency of response efforts.	Fund							
MH-68	Routine maintenance of the community's infrastructure will be done to minimize the potential for system failure because of or during a disaster.	General Fund	PW, IS	Ongoing	X				X
MH-69	Enhance response capability of municipal fire, police, and emergency medical services personnel to meet the needs of special populations.	General Fund	FD, PD, ESD	Ongoing	X				X
MH-70	Assess availability of backup power resources of fire, police, rescue, and emergency management personnel; Upgrade resources as necessary.	General Fund	PW	Ongoing	X				X
MH-71	Vehicle access routes to key health care facilities will be protected from blockage as a result of a disaster.	General Fund	PW, FD, PD	As needed	X				X
MH-72	Develop mitigation strategies to protect identified at-risk historic properties.	General Fund	PBS, ESD, PW	Ongoing	X			X	X
MH-73	Incorporate the training goals and objectives used by fire, EMS, law enforcement, public works, healthcare providers and other support personnel	General Fund	ESD, PD, FD, PW	Ongoing	X				X

Hazard	Action Item	Funding Source	Coordinating Organization	Timeline	Plan Goals Addressed				
					Protect Life and Property	Public Awareness	Natural Systems	Partnerships and Implementation	Emergency Services
	into selected hazardous material training. This will foster the unified command relationship that will serve as the incident management blueprint for all disaster response.								
MH-74	Establish and implement the National Incident Management System (NIMS) throughout all City departments.	General Fund	ESD, CM	Ongoing				X	X
MH-75	Determine what kinds of minor repairs and temporary protection activities (e.g., temporary roofing, protect against loss of life/injury, shoring, protect contents) can be done in the immediate aftermath of a disaster.	General Fund	PBS	As needed	X				X
MH-76	Identify water resources management and conservation opportunities.	General Fund	Public Works Water Division (Water)	Ongoing			X		
MH-77	Develop strategies for debris management following an emergency or disaster.	General Fund	FD, PD	As needed	X	X			X
MH-78	Coordinate the maintenance of emergency transportation routes through communication among the county roads department, neighboring jurisdictions, and CalTrans.	General Fund	PD, PW	As needed	X			X	X
MH-79	Identify and provide signage for evacuation routes.	General	ESD, FD, PD,	Ongoing	X	X		X	X

Hazard	Action Item	Funding Source	Coordinating Organization	Timeline	Plan Goals Addressed				
					Protect Life and Property	Public Awareness	Natural Systems	Partnerships and Implementation	Emergency Services
		Fund	PW						
MH-80	Maintain a low power AM radio station that can be activated in the event of an emergency to notify the public.	General Fund	ESD, PD, FD, PW	Ongoing	X	X		X	X
MH-81	Maintain signs with blinking lights directing public to turn to AM radio station in the event of a disaster.	General Fund	ESD, PW	Ongoing	X	X		X	X
MH-82	Apply for Tsunami Ready/Storm Ready with NOAA/NWS to acknowledge that the city has developed plans and procedures.	General Fund	ESD, FD	Ongoing	X	X	X	X	X
MH-83	Identify funding to purchase and install an emergency alert system using horns/sirens, voice to warn the public of impending danger.	General Fund or Grant Funds	ESD, CM, FD, CC	Ongoing	X	X			X
MH-84	Purchase and install WebEOC to enhance incident management in disasters.	General Fund	ESD, IS	Sept. 2007	X			X	X
MH-85	Improve communication between CalTrans, City, and County road departments to work together to prioritize and identify strategies to deal with road problems.	General Fund	PW	Ongoing	X			X	X

Hazard	Action Item	Funding Source	Coordinating Organization	Timeline	Plan Goals Addressed				
					Protect Life and Property	Public Awareness	Natural Systems	Partnerships and Implementation	Emergency Services
MH-86	Conduct a full review of the Mitigation Plan every 5 years by evaluating mitigation successes, failures, and areas that were not addressed.	General Fund	ESD, FD	Ongoing				X	X
MH-87	Provide business continuity workshops for business owners to learn the importance of disaster mitigation and how to create an emergency operations plan for their businesses.	General Fund	ESD	Ongoing	X	X		X	X
MH-88	Distribution of letters to ALL property owners-all areas of the City on the importance of water conservation and different venues of purchasing water saving mechanisms for homes.	General Fund	PBS, PW	Ongoing	X	X			X
MH-89	Conduct a review of available data concerning potential impacts of global warming, perhaps including coastal flooding, sea level rise, and coastal erosion.	General Fund	PBS	Within 5 years	X	X	X	X	X
Earthquake Action Items									
EQ-1	Integrate new earthquake hazard mapping data for the City of El Segundo and improve technical analysis of earthquake hazards.	General Fund	IS	Ongoing	X	X			X
EQ-2	Encourage seismic strength evaluations of critical facilities in the City to identify vulnerabilities for mitigation of schools and university, public	General Fund	PBS, PW	Ongoing	X			X	

Hazard	Action Item	Funding Source	Coordinating Organization	Timeline	Plan Goals Addressed				
					Protect Life and Property	Public Awareness	Natural Systems	Partnerships and Implementation	Emergency Services
	infrastructure, and critical facilities to meet current seismic standards.								
EQ-3	Encourage reduction of non-structural and structural earthquake hazards in homes, schools, businesses, and government offices.	General Fund	PBS, FD, ESD	Ongoing	X	X			
EQ-4	Minimize earthquake damage risk by retrofitting critical facilities.	General Fund	PBS, PW	Ongoing	X			X	
EQ-5	Encourage purchase of earthquake hazard insurance.	General Fund	PBS, PW	Ongoing		X			X
Flood Action Items									
FLD-1	Analyze each repetitive flood property within the city and identify feasible mitigation options.	General Fund	PBS, PW	Ongoing	X	X			X
FLD-2	Develop better flood warning systems.	General Fund	ESD	Ongoing	X	X			X
FLD-3	Enhance data and mapping for flood-prone areas within the City.	General Fund	GIS, ESD	Ongoing	X	X			X
FLD-4	Identify surface water drainage obstructions for all parts of the City.	General Fund	PW	Ongoing	X	X			
FLD-5	Establish a framework to compile and coordinate surface water management plans and data throughout the City.	General Fund	PW	Ongoing	X	X			X

Hazard	Action Item	Funding Source	Coordinating Organization	Timeline	Plan Goals Addressed				
					Protect Life and Property	Public Awareness	Natural Systems	Partnerships and Implementation	Emergency Services
FLD-6	Record all structures in areas of repetitive losses due to flooding.	General Fund	PBS, PW, ESD	Ongoing	X			X	X
FLD-7	Revise the Zoning and Subdivision Ordinance to require the utilization of various pervious surfaces in order to reduce storm water runoff. This should include utilizing the use of various pervious surfaces in parking lots and recreational areas near the floodplain.	General Fund	PBS	Ongoing	X	X			
FLD-8	Protect surrounding surface water and ecosystems from pollutants often associated with flooding and storm water runoff. Specifically apply storm water mitigation measures as required by TMDL and NEDES.	General Fund	PW	Ongoing	X	X			X
FLD-9	Distribute seasonal disaster preparedness literature to ALL property owners – all areas of the City to include but not limited to winter weather, drought, severe storms, extreme heat, etc.	General Fund	ESD, FD	Ongoing	X	X			X
FLD-10	Understand the National Flood Insurance Program (NFIP) requirements for new construction and substantially improved buildings, in order to maintain compliance with NFIP regulations.	General Fund	PBS	Ongoing	X	X			
FLD-11	The City will adopt a resolution or ordinance that	General	PBS, PW, ESD,	July,	X	X	X	X	X

Hazard	Action Item	Funding Source	Coordinating Organization	Timeline	Plan Goals Addressed				
					Protect Life and Property	Public Awareness	Natural Systems	Partnerships and Implementation	Emergency Services
	will prohibit development in areas of special Flood Hazard Area identified in the Flood Insurance Study for Los Angeles County and Incorporated Areas dated September 26, 2008, with accompanying Flood Insurance Rate Maps (FIRM's) and Flood Boundary and Floodway Maps (FBFM's) and any subsequent revision until such time that standards meet appropriate National Flood Insurance Program (NFIP) requirements are adopted by the city council.	Fund	CC	2008					
Windstorm Action Items									
WS-1	Support/encourage electrical utilities to use underground construction methods where possible to reduce power outages from windstorms.	General Fund	PW	Ongoing	X	X		X	X
WS-2	Encourage development and enforcement of wind-resistant building siting and construction codes.	General Fund	PBS	Ongoing	X	X		X	X
WS-3	Continue to implement programs to keep trees from threatening lives, property, and public infrastructure during windstorm events.	General Fund	R&P, PW	Ongoing	X	X	X		X

Hazard	Action Item	Funding Source	Coordinating Organization	Timeline	Plan Goals Addressed				
					Protect Life and Property	Public Awareness	Natural Systems	Partnerships and Implementation	Emergency Services
Tsunami Action Items									
TS-1	Train regulatory and response staff in tsunami threat.	General Fund	ESD	Ongoing	X	X			X
TS-2	Develop and conduct training and exercises relating to tsunami response.	General Fund	ESD	Ongoing	X	X			X
TS-3	Develop a warning system in the City to notify residents of impending tsunami activity.	General Fund	ESD	Ongoing	X	X			X
TS-4	Maintain system to receive early warning of tsunamis from state and federal agencies.	General Fund	ESD	Ongoing	X	X	X	X	X
TS-5	City staff will continue to monitor studies pertaining to tsunami threats from off-shore faults.	General Fund	PW	Ongoing	X	X	X	X	X
Technological and Human-Caused Event Action Items									
Tech-1	Develop shelter-in-place protocols and redundant notification methods for residents and businesses.	General Fund	FD, PD,ESD	Ongoing	X	X		X	X
Tech-2	Develop and distribute public awareness materials address a range of technological and human-caused hazard threats.	General Fund	FD, PD,ESD	Ongoing	X	X		X	X

SECTION 1: INTRODUCTION

The City of El Segundo is located in the southwestern quadrant of Los Angeles County. The City is characterized by the unique and attractive landscape. However, the potential impacts of hazards associated with the terrain make the environment and its occupants vulnerable to natural disasters.

The City is subject to Earthquake, Flood, Windstorm, Tsunami, and Technological and Human-Caused Hazards. It is impossible to predict exactly when these disasters will occur, or the extent to which they will affect the City. However, with careful planning and collaboration among public agencies, private sector organizations, and citizens within the community, it is possible to minimize the losses that can result from these natural disasters. As the population of the region continues to increase, the exposure to hazards creates an even higher risk than previously experienced.

Why Develop a Mitigation Plan?

As the costs of damage from disasters continue to increase, the City realizes the importance of identifying effective ways to reduce vulnerability to disasters. Mitigation Plans assist communities in reducing risk from hazards by identifying resources, information, and strategies for risk reduction, while helping to guide and coordinate mitigation activities throughout the City.

The plan provides a set of action items to reduce risks from hazards through education and outreach programs and to foster the development of partnerships, and implementation of preventative activities such as land use programs that restrict and control development in areas subject to damage from hazards.
The resources and information within the Mitigation Plan:

(1) Establish a basis for coordination and collaboration among agencies and the public of City of El Segundo;
(2) Identify and prioritize future mitigation projects; and
(3) Assist in meeting the requirements of federal assistance programs.

The Mitigation Plan works in conjunction with other City plans, including the Emergency Operations Plan.

Who Does the Mitigation Plan Affect?

The City of El Segundo Mitigation Plan affects the entire City. Map 1-1 shows the areas contained within the boundaries of the City of El Segundo. The resources and background information in the plan are applicable City-wide. The goals and recommendations contained in this plan will lay groundwork for other local mitigation plans and partnerships.

Map 1-1
Map of City of El Segundo

Hazard Land Use Policy in California

Planning for hazards should be an integral element of any city's land use planning program. All California cities and counties have General Plans and the implementing ordinances that are required to comply with the statewide planning regulations.

The continuing challenge faced by local officials and state government is to keep the network of local plans effective in responding to the changing conditions and needs of California's diverse communities, particularly in light of the very active seismic region in which we live.

Planning for hazards requires a thorough understanding of the various hazards facing the City and region as a whole. Additionally, it's important to take an inventory of the structures and contents of various City holdings. These inventories should include the compendium of hazards facing the city, the built environment at risk, the personal property that may be damaged by hazard events and most of all, the people who live in the shadow of these hazards.

Support for Hazard Mitigation

All mitigation is local and the primary responsibility for development and implementation of risk reduction strategies and policies lies with each local jurisdiction. Local jurisdictions, however, are not alone. Partners and resources exist at the regional, state and federal levels. Numerous California state agencies have a role in hazards and hazard mitigation. Some of the key agencies include:

- The Governor's Office of Emergency Services (OES) is responsible for disaster mitigation, preparedness, response, recovery, and the administration of federal funds after a major disaster declaration;

- The Southern California Earthquake Center (SCEC) gathers information about earthquakes, integrates this information on earthquake phenomena, and communicates this to end-users and the general public to increase earthquake awareness, reduce economic losses, and save lives.

- The California Division of Forestry (CDF) is responsible for all aspects of wildland fire protection on private, and state properties, and administers forest practices regulations, including landslide mitigation, on non-federal lands.

- The California Division of Mines and Geology (DMG) is responsible for geologic hazard characterization, public education, the development of partnerships aimed at reducing risk, and exceptions (based on science-based refinement of tsunami inundation zone delineation) to state mandated tsunami zone restrictions; and

- The California Division of Water Resources (DWR) plans, designs, constructs, operates, and maintains the State Water Project; regulates dams; provides flood protection and assists in emergency management. It also educates the public, serves local water needs by providing technical assistance

Plan Methodology

Information in the Mitigation Plan is based on research from a variety of sources. The City of El Segundo conducted data research and analysis, participated in Planning Team meetings, and developed the final mitigation plan. The research methods and various contributions to the plan include:

Input from the Hazard Mitigation Planning Team

The Hazard Mitigation Planning Team convened five times to guide development of the Mitigation Plan. The Team played an integral role in developing the mission, goals, and action items for the Mitigation Plan. The Team consisted of representatives from:

El Segundo Unified School District – Superintendent's Office
El Segundo Unified School District – Administrative Services
El Segundo Unified School District – Facilities Maintenance
City of El Segundo – Fire Department
City of El Segundo – Police Department
City of El Segundo – City Manager's Office
City of El Segundo – Finance Department
City of El Segundo – Engineering Division
City of El Segundo – Public Works Department
City of El Segundo – Planning, Building, and Safety Department

Stakeholder interviews

Stakeholder interviews were conducted during the workshops and meetings identified above. The interviews identified common concerns related to hazards and identified key long and short-term activities to reduce risk from hazards.

State and federal guidelines and requirements for mitigation plans

Following are the Federal requirements for approval of a mitigation plan:

- Open public involvement, with public meetings that introduce the process and project requirements.
- The public must be afforded opportunities for involvement in: identifying and assessing risk, drafting a plan, and public involvement in approval stages of the plan.
- Community cooperation, with opportunity for other local government agencies, the business community, other educational institutions, and non-profits to participate in the process.
- Incorporation of local documents, including the local General Plan, the Zoning Ordinance, the Building Codes, and other pertinent documents.

The following components must be part of the planning process:

- Complete documentation of the planning process
- A detailed risk assessment on hazard exposures in the City
- A comprehensive mitigation strategy, which describes the goals and objectives, including proposed strategies, programs and actions to avoid long-term vulnerabilities.
- A plan maintenance process, which describes the method and schedule of monitoring,

evaluating and updating the plan and integration of the Mitigation Plan into other planning mechanisms.

- ♦ Formal adoption by the City Council.
- ♦ Plan review by both State OES and FEMA.
- ♦ Plan approval by FEMA.

These requirements are spelled out in greater detail in the following plan sections and supporting documentation.

Public participation opportunities were created through use of local media, the City's website, distribution of a natural, human-caused, and technological hazards questionnaire, and the City Disaster Council and City Council public hearings. In addition, the makeup of a Hazard Mitigation Planning Team ensured a constant exchange of data and input from outside organizations. Through its consultant, Emergency Planning Consultants, the City had access to numerous existing mitigation plans from around the country, as well as current FEMA hazard mitigation planning standards (386 series) and the State of California Mitigation Plan Guidance.

Other reference materials consisted of county and city mitigation plans, including:

Clackamas County (Oregon) Mitigation Plan
City of Long Beach (California) Mitigation Plan
San Diego County (California) Multi-Jurisdictional Hazard Mitigation Plan
Covina-Valley (California) Unified School District Mitigation Plan
City of Hermosa Beach (California) Mitigation Plan
San Diego (California) Unified School District Mitigation Plan
County of Los Angeles (California) Hazard Mitigation Plan

Research

Hazard specific research: City staff collected data and compiled research on five hazards: Earthquake, Flood, Windstorm, Tsunami, and Technological and Human-Caused Hazards. Research materials came from the City General Plan, the City's Threat Assessment contained in the Emergency Operations Plan, and state agencies including OES and CDF. The City of El Segundo staff conducted research by referencing long time City of El Segundo employees and locating City of El Segundo information in historical documents. The City of El Segundo staff identified current mitigation activities, resources and programs, and potential action items from research materials and stakeholder interviews. In advance of planning team meeting number three (Developing Mitigation Action Items) all members of the planning team were assigned to review the City's general plan, the City's Emergency Operations Plan (Threat Assessment), the Capital Improvement Program, The Los Angeles County All-Hazard Mitigation Plan, and The Los Angeles County Operational Area Tsunami Annex (2007) for information on hazards and existing information on mitigation actions. The resources and information cited in the Mitigation Plan provide a strong local perspective and help identify strategies and activities to make City of El Segundo more disaster resistant.

Public Input

The City of El Segundo encouraged public participation and input in the Hazard Mitigation Plan by posting its activities in the local newspaper and on the internet. In addition, the City distributed via U.S. mail and internet a hazard survey. Approximately 1,300 citizens participated in the survey (see Appendix B – Attachment 1 – Page 203). During the review period for the

Draft Plan, sixty (60) electronic copies of the Plan were distributed to local businesses and other interested citizens. The Plan Draft was also posted on the main page of the City's website for over one month and copies were made available at Fire Station #1 and the City Library. The public was encouraged to review public copies of the Plan Draft and participate in the Disaster Council public meeting which was held on April 15, 2008 and the City Council public meeting which was held on May 6, 2008.

Plan Review

The following agencies and organizations were sent review copies and their input was solicited; CERT (Community Emergency Response Team), Los Angeles International Airport (LAX), Chevron/Texaco Corporation, El Segundo Police Department, Raytheon, United Water, Pacific Corporate Towers, Infonet, Northrop Grumman, Los Angeles County Office of Education, and El Segundo City Managers Office. Following a two week review period several minor (typographical) corrections were submitted by the plan reviewers and incorporated into the plan.

How Is the Plan Used?

Each section of the Mitigation Plan provides information and resources to assist people in understanding the City and the hazard-related issues. Combined, the sections of the plan work together to create a document that guides the mission to reduce risk and prevent loss from future hazard events.

The structure of the plan enables people to use a section of interest to them. It also allows the City to review and update sections when new data becomes available. The ability to update individual sections of the mitigation plan places less of a financial burden on the City. Decision-makers can allocate funding and staff resources to selected pieces in need of review, thereby avoiding a full update, which can be costly and time-consuming. New data can be easily incorporated, resulting in a Mitigation Plan that remains current and relevant to the City of El Segundo.

The Mitigation Plan and plan maintenance is organized into three parts. Part I contains an Executive Summary, Introduction, and Plan Maintenance. Part II contains Community Profile, Risk Assessment, and Hazard-Specific Sections. Part III includes the appendices. Each section of the plan is described below.

Part I: Mitigation Actions

Executive Summary: Hazard Mitigation Action Plan

The Action Plan provides an overview of the mitigation plan mission, goals, and action items. The plan action items are included in this section, and address multi-hazard issues, as well as hazard-specific activities that can be implemented to reduce risk and prevent loss from future hazard events. The Executive Summary also contains the Mitigation Actions Matrix.

Section 1: Introduction

The Introduction describes the background and purpose of developing the Mitigation Plan for the City of El Segundo.

Section 2: Plan Maintenance

This section provides information on plan implementation, monitoring and evaluation. The Plan Maintenance Section also contains the STAPLEE Prioritization Tool.

Part II: Hazard Analysis

This section provides information on the process used to develop goals and action items that cut across the five hazards addressed in the Mitigation Plan.

Section 3: Community Profile

The section presents the history, geography, demographics, and socioeconomics of the City of El Segundo. It provides valuable information on the demographics and history of the region.

Sections 4: Risk Assessment

This section provides information on hazard identification, vulnerability and risk associated with hazards in the City of El Segundo.

Section 5: Hazard-Specific Information

Hazard-Specific Section on the five chronic hazards is addressed in this plan. Chronic hazards occur with some regularity and may be predicted through historic evidence and scientific methods. The chronic hazards addressed in the plan include:

Section 5: Earthquake
Section 6: Flood
Section 7: Windstorm
Section 8: Tsunami
Section 9: Technological and Human-Caused Hazards

Each Hazard-Specific Section includes information on the history, hazard causes, hazard characteristics, and hazard assessment.

Part III: Resources

The plan appendices are designed to provide users of the City of El Segundo Multi-Hazard Mitigation Plan with additional information to assist them in understanding the contents of the mitigation plan, and potential resources to assist them with implementation.

Appendix A: Plan Resource Directory

The resource directory includes City, local, regional, state, and national resources and programs that may be of technical and/or financial assistance to the City of El Segundo during plan implementation.

Appendix B: Public Participation

This appendix includes specific information on the various public processes used during

development of the plan.

Appendix C: Benefit/Cost Analysis

This section describes FEMA's requirements for benefit cost analysis in hazards mitigation, as well as various approaches for conducting economic analysis of proposed mitigation activities.

Appendix D: List of Acronyms

This section provides a list of acronyms for City, local, regional, state, and federal agencies and organizations that may be referred to within the Mitigation Plan.

Appendix E: Glossary

This section provides a glossary of terms used throughout the plan.

SECTION 2: PLAN MAINTENANCE

The Plan Maintenance section of this document details the formal process that will ensure that the City of El Segundo Multi-Hazard Mitigation Plan remains an active and relevant document. The plan maintenance process includes a schedule for monitoring and evaluating the Plan annually and producing a plan revision every five years. This section describes how the City will integrate public participation throughout the plan maintenance process. Finally, this section includes an explanation of how the City of El Segundo intends to incorporate the mitigation strategies outlined in this Plan into existing planning mechanisms such as the City General Plan, Capital Improvement Plans, and Building and Safety Codes.

Monitoring and Implementing the Plan

Plan Adoption

The City Council will be responsible for adopting the Mitigation Plan. This governing body has the authority to promote sound public policy regarding hazards. Once the plan has been adopted, the City's Fire Chief (or designee) will be responsible for submitting it to the State Hazard Mitigation Officer at the Governor's Office of Emergency Services. The Governor's Office of Emergency Services will then submit the plan to the Federal Emergency Management Agency (FEMA) for review and approval. This review will address the requirements set forth in 44 C.F.R. Section 201.6 (Local Mitigation Plans). Upon acceptance by FEMA, City of El Segundo will gain eligibility for Hazard Mitigation Grant Program funds.

Coordinating Body

A City of El Segundo Multi-Hazard Mitigation Advisory Committee will be responsible for coordinating implementation of plan action items and undertaking the formal review process. The City will assign representatives from City departments, divisions, and agencies, including, but not limited to, the current Multi-Hazard Mitigation Planning Team will consist of the following individuals:

Multi-Hazard Mitigation Planning Team
City of El Segundo
Kevin Smith, Fire Chief, Planning Team Chair
Eric Moore, Fire Battalion Chief
Jeff Robinson, Emergency Services Coordinator
Bill Crowe, Assistant City Manager
Steve Jones, Business Services Manager
Alexis Schopp, Assistant Planner
Steve Finton, Director of Public Works/City Engineer
Dan Garcia, Assistant City Engineer
Walt Krumbach, Police Lieutenant

In order to make the Committee as broad and useful as possible, the City Manager may choose to involve other relevant organizations and agencies in hazard mitigation. These additional appointments could include:

A representative from the American Red Cross
A representative from a local government emergency response agency

The Multi-Hazard Mitigation Advisory Committee will meet at least once a year. Meeting dates will be scheduled once the final Multi-Hazard Mitigation Advisory Committee has been established. These meetings will provide an opportunity to discuss the progress of the action items and maintain the partnerships that are essential for the sustainability of the mitigation plan.

Convener

The City Council will adopt the City of El Segundo Multi-Hazard Mitigation Plan. Following adoption, the Multi-Hazard Mitigation Advisory Committee will take responsibility for plan implementation. The Fire Chief (or designee) will serve as a Convener to facilitate the Multi-Hazard Mitigation Advisory Committee meetings, and will assign tasks such as updating and presenting the Plan to the members of the Committee. Plan implementation and evaluation will be a shared responsibility among all of the Multi-Hazard Mitigation Advisory Committee members.

Implementation through Existing Programs

City of El Segundo addresses statewide planning goals and legislative requirements through its General Plan, Capital Improvement Plans, and City Building and Safety Codes the Mitigation Plan provides a series of recommendations - many of which are closely related to the goals and objectives of existing planning programs. The City of El Segundo will have the opportunity to implement recommended mitigation action items through existing programs and procedures. The convener of the Mitigation Committee will ensure a through process of Integration by volunteering his/her assistance on preparation/review of all implementing regulatory documents (e.g. General Plan, Zoning Ordinance, Capital Improvement Plan).

The City of El Segundo Planning and Building Safety Department is responsible for adhering to the State of California's Building and Safety Codes. In addition, the Multi-Hazard Mitigation Advisory Committee will work with other agencies at the state level to review, develop and ensure Building and Safety Codes that are adequate to mitigate or present damage by hazards. This is to ensure that life-safety criteria are met for new construction.

Some of the goals and action items in the Mitigation Plan may be achieved through activities recommended in the City's Capital Improvement Program (CIP). Various city departments develop CIP and review it on an annual basis. Upon annual review of the CIP, the Multi-Hazard Mitigation Advisory Committee will work with the city departments to identify areas that the Mitigation Plan action items are consistent with CIP goals and integrate them where appropriate.

Within six months of formal adoption of the Mitigation Plan, the recommendations listed above will be incorporated into the process of existing planning mechanisms at the City level. The meetings of the Multi-Hazard Mitigation Advisory Committee will provide an opportunity for Committee members to report back on the progress made on the integration of mitigation planning elements into City planning documents and procedures.

Economic Analysis of Mitigation Projects

At the Multi-Hazard Mitigation Advisory Committee's first meeting, the Committee will utilize the STAPLEE Tool (Plan Maintenance – Table 2-1) to guide the implementation of the Mitigation Plan.

FEMA's approaches to identify the costs and benefits associated with hazard mitigation strategies, measures, or projects fall into two general categories: benefit/cost analysis and cost-effectiveness analysis.

Conducting benefit/cost analysis for a mitigation activity can assist communities in determining whether a project is worth undertaking now, in order to avoid disaster-related damages later.

Cost-effectiveness analysis evaluates how best to spend a given amount of money to achieve a specific goal. Determining the economic feasibility of mitigating hazards can provide decision-makers with an understanding of the potential benefits and costs of an activity, as well as a basis upon which to compare alternative projects.

Given federal funding, the Multi-Hazard Mitigation Advisory Committee will use a FEMA-approved benefit/cost analysis approach to identify and prioritize mitigation action items. For other projects and funding sources, the Hazard Mitigation Advisory Committee will use other approaches to understand the costs and benefits of each action item and develop a prioritized list. For more information regarding economic analysis of mitigation action items, please see Appendix C: Benefit/Cost Analysis.

Evaluating and Updating the Plan

Formal Update Process

The City of El Segundo Multi-Hazard Mitigation Plan will be evaluated on an annual basis to determine the effectiveness of programs, and to reflect changes in land development or programs that may affect mitigation priorities. The evaluation process includes a firm schedule and timeline, and identifies the agencies and organizations participating in plan evaluation. The Convener or designee will be responsible for contacting the Multi-Hazard Mitigation Advisory Committee members and organizing the annual meeting.

Committee members will be responsible for monitoring and evaluating the progress of the mitigation strategies in the Plan.

The Committee will review the goals and action items to determine their relevance to changing situations in the City, as well as changes in State or Federal policy, and to ensure they are addressing current and expected conditions. The Committee will also review the Risk Assessment portion of the Plan to determine if this information should be updated or modified, given any new available data. The coordinating organizations responsible for the various action items will report on the status of their projects, the success of various implementation processes, difficulties encountered, success of coordination efforts, and which strategies should be revised.

The Convener will assign the duty of updating the Plan to one or more of the Committee members. The designated Committee members will have three months to make appropriate changes to the Plan before submitting it to the Committee members, and presenting it to the City Council (or other authority). The Multi-Hazard Mitigation Advisory Committee will also notify

all holders of the City plan when changes have been made. Every five years the updated plan will be submitted to the State Hazard Mitigation Officer and the Federal Emergency Management Agency for review.

Continued Public Involvement

City of El Segundo is dedicated to involving the public directly in review and updates of the Multi-Hazard Mitigation Plan. The Multi-Hazard Mitigation Advisory Committee members are responsible for the annual review and update of the Plan.

The public will also have the opportunity to provide feedback on implementation of the Plan. Updates to the Plan will be kept at the El Segundo Fire Department – Station #1 at 314 Main Street and El Segundo Library at 111 W. Mariposa Avenue. The existence and location of these Plan updates will be publicized in the quarterly City newsletter "Inside El Segundo", which reaches every employee, resident, and business owner in the City.

In addition, copies of the Plan and any proposed changes will be posted on the City website. This site will also contain an email address and phone number to which people can direct their comments and concerns.

A public meeting will also be held after each annual evaluation or when deemed necessary by the Multi-Hazard Mitigation Advisory Committee. The meetings will provide the public a forum for which they can express its concerns, opinions, or ideas about the Plan. The City's Fire Department and will be responsible for using City resources to publicize the annual public meetings and maintain public involvement such as the City's web page, local Cable TV channels, and local newspapers.

Table 2-1 STAPLEE Prioritization Tool

STAPLEE Instructions

One method of assessing the costs and benefits associated with mitigation actions in FEMA's STAPLEE tool. STAPLEE (Social, Technical, Administrative, Political, Legal, Economic, and Environmental) is a systematic approach for weighing strengths and weaknesses of various mitigation actions. Each of the STAPLEE categories can be assessed in terms of opportunities and constraints. Following is a list of questions that will guide a jurisdiction through the STAPLEE process. **Note: An answer of "yes" is not always judged positively.**

Social

Community Acceptance - Will the mitigation action be socially accepted within the community where it will be implemented?
Yes (+) or No (-)
Effect on Segment of Population - Will the mitigation action adversely impact one particular segment of the population (neighborhood, culture, religion, etc.)?
No (+) or Yes (-)

Technical

Technical Feasibility - Is the mitigation action technically feasible?
Yes (+) or No (-)
Long-Term Solution - Will the mitigation action help to reduce losses in the long term?
Yes (+) or No (-)
Secondary Impacts - Will there be any secondary effects which could nullify the action's benefits?
No (+) or Yes (-)

Administrative

Staffing - Does the jurisdiction have the staffing capability (own and outside resources) to implement the action, and can it be readily obtained?
Yes (+) or No (-)
Funding Allocated – Has the jurisdiction allocated or funded the action (i.e. annual budget, CIP, grants, etc.)?
Yes (+) or No (-)
Maintenance/Operations - Can the community provide the necessary maintenance work required to maintain the mitigation action?
Yes (+) or No (-)

Political

Political Support - Is there political support to implement and maintain the mitigation action?
Yes (+) or No (-)
Local Champion - Is there a local champion (political or public) willing to help see the action to completion?
Yes (+) or No (-)
Public Support - Is there enough public support to ensure the success of the mitigation action?
Yes (+) or No (-)

Legal

State Authority - Do State regulations exist that support the implementation of the mitigation action?
Yes (+) or No (-)
Existing Local Authority - Are the proper local laws, ordinances, and resolutions in place to implement the mitigation action?
Yes (+) or No (-)
Potential Legal Challenge - Is the mitigation action likely to be challenged by stakeholders who may be negatively affected?
No (+) or Yes (-)

Economic

Benefit of Action - Do the benefits of the mitigation action exceed the associated costs?
Yes (+) or No (-)
Cost of Action - Does the cost seem reasonable for the size of the problem and likely benefits?
Yes (+) or No (-)
Contributions to Economic Goals - Does the action contribute to other community economic goals, such as capital improvements or economic development?
Yes (+) or No (-)
Outside Funding Required - Will outside sources of funding be required?
No (+) or Yes (-)

Environmental

Effect on Land/Water - Will the mitigation action have a significant affect the environment (including land, water, and air resources)?
No (+) or Yes (-)

Effect on Endangered Species - Will the mitigation action have a significant affect endangered species?
No (+) or Yes (-)

Effect on HAZMAT/Waste Sites - Will the mitigation action have a significant affect HAZMAT or waste sites?
No (+) or Yes (-)

Consistent with Community Environmental Goals - Will the mitigation action comply with local, State, and Federal environmental laws and regulations?
Yes (+) or No (-)

Consistent with Federal Environmental Laws - Is the mitigation action consistent with the community's environmental values and goals?
Yes (+) or No (-)

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Multi-Hazard Mitigation Action Items																									
MH-1- Integrate the goals and action items from the El Segundo Multi-Hazard Mitigation Plan (Mitigation Plan) into existing regulatory documents and programs, where appropriate.	L	+	+	+	+	+	+	+	+	+	-	+	+	+	+	+	+	+	+	n/a	n/a	n/a	n/a	n/a	17
MH-2 - Conduct a detailed vulnerability assessment in the future in order to accurately identify the extent of damages to vulnerable	M	+	+	+	+	+	-	-	+	+	-	+	+	+	+	+	+	+	-	n/a	n/a	n/a	n/a	n/a	14

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buildings, infrastructure, and critical facilities.																									
MH-3 - Identify and pursue funding opportunities to develop and implement local mitigation activities.	L	+	+	+	+	+	-	+	+	+	-	+	+	+	+	+	+	+	+	n/a	n/a	n/a	n/a	n/a	16
MH-4 - Establish a formal role for the El Segundo Hazard Mitigation Advisory Committee (Committee) to develop a sustainable process for implementing, monitoring, and evaluating citywide mitigation activities.	L	+	+	+	+	+	-	+	+	+	+	+	+	+	+	+	+	+	+	n/a	n/a	n/a	n/a	n/a	17

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MH-5 - Develop public and private partnerships to foster hazard mitigation program coordination and collaboration in the City of El Segundo.	L	+	+	+	+	+	+	+	+	+	-	+	+	+	+	+	+	+	+	n/a	n/a	n/a	n/a	n/a	17
MH-6 - Develop inventories of at-risk buildings and infrastructure and prioritize mitigation projects.	M	+	+	+	+	+	+	-	+	+	-	+	+	+	+	+	+	+	+	n/a	n/a	n/a	n/a	n/a	16
MH-7 - Develop, enhance, and implement education programs aimed at mitigating all hazards, and reducing the risk to citizens, public agencies, private	L	+	+	+	+	+	+	-	+	+	-	+	+	+	+	+	+	+	+	n/a	n/a	n/a	n/a	n/a	16

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property owners, businesses, and schools.																									
MH-8 - Establish policy to ensure mitigation projects are in place to safeguard critical facilities.	L	+	+	+	+	+	+	+	+	+	-	+	+	+	+	+	+	+	+	n/a	n/a	n/a	n/a	n/a	17
MH-9 - Partner with other organizations and agencies with similar goals to promote building codes that are more disaster resistant at the local level.	L	+	+	+	+	+	+	+	+	+	-	+	+	+	+	+	+	+	+	n/a	n/a	n/a	n/a	n/a	17
MH-10 - Adoption of International Building Code by municipality.	L	+	+	+	+	+	+	+	+	+	-	+	+	+	+	+	+	+	+	n/a	n/a	n/a	n/a	n/a	17

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MH-11 - Ensure compliance to rebuilding in conformance with applicable codes, specifications, and standards.	L	+	+	+	+	+	+	+	+	+	-	+	+	+	+	+	+	+	+	n/a	n/a	n/a	n/a	n/a	15
MH-12 - Ensure that repairs or construction funded by Federal disaster assistance conform to applicable codes and standards.	L	+	+	+	+	+	+	+	+	+	-	+	+	+	+	+	+	+	+	n/a	n/a	n/a	n/a	n/a	17
MH-13 - Review current building codes and standards to determine adequacy for disaster restoration of properties.	L	+	+	+	+	+	-	+	+	+	-	+	+	+	+	+	+	+	+	n/a	n/a	n/a	n/a	n/a	16

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MH-14 - Coordinate and integrate hazard mitigation activities, where appropriate, with emergency operations plans and procedures.	L	+	+	+	+	+	+	+	+	+	-	+	+	+	+	+	+	+	+	n/a	n/a	n/a	n/a	n/a	17
MH-15 - Establish measurable standards to evaluate mitigation policies and programs and provide a mechanism to update and revise the mitigation plan.	L	+	+	+	+	+	+	+	+	+	-	+	+	+	+	+	+	+	+	n/a	n/a	n/a	n/a	n/a	17
MH-16 - Establish clear roles for participants of the Committee, meeting regularly	L	+	+	+	+	+	+	+	+	+	-	+	+	+	+	+	+	+	+	n/a	n/a	n/a	n/a	n/a	17

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to pursue and evaluate implementation of mitigation strategies.																									
MH-17 - Strengthen emergency operations by increasing collaboration and coordination among public agencies, nonprofit organizations, business, and industry.	L	+	+	+	+	+	+	+	+	+	-	+	+	+	+	+	+	+	+	n/a	n/a	n/a	n/a	n/a	17
MH-18 - Develop a Preliminary Damage Assessment (PDA) process and review PDA data to identify planning	L	+	+	+	+	+	+	-	+	+	-	+	+	+	+	+	+	+	-	n/a	n/a	n/a	n/a	n/a	15

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concerns.																									
MH-19 - Compile a directory of out-of-area contractors to help with repairs and reconstruction so that restoration occurs in a timely manner.	L	+	+	+	+	+	+	-	+	+	-	+	+	+	+	+	+	+	-	n/a	n/a	n/a	n/a	n/a	15
MH-20 - Conduct a study to determine sufficient information to identify disaster-prone areas such as floodplains, earthquake fault lines, storm surge zones, etc.	L	+	+	+	+	+	+	-	+	+	-	+	+	+	+	+	+	+	-	n/a	n/a	n/a	n/a	n/a	15
MH-21 - Install and improve back-up power in critical facilities.	M	+	+	+	+	+	+	-	+	+	-	+	+	+	+	+	+	+	-	n/a	n/a	n/a	n/a	n/a	15

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MH-22 - Provide additional sheltering facilities.	L	+	+	+	+	+	-	-	+	+	-	+	+	+	+	+	+	+	-	n/a	n/a	n/a	n/a	n/a	15
MH-23 - Create a database with information to track the status of repair or reconstruction of City facilities.	L	+	+	+	+	+	+	-	+	+	-	+	+	+	+	+	+	+	-	n/a	n/a	n/a	n/a	n/a	13
MH-24 - Update the Mitigation Plan based on new information on a regular basis.	L	+	+	+	+	+	-	-	-	+	-	+	+	+	+	+	+	+	-	n/a	n/a	n/a	n/a	n/a	13
MH-25 - Determine how, when, and under what circumstances government will demolish structures.	L	-	-	+	+	-	-	-	-	+	-	-	+	+	-	+	+	+	-	n/a	n/a	n/a	n/a	n/a	8

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MH-26 - Determine which structures and/or facilities that will not be allowed to be repaired or reconstructed.	L	-	-	+	+	+	+	+	+	+	-	-	+	+	-	+	+	+	+	+	n/a	n/a	n/a	n/a	13
MH-27 - Provide technical assistance to help the community develop disaster management operations capabilities.	L	+	+	+	+	+	-	-	+	+	-	+	+	+	+	+	+	+	-	n/a	n/a	n/a	n/a	n/a	14
MH-28 - Encourage the development of mutual aid systems at the local level, including the Emergency Management Assistance	L	+	+	+	+	+	-	-	+	+	-	+	+	+	+	+	+	+	+	n/a	n/a	n/a	n/a	n/a	15

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Compact.																									
MH-29 - Conduct interim planning to locate, set up, and manage temporary sites where government functions can continue their operations during recovery.	L	+	+	+	+	+	+	-	+	+	-	+	+	+	+	+	+	+	-	n/a	n/a	n/a	n/a	n/a	15
MH-30 - Allocate City resources and assistance to mitigation projects when possible.	L	+	+	+	+	+	+	+	+	+	-	+	+	+	+	+	+	+	+	n/a	n/a	n/a	n/a	n/a	17
MH-31 - Identify all organizations within the jurisdiction that have programs or interests in hazards mitigation.	L	+	+	+	+	+	+	+	+	+	-	+	+	+	+	+	+	+	+	n/a	n/a	n/a	n/a	n/a	17

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MH-32 - Involve private businesses throughout the city in mitigation planning.	L	+	+	+	+	+	+	+	n/a	+	+	+	+	+	+	+	+	+	+	n/a	n/a	n/a	n/a	n/a	15
MH-33 - Develop a database that identifies each property that has received damage due to hazards identified within this mitigation plan. The database should also include a tax identification number of the property, a description of the property damage, the value of damage, and links to photographs of the damage.	L	+	+	+	+	+	-	-	+	+	n/a	+	+	+	+	+	+	+	-	n/a	n/a	n/a	n/a	n/a	15

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Developing this database will allow the community to easily identify properties at high risk of damage from certain hazards as well as properties that receive repetitive damage from multiple hazards. In an effort to gain historical information the community shall send a survey to all residents requesting information that should be included in the database.																									

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MH-34 - Engage the private sector to contribute to disaster preparedness and loss reduction at the local level.	L	+	+	+	+	+	+	+	+	+	-	+	+	+	+	+	+	+	+	n/a	n/a	n/a	n/a	n/a	17
MH-35 - Write and administer appropriate grants to enhance all agencies/depart-ments' incident response capabilities.	L	+	+	+	+	+	-	-	-	+	+	+	+	+	+	+	+	+	-	n/a	n/a	n/a	n/a	n/a	14
MH-36 - Promote hazard mitigation as a public value in recognition of its importance to the health, safety, and welfare of the population.	L	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	n/a	n/a	n/a	n/a	n/a	18

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MH-37 - Promote public education to increase awareness of hazards and opportunities for mitigation.	L	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	n/a	n/a	n/a	n/a	n/a	18
MH-38 - Post the City's Hazard Mitigation Plan on the website.	L	+	+	+	+	+	+	+	+	+	-	+	+	+	+	+	+	+	+	n/a	n/a	n/a	n/a	n/a	17
MH-39 - Create 30 second commercials on mitigation steps and strategies and disaster preparedness tips to be shown on the local cable access channels.	M	+	+	+	+	+	-	-	+	+	+	+	+	+	+	+	+	+	-	n/a	n/a	n/a	n/a	n/a	16
MH-40 - Distribute FEMA's Emergency Management Guide	L	+	+	+	+	+	+	+	+	+	-	+	+	+	+	+	+	+	+	n/a	n/a	n/a	n/a	n/a	17

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for Businesses and Industry and Preparing Your Business for the Unthinkable brochure to the Chamber of Commerce.																									
MH-41 - Advertise the availability of emergency management materials on the City's website.	L	+	+	+	+	+	+	+	+	+	-	+	+	+	+	+	+	+	+	n/a	n/a	n/a	n/a	n/a	17
MH-42 - Utilize the media for the distribution and publication of hazard information.	L	+	+	+	+	+	+	+	+	+	-	+	+	+	+	+	+	+	+	n/a	n/a	n/a	n/a	n/a	17
MH-43 - Create a public speaking series on hazard related topics.	L	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	n/a	n/a	n/a	n/a	n/a	18

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MH-44 - Update the City's website to provide additional hazard related information that is easily accessible.	L	+	+	+	+	+	+	+	+	+	-	+	+	+	+	+	+	+	+	n/a	n/a	n/a	n/a	n/a	17
MH-45 - The State and County Office of Emergency Services websites have information about disaster preparedness and related links. Expand and update links to those websites as needed and as appropriate.	L	+	+	+	+	+	+	+	+	+	-	+	+	+	+	+	+	+	+	n/a	n/a	n/a	n/a	n/a	17
MH-46 - Utilize the City's website, press releases, local media and public displays to	L	+	+	+	+	+	+	+	+	+	-	+	+	+	+	+	+	+	+	n/a	n/a	n/a	n/a	n/a	17

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advertise agencies such as the American Red Cross, Community Emergency Response Training, the Local Emergency Planning Committee, Volunteer Organizations Active in Disaster etc.																									
MH-47 - Work with the American Red Cross, Board of Education, and churches towards upgrading all shelter resources.	L	+	+	+	+	+	-	-	-	+	-	+	+	+	+	+	+	+	-	n/a	n/a	n/a	n/a	n/a	13
MH-48 - Meet with local officials and major employers	L	+	+	+	+	+	+	+	+	+	-	+	+	+	+	+	+	+	+	n/a	n/a	n/a	n/a	n/a	17

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encouraging the creation of resource centers in their respective lobbies.																									
MH-49 - Identify and prioritize needs for additional shelter supplies to include but not limited to additional cots, blankets and shelter kits.	L	+	+	+	+	+	+	-	-	+	-	+	+	+	+	+	+	+	-	n/a	n/a	n/a	n/a	n/a	14
MH-50 - Develop and promote a communications plan to recruit and train more volunteers for sheltering assistance.	L	+	+	+	+	+	+	+	+	+	-	+	+	+	+	+	+	+	+	n/a	n/a	n/a	n/a	n/a	17

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MH-51 - Conduct full-scale exercises that include evaluation tools that will identify critical performance expectations every three years.	M	+	+	+	+	+	-	-	-	+	-	+	+	+	+	+	+	+	-	n/a	n/a	n/a	n/a	n/a	13
MH-52 - Conduct annual tabletop disaster exercises with local law enforcement, emergency managers, City officials, the LEPC and other disaster response agencies.	L	+	+	+	+	+	-	-	-	+	-	+	+	+	+	+	+	+	-	n/a	n/a	n/a	n/a	n/a	14
MH-53 - Teach CERT classes to interested citizens in the City to assist their neighbors	L	+	+	+	+	+	+	+	+	+	-	+	+	+	+	+	+	+	+	n/a	n/a	n/a	n/a	n/a	17

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during emergencies. This course will be taught throughout the city utilizing the paramedics and firefighters.																									
MH-54 - Train EMS, fire fighters, law enforcement, public works, healthcare providers and other support personnel in unified command using the Incident Command System (ICS) model. By understanding the role of each discipline will result in a cohesive performance of	L	+	+	+	+	+	-	-	-	+	-	+	+	+	+	+	+	+	-	n/a	n/a	n/a	n/a	n/a	13

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their assigned tasks yielding an overall emergency response that is not only effective, but rapid with optimal outcome.																									
MH-55 - Promote CERT through the Chamber of Commerce to gain business participation.	L	+	+	+	+	+	+	+	+	+	-	+	+	+	+	+	+	+	+	n/a	n/a	n/a	n/a	n/a	17
MH-56 - Develop and deliver information to all residents, through community groups and/or publications, information on how to shelter in place and when it is appropriate to do	L	+	+	+	+	+	+	-	+	+	-	+	+	+	+	+	+	+	-	n/a	n/a	n/a	n/a	n/a	15

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so.																									
MH-57 - Publicize FEMA's Emergency Management Institute's independent study courses available to the public to include but not limited to Emergency Preparedness USA, Hazardous Material: Citizen Orientation, Animals in Disaster, Disaster Mitigation for Homeowners, etc.	L	+	+	+	+	+	+	+	+	+	-	+	+	+	+	+	+	+	+	n/a	n/a	n/a	n/a	n/a	17
MH- 58 - Develop list of available training	L	+	+	+	+	+	-	+	+	+	-	+	+	+	+	+	+	+	+	n/a	n/a	n/a	n/a	n/a	16

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opportunities and to distribute the list to all local emergency responders.																									
MH-59 - Review Capital Improvement Plans to ensure that programmed infrastructure improvements are not in high hazard areas.	L	+	+	+	+	+	+	+	+	+	-	+	+	+	+	+	+	+	+	n/a	n/a	n/a	n/a	n/a	17
MH-60 - Planning, Building and Safety Department will review the General Plan to ensure that designated growth areas are not in high hazard areas identified in this	L	+	+	+	+	+	+	+	+	+	-	+	+	+	+	+	+	+	+	n/a	n/a	n/a	n/a	n/a	17

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plan.																									
MH-61- Planning, Building and Safety Department will review regulations pertaining to the jurisdiction to make sure that adequate zoning regulations are in place to reduce future development in high hazard areas in their jurisdiction.	L	+	+	+	+	+	-	-	+	+	-	+	+	+	+	+	+	+	+	n/a	n/a	n/a	n/a	n/a	15
MH-62 - Establish an offsite Emergency Communications Center (ECC) and Emergency Operations Center	L	+	+	+	+	+	+	-	-	+	-	+	+	+	+	+	-	+	-	n/a	n/a	n/a	n/a	n/a	13

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(EOC). In the event the primary sites must be vacated, the off-site back-up centers can be rapidly mobilized in a secured facility. Both centers will duplicate the primary points of operation.																									
MH-63 - Continue collection of MSDS reports from city facilities to enhance and prepare emergency responders in the event of an incident at these facilities.	L	+	+	+	+	+	+	+	+	+	-	+	+	+	+	+	+	+	+	n/a	n/a	n/a	n/a	n/a	17
MH-64 - Establish and maintain a functional	M	+	+	+	+	+	+	+	+	+	-	+	+	+	+	+	+	+	+	n/a	n/a	n/a	n/a	n/a	17

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Emergency Operations Center.																									
MH-65 - Ensure training and exercise standards are maintained as established in NIMS, National Incident Management System and SEMS, Standardized Emergency Management System.	L	+	+	+	+	+	-	-	-	+	+	+	+	+	+	+	+	+	-	n/a	n/a	n/a	n/a	n/a	14
MH-66 - Develop and complete a baseline survey to gather perceptions of private citizens and the business community regarding hazard risks and identify	L	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	n/a	n/a	n/a	n/a	n/a	18

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mitigation needs.																									
MH-67 - Identify opportunities for partnering with citizens, private contractors, and other jurisdictions to increase availability of equipment and manpower for efficiency of response efforts.	L	+	+	+	+	+	+	+	+	+	-	+	+	+	+	+	+	+	+	n/a	n/a	n/a	n/a	n/a	17
MH-68 - Routine maintenance of the community's infrastructure will be done to minimize the potential for system failure because of or during a disaster.	L	+	+	+	+	+	-	-	-	+	+	+	+	+	+	+	+	+	-	n/a	n/a	n/a	n/a	n/a	14

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MH-69 – Enhance response capability of municipal fire, police, and emergency medical services personnel to meet the needs of special populations.	L	+	+	+	+	+	-	-	-	+	+	+	+	+	+	+	+	+	-	n/a	n/a	n/a	n/a	n/a	14
MH-70 - Assess availability of backup power resources of fire, police, rescue, and emergency management personnel; Upgrade resources as necessary.	L	+	+	+	+	+	-	-	-	+	+	+	+	+	+	+	+	+	-	n/a	n/a	n/a	n/a	n/a	14
MH-71 - Vehicle access routes to key health care facilities will be protected from	L	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	n/a	n/a	n/a	n/a	n/a	18

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blockage as a result of a disaster.																									
MH-72 - Develop mitigation strategies to protect identified at-risk historic properties.	L	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	n/a	n/a	n/a	n/a	n/a	18
MH-73 - Incorporate the training goals and objectives used by fire, EMS, law enforcement, public works, healthcare providers and other support personnel into selected hazardous material training. This will foster the unified command relationship that will serve as the	L	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	n/a	n/a	n/a	n/a	n/a	18

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incident management blueprint for all disaster response.																									
MH-74 - Establish and implement the National Incident Management System (NIMS) throughout all City departments.	L	+	+	+	+	+	-	-	+	+	+	+	+	+	+	+	+	+	-	n/a	n/a	n/a	n/a	n/a	15
MH-75 - Determine what kinds of minor repairs and temporary protection activities (e.g., temporary roofing, protect against loss of life/injury, shoring, protect contents) can be done in the immediate	L	+	+	+	+	+	+	+	+	+	-	+	+	+	+	+	+	+	+	n/a	n/a	n/a	n/a	n/a	17

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aftermath of a disaster.																									
MH-76 - Identify water resources management and conservation opportunities.	L	+	+	+	+	+	-	-	+	+	+	+	+	+	+	+	+	+	-	n/a	n/a	n/a	n/a	n/a	15
MH-77 - Develop strategies for debris management.	L	+	+	+	+	+	-	-	+	+	-	+	+	+	+	+	+	+	-	n/a	n/a	n/a	n/a	n/a	14
MH-78 - Coordinate the maintenance of emergency transportation routes through communication among the county roads department, neighboring jurisdictions, and CalTrans.	L	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	n/a	n/a	n/a	n/a	n/a	18

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MH-79 - Identify and provide signage for evacuation routes.	L	+	+	+	+	+	-	-	+	+	+	+	+	+	+	+	+	+	-	n/a	n/a	n/a	n/a	n/a	15
MH-80 - Maintain a low power AM radio station that can be activated in the event of an emergency to notify the public.	L	+	+	+	+	+	-	-	+	+	+	+	+	+	+	+	+	+	-	n/a	n/a	n/a	n/a	n/a	15
MH-81 - Maintain signs with blinking lights directing public to turn to AM radio station in the event of a disaster.	L	+	+	+	+	+	-	-	+	+	+	+	+	+	+	+	+	+	-	n/a	n/a	n/a	n/a	n/a	15
MH-82 - Apply for Tsunami Ready/Storm Ready with NOAA/NWS to acknowledge that	L	+	+	+	+	+	-	-	+	+	+	+	+	+	+	+	+	+	-	n/a	n/a	n/a	n/a	n/a	15

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the city has developed plans and procedures.																									
MH-83 - Identify funding to purchase and install an emergency alert system using horns/sirens, voice to warn the public of impending danger.	L	+	+	+	+	+	-	-	+	+	+	+	+	+	+	+	+	+	-	n/a	n/a	n/a	n/a	n/a	15
MH-84 - Purchase and install WebEOC to enhance incident management in disasters.	L	+	+	+	+	+	-	-	+	+	+	+	+	+	+	+	+	+	-	n/a	n/a	n/a	n/a	n/a	15
MH-85 - Improve communication between CalTrans, City, and County road departments	L	+	+	+	+	+	-	-	+	+	+	+	+	+	+	+	+	+	-	n/a	n/a	n/a	n/a	n/a	15

Table 2-1
STAPLEE Prioritization Tool
(Scoring: "+" = 1 point, "-" = -1 point, "n/a" = 0 point, "n/k" = not known)

		S Social		**T Technical**			**A Administrative**			**P Political**			**L Legal**			**E Economic**				**E Environmental**					
Mitigation Action	$	Community Acceptance	Effect on Segment of Population	Technical Feasibility	Long-Term Solution	Secondary Impacts	Staffing	Funding Allocated	Maintenance/Operations	Political Support	Local Champion	Public Support	State Authority	Existing Local Authority	Potential Legal Challenge	Benefit of Action	Cost of Action	Contributes to Economic Goals	Outside Funding Required	Effect on Land / Water	Effect on Endangered Species	Effect on HAZMAT/Waste Sites	Consistent with Community Env. Goals	Consistent with Federal Env. Laws	Priority Total (net)
to work together to prioritize and identify strategies to deal with road problems.																									
MH-86 - Conduct a full review of the Mitigation Plan every 5 years by evaluating mitigation successes, failures, and areas that were not addressed.	L	+	+	+	+	+	-	-	+	+	+	+	+	+	+	+	+	+	-	n/a	n/a	n/a	n/a	n/a	15
MH-87 - Provide business continuity workshops for business owners to learn the importance of disaster mitigation and how to create an emergency operations plan for	L	+	+	+	+	+	-	-	+	+	+	+	+	+	+	+	+	+	-	n/a	n/a	n/a	n/a	n/a	15

Table 2-1
STAPLEE Prioritization Tool
(Scoring: "+" = 1 point, "-" = -1 point, "n/a" = 0 point, "n/k" = not known)

		S		**T**			**A**			**P**			**L**			**E**				**E**					
		Social		**Technical**			**Administrative**			**Political**			**Legal**			**Economic**				**Environmental**					
Mitigation Action	$	Community Acceptance	Effect on Segment of Population	Technical Feasibility	Long-Term Solution	Secondary Impacts	Staffing	Funding Allocated	Maintenance/Operations	Political Support	Local Champion	Public Support	State Authority	Existing Local Authority	Potential Legal Challenge	Benefit of Action	Cost of Action	Contributes to Economic Goals	Outside Funding Required	Effect on Land / Water	Effect on Endangered Species	Effect on HAZMAT/Waste Sites	Consistent with Community Env. Goals	Consistent with Federal Env. Laws	Priority Total (net)
their businesses.																									
MH-88 - Distribution of letters to ALL property owners-all areas of the City on the importance of water conservation and different venues of purchasing water saving mechanisms for homes.	L	+	+	+	+	+	-	-	+	+	+	+	+	+	+	+	+	+	-	n/a	n/a	n/a	n/a	n/a	15
MH-89 - Conduct a review of available data concerning potential impacts of global warming, perhaps including coastal flooding, sea level rise, and coastal erosion.	L	+	+	+	+	+	-	-	+	+	+	+	+	+	+	+	+	+	-	n/a	n/a	n/a	n/a	n/a	15

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		S Social		**T Technical**			**A Administrative**			**P Political**			**L Legal**			**E Economic**				**E Environmental**					
Mitigation Action	$	Community Acceptance	Effect on Segment of Population	Technical Feasibility	Long-Term Solution	Secondary Impacts	Staffing	Funding Allocated	Maintenance/Operations	Political Support	Local Champion	Public Support	State Authority	Existing Local Authority	Potential Legal Challenge	Benefit of Action	Cost of Action	Contributes to Economic Goals	Outside Funding Required	Effect on Land / Water	Effect on Endangered Species	Effect on HAZMAT/Waste Sites	Consistent with Community Env. Goals	Consistent with Federal Env. Laws	Priority Total (net)
Earthquake Action Items																									
EQ-1 - Integrate new earthquake hazard mapping data for the City of El Segundo and improve technical analysis of earthquake hazards.	L	+	+	+	+	+	-	-	+	+	+	+	+	+	+	+	+	+	-	n/a	n/a	n/a	n/a	n/a	15
EQ-2 - Encourage seismic strength evaluations of critical facilities in the City to identify vulnerabilities for mitigation of schools and university, public infrastructure, and critical facilities to meet current seismic standards.	L	+	+	+	+	+	-	-	+	+	+	+	+	+	+	+	+	+	-	n/a	n/a	n/a	n/a	n/a	15

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Mitigation Action	$	Community Acceptance	Effect on Segment of Population	Technical Feasibility	Long-Term Solution	Secondary Impacts	Staffing	Funding Allocated	Maintenance/Operations	Political Support	Local Champion	Public Support	State Authority	Existing Local Authority	Potential Legal Challenge	Benefit of Action	Cost of Action	Contributes to Economic Goals	Outside Funding Required	Effect on Land / Water	Effect on Endangered Species	Effect on HAZMAT/Waste Sites	Consistent with Community Env. Goals	Consistent with Federal Env. Laws	Priority Total (net)
EQ-3 - Encourage reduction of nonstructural and structural earthquake hazards in homes, schools, businesses, and government offices.	L	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	n/a	n/a	n/a	n/a	n/a	18
EQ-4 - Minimize earthquake damage risk by retrofitting critical facilities.	M	+	+	+	+	+	-	-	+	+	+	+	+	+	+	+	+	+	-	n/a	n/a	n/a	n/a	n/a	15
EQ-5 - Encourage purchase of earthquake hazard insurance.	L	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	n/a	n/a	n/a	n/a	n/a	18
Flood Action Items																									
FLD-1 - Analyze each repetitive flood property within the city and identify feasible	L	+	+	+	+	+	-	-	+	+	+	+	+	+	+	+	+	+	-	n/a	n/a	n/a	n/a	n/a	15

Table 2-1
STAPLEE Prioritization Tool
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		S		**T**			**A**			**P**			**L**			**E**				**E**					
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Mitigation Action	$	Community Acceptance	Effect on Segment of Population	Technical Feasibility	Long-Term Solution	Secondary Impacts	Staffing	Funding Allocated	Maintenance/Operations	Political Support	Local Champion	Public Support	State Authority	Existing Local Authority	Potential Legal Challenge	Benefit of Action	Cost of Action	Contributes to Economic Goals	Outside Funding Required	Effect on Land / Water	Effect on Endangered Species	Effect on HAZMAT/Waste Sites	Consistent with Community Env. Goals	Consistent with Federal Env. Laws	Priority Total (net)
mitigation options.																									
FLD-2 - Develop better flood warning systems.	L	+	+	+	+	+	-	-	+	+	+	+	+	+	+	+	+	+	-	n/a	n/a	n/a	n/a	n/a	15
FLD-3 - Enhance data and mapping for flood-prone areas within the City.	L	+	+	+	+	+	-	-	+	+	+	+	+	+	+	+	+	+	-	n/a	n/a	n/a	n/a	n/a	15
FLD-4 - Identify surface water drainage obstructions for all parts of the City.	L	+	+	+	+	+	-	-	+	+	+	+	+	+	+	+	+	+	-	n/a	n/a	n/a	n/a	n/a	15
FLD-5 - Establish a framework to compile and coordinate surface water management plans and data throughout the City.	L	+	+	+	+	+	-	-	+	+	+	+	+	+	+	+	+	+	-	n/a	n/a	n/a	n/a	n/a	15

Table 2-1
STAPLEE Prioritization Tool
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		S		**T**			**A**			**P**			**L**			**E**				**E**					
		Social		**Technical**			**Administrative**			**Political**			**Legal**			**Economic**				**Environmental**					
Mitigation Action	$	Community Acceptance	Effect on Segment of Population	Technical Feasibility	Long-Term Solution	Secondary Impacts	Staffing	Funding Allocated	Maintenance/Operations	Political Support	Local Champion	Public Support	State Authority	Existing Local Authority	Potential Legal Challenge	Benefit of Action	Cost of Action	Contributes to Economic Goals	Outside Funding Required	Effect on Land / Water	Effect on Endangered Species	Effect on HAZMAT/Waste Sites	Consistent with Community Env. Goals	Consistent with Federal Env. Laws	Priority Total (net)
FLD-6 - Record all structures in areas of repetitive losses due to flooding.	L	+	+	+	+	+	-	-	+	+	+	+	+	+	+	+	+	+	-	n/a	n/a	n/a	n/a	n/a	15
FLD-7 - Revise the Zoning and Subdivision Ordinance to require the utilization of various pervious surfaces in order to reduce storm water runoff. This should include utilizing the use of various pervious surfaces in parking lots and recreational areas near the floodplain.	L	+	+	+	+	+	-	-	+	+	+	+	+	+	+	+	+	+	-	n/a	n/a	n/a	n/a	n/a	15
FLD-8 - Protect surrounding surface water and ecosystems from	L	+	+	+	+	+	-	-	+	+	+	+	+	+	+	+	+	+	-	n/a	n/a	n/a	n/a	n/a	15

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		S		**T**			**A**			**P**			**L**			**E**				**E**					
		Social		**Technical**			**Administrative**			**Political**			**Legal**			**Economic**				**Environmental**					
Mitigation Action	$	Community Acceptance	Effect on Segment of Population	Technical Feasibility	Long-Term Solution	Secondary Impacts	Staffing	Funding Allocated	Maintenance/Operations	Political Support	Local Champion	Public Support	State Authority	Existing Local Authority	Potential Legal Challenge	Benefit of Action	Cost of Action	Contributes to Economic Goals	Outside Funding Required	Effect on Land / Water	Effect on Endangered Species	Effect on HAZMAT/Waste Sites	Consistent with Community Env. Goals	Consistent with Federal Env. Laws	Priority Total (net)
pollutants often associated with flooding and storm water runoff. Specifically, apply storm water mitigation measures as required by TMDL and NEDES.																									
FLD-9 - Distribute seasonal disaster preparedness literature to ALL property owners – all areas of the City to include but not limited to winter weather, drought, severe storms, extreme heat, etc.	L	+	+	+	+	+	+	+	+	+	-	+	+	+	+	+	+	+	+	n/a	n/a	n/a	n/a	n/a	17
FLD-10 - Understand the National Flood	L	+	+	+	+	+	+	+	+	+	-	+	+	+	+	+	+	+	+	n/a	n/a	n/a	n/a	n/a	17

Table 2-1
STAPLEE Prioritization Tool
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		S		**T**			**A**			**P**			**L**			**E**				**E**						
		Social		**Technical**			**Administrative**			**Political**			**Legal**			**Economic**				**Environmental**						
Mitigation Action	$	Community Acceptance	Effect on Segment of Population	Technical Feasibility	Long-Term Solution	Secondary Impacts	Staffing	Funding Allocated	Maintenance/Operations	Political Support	Local Champion	Public Support	State Authority	Existing Local Authority	Potential Legal Challenge	Benefit of Action	Cost of Action	Contributes to Economic Goals	Outside Funding Required	Effect on Land / Water	Effect on Endangered Species	Effect on HAZMAT/Waste Sites	Consistent with Community Env. Goals	Consistent with Federal Env. Laws	Priority Total (net)
Insurance Program (NFIP) requirements for new construction and substantially improved buildings in order to maintain compliance with NFIP regulations.																										
FLD-11 - The City will adopt a resolution or ordinance that will prohibit development in areas of special Flood Hazard Area identified in the Flood Insurance Study for Los Angeles County and Incorporated Areas dated September 26,	L	+	+	+	+	+	+	-	-	+	+	+	+	-	-	+	+	-	+	+	+	+	+	+	+	13

Table 2-1
STAPLEE Prioritization Tool
(Scoring: "+" = 1 point, "-" = -1 point, "n/a" = 0 point, "n/k" = not known)

		S		**T**			**A**			**P**			**L**			**E**				**E**					
		Social		**Technical**			**Administrative**			**Political**			**Legal**			**Economic**				**Environmental**					
Mitigation Action	$	Community Acceptance	Effect on Segment of Population	Technical Feasibility	Long-Term Solution	Secondary Impacts	Staffing	Funding Allocated	Maintenance/Operations	Political Support	Local Champion	Public Support	State Authority	Existing Local Authority	Potential Legal Challenge	Benefit of Action	Cost of Action	Contributes to Economic Goals	Outside Funding Required	Effect on Land / Water	Effect on Endangered Species	Effect on HAZMAT/Waste Sites	Consistent with Community Env. Goals	Consistent with Federal Env. Laws	Priority Total (net)
2008, with accompanying Flood Insurance Rate Maps (FIRM's) and Flood Boundary and Floodway Maps (FBFM's) and any subsequent revision until such time that standards meet appropriate National Flood Insurance Program (NFIP) requirements are adopted by the city council.																									
Windstorm Action Items																									
WS-1 - Support/encourage electrical utilities to use underground	L	+	+	+	+	+	+	+	+	+	-	+	+	+	+	+	+	+	+	n/a	n/a	n/a	n/a	n/a	17

Table 2-1
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construction methods where possible to reduce power outages from windstorms.																									
WS-2 - Encourage development and enforcement of wind-resistant building siting and construction codes.	L	+	+	+	+	+	+	+	+	+	-	n/a	+	+	+	+	+	+	+	n/a	n/a	n/a	n/a	n/a	17
WS-3 - Continue to implement programs to keep trees from threatening lives, property, and public infrastructure during windstorm events.	L	+	+	+	+	+	-	-	-	+	-	+	+	+	+	+	+	+	-	n/a	n/a	n/a	n/a	n/a	13
Tsunami Action Items																									

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TS-1 - Train regulatory and response staff in tsunami threat.	L	+	+	+	+	+	-	-	+	+	-	+	+	+	+	+	+	+	-	n/a	n/a	n/a	n/a	n/a	14
TS-2 - Develop and conduct training and exercises relating to tsunami response.	M	+	+	+	+	+	-	-	+	+	-	+	+	+	+	+	+	+	-	n/a	n/a	n/a	n/a	n/a	14
TS-3 - Develop a warning system in the City to notify residents of impending tsunami activity.	L	+	+	+	+	+	-	-	+	+	-	+	+	+	+	+	+	+	-	n/a	n/a	n/a	n/a	n/a	14
TS-4 - Maintain system to receive early warning of tsunamis from state and federal agencies.	L	+	+	+	+	+	+	+	+	+	-	+	+	+	+	+	+	+	+	n/a	n/a	n/a	n/a	n/a	17
TS-5 – City staff will continue to monitor studies	L	+	+	+	+	+	-	-	+	+	-	+	+	+	+	+	+	+	-	n/a	n/a	n/a	n/a	n/a	14

Table 2-1
STAPLEE Prioritization Tool
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pertaining to tsunami threats from off-shore faults.																									
Technological and Human Caused Action Items																									
Tech-1 - Develop shelter-in-place protocols and redundant notification methods for residents and businesses.	L	+	+	+	+	+	-	-	+	+	-	+	+	+	+	+	+	+	-	n/a	n/a	n/a	n/a	n/a	14
Tech-2 – Develop and distribute public awareness materials address a range of technological and human-caused hazard threats.	L	+	+	+	+	+	-	-	+	+	-	+	+	+	+	+	+	+	-	n/a	n/a	n/a	n/a	n/a	14

SECTION 3: COMMUNITY PROFILE

Why Plan for Hazards in City of El Segundo?

Hazards impact residents, property, the environment, and the economy of City of El Segundo. Earthquake, Flood, Windstorm, Tsunami, and Technological and Human-Caused Hazards have exposed the City of El Segundo to the financial and emotional costs of recovering after natural, human-caused, and technological disasters. The risk associated with hazards increases as more people move to areas affected by hazards.

Even in those communities that are essentially "built-out" i.e., have little or no vacant land remaining for development; population density continues to increase when low density housing is replaced with medium and high density development projects.

The inevitability of hazards, and the growing population and activity within the City create an urgent need to develop strategies, coordinate resources, and increase public awareness to reduce risk and prevent loss from future hazard events. Identifying the risks posed by hazards, and developing strategies to reduce the impact of a hazard event can assist in protecting life and property of citizens and communities. Local residents and businesses can work together with the City to create a Mitigation Plan that addresses the potential impacts of hazard events.

Geography and the Environment

City of El Segundo has an area of 5.46 square miles and is located in southern Los Angeles County. (Source: El Segundo General Plan)

Elevations in the City range from a high of 90 feet above sea level to a low of 5 feet above sea level. The terrain of the community is predominantly rolling sand dune topography. (Source: El Segundo General Plan)

Community Profile

The Standard Oil Company first settled the area comprising the City of El Segundo in 1911. Less than six years later, the City itself was incorporated in January 18, 1917.

The City is served by the 105 and 405 freeways, and the major arterial is Highway 1 (Sepulveda Boulevard) which runs north to south. The Metro Green Line Light Rail Line serves the City with an elevated rail system running through the City. The Metropolitan Transportation Authority provides passenger transportation.

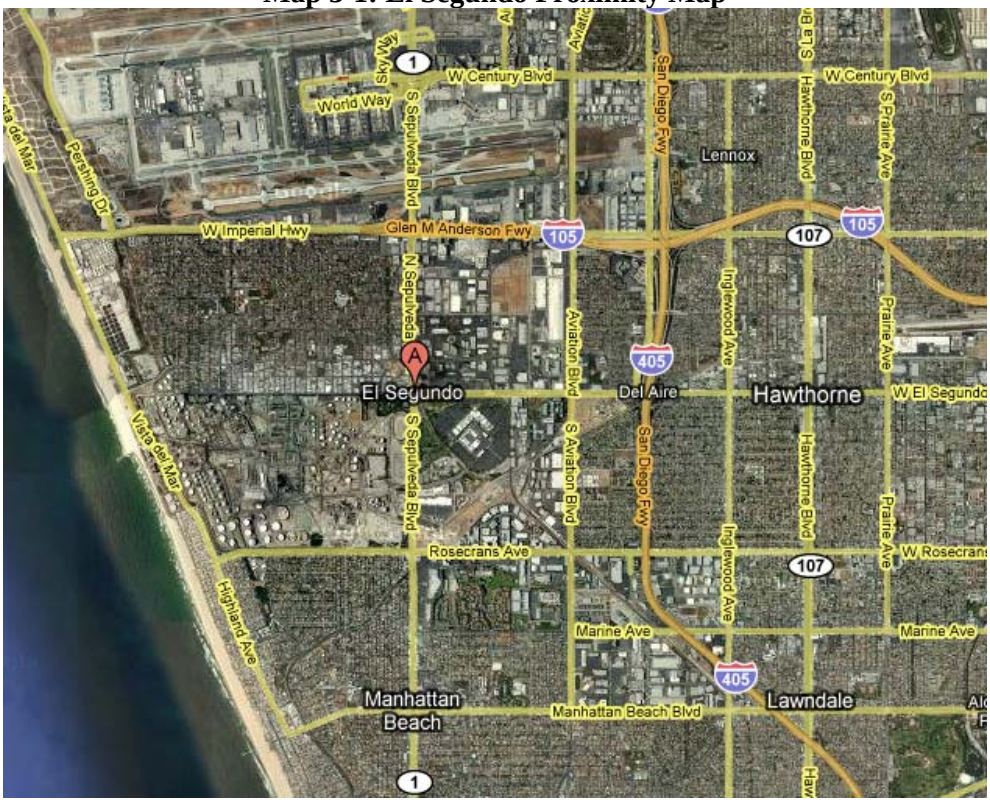
To the north is Los Angeles International Airport (LAX) in the City of Los Angeles. The Los Angeles residential areas of Playa del Rey and Westchester are located just north of the Airport. To the east is the City of Hawthorne and Del Aire - an island of Los Angeles County. Both areas are predominantly residential.

The City of Manhattan Beach is directly south of El Segundo. The Chevron Refinery is located in the southern portion of El Segundo, between the City's residential areas and the City of Manhattan Beach.

To the west of El Segundo is the Pacific Ocean. A majority of the coastline is owned by the City of Los Angeles, which operates two facilities within this area: the Hyperion Sewage Treatment

Plant, currently undergoing an expansion, and the Los Angeles Department of Water and Power Scattergood Generating Station. A small portion of the coastline, 0.8 miles, is within the El Segundo city limits. The Southern California Edison Generating Station and a coastal portion of the Chevron Refinery are located along this portion of the shoreline.

Map 3-1: El Segundo Proximity Map



Climate

Temperatures in the City of El Segundo range from 55 degrees in the winter months to 70 degrees in the summer months. However the temperatures can vary over a wide range, particularly when the Santa Ana winds blow, bringing higher temperatures, very low humidity, and strong winds. (Source: Los Angeles County All-Hazard Mitigation Plan)

Rainfall in the region averages 12 inches of rain per year. But the term "average" means very little in this region as the annual rainfall during this time period has ranged from only 4.35 inches in 2001-2002 to 38.2 inches in 1883-1884. (Los Angeles). Furthermore, actual rainfall in the Southern California region tends to fall in large amounts during sporadic and often heavy storms rather than consistently over storms at somewhat regular intervals. In short rainfall in Southern California might be characterized as feast or famine within a single year.

Minerals and Soils

El Segundo is underlain by the Pliestocene-age El Segundo San Dunes at the western edge of the Los Angeles Basin within the Transverse Ranges Geomorphic Province in Southern California. The El Segundo Sand Dunes consist predominantly of dense sands, with some local deposits of silts and clays within natural depressions, particularly in the eastern portion of the City. Rock is

present at great depth beneath the City.

Other Significant Geologic Features

There are no known faults with the potential for surface fault rupture within the City of El Segundo, but significant ground shaking can result from rupture of a large number of nearby faults.

The major faults that have the potential to affect the greater El Segundo region are the:

Newport-Inglewood Fault (east of the City)
Palos Verdes Fault (offshore, west of the City)

Southern California has a history of powerful and relatively frequent earthquakes, dating back to the powerful magnitude 8.0+ 1857 San Andreas Earthquake which did substantial damage to the relatively few buildings that existed at the time. Paleoseismological research indicates that large magnitude (8.0+) earthquakes occur on the San Andreas Fault at intervals between 45 and 332 years with an average interval of 140 years. Other lesser faults have also caused very damaging earthquakes since 1857. Notable earthquakes include the 1933 Long Beach Earthquake, the 1971 San Fernando Earthquake, the 1987 Whittier Earthquake and the 1994 Northridge Earthquake.

In addition, many areas in Southern California have sandy soils that are subject to liquefaction. The City of El Segundo has no liquefaction zones except for an area of coastline at the west side of the City as discussed in Section 5: Earthquake.

Population and Demographics

The City of El Segundo has a residential population of about 17,000 in an area of 5.46 square miles. The daytime population of the City increases to approximately 85,000 with an influx of people working or conducting business within the City.

The increase of people living and working in City of El Segundo creates more community exposure, and changes how agencies prepare for and respond to hazards.

The City of El Segundo is experiencing a great deal of in-fill building, which is increasing the population density creating greater service loads on the built infrastructure, including roads, water supply, sewer services and storm drains.

Hazards do not discriminate, but the impacts in terms of vulnerability and the ability to recover vary greatly among the population. According to Peggy Stahl of the Federal Emergency Management Agency (FEMA) Preparedness, Training, and Exercise Directorate, 80% of the disaster burden falls on the public, and within that number, a disproportionate burden is placed upon special needs groups: women, children, minorities, and the poor.

According the 2000 Census figures, the demographic make up of the City is as follows:

City of El Segundo	
Caucasian	83.6%
African American	1.2%
Asian	6.4%

Native American	0.5%
Other	3.5%
Mixed Race	4.8%

The ethnic and cultural diversity suggests a need to address multi-cultural needs and services.

The percentage of citizens living in poverty in the City of El Segundo is about 4.6% according to the 2000 Census.

Vulnerable populations, including seniors, disabled citizens, women, and children, as well as those people living in poverty, may be disproportionately impacted by hazards.

Examining the reach of hazard mitigation policies to special needs populations may assist in increasing access to services and programs. FEMA's Office of Equal Rights addresses this need by suggesting that agencies and organizations planning for natural disasters identify special needs populations, make recovery centers more accessible, and review practices and procedures to remedy any discrimination in relief application or assistance.

The cost of hazards recovery can place an unequal financial responsibility on the general population when only a small proportion may benefit from governmental funds used to rebuild private structures. Discussions about hazards that include local citizen groups, insurance companies, and other public and private sector organizations can help ensure that all members of the population are a part of the decision-making processes.

Land and Development

Development in Southern California from the earliest days was a cycle of boom and bust. The Second World War however dramatically changed that cycle. Military personnel and defense workers came to Southern California to fill the logistical needs created by the war effort. The available housing was rapidly exhausted and existing commercial centers proved inadequate for the influx of people. Immediately after the war, construction began on the freeway system, and the face of Southern California was forever changed. Home developments and shopping centers sprung up everywhere and within a few decades the urbanized portions of Southern California were virtually built out. This pushed new development further and further away from the urban center.

The City of El Segundo General Plan addresses the use and development of private land, including residential and commercial areas. This Plan is one of the City's most important tools in addressing environmental challenges including transportation and air quality; growth management; conservation of natural resources; clean water and open spaces.
The environment of most Los Angeles County cities is nearly identical with that of their immediate neighbors and the transition from one incorporated municipality to another is seamless to most people. Seamless too are the exposures to the hazards that affect all of Southern California.

Housing and Community Development
(Source: 2000 Census)

City of El Segundo	
Development Type	
Residential	30%
Commercial/Industrial	70%
Housing Type	
Single-Family	77.4%
Multi-Residential (20+ units)	11.6%
other	11%
Housing Statistics	
Total Available Housing Units	7,261
Owner-Occupied Housing	97.23%
Average Household Size	2.27
Average Home Value	$371,900

Employment and Industry
(Source: 2000 Census)

City of El Segundo	
Major Industries	**Employees**
Professional, scientific, and technical services	8,334
Educational services	1-19
Health care and social assistance	379
Arts, entertainment, and recreation	250-499
Other services (except public administration)	1,183

Mitigation activities are needed at the business level to ensure the safety and welfare of workers and limit damage to industrial infrastructure. Employees are highly mobile, commuting from surrounding areas to industrial and business centers. This creates a greater dependency on roads, communications, accessibility and emergency plans to reunite people with their families. Before a hazard event, large and small businesses can develop strategies to prepare for hazards, respond efficiently, and prevent loss of life and property.

Transportation and Commuting Patterns

Private automobiles are the dominant means of transportation in Southern California and in the City of El Segundo. However, the City of El Segundo meets its public transportation needs through a mixture of a regional transit system (MTA), and various City contracted bus systems.

MTA provides both bus and light rail service to the City of El Segundo and to the Los Angeles County metropolitan area. In addition to this service, the City promotes alternative transportation activities.

As stated in the City's General Plan, the City of El Segundo is served by the 405 and 105, connecting the City to adjoining parts of Los Angeles County. As daily transit rises, there is an increased risk that a hazard event will disrupt the travel plans of residents across the region, as well as local, regional and national commercial traffic.

Localized flooding can render roads unusable. A severe winter storm has the potential to disrupt the daily driving routine of hundreds of thousands of people. Hazards can disrupt automobile traffic and shut down local and regional transit systems.

SECTION 4: RISK ASSESSMENT

What is a Risk Assessment?

Conducting a risk assessment can provide information: on the location of hazards, the value of existing land and property in hazard locations, and an analysis of risk to life, property, and the environment that may result from hazard events. Specifically, the five levels of a risk assessment are as follows:

1) Hazard Identification

The City's consultant reviewed the following documents for information pertaining to natural and human-caused hazards with potential to significantly impact the community:

City of El Segundo Multi-Hazard Functional Plan (2003)
County of Los Angeles All-Hazard Mitigation Plan (2005)
State of California Multi-Hazard Mitigation Plan (2007)

The results of that review were provided to the Planning Team for consideration and ranking. Information was not available to address issues pertaining to "global warming" impacts including sea level rise, coastal erosion, or coastal flooding. The Mitigation Strategy includes an action item for pursuing information on these potential threats (**see Mitigation Action Matrix and STAPLEE**).

The Planning Team considered a range of hazards facing the region including: Earthquakes, Flooding, Wildfire, Landslide, Tsunami, Windstorm, Drought, and Technological and Human-Caused Hazards. The attached Ranking Your Hazards – Figure 4-1 is used by the Team to prioritize the hazards with the highest probability of impacting the City of El Segundo. The Team agreed that any hazard receiving a Team score higher than "3" would be included in the Mitigation Plan. Utilizing the ranking technique, the Team identified Earthquake, Flood, Windstorm, Tsunami, and Technological and Human-Caused Hazards as the most prominent hazards facing the City.

This is the description of the geographic extent, potential intensity, and the probability of occurrence of a given hazard. Maps are frequently used to display hazard identification data. The City of El Segundo identified five major hazards that affect this geographic area. These hazards – Earthquake, Flood, Windstorm, Tsunami, and Technological and Human-Caused Hazards - were identified through an extensive process that utilized input from the Hazard Mitigation Planning Team (see Section 4: Risk Assessment - Attachments 1, 2, 3, 4, 5 for documentation of previous damage from hazards). The existence and geographic extent of each of the hazards was based on the maps and findings contained in the City of El Segundo's General Plan and the Los Angeles County All-Hazard Mitigation Plan. The vulnerabilities posed by these hazards are depicted on Table 4-1.

2) Profiling Hazard Events

This process describes the causes and characteristics of each hazard and what part of the City's facilities, infrastructure, and environment may be vulnerable to each specific hazard. A profile of each hazard discussed in this plan is provided in each hazard section.

Table 4-1:
Vulnerability: Location, Extent, and Probability*

	Location (Where)	**Extent (How Big an Event)**	**Probability (How Often)***
Hazard			
Earthquake	Entire Project Area	The Southern California Earthquake Center (SCEC) in 2007 concluded that there is an 99.7 % probability that an earthquake of M6.7 or greater will hit California within 30 years.[1]	Moderate
Urban and Coastal Flooding	Coastal Area (Coastal Flooding)	Coastal and Urban Flooding: Coastal Areas impacted from severe weather resulting in flooding	Moderate
Windstorm	Entire Project area	50 miles per hour or greater	Moderate
Tsunami	Coast	Up to 40 foot run-up along coastal region.[2]	Low
Technological and Human-Caused Hazards	Entire Project Area	Varies widely by hazard event	Low-Moderate
* Probability is defined as: Low = 1:500 years, Moderate = 1:100 years, High = 1:10 years			
[1] Uniform California Earthquake Rupture Forecast			

3) Vulnerability Assessment/Inventorying Assets

This is a combination of hazard identification with an inventory of the existing (or planned) property development(s) and population(s) exposed to a hazard. Critical facilities are of particular concern because these entities provide essential products and services to the general public that are necessary to preserve the welfare and quality of life in the City and fulfill important public safety, emergency response, and/or disaster recovery functions. The critical facilities have been identified and are illustrated in Table 4-3 at the end of this section.

4) Risk Analysis

Estimating potential losses involves assessing the damage, injuries, and financial costs likely to be sustained in a geographic area over a given period of time. This level of analysis involves using mathematical models. The two measurable components of risk analysis are magnitude of the harm that may result and the likelihood of the harm occurring. Describing vulnerability in terms of dollar losses provides the community and the state with a common framework in which to measure the effects of hazards on assets. For each hazard where data was available, quantitative estimates for potential losses have been included in the hazard assessment. Data was not available to make vulnerability determinations in terms of dollar losses. The Mitigation Actions Matrix (Executive Summary – Table 1) includes an action item to conduct such an assessment in the future.

5) Assessing Vulnerability/ Analyzing Development Trends

This step provides a general description of City facilities and contents in relation to the identified

hazards so that mitigation options can be considered in land use planning and future land use decisions. This Mitigation Plan provides comprehensive description of the character of the City of El Segundo in the Community Profile. This description includes the geography and environment, population and demographics, land use and development, housing and community development, employment and industry, and transportation and commuting patterns. Analyzing these components of the City of El Segundo can help in identifying potential problem areas and can serve as a guide for incorporating the goals and ideas contained in this mitigation plan into other community development plans.

Hazard assessments are subject to the availability of hazard-specific data. Gathering data for a hazard assessment requires a commitment of resources on the part of participating organizations and agencies. Each hazard-specific section of the Plan includes a section on hazard identification using data and information from City, County or State agency sources.

Regardless of the data available for hazard assessments, there are numerous strategies the City can take to reduce risk. These strategies are described in the action items detailed in the Mitigation Actions Matrix (Executive Summary – Table 1). Mitigation strategies can further reduce disruption to critical services, reduce the risk to human life, and alleviate damage to personal and public property and infrastructure.

Federal Requirements for Risk Assessment

Federal regulations for local hazard mitigation plans (44 C.F.R. Section 201.6(c)(2)) require a risk assessment. This risk assessment requirement is intended to provide information that will help communities to identify and prioritize mitigation activities that will reduce losses from the identified hazards. There are five hazards profiled in the Mitigation Plan, including Earthquake, Flood, Windstorm, Tsunami, and Technological and Human-Caused Hazards. The Federal criteria for risk assessment and information on how the City of El Segundo Mitigation Plan meets those criteria is outlined in Table 4-2 below.

Table 4-2: Federal Criteria for Risk Assessment

Section 322 Plan Requirement	How is this addressed?
Identifying Hazards	Each hazard section includes an inventory of the best available data sources that identify hazard areas. To the extent data are available; the existing maps identifying the location of the hazard were utilized. The Executive Summary and the Risk Assessment sections of the Plan include a list of the hazard maps.
Profiling Hazard Events	Each hazard section includes documentation of the history, and causes and characteristics of the hazard in the City.
Assessing Vulnerability: Identifying Assets	Where data is available, the vulnerability assessment for each hazard addressed in the Mitigation Plan includes an inventory of all publicly owned land within hazardous areas. Each hazard section provides information on vulnerable areas within the City. Each hazard section also identifies potential mitigation strategies.
Assessing Vulnerability: Estimating Potential Losses	The Risk Assessment Section of this Mitigation Plan identifies key critical facilities that provide services to the City and includes a map of these facilities. Assessments

Section 322 Plan Requirement	How is this addressed?
	have been completed for the hazards addressed in the plan, and quantitative estimates were made for each hazard where data was available.
Assessing Vulnerability: Analyzing Development Trends	The Community Profile Section of this Plan provides a description of the population trends and transportation patterns.

Critical and Essential Facilities

Facilities critical to government response and recovery activities (i.e., life safety and property and environmental protection) include: local government 9-1-1 dispatch centers, local government emergency operations centers, schools (hosting shelters), local police and fire stations, local public works facilities, local communications centers, hospitals, bridges and major roads, and shelters. Also, facilities that, if damaged, could cause serious secondary impacts may also be considered "critical". A hazardous materials facility is one example of this type of critical facility.

Essential facilities are those facilities that are vital to the continued delivery of key City services or that may significantly impact the City's ability to recover from the disaster. These facilities may include: buildings such as the jail, law enforcement center, public services building, community corrections center, the courthouse, and juvenile services building and other public facilities such as schools. The following Table 4-3 illustrates the critical and essential facilities providing services to the City of El Segundo. Note that secondary impacts associated with earthquake hazards have been included on a site-by-site basis.

City Assets and Potential Estimated Losses

The City owns a number of assets that could potentially be impacted by hazards. **Worksheet 4-1: City of El Segundo Inventory of Assets** identifies each of the significant assets owned by the City including buildings and other facilities. The worksheet details estimated replacement value for each of the assets as well as the estimated value of the contents of the buildings. **Worksheet 4-2: City of El Segundo Estimated Loss – Structure and Contents of City Facilities** provides estimates of the total potential loss including structure and contents for all significant City assets in the event of a significant earthquake on a local fault. The estimates are based on a magnitude 6.9 earthquake on the Newport-Inglewood Fault with a peak ground acceleration of 55%.

Table 4-3: City of El Segundo Critical and Essential Facilities Vulnerable to Hazards
(X = site's risk rating is "possible, likely, or highly likely", N/A = Not Applicable)
(Note: data was not available to determine the extent of damages to the critical and essential facilities)

EQ	Flood	Wind	Tsunami	Tech and Human-Caused	Facility	Address
X	N/A	X	N/A	X	9-1-1 Dispatch Center	348 Main Street
X	N/A	X	N/A	X	Police Station	348 Main Street
X	N/A	X	N/A	X	Fire Station No. 1	314 Main Street
X	N/A	X	N/A	X	City Hall	350 Main Street
X	N/A	X	N/A	X	Fire Station No. 2	2161 E. El Segundo Boulevard
X	N/A	X	N/A	X	Water Department Office and Maintenance Building	400 Lomita Street
X	N/A	X	N/A	X	Reservoirs	400 Lomita Street

Worksheet 4-1: City of El Segundo Inventory of Assets

Identify Asset	Source of Info	Critical Facility	Vulnerable Populations	Economic Assets	Special Considerations	Historic/ Other Considerations	Size of Bldg (sq ft)	Replacement Value ($)	Content Value ($)
9-1-1 Dispatch Center	Fire	X		X			4,980	1,278,680	2,200,000
Police Station	Fire	X		X			26,466	6,107,370	1,067,100
Fire Station No. 1	Fire	X		X			8,539	4,291,110	235,700
City Hall	Fire			X			29,700	8,835,570	859,800
Fire Station No. 2	Fire	X		X			4,976	1,116,180	64,800
Water Department Office and Maintenance Building	Fire	X					5,476	1,144,780	150,500
Reservoirs	Fire	X		X			Holds 9.5 Million Gallons	9,596,200	0
Pump House A	Fire	X					2,155	483,100	366,200
Pump House B	Fire	X					1,058	258,480	250,000
Maintenance Facility Administration	Fire	X					5,214	1,434,480	192,400
Maintenance Facility Shop	Fire	X					17,170	2,992,490	660,700
Maintenance Facility Vehicle Storage	Fire						8,814	1,219,220	242,300
Maintenance Facility Warehouse Storage	Fire						4,320	475,190	95,000
Library	Fire						14,686	3,818,980	1,453,300
Library Annex	Fire						15,643	4,042,010	1,548,000
Urho Saari Swim Stadium	Fire						6,520	3,884,050	109,400
Park Vista Senior Housing 97 Apartment Units	Fire		X				26,500	Not known	Not known
Gordon Clubhouse	Fire						11,623	2,217,530	161,000
Joslyn Center	Fire						7,350	1,324,470	97,100
Pump Station 1	Fire	X						51,200	40,000

Identify Asset	Source of Info	Critical Facility	Vulnerable Populations	Economic Assets	Special Considerations	Historic/ Other Considerations	Size of Bldg (sq ft)	Replacement Value ($)	Content Value ($)
Pump Station 7	Fire	X						83,900	65,000
Pump Station 2	Fire	X						94,900	50,000
Pump Station 4	Fire	X						68,900	120,000
Pump Station 6	Fire	X						76,300	50,000
Pump Station 8	Fire	X						52,900	50,000
Pump Station 13	Fire	X						28,600	125,000
Pump Station 16	Fire	X						51,000	225,000
Pump Station 17	Fire	X						151,350	175,000
Pump Station 9	Fire	X						65,000	50,000
Pump Station 5	Fire	X						109,700	50,000
Storm Drain Plant 18	Fire	X						1,379,790	750,000
Teen Center	Fire						5,518	1,045,270	75,900
Fire Station #1 Handball Court	Fire						1,070	164,530	0
Fire Station #1 Hose Tower	Fire						105	32,700	0
Fire Station #1 Gym	Fire						726	85,000	15,000
Fire Training Tower	Fire						2,000	325,530	0
Golf Course Clubhouse	Fire						5,200	1,386,510	230,000
Golf Course Maintenance	Fire						1,740	223,770	75,400
Acacia Park Pool Restrooms	Fire						147	28,700	0
Hilltop Park Pool Restrooms	Fire						760	144,300	0
Library Park Bandstand	Fire						850	63,800	0
Recreation Park Checkout Building	Fire						3,880	388,590	55,400
Elevator Tower	Fire						510	37,820	75,000

Identify Asset	Source of Info	Critical Facility	Vulnerable Populations	Economic Assets	Special Considerations	Historic/ Other Considerations	Size of Bldg (sq ft)	Replacement Value ($)	Content Value ($)
Recreation Park Electrical Distribution Room, Shop, Small Equipment Garage, Restroom	Fire						1,245	204,300	0
Recreation Park Concession Stand and Restrooms	Fire						584	106,650	8,200
Recreation Park Hardball Concession Stand and Restrooms	Fire						960	190,850	0
Recreation Park Softball Concession Stand and Restrooms	Fire						640	141,050	0
Recreation Park Racquetball Court	Fire						1,870	245,080	0
Recreation Park Announcers Booth	Fire						108	14,560	600
Camp Eucalyptus	Fire							225,630	30,600
Insulation Test House	Fire						1,400	157,300	0
Cable Building	Fire	X					836	109,150	98,500
Pressure Reduction Station	Fire	X						140,970	200,000
Storage Building	Fire						1,066	373,310	26,800
Totals							**232,405**	**$62,568,800**	**$12,394,700**

Worksheet 4-2: City of El Segundo Estimated Loss – Structure and Contents of City Facilities
(Note: These estimates are based on an Earthquake on the Newport-Inglewood Fault (M 6.9) with a Peak Ground Acceleration of 55%)

Name or Description of Structure	Structure Replacement Value ($)	X	Percent Damage (%)	=	Structure Loss ($)	+	Replacement Value of Contents ($)	X	Percent Damage (%)	=	Contents Loss ($)	Total (Structure + Contents)
9-1-1 Dispatch Center	1,278,680	X	0.29	=	370,817	+	2,200,000	X	0.29	=	638,000	2,570,817
Police Station	6,107,370	X	0.29	=	1,771,137	+	1,067,100	X	0.29	=	309,459	2,838,237
Fire Station No. 1	4,291,110	X	0.29	=	1,244,421	+	235,700	X	0.29	=	68,353	1,480,121
City Hall	8,835,570	X	0.29	=	2,562,315	+	859,800	X	0.29	=	249,342	3,422,115
Fire Station No. 2	1,116,180	X	0.29	=	323,692	+	64,800	X	0.29	=	18,792	388,492
Water Department Office and Maintenance Building	1,144,780	X	0.29	=	331,986	+	150,500	X	0.29	=	43,645	482,486
Reservoirs	9,596,200	X	N/K	=	N/K	+	N/K	X	N/K	=	N/K	N/K
Pump House A	483,100	X	0.29	=	140,099	+	366,200	X	0.29	=	106,198	506,299
Pump House B	258,480	X	0.29	=	74,959	+	250,000	X	0.29	=	72,500	324,959
Maintenance Facility Administration	1,434,480	X	0.29	=	415,999	+	192,400	X	0.29	=	55,796	608,399
Maintenance Facility Shop	2,992,490	X	0.29	=	867,822	+	660,700	X	0.29	=	191,603	1,528,522
Maintenance Facility Vehicle Storage	1,219,220	X	0.29	=	353,573	+	242,300	X	0.29	=	70,267	595,8734
Maintenance Facility Warehouse Storage	475,190	X	0.29	=	137,805	+	95,000	X	0.29	=	27,550	232,805
Library	3,818,980	X	0.29	=	1,107,504	+	1,453,300	X	0.29	=	421,457	2,560,804
Library Annex	4,042,010	X	0.29	=	1,172,182	+	1,548,000	X	0.29	=	448,920	2,720,183

Name or Description of Structure	Structure Replacement Value ($)	X	Percent Damage (%)	=	Structure Loss ($)	+	Replacement Value of Contents ($)	X	Percent Damage (%)	=	Contents Loss ($)	Total (Structure + Contents)
Urho Saari Swim Stadium	3,884,050	X	0.29	=	1,126,374	+	109,400	X	0.29	=	31,726	1,235,774
Park Vista Senior Housing 97 Apartment Units	N/K	X	N/K	=	N/K	+	N/K	X	N/K	=	N/K	N/K
Gordon Clubhouse	2,217,530	X	0.29	=	643,083	+	161,000	X	0.29	=	46,690	804,084
Joslyn Center	1,324,470	X	0.23	=	304,628	+	97,100	X	0.23	=	22,333	401,728
Pump Station 1	51,200	X	0.29	=	14,848	+	40,000	X	0.29	=	11,600	54,848
Pump Station 7	83,900	X	0.29	=	24,331	+	65,000	X	0.29	=	18,850	89,331
Pump Station 2	94,900	X	0.29	=	27,521	+	50,000	X	0.29	=	14,500	77,521
Pump Station 4	68,900	X	0.29	=	19,981	+	120,000	X	0.29	=	34,800	139,981
Pump Station 6	76,300	X	0.29	=	22,127	+	50,000	X	0.29	=	14,500	72,127
Pump Station 8	52,900	X	0.29	=	15,341	+	50,000	X	0.29	=	14,500	65,341
Pump Station 13	28,600	X	0.29	=	8,294	+	125,000	X	0.29	=	36,250	133,294
Pump Station 16	51,000	X	0.29	=	14,790	+	225,000	X	0.29	=	65,250	239,790
Pump Station 17	151,350	X	0.29	=	43,891	+	175,000	X	0.29	=	50,750	218,891
Pump Station 9	65,000	X	N/K	=	N/K	+	50,000	X	N/K	=	N/K	N/K
Pump Station 5	109,700	X	0.23	=	25,231	+	50,000	X	0.23	=	11,500	75,231
Storm Drain Plant 18	1,379,790	X	0.29	=	400,139	+	750,000	X	0.29	=	217,500	1,150,139
Teen Center	1,045,270	X	0.29	=	303,128	+	75,900	X	0.29	=	22,011	379,028
Fire Station #1 Handball Court	164,530	X	0.29	=	47,714	+	N/K	X	0.29	=	N/K	N/K
Fire Station #1 Hose Tower	32,700	X	0.29	=	9,483	+	N/K	X	0.29	=	N/K	N/K
Fire Station #1 Gym	85,000	X	0.23	=	19,550	+	15,000	X	0.23	=	3,450	34,550
Fire Training Tower	325,530	X	0.29	=	94,403	+	N/K	X	0.29	=	N/K	N/K
Golf Course Clubhouse	1,386,510	X	0.29	=	402,087	+	230,000	X	0.29	=	66,700	632,088

Name or Description of Structure	Structure Replacement Value ($)	X	Percent Damage (%)	=	Structure Loss ($)	+	Replacement Value of Contents ($)	X	Percent Damage (%)	=	Contents Loss ($)	Total (Structure + Contents)
Golf Course Maintenance	223,770	X	0.29	=	64,893	+	75,400	X	0.29	=	21,866	140,29
Acacia Park Pool Restrooms	28,700	X	N/K	=	N/K	+	N/K	X	N/K	=	N/K	N/K
Hilltop Park Pool Restrooms	144,300	X	0.29	=	41,847	+	N/K	X	0.29	=	N/K	N/K
Library Park Bandstand	63,800	X	0.29	=	18,502	+	N/K	X	0.29	=	N/K	N/K
Recreation Park Checkout Building	388,590	X	0.29	=	112,691	+	55,400	X	0.29	=	16,066	168,09
Elevator Tower	37,820	X	0.23	=	8,698	+	75,000	X	0.23	=	17,250	83,699
Recreation Park Electrical Distribution Room, Shop, Small Equipment Garage, Restroom	204,300	X	0.23	=	46,989	+	N/K	X	0.23	=	N/K	N/K
Recreation Park Concession Stand and Restrooms	106,650	X	0.29	=	30,928	+	8,200	X	0.29	=	2,378	39,128
Recreation Park Hardball Concession Stand and Restrooms	190,850	X	0.29	=	55,346	+	N/K	X	0.29	=	N/K	N/K
Recreation Park Softball Concession Stand and Restrooms	141,050	X	0.29	=	40904	+	N/K	X	0.29	=	N/K	N/K
Recreation Park Racquetball Court	245,080	X	N/K	=	N/K	+	N/K	X	N/K	=	N/K	N/K
Recreation Park Announcers Booth	14,560	X	N/K	=	N/K	+	600	X	N/K	=	N/K	N/K

Name or Description of Structure	Structure Replacement Value ($)	X	Percent Damage (%)	=	Structure Loss ($)	+	Replacement Value of Contents ($)	X	Percent Damage (%)	=	Contents Loss ($)	Total (Structure + Contents)
Camp Eucalyptus	225,630	X	N/K	=	N/K	+	30,600	X	N/K	=	N/K	N/K
Insulation Test House	157,300	X	0.29	=	45617	+	N/K	X	0.29	=	N/K	N/K
Cable Building	109,150	X	0.23	=	25104	+	98,500	X	0.23	=	22,655	123,604
Pressure Reduction Station	140,970	X		=	0	+	200,000	X	N/K	=	N/K	N/K
Storage Building	373,310	X	0.29	=	108259	+	26,800	X	0.29	=	7,772	135,060
Total Loss to Structure and Contents												**$26,753,739.00**

Summary

Hazard mitigation strategies can reduce the impacts concentrated at large employment and industrial centers, public infrastructure, and critical facilities. Hazard mitigation for industries and employers may include developing relationships with emergency management services and their employees before disaster strikes, and establishing mitigation strategies together. Collaboration among the public and private sector to create mitigation plans and actions can reduce the impacts of hazards.

Figure 4-1:

Ranking Your Hazards

It is important to keep in mind that your rankings should be based on a hazard event that would overwhelm your jurisdiction's ability to respond effectively.

For each hazard listed assign a score. Place a number in the appropriate box.

Hazard Scoring	
1	An event of that magnitude is not likely to occur
2	There is a slight chance that an event of that magnitude will occur
3	It is possible that an event of that magnitude will occur
4	An event of that magnitude has occurred here in the past and is likely to occur again
5	There is a high probability that an event of that magnitude will occur

Identify any additional hazards for the jurisdiction at the end of the list labeled as "Other Hazard."

Hazard	***Score***
Earthquake	**3**
Flooding	**3**
Tsunami	**3**
Windstorm	**3**
Drought	**1**
Landslide	**1**
Wildfire	**1**
Technological and Human-Caused Hazards	**3**

SECTION 5: EARTHQUAKE HAZARDS

Why Are Earthquakes a Threat to the City of El Segundo?

The City of El Segundo was impacted by the 1933 Long Beach Earthquake however data is not available on the extent or values of the damages sustained by the City. It is known that the both the El Segundo High School and the elementary school (now known as Richmond Street School) suffered significant damages that resulted in the demolition and rebuilding of both campuses. The only example, in the City of El Segundo's recorded history, of direct damages associated with an earthquake was the 1933 Long Beach event.

The most recent significant earthquake event affecting Southern California was the January 17th 1994 Northridge Earthquake. At 4:31 A.M. on Monday, January 17, a moderate but very damaging earthquake with a magnitude of 6.7 struck the San Fernando Valley. In the following days and weeks, thousands of aftershocks occurred, causing additional damage to affected structures.

57 people were killed and more than 1,500 people seriously injured. For days afterward, thousands of homes and businesses were without electricity; tens of thousands had no gas; and nearly 50,000 had little or no water. Approximately 15,000 structures were moderately to severely damaged, which left thousands of people temporarily homeless. 66,500 buildings were inspected. Nearly 4,000 were severely damaged and over 11,000 were moderately damaged. Several collapsed bridges and overpasses created commuter havoc on the freeway system. Extensive damage was caused by ground shaking, but earthquake triggered liquefaction and dozens of fires also caused additional severe damage. This extremely strong ground motion in large portions of Los Angeles County resulted in record economic losses.

However, the earthquake occurred early in the morning on a holiday. This circumstance considerably reduced the potential effects. Many collapsed buildings were unoccupied, and most businesses were not yet open.

Historical and geological records show that California has a long history of seismic events. Southern California is probably best known for the San Andreas Fault, a 400 mile long fault running from the Mexican border to a point offshore, west of San Francisco. "Geologic studies show that over the past 1,400 to 1,500 years large earthquakes have occurred at about 130 year intervals on the Southern San Andreas Fault. As the last large earthquake on the Southern San Andreas occurred in 1857, that section of the fault is considered a likely location for an earthquake within the next few decades."

But San Andreas is only one of dozens of known earthquake faults that crisscross Southern California. Some of the better known faults include the Newport-Inglewood, Whittier, Chatsworth, Elsinore, Hollywood, Los Alamitos, Puente Hills, and Palos Verdes Faults. Beyond the known faults, there are a potentially large number of "blind" faults that underlie the surface of Southern California. One such blind fault was involved in the October 1987 Whittier Narrows Earthquake.

Although the most famous of the faults, the San Andreas, is capable of producing an earthquake with a moment magnitude of greater than 8, some of the "lesser" faults have the potential to inflict greater damage on the urban core of Southern California. Seismologists believe that local faults such as the Newport-Inglewood Fault or the Palos Verdes Fault could potentially inflict

greater damage on El Segundo than certain scenarios of ground rupture on the more distant San Andreas Fault.

Tremendous earthquake mapping and mitigation efforts have been made in California in the past two decades, and public awareness has risen remarkably during this time. Major federal, state, and local government agencies and private organizations support earthquake risk reduction, and have made significant contributions in reducing the adverse impacts of earthquakes. Despite the progress, the majority of California communities remain unprepared because there is a general lack of understanding regarding earthquake hazards among Californians.

Table 5-1: Earthquake Events in the Southern California Region
(Source: U.S. Geological Survey)

Southern California Region Earthquakes with a Magnitude 5.0 or Greater			
1769	Los Angeles Basin	1916	Tejon Pass Region
1800	San Diego Region	1918	San Jacinto
1812	Wrightwood	1923	San Bernardino Region
1812	Santa Barbara Channel	1925	Santa Barbara
1827	Los Angeles Region	1933	Long Beach
1855	Los Angeles Region	1941	Carpenteria
1857	Great Fort Tejon	1952	Kern County
1858	San Bernardino Region	1954	West of Wheeler Ridge
1862	Old Town San Diego	1971	San Fernando
1892	San Jacinto/Elsinore Fault	1973	Point Mugu
1893	Pico Canyon	1986	Coastal San Diego
1894	Lytle Creek Region	1986	North Palm Springs
1894	East of San Diego	1987	Whittier Narrows
1899	Lytle Creek Region	1992	Landers
1899	San Jacinto and Hemet	1992	Big Bear
1907	San Bernardino Region	1994	Northridge
1910	Glen Ivy Hot Springs	1999	Hector Mine

To better understand the earthquake hazard, the scientific community has looked at historical records and accelerated research on those faults that are the sources of the earthquakes occurring in the Southern California region. Historical earthquake records can generally be divided into records of the pre-instrumental period and the instrumental period. In the absence of instrumentation, the detection of earthquakes is based on observations and felt reports, and are dependent upon population density and distribution. Since California was sparsely populated in the 1800s, the detection of pre-instrumental earthquakes is relatively difficult. However, two

very large earthquakes, the Fort Tejon in 1857 (M7.9) and the Owens Valley in 1872 (M7.6) are evidence of the tremendously damaging potential of earthquakes in Southern California. In more recent times two M7.3 earthquakes struck Southern California, in Kern County (1952) and Landers (1992). The damage from these four large earthquakes was limited because they occurred in areas which were sparsely populated at the time they happened. The seismic risk is much more severe today than in the past because the population at risk is in the millions, rather than a few hundred or a few thousand persons.

History of Earthquake Events in Southern California

Since seismologists started recording and measuring earthquakes, there have been tens of thousands of recorded earthquakes in Southern California, most with a magnitude below three. No community in Southern California is beyond the reach of a damaging earthquake. Table 5-1 describes the historical earthquake events that have affected Southern California.

Impact of Earthquakes in the City of El Segundo

Based on the risk assessment, it is evident that Earthquakes will continue to have potentially devastating economic impacts to certain areas of the city. Impacts that are not quantified, but can be anticipated in future events, include:

- Injury and loss of life;
- Commercial and residential structural damage;
- Disruption of and damage to public infrastructure;
- Secondary Health hazards e.g. mold and mildew;
- Damage to roads/bridges resulting in loss of mobility;
- Significant economic impact (jobs, sales, tax revenue) upon the community;
- Negative impact on commercial and residential property values; and
- Significant disruption to students and teachers as temporary facilities and relocations would likely be needed.

Measuring and Describing Earthquakes

An earthquake is a sudden motion or trembling that is caused by a release of strain accumulated within or along the edge of the Earth's tectonic plates. The effects of an earthquake can be felt far beyond the site of its occurrence. They usually occur without warning and, after just a few seconds, can cause massive damage and extensive casualties. Common effects of earthquakes are ground motion and shaking, surface fault ruptures, and ground failure. Ground motion is the vibration or shaking of the ground during an earthquake. When a fault ruptures, seismic waves radiate, causing the ground to vibrate. The severity of the vibration increases with the amount of energy released and decreases with distance from the causative fault or epicenter. Soft soils can further amplify ground motions. The severity of these effects is dependent on the amount of energy released from the fault or epicenter. One way to express an earthquake's severity is to compare its acceleration to the normal acceleration due to gravity. The acceleration due to gravity is often called "g". A ground motion with a peak ground acceleration of 100%g is very severe. Peak Ground Acceleration (PGA) is a measure of the strength of ground motion. PGA is used to project the risk of damage from future earthquakes by showing earthquake ground motions that have a specified probability (10%, 5%, or 2%) of being exceeded in 50 years. These ground motion values are used for reference in construction design for earthquake resistance. The ground motion values can also be used to assess relative hazard between sites, when making economic and safety decisions. Another tool used to describe earthquake intensity is the Magnitude Scale. The Magnitude Scale is sometimes referred to as the Richter Scale. The two

are similar but not exactly the same. The Magnitude Scale was devised as a means of rating earthquake strength and is an indirect measure of seismic energy released. The Scale is logarithmic with each one-point increase corresponding to a 10-fold increase in the amplitude of the seismic shock waves generated by the earthquake. In terms of actual energy released, however, each one-point increase on the Richter scale corresponds to about a 32-fold increase in energy released. Therefore, a magnitude 7 (M7) earthquake is 100 times (10 X 10) more powerful than a M5 earthquake and releases 1,024 times (32 X 32) the energy. An earthquake generates different types of seismic shock waves that travel outward from the focus or point of rupture on a fault. Seismic waves that travel through the earth's crust are called body waves and are divided into primary (P) and secondary (S) waves. Because P waves move faster (1.7 times) than S waves they arrive at the seismograph first. By measuring the time delay between arrival of the P and S waves and knowing the distance to the epicenter, seismologists can compute the magnitude for the earthquake.

The Modified Mercalli Scale (MMI) is another means for rating earthquakes, but one that attempts to quantify intensity of ground shaking. Intensity under this scale is a function of distance from the epicenter (the closer to the epicenter the greater the intensity), ground acceleration, duration of ground shaking, and degree of structural damage. This rates the level of severity of an earthquake by the amount of damage and perceived shaking (Table 5-2).

Table 5-2: Modified Mercalli Intensity Scale

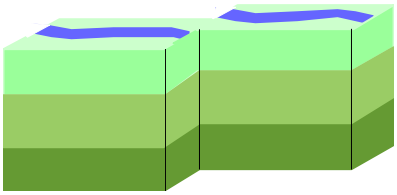
MMI Value	Description of Shaking Severity	Summary Damage Description Used on 1995 Maps	Full Description
I			Not Felt
II			Felt by persons at rest, on upper floors, or favorably placed.
III			Felt indoors. Hanging objects swing. Vibration like passing of light trucks. Duration estimated. May not be recognized as an earthquake.
IV			Hanging objects swing. Vibration like passing of heavy trucks; or sensation of a jolt like a heavy ball striking the walls. Standing motorcars rock. Windows, dishes, doors rattle. In the upper range of IV, wooden walls and frame creak.
V	Light	Pictures Move	Felt outdoors; direction estimated. Sleepers wakened. Liquids disturbed, some spilled. Small unstable objects displaced or upset. Doors swing, close, open. Shutters, pictures move. Pendulum clock stop, start, change rate.
VI	Moderate	Objects Fall	Felt by all. Many frightened and run outdoors. Persons walk unsteadily. Windows, dishes, glassware broken. Knickknacks, books, etc., off shelves. Pictures off walls. Furniture moved or overturned. Weak plaster and masonry D cracked.
VII	Strong	Nonstructural Damage	Difficult to stand. Noticed by drivers of motorcars. Hanging objects quiver. Furniture broken. Damage to masonry D, including cracks. Weak chimneys broken at roofline. Fall of plaster, loose bricks, stones, tiles, cornices. Some cracks in masonry C. Small slides and caving in along sand or gravel banks. Concrete irrigation ditches damaged.
VIII	Very Strong	Moderate Damage	Steering of motorcars affected. Damage to masonry C, partial collapse. Some damage to masonry B; none to masonry A. Fall of stucco and some masonry walls. Twisting, fall of chimneys, factory stacks, monuments, towers, and elevated tanks. Frame houses moved on foundations if not bolted down; loose panel walls thrown out. Cracks in wet ground and on steep slopes.
IX	Very Violent	Extreme Damage	Most masonry and frame structures destroyed with their foundations. Some well-built wooden structures and bridges

MMI Value	Description of Shaking Severity	Summary Damage Description Used on 1995 Maps	Full Description
			destroyed. Serious damage to dams, dikes, embankments. Large landslides. Water thrown on banks of canals, rivers, lakes, etc. Sand and mud shifted horizontally on beaches and flat land.
X			Rails bent greatly. Underground pipelines completely out of services.
XII			Damage nearly total. Large rock masses displaced. Lines of sight and level distorted. Objects thrown into air.

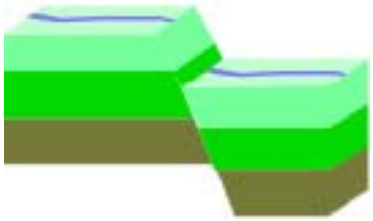
Figure 5-1: Causes and Characteristics of Earthquakes in Southern California

Earthquake Faults
A fault is a fracture along between blocks of the earth's crust where either side moves relative to the other along a parallel plane to the fracture.

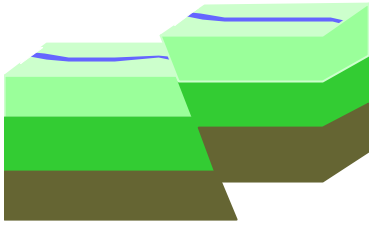
Strike-slip
Strike-slip faults are vertical or almost vertical rifts where the earth's plates move mostly horizontally. From the observer's perspective, if the opposite block looking across the fault moves to the right, the slip style is called a right lateral fault; if the block moves left, the shift is called a left lateral fault.



Dip-slip
Dip-slip faults are slanted fractures where the blocks mostly shift vertically. If the earth above an inclined fault moves down, the fault is called a normal fault, but when the rock above the fault moves up, the fault is called a reverse fault.



Thrust faults
Thrust faults have a reverse fault with a dip of 45 ° or less.



Dr. Kerry Sieh of Cal Tech has investigated the San Andreas Fault at Pallett Creek. "The record at Pallett Creek shows that rupture has recurred about every 130 years, on average, over the past 1500 years. But actual intervals have varied greatly, from less than 50 years to more than 300. The physical cause of such irregular recurrence remains

unknown." Damage from a great quake on the San Andreas would be widespread throughout Southern California.

Earthquake Related Hazards

Ground shaking, landslides, liquefaction, and amplification are the specific hazards associated with earthquakes. The severity of these hazards depends on several factors, including soil and slope conditions, proximity to the fault, earthquake magnitude, and the type of earthquake.

Ground Shaking
Ground shaking is the motion felt on the earth's surface caused by seismic waves generated by the earthquake. It is the primary cause of earthquake damage. The strength of ground shaking depends on the magnitude of the earthquake, the type of fault, and distance from the epicenter (where the earthquake originates). Buildings on poorly consolidated and thick soils will typically see more damage than buildings on consolidated soils and bedrock.

Earthquake-Induced Landslides
Earthquake-induced landslides are secondary earthquake hazards that occur from ground shaking. They can destroy the roads, buildings, utilities, and other critical facilities necessary to respond and recover from an earthquake. Many communities in Southern California have a high likelihood of encountering such risks, especially in areas with steep slopes.

Liquefaction
Liquefaction occurs when ground shaking causes wet granular soils to change from a solid state to a liquid state. This results in the loss of soil strength and the soil's ability to support weight. Buildings and their occupants are at risk when the ground can no longer support these buildings and structures. Many communities in Southern California are built on ancient river bottoms and have sandy soil. In some cases this ground may be subject to liquefaction, depending on the depth of the water table.

Amplification
Soils and soft sedimentary rocks near the earth's surface can modify ground shaking caused by earthquakes. One of these modifications is amplification. Amplification increases the magnitude of the seismic waves generated by the earthquake. The amount of amplification is influenced by the thickness of geologic materials and their physical properties. Buildings and structures built on soft and unconsolidated soils can face greater risk. Amplification can also occur in areas with deep sediment filled basins and on ridge tops.

Earthquake Hazard Assessment

Hazard Identification
The 2007 Working Group on California Earthquake Probabilities (WGCEP 2007), a multi-disciplinary collaboration of scientists and engineers, has released the Uniform California Earthquake Rupture Forecast (UCERF), the first comprehensive framework for comparing earthquake likelihoods throughout all of California. In developing the UCERF, the 2007 Working Group revised earlier forecasts for Southern California (WGCEP 1995) and the San Francisco Bay Area (WGCEP 2003) by incorporating new data on active faults and an improved scientific understanding of how faults rupture to produce large earthquakes. It extended the forecast across the entire state using a uniform methodology, allowing for the first time meaningful comparisons of earthquake probabilities in urbanized areas such as Los Angeles and San Francisco Bay Area, as well as comparisons among the large faults in different parts of the

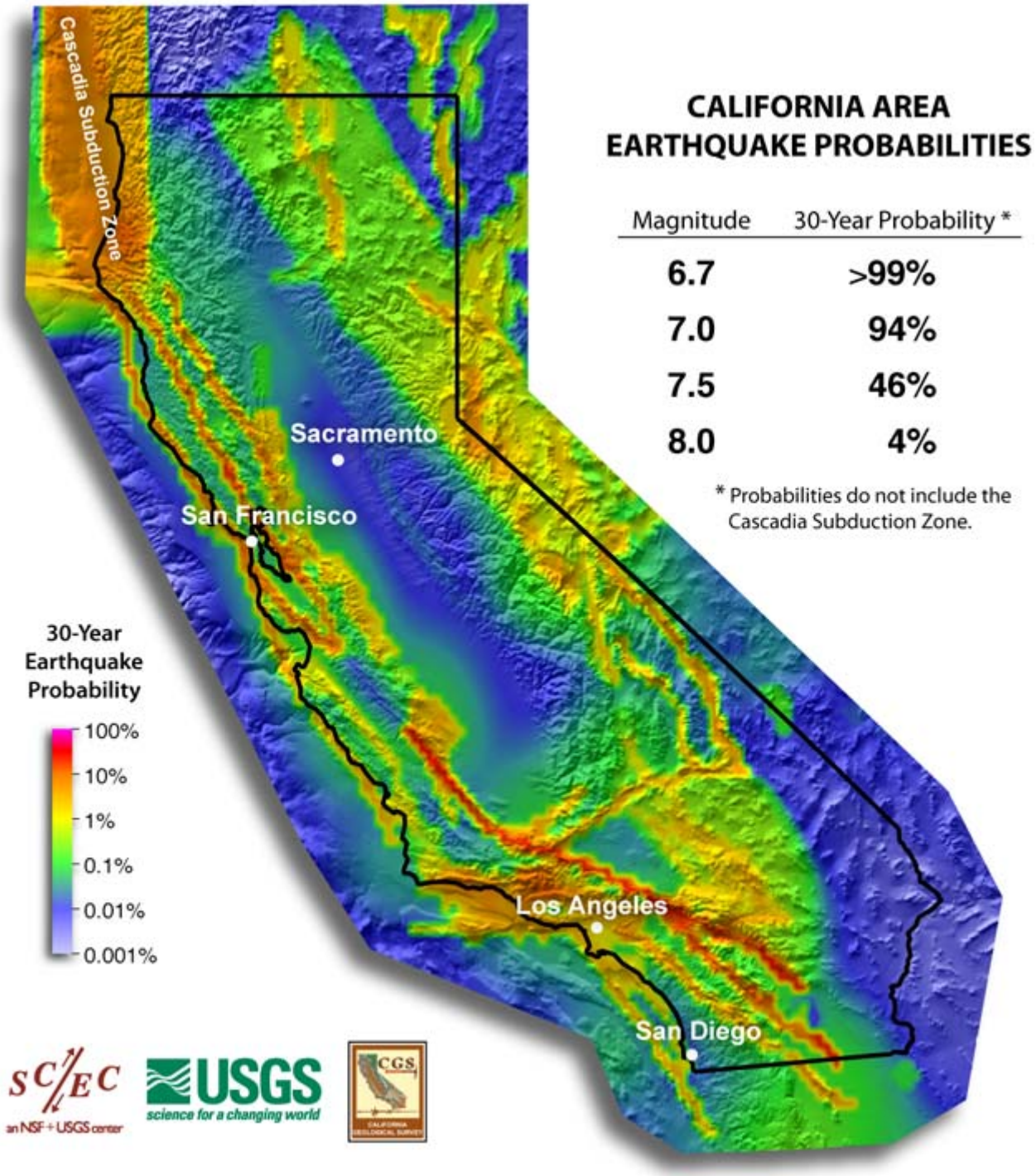
State. The study was organized by the Southern California Earthquake Center, the U.S. Geological Survey, and the California Geological Survey, and it received major support from the California Earthquake Authority, which is responsible for setting earthquake insurance rates statewide. According to the new forecast, California has a 99.7% chance of having a magnitude 6.7 or larger earthquake during the next 30 years. The likelihood of an even more powerful quake of magnitude 7.5 or greater in the next 30 years is 46%. **Map 5-1: Earthquake Probabilities for California** illustrates the probability that an earthquake of various magnitudes will occur in California within 30 years. Such a quake is more likely to occur in the southern half of the State, 37% chance in 30 years, than in the northern half, 15% chance in 30 years. The probability of a magnitude 6.7 or larger earthquake over the next 30 years striking the greater Los Angeles area is 67%. For the entire California region, the fault with the highest probability of generating at least one magnitude 6.7 quake or larger is the southern San Andreas, 59% in the next 30 years. **Map 5-2: Earthquake Probabilities of Major California Faults** illustrates the probability that a rupture of a major fault will occur within California that will result in an earthquake of a magnitude 6.7 or greater within 30 years (Southern California Earthquake Data Center).

Map 5-3: Southern California Earthquake Faults plots the various major faults in Southern California.

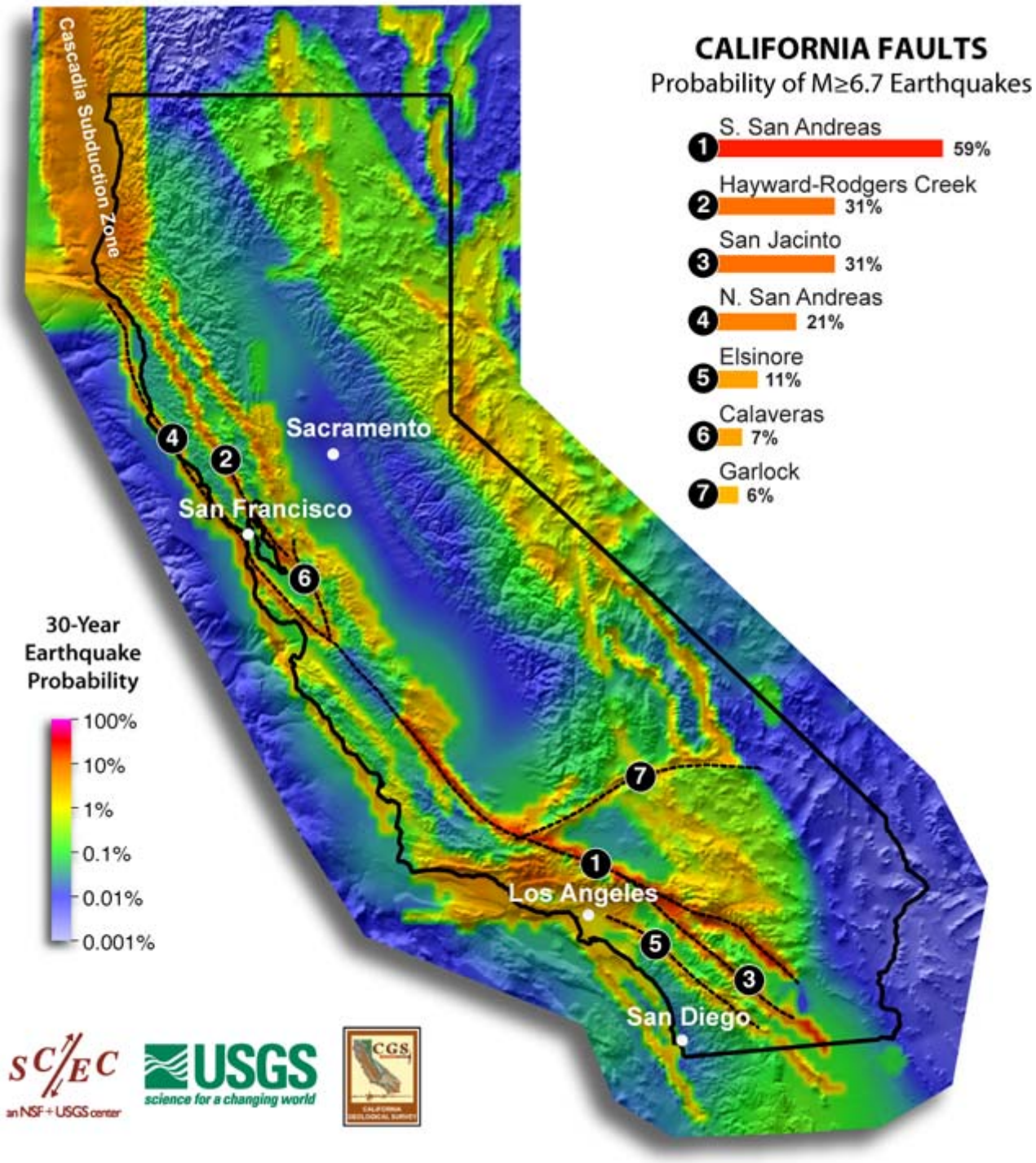
In California, many agencies are focused on seismic safety issues: the State's Seismic Safety Commission, the Applied Technology Council, Governor's Office of Emergency Services, United States Geological Survey, Cal Tech, the California Geological Survey as well as a number of universities and private foundations.

These organizations, in partnership with other state and federal agencies, have undertaken a rigorous program in California to identify seismic hazards and risks including active fault identification, bedrock shaking, tsunami inundation zones, ground motion amplification, liquefaction, and earthquake induced landslides. Seismic hazard maps have been published and are available for many communities in California through the State Division of Mines and Geology.

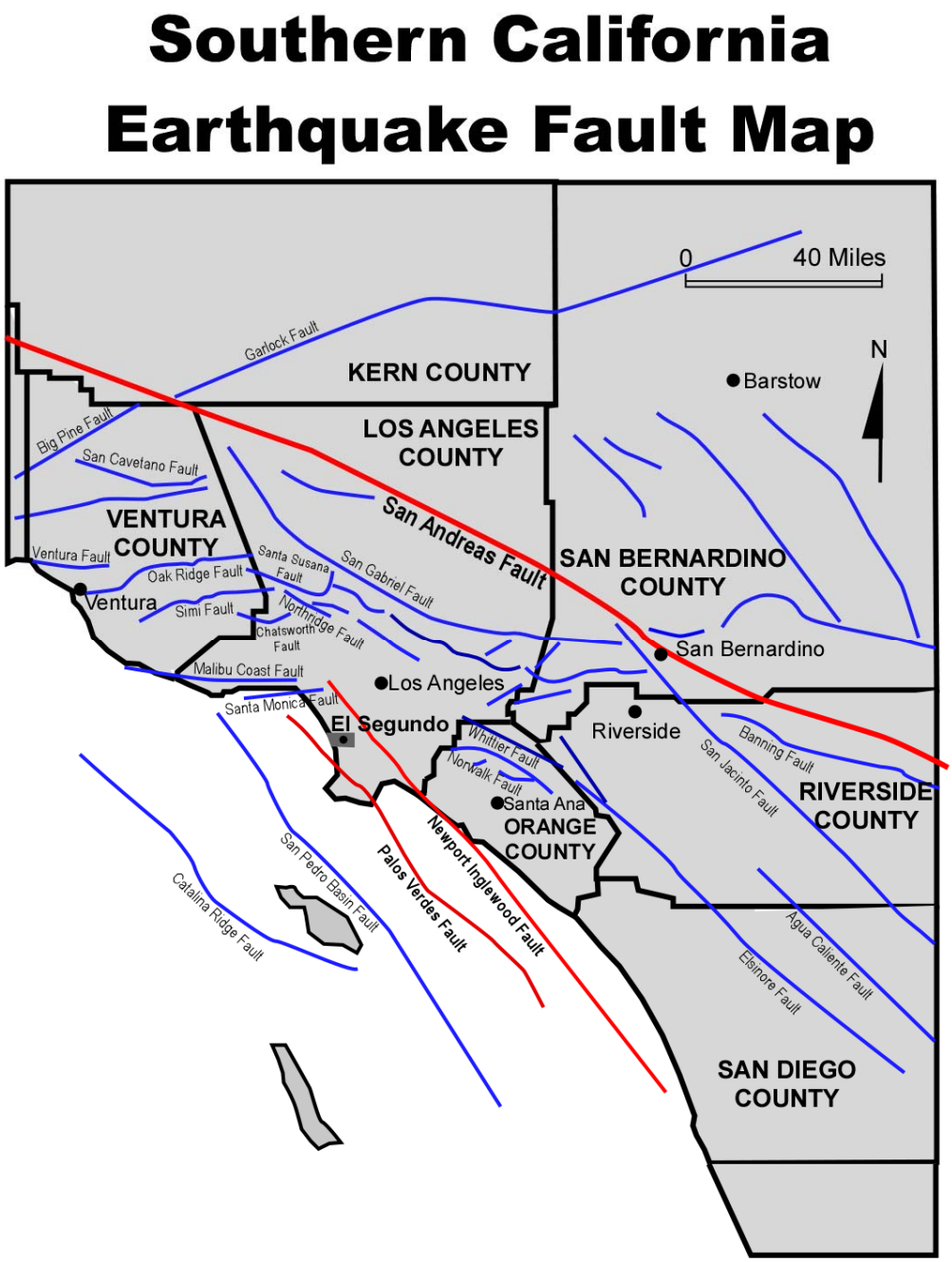
Map 5-1: Earthquake Probabilities for California
(Source: www.scec.org/ucerf)



Map 5-2: Earthquake Probabilities of Major California Faults
(Source: www.scec.org/ucerf)



Map 5-3: Southern California Earthquake Fault Map



Attachment 5-1

Earthquake Probable Events

(Source: Southern California Earthquake Data Center)

Elsinore Fault Zone
TYPE OF FAULTING: right-lateral strike-slip
LENGTH: about 180 km (not including the Whittier, Chino, and Laguna Salada Faults)
NEARBY COMMUNITIES: Temecula, Lake Elsinore, Julian
LAST MAJOR RUPTURE: May 15, 1910; Magnitude 6 -- no surface rupture found
SLIP RATE: roughly 4.0 mm/yr
INTERVAL BETWEEN MAJOR RUPTURES: roughly 250 years
PROBABLE MAGNITUDES: M6.5 - 7.5
MOST RECENT SURFACE RUPTURE: 18th century A.D.(?)

Newport-Inglewood Fault Zone
TYPE OF FAULTING: right-lateral; local reverse slip associated with fault steps
LENGTH: 75 km
NEAREST COMMUNITIES: Culver City, Inglewood, Gardena, Compton, Signal Hill, Long Beach, Seal Beach, Huntington Beach, Newport Beach, Costa Mesa
MOST RECENT MAJOR RUPTURE: March 10, 1933, M_W6.4 (but no surface rupture)
SLIP RATE: 0.6 mm/yr
INTERVAL BETWEEN MAJOR RUPTURES: unknown
PROBABLE MAGNITUDES: M6.0 - 7.4
OTHER NOTES: Surface trace is discontinuous in the Los Angeles Basin, but the fault zone can easily be noted there by the existence of a chain of low hills extending from Culver City to Signal Hill. South of Signal Hill, it roughly parallels the coastline until just south of Newport Bay, where it heads offshore, and becomes the Newport-Inglewood - Rose Canyon Fault Zone.

Palos Verdes Fault Zone
TYPE OF FAULT: right-reverse (?)
LENGTH: roughly 80 km
NEARBY COMMUNITIES: San Pedro, Palos Verdes Estates, Torrance, Redondo Beach
MOST RECENT SURFACE RUPTURE: Holocene, offshore; Late Quaternary, onshore
SLIP RATE: between 0.1 and 3.0 mm/yr
INTERVAL BETWEEN MAJOR RUPTURES: unknown
PROBABLE MAGNITUDES: M6.0 - 7.0 (or greater?); fault geometries may allow only partial rupture at any one time
OTHER NOTES: Has two main branches (see below). Continues southward as the Palos Verdes - Coronado Bank Fault Zone.

San Andreas Fault Zone
TYPE OF FAULT: right-lateral strike-slip
LENGTH: 1200 km 550 km south from Parkfield; 650km northward
NEARBY COMMUNITY: Parkfield, Frazier Park, Palmdale, Wrightwood, San Bernardino, Banning, Indio
LAST MAJOR RUPTURE: January 9, 1857 (Mojave segment); April 18, 1906 (Northern segment)
SLIP RATE: about 20 to 35 mm per year
INTERVAL BETWEEN MAJOR RUPTURES: average of about 140 years on the Mojave

segment; recurrence interval varies greatly -- from under 20 years (at Parkfield only) to over 300 years
PROBABLE MAGNITUDES: M6.8 - 8.0

San Fernando Fault Zone
TYPE OF FAULTING: thrust
LENGTH: 17 km
NEAREST COMMUNITIES: San Fernando, Sunland
LAST MAJOR RUPTURE: February 9, 1971, M6.6
SLIP RATE: 5 mm/yr (?)
INTERVAL BETWEEN MAJOR RUPTURES: roughly 200 years
PROBABLE MAGNITUDES: M6.0 - 6.8
OTHER NOTES: Dip is to the north. The slip rate is not well known, but trenching studies indicate recurrence interval as between 100 and 300 years.

San Jacinto Fault Zone
TYPE OF FAULTING : right-lateral strike-slip; minor right-reverse
LENGTH: 210 km, including Coyote Creek Fault
NEARBY COMMUNITIES: Lytle Creek, San Bernardino, Loma Linda, San Jacinto, Hemet, Anza, Borrego Springs, Ocotillo Wells
MOST RECENT SURFACE RUPTURE: within the last few centuries; April 9, 1968, M6.5 on Coyote Creek segment
SLIP RATE: typically between 7 and 17 mm/yr
INTERVAL BETWEEN SURFACE RUPTURES: between 100 and 300 years, per segment
PROBABLE MAGNITUDES: M6.5 - 7.5

Sierra Madre Fault System
TYPE OF FAULTING: reverse
LENGTH: the zone is about 55 km long;
total length of main fault segments is about 75 km, with each segment measuring roughly 15 km long
NEARBY COMMUNITIES: Sunland, Altadena, Sierra Madre, Monrovia, Duarte, Glendora
MOST RECENT SURFACE RUPTURE: Holocene
SLIP RATE: between 0.36 and 4 mm/yr
INTERVAL BETWEEN SURFACE RUPTURES: several thousand years (?)
PROBABLE MAGNITUDES: M6.0 - 7.0 (?)
OTHER NOTES: This fault zone dips to the north. It was not the fault responsible for the 1991 Sierra Madre earthquake.

Whittier Fault
TYPE OF FAULTING: right-lateral strike-slip with some reverse slip
LENGTH: about 40 km
NEARBY COMMUNITIES: Yorba Linda, Hacienda Heights, Whittier
MOST RECENT SURFACE RUPTURE: Holocene
SLIP RATE: between 2.5 and 3.0 mm/yr
INTERVAL BETWEEN MAJOR RUPTURES: unknown
PROBABLE MAGNITUDES: M6.0 - 7.2
OTHER NOTES: The Whittier Fault dips toward the northeast.

In California, each earthquake is followed by revisions and improvements in the Building Codes. 1933 Long Beach Earthquake resulted in the Field Act, affecting school construction. The 1971 Sylmar Earthquake brought another set of increased structural standards. Similar re-evaluations occurred after the 1989 Loma Prieta Earthquake and 1994 Northridge Earthquake. These code changes have resulted in stronger and more earthquake resistant structures.

The Alquist-Priolo Earthquake Fault Zoning Act was passed in 1972 to mitigate the hazard of surface faulting to structures for human occupancy. This state law was a direct result of the 1971 San Fernando Earthquake, which was associated with extensive surface fault ruptures that damaged numerous homes, commercial buildings, and other structures. Surface rupture is the most easily avoided seismic hazard.

The Seismic Hazards Mapping Act, passed in 1990, addresses non-surface fault rupture earthquake hazards, including liquefaction and seismically induced landslides. The State Department of Conservation operates the Seismic Mapping Program for California. Extensive information is available at their website: http://gmw.consrv.ca.gov/shmp/index.htm

Vulnerability Assessment

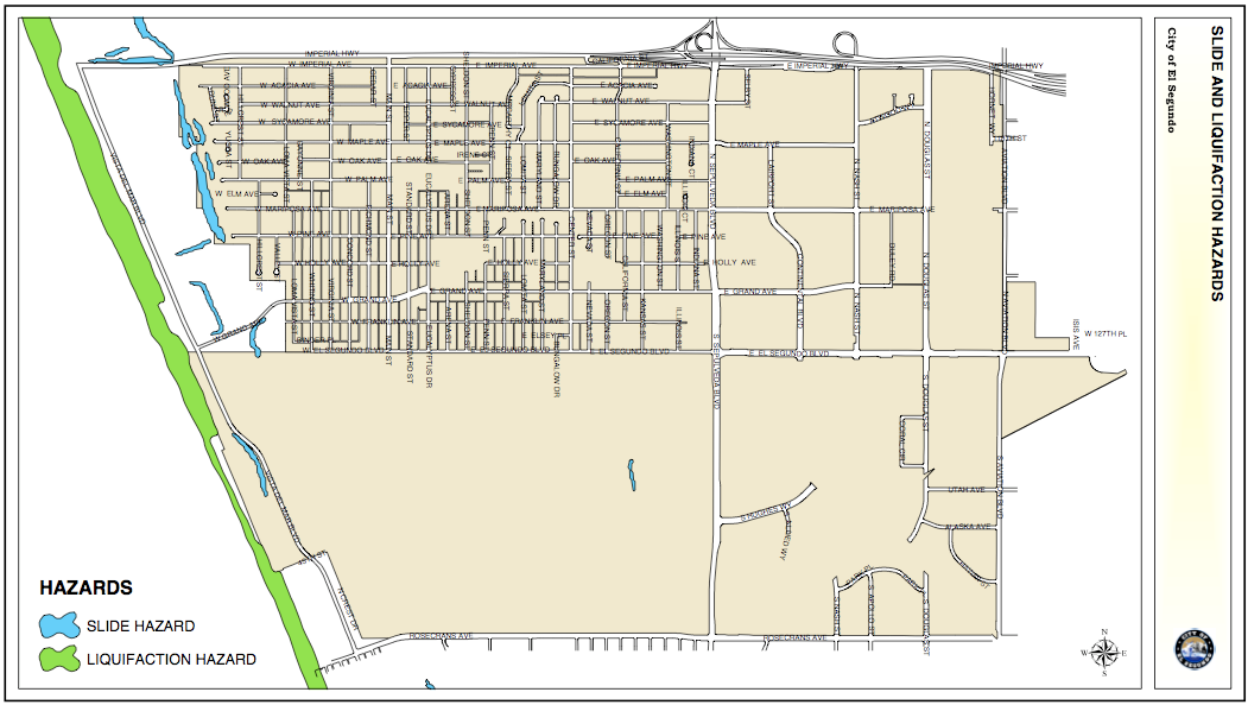
The effects of earthquakes span a large area, and large earthquakes occurring in many parts of the Southern California region would probably be felt throughout the region. However, the degree to which the earthquakes are felt, and the damages associated with them may vary. At risk from earthquake damage are large stocks of old buildings and bridges: many high tech and hazardous materials facilities: extensive sewer, water, and natural gas pipelines; earth dams; petroleum pipelines; and other critical facilities and private property located in the county. The relative or secondary earthquake hazards, which are liquefaction, ground shaking, amplification, and earthquake-induced landslides, can be just as devastating as the earthquake.

The California Geological Survey has identified areas most vulnerable to liquefaction. Liquefaction occurs when ground shaking causes wet granular soils to change from a solid state to a liquid state. This results in the loss of soil strength and the soil's ability to support weight. Buildings and their occupants are at risk when the ground can no longer support these buildings and structures. Map 5-4 identifies areas in the vicinity that are subject to liquefaction and landslides associated with earthquake activities.

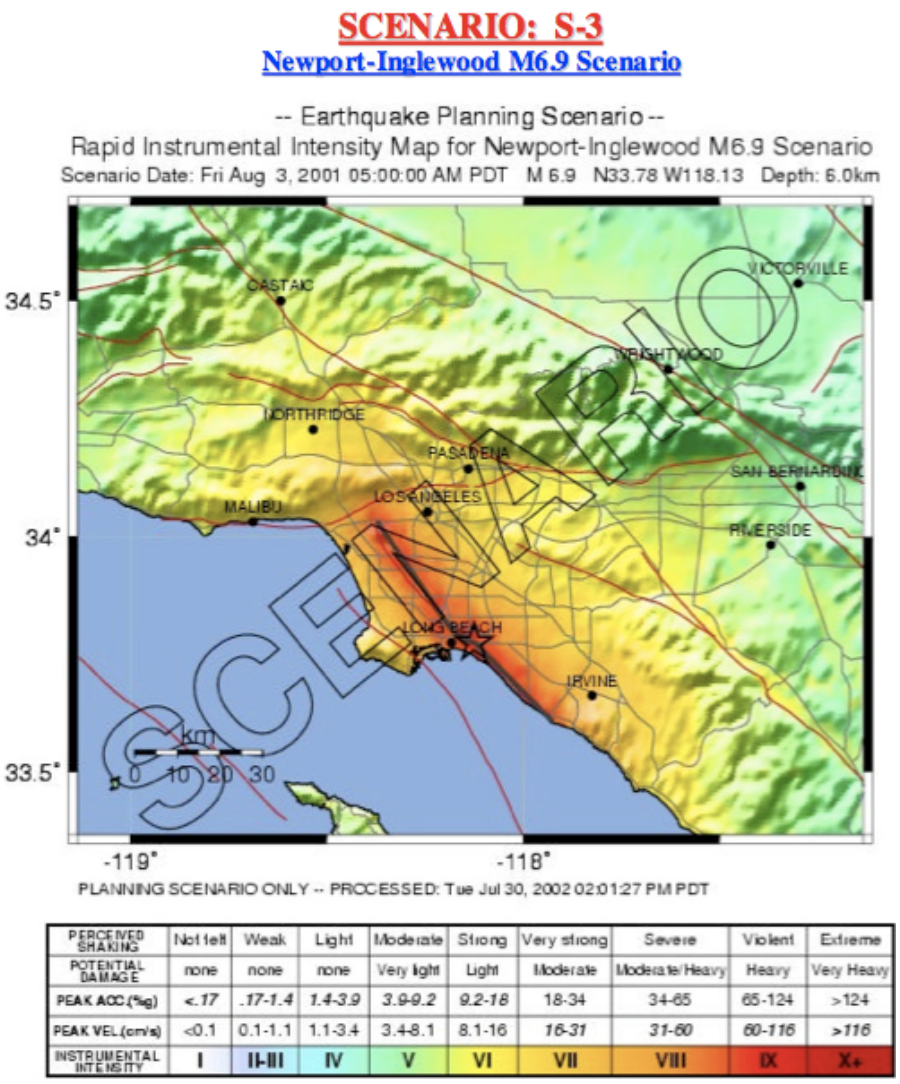
The City of El Segundo has facilities near liquefaction zones as shown on **Map 5-4: Slide and Liquefaction Hazards in the City of El Segundo**. The only liquefaction prone areas within El Segundo are located in the coastal area at the west side of the City.

Several major active faults exist in Los Angeles County, including the San Andres, Newport Inglewood, Elsinore, San Jacinto, Whittier, and Norwalk. The Newport Inglewood Fault and the Palos Verdes Fault Zone are considered to be the greatest potential threat to El Segundo, due to there proximity to the City. (Source: Southern California Earthquake Data Center).

Map 5-4: Slide and Liquefaction Hazards in the City of El Segundo
(Source: El Segundo General Plan)



Map 5-5: Seismic Shaking Intensities for the Newport-Inglewood Fault (Source: http://www.consrv.ca.gov/cgs/rghm/loss/index.htm)



Risk Analysis

Risk analysis is the third phase of a hazard assessment. Risk analysis involves estimating the damage and costs likely to be experienced in a geographic area over a period of time. Factors included in assessing earthquake risk include population and property distribution in the hazard area, the frequency of earthquake events, landslide susceptibility, buildings, infrastructure, and disaster preparedness of the region. This type of analysis can generate estimates of the damages to the region due to an earthquake event in a specific location. FEMA's software program, HAZUS, uses mathematical formulas and information about building stock, local geology and the location and size of potential earthquakes,

economic data, and other information to estimate losses from a potential earthquake. The HAZUS software is available from FEMA at no cost.

For greater Southern California there are multiple worst case scenarios, depending on which fault might rupture, and which communities are in proximity to the fault. But damage will not necessarily be limited to immediately adjoining communities. Depending on the hypocenter of the earthquake, seismic waves may be transmitted through the ground to unsuspecting communities. In the 1994 Northridge Earthquake, Santa Monica suffered extensive damage, even though there was a range of mountains between it and the origin of the earthquake.

Damages for a large earthquake almost anywhere in Southern California are likely to run into the billions of dollars. Although building codes are some of the most stringent in the world, ten's of thousands of older existing buildings were built under much less rigid codes. California has laws affecting un-reinforced masonry buildings (URM's) and although many building owners have retrofitted their buildings, hundreds of pre-1933 buildings still have not been brought up to current standards. The City of El Segundo has 14 un-reinforced masonry commercial buildings which have all been retrofitted. These buildings are located primarily in the "Old Town" area in the 100-300 blocks of Richmond Street and Virginia Street.

Non-structural bracing of equipment and contents is often the most cost-effective type of seismic mitigation. Inexpensive bracing and anchoring may be the most cost effective way to protect expensive equipment. Non-structural bracing of equipment and furnishings will also reduce the chance of injury for the occupants of a building.

City Earthquake Issues

What is Susceptible to Earthquakes?
Earthquake damage occurs because humans have built structures that cannot withstand severe shaking. Buildings, airports, schools, and lifelines (highways and utility lines) suffer damage in earthquakes and can cause death or injury to humans. The welfare of homes, major businesses, and public infrastructure is very important. Addressing the reliability of buildings, critical facilities, and infrastructure, and understanding the potential costs to government, businesses, and individuals as a result of an earthquake, are challenges faced by the region.

Dams
There are a total of 103 dams in Los Angeles County, owned by various agencies. These dams hold billions of gallons of water in reservoirs. Releases of water from the major reservoirs are designed to protect Southern California from flood waters and to store domestic water. Seismic activity can compromise the dam structures, and the resultant flooding could cause catastrophic flooding. Following the 1971 Sylmar Earthquake the Lower Van Norman Dam showed signs of structural compromise, and tens of thousands of persons had to be evacuated until the dam could be drained. The dam has never been refilled.

El Segundo is not downstream of any dams or major water reservoirs.

Buildings
The built environment is susceptible to damage from earthquakes. Buildings that collapse can trap and bury people. Lives are at risk and the cost to clean up the damages is great. In most California

communities, including the City of El Segundo, many buildings were built before 1993 when building codes were not as strict. City structures are built in compliance with State of California building standards, not those controlled by the local jurisdictions.

Retrofitting of critical facilities was mandated back in 1990. To date, the City has retrofitted 100% of City owned proposed structures. Given the retrofitting program, the number of buildings at risk has been decreased significantly. The California Seismic Safety Commission makes annual reports on the progress of the retrofitting of un-reinforced masonry buildings.

Infrastructure and Communication
Residents in the City of El Segundo commute frequently by automobiles and public transportation such as buses and light rail. An earthquake can greatly damage bridges and roads, hampering emergency response efforts and the normal movement of people and goods. Damaged infrastructure strongly affects the economy of the community because it disconnects people from work, school, food, and leisure, and separates businesses from their customers and suppliers.

Damage to Lifelines
Lifelines are the connections between communities and outside services. They include water and gas lines, transportation systems, electricity, and communication networks. Ground shaking and amplification can cause pipes to break open, power lines to fall, roads and railways to crack or move, and radio and telephone communication to cease. Disruption to transportation makes it especially difficult to bring in supplies or services. Lifelines need to be usable after earthquake to allow for rescue, recovery, and rebuilding efforts and to relay important information to the public.

Disruption of Critical Services
Critical facilities include police stations, fire stations, hospitals, shelters, and other facilities that provide important services to the City. These facilities and their services need to be functional after an earthquake event. See Section 4: Risk Assessment for critical and essential facilities vulnerable to earthquakes.

Businesses
Seismic activity can cause great loss to businesses, both large-scale corporations and small retail shops. When a company is forced to stop production for just a day, the economic loss can be tremendous, especially when its market is at a national or global level. Seismic activity can create economic loss that presents a burden to large and small shop owners who may have difficulty recovering from their losses. These closures can also have a significant impact on local school districts.

Forty percent of businesses do not reopen after a disaster and another twenty-five percent fail within one year according to the Federal Emergency Management Agency (FEMA). Similar statistics from the United States Small Business Administration indicate that over ninety percent of businesses fail within two years after being struck by a disaster. These businesses could easily be providers of services to the City. These disruptions would also impact the City.

Individual Preparedness
Because the potential for earthquake occurrences and earthquake related property damage is relatively high in the City of El Segundo, increasing individual preparedness is a significant need. Strapping down heavy furniture, water heaters, and expensive personal property, as well as being earthquake insured, and anchoring buildings to foundations are just a few steps individuals can take to prepare for an earthquake.

Death and Injury
Death and injury can occur both inside and outside of buildings due to collapsed buildings, falling equipment, furniture, debris, and structural materials. Downed power lines and broken water and gas lines can also endanger human life.

Fire
Downed power lines or broken gas mains may trigger fires. When fire stations suffer building or lifeline damage, quick response to extinguish fires is less likely. Furthermore, major incidents will demand a larger share of resources, and initially smaller fires and problems will receive little or insufficient resources in the initial hours after a major earthquake event. Loss of electricity may cause a loss of water pressure in some communities, further hampering fire fighting ability.

Debris
After damage to a variety of structures, much time is spent cleaning up bricks, glass, wood, steel or concrete building elements, office and home contents, and other materials. Developing a strong debris management strategy is essential in post-disaster recovery. Disasters do not exempt the City of El Segundo from compliance with AB 939 regulations.

SECTION 6: FLOOD HAZARDS

Why are Floods a Threat to the City of El Segundo?

Urban flooding could pose a threat to life and safety, and possibly can cause damage to public and private property. There is potential for localized urban flooding in natural depressions within the City's sand dune topography. Coastal flooding could also potentially impact a small portion of the City coastline area located generally between Grand Avenue and 45th Street. The City of El Segundo has not had a major flood event since the area was first settled in the 19th century.

History of Flooding in the City of El Segundo

Although the National Flood Insurance Program ranks the majority of the City of El Segundo as a Zone "X", or area of minimal flood hazard outside the 0.2% annual chance floodplain, it is still susceptible to occasional urban flooding. The main source of flooding for the City is from localized urban flooding caused by severe weather. This flooding is isolated to the natural depressions within the sand dune topography. A small portion of the City located on the coastline has been determined by the Federal Emergency Management Agency to be in a Special Flood Hazard Area (SFHA) Zone "A" which is subject to inundation by the 1% annual chance flood.

Flooding within the region can be earthquake-induced or can result from intense rainfall. The City of El Segundo is not at risk from flooding during a 100-year storm and there are no major dams or waterways located near the City. Thus, the potential for flood hazard is most specifically related to localized flooding that may result from inadequate storm drains during periods of heavy rainfall. Localized flooding due to an inadequate storm drain system could result in property damage and cause the disruption of traffic within the City. (Source: El Segundo General Plan)

El Segundo records indicate disaster assistance funds were received for the following local flood disasters: 1995 for severe storms resulting in $695,000, in 1998 El Nino resulting in $72,000, and in 2004/2005 severe storms resulting in $45,000. After 1995, the Los Angeles County Flood Control District performed a major upgrade of the storm drain system within the City, which has resulted in significantly less damages due to localized flooding in subsequent years.

See Section 6: Floods-Attachments 1 through 4 for information about historical flooding events.

Repetitive Loss

The City of El Segundo has no evidence of any flood-related repetitive loss properties.

Impact of Flooding in the City of El Segundo

Floods and their impacts will vary by location and severity of any given flood event and will likely only affect certain areas of the county during specific times. Based on the risk assessment, it is evident that floods will continue to have potentially devastating economic impacts to certain areas of the city. Impacts that are not quantified, but can be anticipated in future events, include:

- Injury and loss of life;
- Commercial and residential structural damage;
- Disruption of and damage to public infrastructure;

• Secondary health hazards e.g. mold and mildew;
• Damage to roads/bridges resulting in loss of mobility;
• Significant economic impact (jobs, sales, tax revenue) upon the community;
• Negative impact on commercial and residential property values; and
• Significant disruption to students and teachers as temporary facilities and relocations would likely be needed.

Historic Flooding in Los Angeles County

Historic Flooding in Los Angeles County Records show that since 1811, the Los Angeles River has flooded 30 times, on average once every 6.1 years. But averages are deceiving, for the Los Angeles basin goes through periods of drought and then periods of above average rainfall. Between 1889 and 1891 the river flooded every year, from 1941 to 1945, the river flooded 5 times. Conversely, from 1896 to 1914, and again from 1944 to 1969, a period of 25 years, the river did not have serious floods.

Average annual precipitation in Los Angeles County ranges from 13 inches on the coast to approximately 40 inches on the highest point of the Peninsular Mountain Range that transects the county. Several factors determine the severity of floods, including rainfall intensity and duration. A large amount of rainfall over a short time span can result in flash flood conditions. A sudden thunderstorm or heavy rain, dam failure, or sudden spills can cause flash flooding. The National Weather Service's definition of a flash flood is a flood occurring in a watershed where the time of travel of the peak of flow from one end of the watershed to the other is less than six hours.

Table 6-1: Historical Records of Large Floods in Los Angeles County
(Source: http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwevent~ShowEvent~192429)

Date	Loss Estimation	Source of Estimate	Comments
1995	$50 million	National Oceanic and Atmospheric Association	Flash Flood
1995	$50 thousand	National Oceanic and Atmospheric Association	Flood/Flash Flood
2005	$1 million	National Oceanic and Atmospheric Association	Flash Flood

Naturally, this rainfall moves rapidly downstream, often with severe consequences for anything in its path. In extreme cases, flood-generated debris flows will roar down a canyon at speeds near 40 miles per hour with a wall of mud, debris and water many feet high.

In Southern California, stories of floods, debris flows, persons buried alive under tons of mud and rock and persons swept away to their death in a river flowing at thirty-five miles an hour are without end.

What Factors Create Flood Risk?
Flooding occurs when climate, geology, and hydrology combine to create conditions where water flows outside of its usual course.

Winter Rainfall
Over the last 125 years, the average annual rainfall in the region is 15 inches. But the term "average" means very little because there is a fluctuation rate in the coastal rains as high as thirty percent in forty-five out of every one hundred years, which is coupled with a highly seasonal rainfall pattern with only fifteen percent falling during the hottest six months of the year.

Monsoons
Another relatively regular source for heavy rainfall, particularly in nearby mountains and foothills is from summer tropical storms. Table 6-2 lists tropical storms that have had significant rainfall in the past century, and the general areas affected by these storms. These tropical storms usually coincide with El Niño years.

Table 6-2: Tropical Cyclones of Southern California
(Source: http://www.fema.gov/nwz97/eln_scal.shtm)

Month-Year	Date(s)	Area(s) Affected	Rainfall
July 1902	20th and 21st	Deserts and Southern Mountains	up to 2"
Aug. 1906	18th and 19th	Deserts and Southern Mountains	up to 5"
Sept. 1910	15th	Mountains of Santa Barbara County	2"
Aug. 1921	20th and 21st	Deserts and Southern Mountains	up to 2"
Sept. 1921	30th	Deserts	up to 4"
Sept. 1929	18th	Southern Mountains and Deserts	up to 4"
Sept. 1932	28th - Oct 1st	Mountains and Deserts, 15 Fatalities	up to 7"
Aug. 1935	25th	Southern Valleys, Mountains and Deserts	up to 2"
Sept. 1939	4th - 7th	Southern Mountains, Southern and Eastern Deserts	up to 7"
	11th and 12th	Deserts, Central and Southern Mountains	up to 4"
	19th - 21st	Deserts, Central and Southern Mountains	up to 3"
	25th	Long Beach, W/ Sustained Winds of 50 Mph	5"
		Surrounding Mountains	6 to 12"
Sept. 1945	9th and 10th	Central and Southern Mountains	up to 2"
Sept. 1946	30th - Oct 1st	Southern Mountains	up to 4"
Aug. 1951	27th - 29th	Southern Mountains and Deserts	2 to 5"
Sept. 1952	19th - 21st	Central and Southern Mountains	up to 2"
July 1954	17th - 19th	Deserts and Southern Mountains	up to 2"

Month-Year	Date(s)	Area(s) Affected	Rainfall
July 1958	28th and 29th	Deserts and Southern Mountains	up to 2"
Sept. 1960	9th and 10th	Julian	3.40"
Sept. 1963	17th - 19th	Central and Southern Mountains	up to 7"
Sept. 1967	1st - 3rd	Southern Mountains and Deserts	2"
Oct. 1972	6th	Southeast Deserts	up to 2"
Sept. 1976	10th and 11th	Central and Southern Mountains. Ocotillo, CA was Destroyed 3 Fatalities	6 to 12"
Aug. 1977	n/a	Los Angeles	2"
		Mountains	up to 8"
Oct. 1977	6th and 7th	Southern Mountains and Deserts	up to 2"
Sept. 1978	5th and 6th	Mountains	3"
Sept. 1982	24th - 26th	Mountains	up to 4"
Sept. 1983	20th and 21st	Southern Mountains and Deserts	up to 3"

Geography and Geology

The greater Southern California region is the product of rainstorms and erosion for millennia. "Most of the mountains that ring the valleys and coastal plain are deeply fractured faults and, as they (the mountains) grew taller, their brittle slopes were continually eroded. Rivers and streams carried boulders, rocks, gravel, sand, and silt down these slopes to the valleys and coastal plain....In places these sediments are as much as twenty thousand feet thick".

Much of the coastal plain rests on the ancient rock debris and sediment washed down from the mountains. This sediment can act as a sponge, absorbing vast quantities of rain in those years when heavy rains follow a dry period. But like a sponge that is near saturation, the same soil fills up rapidly when a heavy rain follows a period of relatively wet weather. So even in some years of heavy rain, flooding is minimal because the ground is relatively dry. The same amount of rain following a wet period of time can cause extensive flooding.

As a region, the majority of buildable portions of Los Angeles County are developed. This leaves very little open land to absorb rainfall. This lack of open ground forces water to remain on the surface and rapidly accumulate. If it were not for flood control systems including concrete lined river and stream beds, flooding would be a much more common occurrence. In-fill building is becoming a much more common practice in many areas. Developers tear down an older home which typically covers up to 40% of the lot size and replacing it with three or four town homes or apartments which may cover 90-95% of the lot.

Another potential source of flooding is "asphalt creep." The street space between the curbs of a street is a part of the flood control system. Water leaves property and accumulates in the streets, where it is directed

towards the underground portion of the flood control system. The carrying capacity of the street is determined by the width of the street and the height of the curbs along the street. Often, when streets are being resurfaced, a one to two inch layer of asphalt is laid down over the existing asphalt. This added layer of asphalt subtracts from the rated capacity of the street to carry water. Thus the original engineered capacity of the entire storm drain system is marginally reduced over time. Subsequent re-paving of the street will further reduce the engineered capacity even more.

Flood Terminology

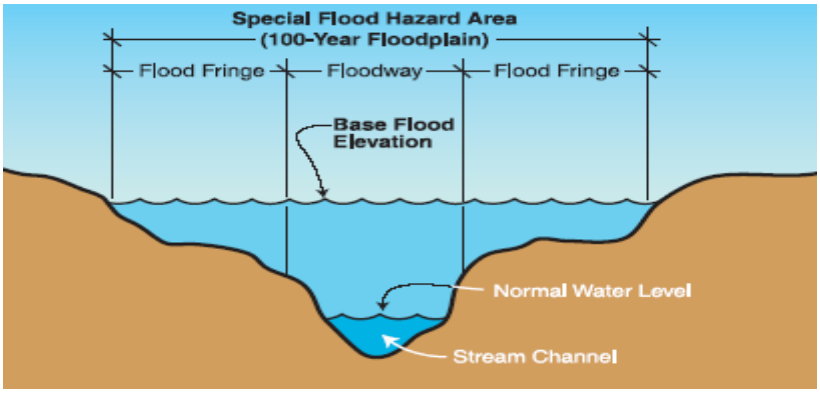
Floodplain

A floodplain is a land area adjacent to a river, stream, lake, estuary, or other water body that is subject to flooding. This area, if left undisturbed, acts to store excess flood water. The floodplain is made up of two sections: the floodway and the flood fringe.

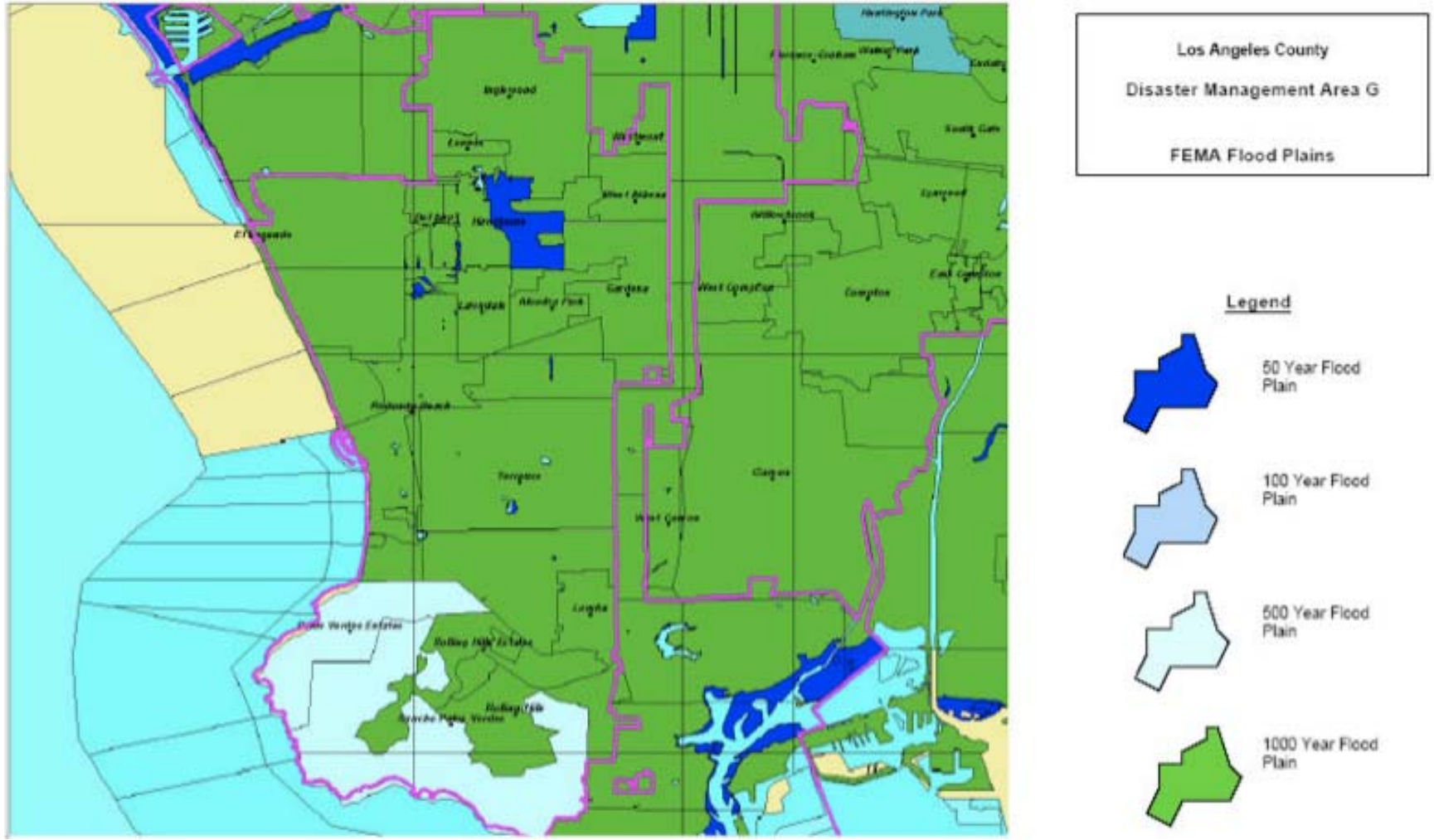
100-Year Flood

The 100-year flooding event is the flood having a 1% chance of being equaled or exceeded in magnitude in any given year. Contrary to popular belief, it is not a flood occurring once every 100 years. The 100-year floodplain is the area adjoining a river, stream, or watercourse covered by water in the event of a 100-year flood. Schematic 6-1 Floodplain shows the relationship of the floodplain and the floodway. The coastal area of El Segundo deemed to be a Special Flood Hazard Area (SFHA) in Zone "A" is subject to inundation by the 1% annual chance flood.

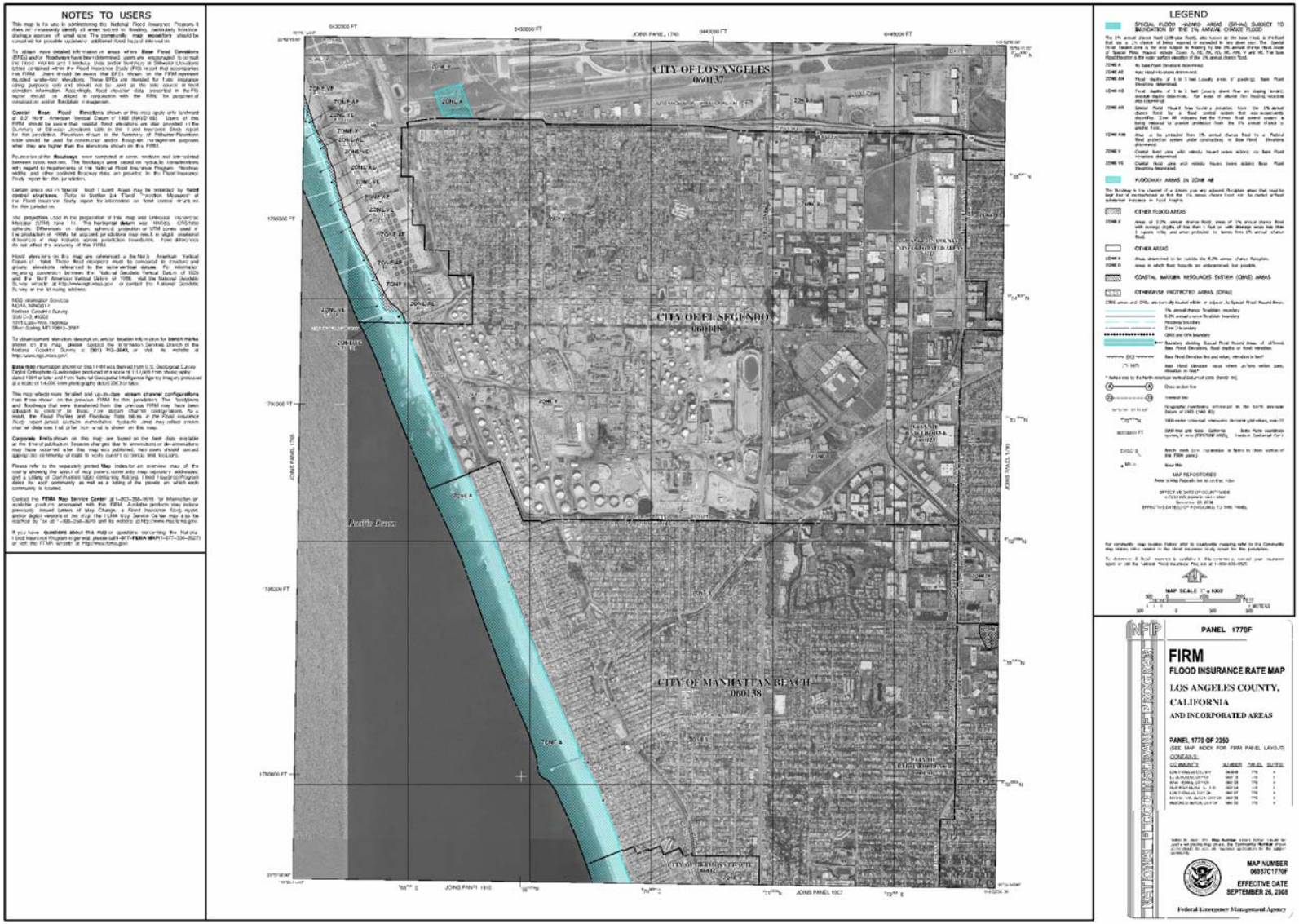
Schematic 6-1: Floodplain and Floodway
(Source: FEMA How-To-Guide Assessing Hazards)



Map 6-1: Floodplains in Los Angeles County – Area G
(Source: Los Angeles County All-Hazard Mitigation Plan)



Map 6-2: Flood Insurance Rate Map Los Angeles County, California and Incorporated Areas
(Source: Federal Emergency Management Agency, National Flood Insurance Program)



Floodway
The floodway is one of two main sections that make up the floodplain. Floodways are defined for regulatory purposes. Unlike floodplains, floodways do not reflect a recognizable geologic feature. For NFIP purposes, floodways are defined as the channel of a river or stream, and the overbank areas adjacent to the channel. The floodway carries the bulk of the flood water downstream and is usually the area where water velocities and forces are the greatest. NFIP regulations require that the floodway be kept open and free from development or other structures that would obstruct or divert flood flows onto other properties.

The City of El Segundo regulations prohibit all development in the floodway. The NFIP floodway definition is "the channel of a river or other watercourse and adjacent land areas that must be reserved in order to discharge the base flood without cumulatively increasing the water surface elevation more than one foot. Floodways are not mapped for all rivers and streams but are generally mapped in developed areas.

Base Flood Elevation (BFE)
The term "Base Flood Elevation" refers to the elevation (normally measured in feet above sea level) that the base flood is expected to reach. Base flood elevations can be set at levels other than the 100-year flood. Some communities use higher frequency flood events as their base flood elevation for certain activities, while using lower frequency events for others. For example, for the purpose of storm water management, a 25-year flood event might serve as the base flood elevation; while the 500-year flood event may serve as base flood elevation for the tie down of mobile homes. The regulations of the NFIP focus on development in the 100-year floodplain.

Characteristics of Flooding
There are several types of flooding that could affect the City: coastal, urban, and reservoir failure (see descriptions below). In addition, any low-lying areas have a potential for ponding. The flooding of developed areas may occur when the amount of water generated from rainfall and runoff exceeds a storm water system’s capability to remove it.

Urban Flooding
As land is converted from fields or woodlands to roads and parking lots, it loses its ability to absorb rainfall. Urbanization of a watershed changes the hydrologic systems of the basin. Heavy rainfall collects and flows faster on impervious concrete and asphalt surfaces. The water moves from the clouds, to the ground, and into streams at a much faster rate in urban areas. Adding these elements to the hydrological systems can result in flood waters that rise very rapidly and peak with violent force.

The City of El Segundo has a high concentration of impermeable surfaces that either collect water, or concentrate the flow of water in unnatural channels. During periods of urban flooding, streets can become swift moving rivers and basements can fill with water. Storm drains often back up with vegetative debris causing additional, localized flooding. There are also localized areas of potential for frequent flooding in natural depressions within the sand dune topography.

Another possible source of urban flooding could result from damage to the two in-ground concrete reservoirs and one steel elevated water tank containing 9.6 million gallons that are located in the 300 block of Lomita Street.

Coastal Flooding
Low lying coastal communities of Southern California have one other source of flooding, coastal flooding. This occurs most often during storms which bring higher than normal tides. Storms,

the time of year and the tidal cycle can sometimes work to bring much higher than normal tides which cause flooding in low lying coastal areas. This hazard however is limited to those areas.

What is the Effect of Development on Floods?
When structures or fill are placed in the floodway or floodplain water is displaced. Development raises the river levels by forcing the river to compensate for the flow space obstructed by the inserted structures and/or fill. When structures or materials are added to the floodway or floodplain and no fill is removed to compensate, serious problems can arise. Flood waters may be forced away from historic floodplain areas. As a result, other existing floodplain areas may experience flood waters that rise above historic levels. Displacement of only a few inches of water can mean the difference between no structural damage occurring in a given flood event, and the inundation of many homes, businesses, and other facilities. Careful attention should be given to development that occurs within the floodway to ensure that structures are prepared to withstand base flood events. In highly urbanized areas, increased paving can lead to an increase in volume and velocity of runoff after a rainfall event, exacerbating the potential flood hazards. Care should be taken in the development and implementation of storm water management systems to ensure that these runoff waters are dealt with effectively.

How are Flood-Prone Areas Identified?
Flood maps and Flood Insurance Studies (FIS) are often used to identify flood-prone areas. The NFIP was established in 1968 as a means of providing low-cost flood insurance to the nation's flood-prone communities. The NFIP also reduces flood losses through regulations that focus on building codes and sound floodplain management. NFIP regulations (44 Code of Federal Regulations (CFR) Chapter 1, Section 60, 3) require that all new construction in floodplains must be elevated at or above base flood level.

Flood Insurance Rate Maps (FIRM) and Flood Insurance Studies (FIS) Floodplain maps are the basis for implementing floodplain regulations and for delineating flood insurance purchase requirements. A Flood Insurance Rate Map (FIRM) is the official map produced by FEMA which delineates SFHA in communities where NFIP regulations apply. FIRMs are also used by insurance agents and mortgage lenders to determine if flood insurance is required and what insurance rates should apply.

Water surface elevations are combined with topographic data to develop FIRMs. FIRMs illustrate areas that would be inundated during a 100-year flood, floodway areas, and elevations marking the 100-year-flood level. In some cases they also include base flood elevations (BFEs) and areas located within the 500-year floodplain. Flood Insurance Studies and FIRMs produced for the NFIP provide assessments of the probability of flooding at a given location. FEMA conducted many Flood Insurance Studies in the late 1970s and early 1980s. These studies and maps represent flood risk at the point in time when FEMA completed the studies. However, it is important to note that not all 100-year or 500-year floodplains have been mapped by FEMA.

FEMA flood maps are not entirely accurate. These studies and maps represent flood risk at the point in time when FEMA completed the studies, and does not incorporate planning for floodplain changes in the future due to new development. Although FEMA is considering changing that policy, it is optional for local communities. The FEMA FIRM map for the City of El Segundo was originally published in 1987. FEMA recently issued a new FIRM map of El Segundo (September 26, 2008). **Map 6-2: Flood Insurance Rate Map Los Angeles County, California and Incorporated Areas** represents the current status of the FIRM map scheduled to become effective in September 2008. Human-caused and natural changes to the environment have changed the dynamics of storm water run-off since then.

Flood Mapping Methods and Techniques
Although many communities rely exclusively on FIRMs to characterize the risk of flooding in their area, there are some flood-prone areas that are not mapped but remain susceptible to flooding. These areas include locations next to small creeks, local drainage areas, and areas susceptible to manmade flooding.

Communities find it particularly useful to overlay flood hazard areas on tax assessment parcel maps. This allows a community to evaluate the flood hazard risk for a specific parcel during review of a development request. Coordination between FEMA and local planning jurisdictions is the key to making a strong connection with GIS technology for the purpose of flood hazard mapping.

Hazard Assessment

Hazard Identification
Hazard identification is the first phase of flood-hazard assessment. Identification is the process of estimating: (1) the geographic extent of the floodplain (i.e., the area at risk from flooding); (2) the intensity of the flooding that can be expected in specific areas of the floodplain; and (3) the probability of occurrence of flood events. This process usually results in the creation of a floodplain map. Floodplain maps provide detailed information that can assist jurisdictions in making policies and land-use decisions.

Vulnerability Assessment
Vulnerability assessment is the second step of flood-hazard assessment. It combines the floodplain boundary, generated through hazard identification, with an inventory of the property within the floodplain. Understanding the population and property exposed to hazards will assist in reducing risk and preventing loss from future events. Because site-specific inventory data and inundation levels given for a particular flood event (10-year, 25-year, 50-year, 100-year, and 500-year) are not readily available, calculating a community's vulnerability to flood events is not straightforward. The amount of property in the floodplain, as well as the type and value of structures on those properties, should be calculated to provide a working estimate for potential flood losses.

None of the City of El Segundo's facilities are located within a 100-year floodplain.

Risk Analysis
Risk analysis is the third and most advanced phase of a hazard assessment. It builds upon the hazard identification and vulnerability assessment. A flood risk analysis for the City of El Segundo should include two components: (1) the life and value of property that may incur losses from a flood event (defined through the vulnerability assessment); and (2) the number and type of flood events expected to occur over time. Within the broad components of a risk analysis, it is possible to predict the severity of damage from a range of events. Flow velocity models can assist in predicting the amount of damage expected from different magnitudes of flood events.

Community Flood Issues

What is Susceptible to Damage during a Flood Event?
The largest impact on communities from flood events is the loss of life and property. During certain years, property losses resulting from flood damage have been considerable. Losses in the City of El Segundo over the past 25 years have totaled approximately $812,000. In 1995 and 1998, flood related emergencies were declared. The City of El Segundo is familiar with the

flooding and destruction caused by storms. In 1998, the El Nino storms caused approximately $400,000 in flood damage along Smokey Hollow, blocking Franklin Street. Mitigation measures of installing additional water pumping stations have assisted in removing water from the area. A powerful, wet storm system dropped three to six inches of rain over portions of Los Angeles County. The heavy rains caused extensive flooding in the Los Angeles Basin with Long Beach being the hardest hit. A section of 20th Street near Signal Hill was submerged under two to four feet of water that flowed into adjacent homes. Between 200 and 300 people were evacuated from Leisure World at Seal Beach when floodwaters inundated homes. The floodwaters caused an estimated $3 million in damage to the local amphitheater, church, community center, and pharmacy. Flood waters also collapsed the 405 Freeway overpass, and sent water and mud into the street below, between Lakewood Boulevard and Clark Avenue. Sepulveda Boulevard near the Harbor Freeway was four feet under water. Motorists were left stranded in their cars due to the floodwaters, and one man died in his stranded car when water filled the exhaust pipe. A nearby wash overflowed onto Orchard Village Road in Santa Clarita, and two men had to be rescued when their truck became submerged in the raging waters.

Property Loss Resulting from Flooding Events

The type of property damage caused by flood events depends on the depth and velocity of the flood waters. Faster moving flood waters can wash buildings off their foundations and sweep cars downstream. Pipelines, bridges, and other infrastructure can be damaged when high waters combine with flood debris. Extensive damage can be caused by basement flooding and landslide damage related to soil saturation from flood events. Most flood damage is caused by water saturating materials susceptible to loss (i.e., wood, insulation, wallboard, fabric, furnishings, floor coverings, and appliances). In many cases, flood damage to homes renders them unlivable.

Business/Industry

Flood events impact businesses by damaging property and by interrupting business. Flood events can cut off customer access to a business as well as close a business for repairs. A quick response to the needs of businesses affected by flood events can help a community maintain economic vitality in the face of flood damage. Responses to business damages can include funding to assist owners in elevating or relocating flood-prone business structures.

Public Infrastructure

Publicly owned facilities are a key component of daily life for all citizens of the county. Damage to public water and sewer systems, transportation networks, flood control facilities, emergency facilities, and offices can hinder the ability of the government to deliver services. Government can take action to reduce risk to public infrastructure from flood events, as well as craft public policy that reduces risk to private property from flood events.

Roads

During hazard events, or any type of emergency or disaster, dependable road connections are critical for providing emergency services. Roads systems in the City of El Segundo are maintained by multiple jurisdictions. Federal, state, county, and city governments all have a stake in protecting roads from flood damage. Road networks often traverse floodplain and floodway areas. Transportation agencies responsible for road maintenance are typically aware of roads at risk from flooding.

Storm Water Systems

Local drainage problems are common throughout the City of El Segundo. The City of El Segundo maintenance and operations staff is aware of local drainage threats. The problems are often present where storm water runoff enters culverts or goes underground into storm sewers.

Inadequate maintenance can also contribute to the flood hazard in urban areas.

Water/Wastewater Treatment Facilities
The City of El Segundo receives its water services from the West Basin Municipal Water District which is responsible for both potable and reclaimed water. Sewage from the west part of town is sent to the Hyperion Treatment Plant on Vista Del Mar, while sewage from the east side of the City goes to the Los Angeles County Sanitation District in San Pedro.

Water Quality
Environmental quality problems include bacteria, toxins, and pollution.

Attachment 1
City Council Resolution No. 4495
Authorizing Contracting in Response to an Emergency

RESOLUTION NO. 4495

A RESOLUTION ADOPTED PURSUANT TO PUBLIC CONTRACTS CODE § 20168 FINDING THAT AN EMERGENCY EXISTS WITHIN THE CITY AND AUTHORIZING CONTRACTING WITHOUT THE NEED FOR BIDDING PURSUANT TO § 22050.

The City Council does resolve as follows

SECTION 1 The City Council finds and declares as follows

A Pursuant to Public Contracts Code ("PCC") § 20168, the City Council may, upon a four-fifths vote, declare that public interest and necessity demand the immediate expenditure of public money to safeguard life, health, or property because of an emergency

B In accordance with PCC §§ 20168 and 22050, the City Council may repair or replace a public facility, take any directly related and immediate action required by that emergency, and procure the necessary equipment, services, and supplies for those purposes, without giving notice for bids to let contracts

C On November 6, 2006, a breakage of an 8-inch water pipeline occurred at the intersection of Alaska Avenue and Hawaii street causing flooding, extensive pavement damage and closure of Alaska Avenue and Hawaii Street in the vicinity of the intersection

D In compliance with applicable law, and to protect public, health, safety and welfare, the City took immediate emergency action to repair the broken water pipeline and street pavement in accordance with El Segundo Municipal Code ("ESMC")§ 1-7-12

E The broken water pipeline and consequent flooding constituted a sudden, unexpected occurrence that posed a clear and imminent danger to the City property, its citizens, and employees This threat required immediate action to prevent or mitigate the loss or impairment of essential public services.

F Under such emergency conditions, the City Council finds that the delay resulting from public bidding would imperil essential public services

SECTION 2 In light of the emergency described above, the City Council directs the City Manager, or designee, to take all steps necessary to protect public health, safety and welfare including, without limitation, awarding contracts in accordance with PCC § 22050

SECTION 3· This Resolution will become effective immediately upon adoption and remain effective unless superseded by a subsequent resolution

PASSED AND ADOPTED this 21st day of November, 2006

Kelly McDowell, Mayor

APPROVED AS TO FORM:
Mark D Hensley, City Attorney

By _____
Karl H Berger, Assistant City Attorney

CERTIFICATION

STATE OF CALIFORNIA)
COUNTY OF LOS ANGELES) SS
CITY OF EL SEGUNDO)

I, Cindy Mortesen, City Clerk of the City of El Segundo, California, DO HEREBY CERTIFY that the whole number of members of the City Council of the said City is five, that the foregoing resolution, being RESOLUTION NO 4495 was duly passed and adopted by the said City Council, approved and signed by the Mayor of said City, and attested by the City Clerk of said City, all at a regular meeting of the said Council held on the 21st day of November, 2006, and the same was so passed and adopted by the following vote

AYES	McDowell, Busch, Boulgarides, Jacobson
NOES	None
ABSENT	Fisher
ABSTENTION:	None
NOT PARTICIPATING	None

WITNESS MY HAND THE OFFICIAL SEAL OF SAID CITY this 21st day of November, 2006

Cindy Mortesen, City Clerk
Of the City of El Segundo,
California

Attachment 2
City Council Resolution No.4469
Authorizing Contracting in Response to an Emergency

RESOLUTION NO. 4469

A RESOLUTION ADOPTED PURSUANT TO PUBLIC CONTRACTS CODE § 20168 FINDING THAT AN EMERGENCY EXISTED WITHIN THE CITY AND AUTHORIZING CONTRACTING WITHOUT THE NEED FOR BIDDING PURSUANT TO § 22050.

The City Council does resolve as follows

SECTION 1 The City Council finds and declares as follows

A Pursuant to Public Contracts Code ("PCC") § 20168, the City Council may, upon a four-fifths vote, declare that public interest and necessity demand the immediate expenditure of public money to safeguard life, health, or property because of an emergency

B In accordance with PCC §§ 20168 and 22050, the City Council may repair or replace a public facility, take any directly related and immediate action required by that emergency, and procure the necessary equipment, services, and supplies for those purposes, without giving notice for bids to let contracts.

C On April 21, 2006, a breakage in 12" water main had occurred in Douglas Street at the intersection of Mariposa Avenue causing flooding, extensive pavement damage and closure of Douglas Street between El Segundo Boulevard and Imperial Highway and Mariposa Avenue between Nash and Douglas Streets.

D In compliance with applicable law, and to protect public, health, safety and welfare, the City took immediate emergency action to repair the broken water main and street pavement and open Douglas Street and Mariposa Avenue to thru traffic in accordance with El Segundo Municipal Code ("ESMC")§ 1-7-12

E The broken water main and consequent flooding constituted a sudden, unexpected occurrence that poses a clear and imminent danger to the City property, its citizens, and employees This threat requires immediate action to prevent or mitigate the loss or impairment of essential public services.

F Under such emergency conditions, the City Council finds that the delay resulting from public bidding would imperil essential public services

SECTION 2 In light of the emergency described above, the City Council directs the City Manager, or designee, to take all steps necessary to protect public health, safety and welfare including, without limitation, awarding contracts in accordance with PCC § 22050

SECTION 3 This Resolution will become effective immediately upon adoption and remain effective unless superseded by a subsequent resolution

PASSED AND ADOPTED this 7th day of June, 2006

Kelly McDowell, Mayor

APPROVED AS TO FORM
Mark D Hensley, City Attorney

By
Karl H Berger, Assistant City Attorney

CERTIFICATION

STATE OF CALIFORNIA)
COUNTY OF LOS ANGELES) SS
CITY OF EL SEGUNDO)

I, Cindy Mortesen, City Clerk of the City of El Segundo, California, DO HEREBY CERTIFY that the whole number of members of the City Council of the said City is five, that the foregoing resolution, being RESOLUTION NO 4469 was duly passed and adopted by the said City Council, approved and signed by the Mayor of said City, and attested by the City Clerk of said City, all at a regular meeting of the said Council held on the 7th day of June, 2006, and the same was so passed and adopted by the following vote

AYES	McDowell, Busch, Boulgarides, Jacobson, Fisher
NOES	None
ABSENT	None
ABSTENTION	None
NOT PARTICIPATING	None

WITNESS MY HAND THE OFFICIAL SEAL OF SAID CITY this 7th day of June, 2006

Cindy Mortesen, City Clerk
Of the City of El Segundo,
California
(SEAL)

Attachment 3
City Council Resolution No. 4050
Proclaiming Existence of a Local Emergency

RESOLUTION NO. 4050

RESOLUTION PROCLAIMING EXISTENCE OF A LOCAL EMERGENCY

El Segundo City Council

WHEREAS, Ordinance No. 917 of the City of El Segundo empowers the City Council to proclaim the existence or threatened existence of a local emergency when said city is affected or likely to be affected by a public calamity; and

WHEREAS, said City Council has been requested by the Director of Emergency Services of said city to proclaim the existence of a local emergency therein; and

WHEREAS, said City Council does hereby find:

That conditions of extreme peril to the safety of persons and property have arisen within said city, caused by severe storm commencing on or about 6 a.m. on the 3 day of February, 1998; and

That the aforesaid conditions of extreme peril warrant and necessitate the proclamation of the existence of a local emergency;

NOW, THEREFORE, IT IS HEREBY PROCLAIMED that a local emergency now exists throughout said city; and

IT IS HEREBY FURTHER PROCLAIMED AND ORDERED that during the existence of said local emergency the powers, functions, and duties of the Director of Emergency Services and the emergency organization of this city shall be those prescribed by state law, by ordinances, and resolutions of this city and approved by the City Council on February 3, 1998.

IT IS FURTHER PROCLAIMED AND ORDERED that said local emergency shall be deemed to continue to exist until its termination is proclaimed by the City Council of the City of El Segundo, State of California.

Dated: February 3, 1998

CITY COUNCIL

ATTEST: Tracy Martson

City of El Segundo

Sandra Jacobs

4050

CERTIFICATION

STATE OF CALIFORNIA]
COUNTY OF LOS ANGELES] SS
CITY OF EL SEGUNDO]

I, Cindy Mortesen, City Clerk of the City of El Segundo, California, DO HEREBY CERTIFY that the whole number of members of the City Council of the said City is five; that the foregoing resolution, being **RESOLUTION NO. 4050** was duly passed and adopted by the said City Council, approved and signed by the Mayor of said City, and attested by the City Clerk of said City, all at a **regular meeting** of the said Council held on the **3rd day of February, 1998**, and the same was so passed and adopted by the following vote:

AYES:	Mayor Jacobs, Mayor ProTem Wernick, Councilman Weston, Councilman Gordon and Councilwoman Friedkin
NOES:	None
ABSENT:	Nons
ABSTENTION:	None
NOT PARTICIPATING:	None

WITNESS MY HAND THE OFFICIAL SEAL OF SAID CITY this **5th day of February, 1998**.

Cindy Mortesen, City Clerk
of the City of El Segundo,
California
(SEAL)

4050

Attachment 3
City Council Resolution No. 3903
Proclaiming the Existence of a Local Emergency

RESOLUTION NO. 3903

RESOLUTION PROCLAIMING THE EXISTENCE OF A LOCAL EMERGENCY
(by City Council or Board of Supervisors)

WHEREAS, Ordinance No. 917 of the City of El Segundo empowers the City Council to proclaim the existence or threatened existence of a local emergency when said city is affected by a public calamity; and

WHEREAS, said City Council has been requested by the Director of Emergency Services of said city to proclaim the existence of a local emergency therein; and

WHEREAS, the City Council does hereby find:

That conditions of extreme peril to the safety of persons and property have arisen within said city caused by flooding commencing on January 4, 1995
(fire, flood, storm, epidemic, riot, earthquake, drought, energy shortage, or other causes)
commencing on or about 6:00 a.m.; and

That aforesaid conditions of extreme peril warrant and necessitate the proclamation of the existence of a local emergency:

NOW, THEREFORE, IT IS HEREBY PROCLAIMED that a local emergency now exists throughout said city; and

IT IS FURTHER PROCLAIMED AND ORDERED that during the existence of said local emergency the powers, functions, and duties of the Director of Emergency Services and the emergency organization of this city shall be those prescribed by state law, by ordinances, and resolutions of this city approved by the City Council on January 9, 1995.

Dated: 1-11-95

ATTEST: Sandy Morteo

CITY COUNCIL
City of El Segundo

Mayor

STATE OF CALIFORNIA]
COUNTY OF LOS ANGELES] SS
CITY OF EL SEGUNDO]

I, Cindy Mortesen, City Clerk of the City of El Segundo, California, DO HEREBY CERTIFY that the whole number of members of the City Council of the said City is five; that the foregoing resolution, being **RESOLUTION NO. 3903** was duly passed and adopted by the said City Council, approved and signed by the Mayor or said City, and attested by the City Clerk of said City, all at a **regular meeting** of the said Council held on the **9th day of January 1995,** and the same was so passed and adopted by the following vote:

AYES: Mayor Jacobson, Mayor ProTem Weston, Councilman Switz, Councilman Robbins, and Councilwoman Friedkin.

NOES: None

ABSENT: None

ABSTENTION: None

WITNESS MY HAND THE OFFICIAL SEAL OF SAID CITY this **13h day of January, 1995.**

CINDY MORTESEN
City Clerk of the
City of El Segundo,
California

(SEAL)

Attachment 4
City Council Resolution No. 3769
Declaring the Existence of a State of Local Emergency

RESOLUTION NO. 3769

A RESOLUTION OF THE CITY COUNCIL OF THE CITY OF EL SEGUNDO, CALIFORNIA, DECLARING THE EXISTENCE OF A STATE OF **LOCAL EMERGENCY** ON OR ABOUT 5:30 P.M., WEDNESDAY, APRIL 29, 1992 THROUGH NOON, MONDAY, MAY 4, 1992 AS A RESULT OF THE CIVIL DISTURBANCE DUE TO THE LOS ANGELES RIOTS.

WHEREAS, Ordinance No. 917, of the City of El Segundo empowers the City to proclaim the existence or threatened existence of a local emergency when said City is affected or likely to be affected by a public calamity; and

WHEREAS, conditions of extreme peril to the safety of persons and property of the citizens of El Segundo did arise on or about 5:30 p.m., Wednesday, April 29, 1992 and lasted through noon on Monday, May 4, 1992, as a direct result of the civil disturbance due to the Los Angeles Riots.

NOW, THEREFORE, THE CITY COUNCIL OF THE CITY OF EL SEGUNDO, CALIFORNIA, DOES HEREBY DECLARE that a local emergency existed in the City of El Segundo on or about 5:30 p.m., April 29, 1992 through noon on Monday, May 4, 1992.

IT IS FURTHER RESOLVED that said local emergency shall be deemed to have existed until noon, Monday, May 4, 1992.

APPROVED, PASSED and ADOPTED this 29th day of June, 1992.

Carl Jacobson, Mayor

By: Cindy Mortesen, City Clerk

joa:R-riots.Emg

CERTIFICATION

STATE OF CALIFORNIA }

COUNTY OF LOS ANGELES } SS

CITY OF EL SEGUNDO }

I, Cindy Mortesen, CITY CLERK OF THE CITY OF EL SEGUNDO, CALIFORNIA, and ex-officio Clerk of the City Council of said City, do hereby certify and attest the foregoing to be a full, and correct copy of the original **RESOLUTION NO. 3769** in this office, and that I have carefully compared the same with the original.

IN WITNESS WHEREOF, I have hereunto set my hand and affixed the official seal of the City of El Segundo, California this 1st day of July, 1992.

CINDY MORTESEN
City Clerk
City of El Segundo
California

SECTION 7: WINDSTORM HAZARDS

Why are Severe Windstorms a Threat to the City of El Segundo?

Although the City of El Segundo has not been victim to significant damage from severe windstorms, it has been moderately impacted in the past with both El Nino events and Santa Ana winds.

Severe wind storms pose a significant risk to life and property in El Segundo by creating conditions that disrupt essential systems such as public utilities, telecommunications, and transportation routes. High winds can and do occasionally cause tornado-like damage to local homes and businesses in and near El Segundo. High winds can have destructive impacts, especially to trees, power lines, and utility services.

The County of Los Angeles All-Hazards Mitigation Plan classifies "severe weather" as a moderate risk hazard and "tornadoes" as a low risk hazard. The following is an excerpt from the All-Hazards Plan concerning the existence and impacts of Santa Ana winds:

> "The *Santana Winds* or *Santa Ana Winds*, most common in the late summer and early fall, begin with dry air moving in from the interior of the U.S. towards Southern California. As this air flows down into the Los Angeles Basin through the low gaps in the mountains (notably Cajon Pass on the east end of the San Gabriel Mountains and Soledad Pass south of Palmdale), it compresses and warms about five degrees Fahrenheit for every 1,000 feet that it descends. Though these winds are much cooler high in the mountains, they can become hot and dry and assume gale force when descending into the Los Angeles Basin. They are often the source of air turbulence for aircraft approaching Los Angeles International Airport (*Note: City of El Segundo adjoins and is immediately south of Los Angeles Airport*)."

The National Weather Service in 2008 published Los Angeles Climate. The publication was prepared by the Weather Service Forecast Office in Oxnard, California which serves the Los Angeles metropolitan area. The goal of the document was to assemble the latest available climatological data from as many reliable sources as possible for the City of Los Angeles and surrounding communities (including El Segundo). Following is an excerpt concerning the National Weather Service's findings pertaining to frequency and severity of wind:

> "Winds are generally light, with frequent afternoon sea breezes of 10 to 15 miles per hour. While severe weather is uncommon, strong offshore winds, known as *Santa Anas*, can reach hurricane strength below passes and canyons. Also, passing winter storms can bring southeast winds to gale force. However, for the most part, damaging winds tend to be rare, or highly localized."

Los Angeles Climate provided the following insights concerning the frequency and severity of "tropical storms" in the region:

> "The average number of tropical storms in the eastern Pacific Ocean is 16.7 per year, of which about seven develop into hurricanes. Only once in the twentieth century did an eastern Pacific tropical storm directly impact the Los Angeles area with gale force winds and heavy rain. About once every two years, however, eastern Pacific tropical storms or hurricanes indirectly impact southern California with residual rains and/or heavy surf. A tropical storm crossed the Los Angeles County coastline in 1939. In the event, a tropical

depression had developed off the coast of Panama on September 15th. The storm quickly grew into a hurricane. The lowest pressure (28.67") occurred on September 22nd, when the storm was centered approximately 300 miles southwest of Cabo San Lucas. On Sunday, September 24th the dying storm crossed Catalina Island, where southeast winds gusted to 50 miles per hour. The storm came ashore near San Pedro. Torrential rains fell Monday morning and again Monday night across the Los Angeles coastal plain. The Civic Center (City of Los Angeles) received 5.62 inches of rain and Mount Wilson reported 11.60 inches. Forty-five lives were lost at sea, and property losses were placed at $2 million. The 1939 tropical storm had other repercussions for Los Angeles. The Weather Bureau Forecast Office in San Francisco had been completely surprised by the storm. Largely in response to this tragedy, the Weather Bureau decided to establish a new forecast office for southern California. In February 1940, the first forecast office in southern California was opened in the Lockheed Terminal at Burbank Airport. The heaviest property damage caused by the remains of a tropical storm occurred in September 1976, when heavy rains from the remains of Tropical Storm Kathleen caused $160 million in agricultural and urban flooding damages."

Los Angeles Climate went on to point out the frequency and severity of tornadoes:

"The south coastal region of California, including the Los Angeles Basin, has the greatest incidence of tornadoes in the state. In the period from 1950 to 1992, the basin had 99 confirmed tornadoes. According to Blier and Battan (1994), this area has a tornadic incidence similar to that of the State of Oklahoma. However, these researchers go on to point out that the size, severity and duration of California tornadoes is less than those common to the plains states, and the tornado count in the Golden State (California) may be inflated due to inaccuracies within the database. Nevertheless, the fact that tornadoes occur with great frequency in a very densely populated urban area makes the occurrence of tornadoes in the Los Angeles Basin particularly relevant. Severe storms researcher John E. Hales, Jr. (1983) stated that a tornado can hardly find a place to touch down around Los Angeles that won't hit something! That assertion notwithstanding, there is no record of a Los Angeles tornado ever causing a fatality. Unlike their plains counterparts, Southern California tornadoes occur mainly in the winter. Of the 99 tornadoes that were reported in the Los Angeles Basin between 1950 and 1992, the vast majority occurred in the months November through March. March had the highest number of incidents, with 22. The fact that few tornadoes occur in the Los Angeles Basin during the warm season is primarily due to the stabilizing effect of the marine layer, and the lack of dynamic forcing during the warmer months. Roughly a quarter of the tornadoes listed by Blier and Battan originated as waterspouts over either Santa Monica Bay or San Pedro Channel. There were many more waterspouts that never made landfall; these were not included in the tornado count. The cause of many, if not most, Los Angeles Basin tornadoes seems to be linked to the terrain layout of the basin. Hales specifically mentioned the natural curvature of the shoreline and the location of the coastal mountains. Due to frictional and barrier flow effects, a convergent cyclonic wind pattern is established in the vicinity where most Los Angeles tornadoes occur. Blier and Battan discussed several features that require further investigation, including convergence to the lee of the Palos Verdes Peninsula and Santa Catalina Island. In conjunction with topographic features which set up favorable cyclonic, low-level wind patterns, Hales further identified a number of synoptic weather features more common to the cool season that are associated with the strongest of the tornadoes that he studied. These include:

- Closed cyclonic circulations from the surface to 500 millibars (mb)
- A west-southwest oriented, 120 knot or stronger, 300 mb jet that crosses the

coast near San Diego. The tornadoes always form on the cyclonic side of the jet
•A dewpoint at San Diego of 51or greater
•The 500 mb temperature on the Vandenberg sounding -5 • • (-20• •C) or colder
•A mean cold front position on the California/Arizona border. Usually, tornadoes occur well behind the surface cold front
•A time of occurrence between 1200 and 1500 PST, coincident with maximum solar heating
•A strong increase in wind speed with height similar to wind profiles in the central United States

In the 1997-98 *El Niño* episode, the Pacific storm track was located over Southern California for much of the winter season. This produced a number of days in which Hales' criteria were approximated over the Los Angeles Basin and adjacent waters. In that season, there were over twenty days in which either waterspouts, funnel clouds or tornadoes were reported including 30 separate sightings. Two tornadoes touched down within the City of Long Beach.

Following is a listing of the various tornado events in Los Angeles County from 1918-2000 (Source: www.tornadoproject.com/alltorns/catorn.htm)

Los Angeles County Tornadoes

JAN 26, 1918	001	1330	0	0	F2	037
APR 05, 1926	002		0	0	F2	037
MAR 15, 1930	001	1140	0	4	F2	037
MAR 02, 1934	001	1340	0	0	F0	037
FEB 12, 1936	001	1530	0	0	F0	037
NOV 11, 1944	001	2100	0	0	F2	037
DEC 20, 1952	001	1200	0	0	F1	037
JAN 18, 1955	001	1101	0	0	F1	037
MAY 09, 1956	002	0830	0	1	F0	037
FEB 19, 1962	002	1600	0	0	F1	037
MAY 14, 1962	004	1200	0	0	F1	037
NOV 09, 1964	003	0700	0	0	F1	037
NOV 07, 1966	003	1300	0	0	F2	037
NOV 07, 1966	004	1300	0	10	F2	037
APR 18, 1967	001	1800	0	0	F0	037
MAY 08, 1977	003	1000	0	0	F1	037
JAN 04, 1978	001	1515	0	0	F1	037
FEB 09, 1978	003	2230	0	0	F1	037
JAN 31, 1979	002	1045	0	0	F1	037
JAN 28, 1980	002	1315	0	0	F0	037
MAR 29, 1982	005	2130	0	0	F1	037
NOV 09, 1982	008	0930	0	0	F1	037
NOV 09, 1982	009	1130	0	0	F2	037
NOV 09, 1982	010	1200	0	0	F2	037
NOV 09, 1982	011	1200	0	0	F0	037
MAR 01, 1983	002	0740	0	30	F2	037
MAR 01, 1983	003	0815	0	0	F0	037
SEP 30, 1983	007	0700	0	0	F0	037
SEP 30, 1983	008	2235	0	3	F1	037
MAY 30, 1984	002	0915	0	0	F0	037
JUN 05, 1987	003	1315	0	0	F0	037
JAN 16, 1990	002	2120	0	0	F0	037
MAR 19, 1991	004	0200	0	0	F0	037

MAR 20, 1992	002	1900	0	0	F1	037
JAN 17, 1993	004	2345	0	0	F0	037
FEB 07, 1994	001	1545	0	0	F0	037
JUN 16, 1995	006	1155	0	0	F0	037
JLY 21, 1997	009	1555	0	0	F0	037
JAN 09, 1998	001	1400	0	0	F1	037
APR 01, 1999	001	1400	0	0	F0	037
AUG 28, 2000	006	1345	0	0	F0	037

The following query results were drawn from the NOAA website containing historical information on water spouts and funnel clouds in the vicinity of City of El Segundo:

Article I.

Query Results

5 WATERSPOUT event(s) were reported in **Los Angeles County, California** between **01/01/1950** and **11/30/2008**.

*Click on **Location or County** to display Details.*

Mag: Magnitude
Dth: Deaths
Inj: Injuries
PrD: Property Damage
CrD: Crop Damage

California

Location or County	Date	Time	Type	Mag	Dth	Inj	PrD	CrD
1 Santa Monica Bay	03/14/1996	04:45 PM	Waterspout	N/A	0	0	0	0
2 Point Fermin	01/20/1997	08:50 AM	Waterspout	N/A	0	0	0	0
3 (lax)los Angeles Int	01/12/2001	08:49 AM	Waterspout	N/A	0	0	0	0
4 (lgb)long Beach Arpt	01/12/2001	11:57 AM	Waterspout	N/A	0	0	0	0
5 Long Beach Arpt	02/11/2001	12:10 PM	Waterspout	N/A	0	0	0	0
				TOTALS:	0	0	0	0

Article II.

Query Results

10 FUNNEL CLOUD event(s) were reported in **Los Angeles County, California** between **01/01/1950** and **11/30/2008**.

*Click on **Location or County** to display Details.*

Mag: Magnitude
Dth: Deaths
Inj: Injuries
PrD: Property Damage
CrD: Crop Damage

California

Location or County	Date	Time	Type	Mag	Dth	Inj	PrD	CrD
1 Los Angeles	04/27/1994	1600	Funnel Cloud	N/A	0	0	0	0
2 Century City	03/14/1996	03:10 PM	Funnel Cloud	N/A	0	0	0	0
3 Long Beach	02/24/1998	01:10 AM	Funnel Cloud	N/A	0	0	0	0
4 Long Beach	03/13/1998	07:25 PM	Funnel Cloud	N/A	0	0	0	0
5 Santa Monica	03/31/1998	01:30 PM	Funnel Cloud	N/A	0	0	0	0
6 Manhattan Beach	05/05/1998	09:27 AM	Funnel Cloud	N/A	0	0	0	0
7 Pomona	09/02/1998	02:55 PM	Funnel Cloud	N/A	0	0	0	0
8 Palos Verdes Estates	06/03/1999	05:15 PM	Funnel Cloud	N/A	0	0	0	0
9 San Pedro	06/03/1999	05:30 PM	Funnel Cloud	N/A	0	0	0	0
10 Rancho Palos Verdes	03/04/2000	11:45 AM	Funnel Cloud	N/A	0	0	0	0
				TOTALS:	0	0	0	0

http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwevent~storms

Please see Section 7: Windstorm-Attachment 1 for an article entitles “The Greatest Catastrophe That Never Happened” from PBS Nova dated February 11, 1998.

Figure 7-1: Santa Ana Winds (Source: NASA's "Observatorium")

Santa Ana Winds and Tornado-Like Wind Activity
Based on local history, most incidents of high wind in the City of El Segundo are the result of the Santa Ana and El Nino related wind conditions. While high impact wind incidents are not frequent in the area, significant wind events and sporadic tornado activity have been known to negatively impact the city. In addition, the city is increasingly concerned with "global warming" ramifications and potential increases in wind related events.

What are Santa Ana Winds?
"Santa Ana winds are generally defined as warm, dry winds that blow from the east or northeast (offshore). These winds occur below the passes and canyons of the coastal ranges of Southern California and in the Los Angeles basin. Santa Ana winds often blow with exceptional speed in the Santa Ana Canyon (the canyon from which it derives its name). Forecasters at the National Weather Service offices in Oxnard and San Diego usually place speed minimums on these winds and reserve the use of "Santa Ana" for winds greater than 25 knots." These winds accelerate to speeds of 35 knots as they move through canyons and passes, with gusts to 50 or even 60 knots.

"The complex topography of Southern California combined with various atmospheric conditions create numerous scenarios that may cause widespread or isolated Santa Ana events. Commonly, Santa Ana winds develop when a region of high pressure builds over the Great Basin (the high plateau east of the Sierra Mountains and west of the Rocky Mountains including most of Nevada and Utah). Clockwise circulation around the center of this high pressure area forces air downslope from the high plateau. The air warms as it descends toward the California coast at the rate of 5 degrees F per 1000 feet due to compressional heating. Thus, compressional heating provides the primary source of warming. The air is dry since it originated in the desert, and it dries out even more as it is heated."

These regional winds typically occur from October to March, and, according to most accounts are named either for the Santa Ana River Valley where they originate or for the Santa Ana Canyon, southeast of Los Angeles, where they pick up speed.

What are Tornados?
Tornadoes are spawned when there is warm, moist air near the ground, cool air aloft, and winds that speed up and change direction. An obstruction, such as a house, in the path of the wind causes it to change direction. This change increases pressure on parts of the house, and the combination of increased pressures and fluctuating wind speeds creates stresses that frequently cause structural failures.

In order to measure the intensity and wind strength of a tornado, Dr. T. Theodore Fujita developed the Fujita Tornado Damage Scale. This scale compares the estimated wind velocity with the corresponding amount of suspected damage. The scale measures six classifications of tornadoes with increasing magnitude from an "F0" tornado to a "F6+" tornado.

Table 7-1: Fujita Tornado Damage Scale
(Source: http://weather.latimes.com/tornadoFAQ.asp)

Scale	Wind Estimated (mph)	Typical Damage
F0	< 73	**Light damage.** Some damage to chimneys and TV antennas; breaks twigs off trees; pushes over shallow-rooted trees.
F1	73-112	**Moderate damage.** Peels surface off roofs; windows broken; light trailer houses pushed or overturned; some trees uprooted or snapped; moving automobiles pushed off the road. 74 mph is the beginning of hurricane wind speed.
F2	113-157	**Considerable damage.** Roofs torn off frame houses leaving strong upright walls; weak buildings in rural areas demolished; trailer houses destroyed; large trees snapped or uprooted; railroad boxcars pushed over; light object missiles generated; cars blown off highway.
F3	158-206	**Severe damage.** Roofs and some walls torn off frame houses; some rural buildings completely demolished; trains overturned; steel-framed hangar-warehouse-type structures torn; cars lifted off the ground; most trees in a forest uprooted snapped, or leveled.
F4	207-260	**Devastating damage.** Whole frame houses leveled, leaving piles of debris; steel structures badly damaged; trees debarked by small flying debris; cars and trains thrown some distances or rolled considerable distances; large missiles generated.
F5	261-318	**Incredible damage.** Whole frame houses tossed off foundations; steel-reinforced concrete structures badly damaged; automobile-sized missiles generated; trees debarked; incredible phenomena can occur.
F6-F12	319 to sonic	**Inconceivable damage.** Should a tornado with the maximum wind speed in excess of F5 occur, the extent and types of damage may not be conceived. A number of missiles such as iceboxes, water heaters, storage tanks, automobiles, etc. will create serious secondary damage on structures.

Microbursts
Unlike tornados, microbursts, are strong, damaging winds which strike the ground and often give

the impression a tornado has struck. They frequently occur during intense thunderstorms. The origin of a microburst is downward moving air from a thunderstorm's core. But unlike a tornado, they affect only a rather small area.

University of Chicago storm researcher Dr. Ted Fujita first coined the term “downburst” to describe strong, downdraft winds flowing out of a thunderstorm cell that he believed were responsible for the crash of Eastern Airlines Flight 66 in June of 1975.

A downburst is a straight-direction surface wind in excess of 39 mph caused by a small-scale, strong downdraft from the base of convective thundershowers and thunderstorms. In later investigations into the phenomena he defined two sub-categories of downbursts: the larger macrobursts and small microbursts.

Macrobursts are downbursts with winds up to 117 mph which spread across a path greater than 2.5 miles wide at the surface and which last from 5 to 30 minutes. The microburst, on the other hand is confined to an even smaller area, less than 2.5 miles in diameter from the initial point of downdraft impact. An intense microburst can result in damaging winds near 270 km/hr (170 mph) and often last for less than five minutes.

> “Downbursts of all sizes descend from the upper regions of severe thunderstorms when the air accelerates downward through either exceptionally strong evaporative cooling or by very heavy rain which drags dry air down with it. When the rapidly descending air strikes the ground, it spreads outward in all directions, like a fast-running faucet stream hitting the sink bottom.
>
> When the microburst wind hits an object on the ground such as a house, garage or tree, it can flatten the buildings and strip limbs and branches from the tree. After striking the ground, the powerful outward running gust can wreak further havoc along its path. Damage associated with a microburst is often mistaken for the work of a tornado, particularly directly under the microburst. However, damage patterns away from the impact area are characteristic of straight-line winds rather than the twisted pattern of tornado damage.”

Tornados, like those that occur every year in the Midwest and Southeast parts of the United States, are a rare phenomenon in most of California, with most tornado-like activity coming from micro-bursts.

Local History of Windstorm Events

While the effects of Santa Ana Winds are often overlooked, it should be noted that in 2003, two deaths in Southern California were directly related to the fierce condition. A falling tree struck one woman in San Diego. The second death occurred when a passenger in a vehicle was hit by a flying pickup truck cover launched by the Santa Ana Winds.

Impact of Windstorm in the City of El Segundo

Based on the risk assessment, it is evident that Windstorms will continue to have potentially devastating economic impacts to certain areas of the city. Impacts that are not quantified, but can be anticipated in future events, include:

- Injury and loss of life;
- Commercial and residential structural damage;
- Disruption of and damage to public infrastructure;

• Secondary Health hazards e.g. mold and mildew;
• Damage to roads/bridges resulting in loss of mobility;
• Significant economic impact (jobs, sales, tax revenue) upon the community;
• Negative impact on commercial and residential property values; and
• Significant disruption to students and teachers as temporary facilities and relocations would likely be needed.

Table 7-2: Santa Ana Wind Events during 2003 in the Vicinity

The following Santa Ana wind events were featured in news resources during 2003

January 6, 2003 OC Register	"One of the strongest Santa Ana windstorms in a decade toppled 26 power poles in Orange early today, blew over a mobile derrick in Placentia, crushing two vehicles, and delayed Metrolink rail service." This windstorm also knocked out power to thousands of people in northeastern Orange County.
January 8, 2003 CBSNEWS.com	"Santa Ana's roared into Southern California late Sunday, blowing over trees, trucks and power poles. Thousands of people lost power."
March 16, 2003 dailybulletin.com	**Fire Officials Brace for Santa Ana Winds** - - "The forest is now so dry and so many trees have died that fires, during relatively calm conditions, are running as fast and as far as they might during Santa Ana Winds. Now the Santa Ana season is here. Combine the literally tinder dry conditions with humidity in the single digits and 60-80 mph winds, and fire officials shudder."

Table 7-3: Major Windstorms in the Vicinity of City of El Segundo
(Source: http://www.wrh.noaa.gov/sandiego/research/Guide/weatherhistory.pdf)

Date	Location and Damage
November 5-6, 1961	Santa Ana winds. Fire in Topanga Canyon
February 10-11, 1973	Strong storm winds: 57 mph at Riverside, 46 Newport Beach. Some 200 trees uprooted in Pacific Beach alone
October 26-27, 1993	Santa Ana winds. Fire in Laguna Hills
October 14, 1997	Santa Ana winds: gusts 87 mph in central Orange County. Large fire in Orange County
December 29, 1997	Gusts 60+ mph at Santa Ana
March 28-29, 1998	Strong storm winds in Orange County: sustained 30-40 mph. Gust 70 mph at Newport Beach, gust 60 Huntington Beach. Trees down, power out, and damage across Orange and San Diego Counties. 1 illegal immigrant dead in Jamul.
September 2, 1998	Strong winds from thunderstorms in Orange County with gusts to 40mph. Large fires in Orange County
December 6, 1998	Thunderstorm in Los Alamitos and Garden Grove: gust 50-60 mph called “almost a tornado”
December 21-22, 1999	Santa Ana winds: gust 68 mph at Campo, 53 Huntington Beach, 44 Orange. House and tree damage in Hemet.
March 5-6, 2000	Strong thunderstorm winds at the coast: gust 60 mph at Huntington Beach Property damage and trees downed along the coast
April 1, 2000	Santa Ana winds: gust 93 mph at Mission Viejo, 67 Anaheim Hills
December 25-26, 2000	Santa Ana winds: gust 87 mph at Fremont Canyon. Damage and injuries in Mira Loma, Orange and Riverside Counties
February 13, 2001	Thunderstorm gust to 89 mph in east Orange

Following is a glimpse of major tornado-like events to hit the City of El Segundo, and surrounding areas:

Table 7-4: Major Tornado-like Events in the Vicinity of City of El Segundo 1958-2001	
Date	**Location and Damage**
April 1, 1958	Tornado: Laguna Beach
February 19, 1962	Tornado: Irvine
April 8, 1965	Tornado: Costa Mesa
November 7, 1966	Newport Beach and Costa Mesa: Property Damage
March 16, 1977	Tornado skipped from Fullerton to Brea Damage to 80 homes and injured four people
February 9, 1978	Tornado: Irvine. Property damage and 6 injured
January 31, 1979	Tornado Santa Ana Numerous power outages
November 9, 1982	Tornadoes in Garden Grove and Mission Viejo. Property damage
January 13, 1984	Tornado: Huntington Beach. Property damage
March 16, 1986	Tornado: Anaheim. Property damage
February 22-24, 1987	Tornadoes and waterspouts: Huntington Beach
January 18, 1988	Tornadoes: Mission Viejo and San Clemente. Property damage
February 28, 1991	Tornado: Tustin
March 27, 1991	Tornado: Huntington Beach
December 7, 1992	Tornadoes: Anaheim and Westminster Property damage
January 18, 1993	Tornado: Orange County Property damage
February 8, 1993	Tornado: Brea. Property damage
February 7, 1994	Tornado from Newport Beach to Tustin. Roof and window damage. Trees were also knocked down
December 13, 1994	Two waterspouts about 0.5 mile off Newport Beach
December 13, 1995	Funnel cloud near Fullerton Airport
March 13, 1996	Funnel cloud in Irvine
November 10-11, 1997	Waterspout came ashore at Newport Pier on the 10th and dissipated over western Costa Mesa. Tornadoes in Irvine on the 11th and a funnel cloud developed. 10th: Winds estimated at 60-70 mph. 11th: Minor power outages occurred with little property damage. A fisherman was blown from one end of Newport Pier to the other. Property and vehicle damage in Irvine from flying debris. Ten cars were thrown a few feet.

Table 7-4: Major Tornado-like Events in the Vicinity of City of El Segundo 1958-2001	
December 21, 1997	Waterspout and tornado in Huntington Beach. Damage to boats, houses, and city property
February 24, 1998	Tornado in Huntington Beach. Property damage with a power outage, roof flew ¼ mile
March 13-14, 1998	Numerous waterspouts between Long Beach, Huntington Beach, and Catalina
March 31-April 1, 1998	Numerous funnel clouds reported off Orange County coastline, two of which became waterspouts off Orange County. One waterspout briefly hit the coast off the Huntington Beach pier.
June 6, 1998	Two funnel clouds off Dana Point
December 31, 1998	Funnel clouds in Santa Ana. Waterspout off Costa Mesa coast
February 21, 2000	Tornado: Anaheim Hills. Property damage
October 28, 2000	Funnel clouds around Newport Beach and Costa Mesa
January 10, 2001	Funnel cloud at Orange County Airport and Newport Beach
February 24, 2001	Tornado in Orange. Damage to warehouse, 6 structures, fences, and telephone wires.

Windstorm Hazard Assessment

Hazard Identification

A windstorm event in the region can range from short term microburst activity lasting only minutes to a long duration Santa Ana wind condition that can last for several days as in the case of the January 2003 Santa Ana wind event. Windstorms in the region can cause extensive damage including heavy tree stands, exposed coastal properties, road and highway infrastructure, and critical utility facilities.

Figure 7-1 shows the direction of the Santa Ana winds as they travel from the stable, high-pressure weather system called the Great Basin through the canyons and towards the low-pressure system off the Pacific. Clearly the area of the City of El Segundo is in the direct path of the ocean-bound Santa Ana winds.

Vulnerability and Risk

With an analysis of the high wind and tornado events depicted in the "Local History" section, we can deduce the common windstorm impact areas including impacts on life, property, utilities, infrastructure and transportation. Additionally, if a windstorm disrupts power to local residential communities, the American Red Cross and City resources might be called upon for care and shelter duties. Displacing residents and utilizing city resources for shelter staffing and disaster cleanup can cause an economic hardship on the City.

Community Windstorm Issues

What is Susceptible to Windstorms?

Life and Property

Based on the history of the region, windstorm events can be expected, perhaps annually, across widespread areas of the region which can be adversely impacted during a windstorm event. This can result in the involvement of City of El Segundo emergency response personnel during a wide-ranging windstorm or microburst tornadic activity. Both residential and commercial structures with weak reinforcement are susceptible to damage. Wind pressure can create a direct and frontal assault on a structure, pushing walls, doors, and windows inward. Conversely, passing currents can create lift suction forces that pull building components and surfaces outward. With extreme wind forces, the roof or entire building can fail causing considerable damage.

Debris carried along by extreme winds can directly contribute to loss of life and indirectly to the failure of protective building envelopes, siding, or walls. When severe windstorms strike a city, downed trees, power lines, and damaged property can be major hindrances to emergency response and disaster recovery.

The Beaufort Scale below, coined and developed by Sir Francis Beaufort in 1805, illustrates the effect that varying wind speed can have on sea swells and structures:

Table 7-5: Beaufort Scale
(Source: http://www.compuweather.com/decoder-charts.html)

Beaufort Force	Speed (mph)	Wind Description - State of Sea - Effects on Land
0	Less 1	Calm - Mirror-like - Smoke rises vertically
1	1-3	Light - Air Ripples look like scales; No crests of foam - Smoke drift shows direction of wind, but wind vanes do not
2	4-7	Light Breeze - Small but pronounced wavelets; Crests do not break - Wind vanes move; Leaves rustle; You can feel wind on the face
3	8-12	Gentle Breeze - Large Wavelets; Crests break; Glassy foam; A few whitecaps - Leaves and small twigs move constantly; Small, light flags are extended
4	13-18	Moderate Breeze - Longer waves; Whitecaps - Wind lifts dust and loose paper; Small branches move
5	19-24	Fresh Breeze - Moderate, long waves; Many whitecaps; Some spray - Small trees with leaves begin to move
6	25-31	Strong Breeze - Some large waves; Crests of white foam; Spray - Large branches move; Telegraph wires whistle; Hard to hold umbrellas

Beaufort Force	Speed (mph)	Wind Description - State of Sea - Effects on Land
7	32-38	Near Gale - White foam from breaking waves blows in streaks with the wind - Whole trees move; Resistance felt walking into wind
8	39-46	Gale - Waves high and moderately long; Crests break into spin drift, blowing foam in well marked streaks - Twigs and small branches break off trees; Difficult to walk
9	47-54	Strong Gale - High waves with wave crests that tumble; Dense streaks of foam in wind; Poor visibility from spray - Slight structural damage
10	55-63	Storm - Very high waves with long, curling crests; Sea surface appears white from blowing foam; Heavy tumbling of sea; Poor visibility - Trees broken or uprooted; Considerable structural damage
11	64-73	Violent Storm - Waves high enough to hide small and medium sized ships; Sea covered with patches of white foam; Edges of wave crests blown into froth; Poor visibility - Seldom experienced inland; Considerable structural damage
12	>74	Hurricane - Sea white with spray. Foam and spray render visibility almost non-existent - Widespread damage. Very rarely experienced on land.

Utilities
Historically, falling trees have been the major cause of power outages in the region. Windstorms such as strong microbursts and Santa Ana Wind conditions can cause flying debris and downed utility lines. For example, tree limbs breaking in winds of only 45 mph can be thrown over 75 feet. As such, overhead power lines can be damaged even in relatively minor windstorm events. Falling trees can bring electric power lines down to the pavement, creating the possibility of lethal electric shock.

Infrastructure
Windstorms can damage buildings, power lines, and other property and infrastructure due to falling trees and branches. During wet winters, saturated soils cause trees to become less stable and more vulnerable to uprooting from high winds.

Increased Fire Threat
Perhaps the greatest danger from windstorm activity in Southern California comes from the combination of the Santa Ana winds with the major fires that occur every few years in the urban/wildland interface. With the Santa Ana winds driving the flames, the speed and reach of the flames is even greater than in times of calm wind conditions.

Transportation
Windstorm activity can have an impact on local transportation in addition to the problems caused by downed trees and electrical wires blocking streets and highways. During periods of extremely strong Santa Ana winds, major highways can be temporarily closed to truck and recreational vehicle traffic. However, typically these disruptions are not long lasting, nor do they carry a severe long term economic impact on the region.

The Greatest Catastrophe
That Never Happened
A Guest Dispatch: February 11, 1998
By meteorologist Peter R. Chaston

With all of the recent focus on storms lashing California and Peru, it's amazing to me that most people don't realize that in September, only by some last minute luck, Los Angeles avoided what would have been the costliest and most destructive weather catastrophe of all time. The bullet was in the chamber, and the gun was pointed at Los Angeles....

In the winter of 1982-83, El Niño pummeled California and the West Coast with a series of powerful storms. South of the equator, its rains transformed the coastal deserts of Peru and Ecuador into grasslands dotted with lakes and ponds; other effects led to massive bird and fish migrations away from the South American coast. So, when surface water temperatures jumped almost 10 degrees Fahrenheit above normal off Peru and Ecuador last summer, meteorologists concluded that a major El Niño was underway, and knew what to expect. Armed with new models, and given an earlier warning than ever before, meteorologists issued advisories, detailing the possible serious weather that might again plague the west coasts of both of the American continents.

In particular, residents of southern California took the warnings to heart. Scientists feared that an eastern pacific hurricane could take a northward journey and decimate Southern California. Three key initial conditions caused by El Niño were coming together to create an ominous threat to the area from San Diego to Los Angeles:

1. The long stretch—over 1,500 miles—of heated ocean was warming the air above it, allowing the air to absorb more water vapor from the ocean. This set up a self-replenishing, long-distance source of warm, moist air to feed into any developing storms, giving a powerful kick to tropical cyclones and, in the coming winter and spring, non-tropical low pressure systems.
2. The southern branch of the jet stream was setting itself up to transport the moisture-laden air into the West Coast.
3. The normally cool waters off southern California were warming substantially, and would allow any hurricane that might approach that region to maintain much of its intensity. (In California, you only had to look at surfers to detect the warming of the sea; they stopped wearing wetsuits.)

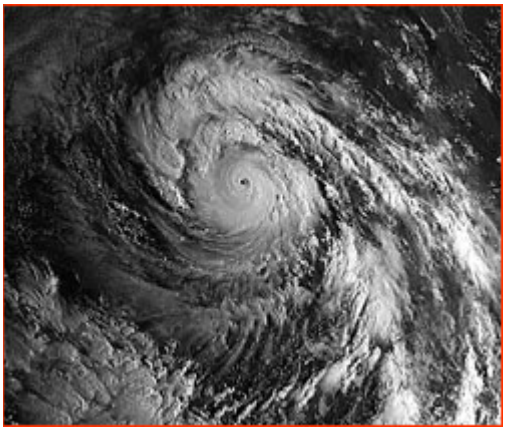
Normally, hurricanes that form in the Pacific off Mexico strike the west coast of Mexico or, most often, move out to sea. They almost never reach the US because they must pass over cool water, which cuts off their energy source. Until this year, hurricanes had affected the American southwest only three times in the 20th century. In September of 1932 a hurricane moved up the Gulf of California, producing gusty winds and heavy rainfall in the Arizona desert. In September of 1939, a tropical storm slammed into San Diego with winds of 52 mph south of Los Angeles. And in September 1976, a hurricane gusted to 76 mph at Yuma, Arizona. Since accurate and widespread observations of sea surface temperatures were not or could not be taken until recently, we are not certain if these three years were strong El Niño periods, but collateral evidence suggests that they were.

On September 9th, 1997, Hurricane Linda formed about 700 miles south-southwest of the Baja peninsula. As the storm slowly moved north-northwestward, running along the Mexican coastline, El Niño's warm waters caused Linda to grow explosively into a large howling hurricane, with

sustained winds on September 12th of 185 miles per hour, and gusts over 200 miles per hour! Linda had become the most powerful East Pacific hurricane in the history of weather records, big enough to cause many scientists to propose creating a new Category Six, for super hurricanes.

As the clock ticked and the storm raged, terrifying forecasts spewed from computer models; the storm would most likely slam the coast somewhere between San Diego and Los Angeles, more probably at Los Angeles.

A hurricane requires surface water temperatures of at least 79 degrees Fahrenheit to keep growing. El Niño had made the water temperatures ideal all the way up to the California border, greasing the slide. Los Angeles' fate seemed sealed.



Hurricane Linda in the Pacific, 18N 110W, September 12, 1997. **Full-size version of the image (240k)**

At almost the last moment, an upper-level trough (a fancy term for a sharp dip in higher-level winds) moved erratically, and Hurricane Linda was turned out to sea as it neared the California border.

The only time in history a hurricane with winds over 100 miles per hour has struck Los Angeles was on August 23rd, 1838, and that leveled the then-small city. In 1997, Los Angeles came incredibly close to experiencing a direct-hit assault by the most powerful Eastern Pacific hurricane in history!

I inspected the Homestead area of south Florida, along with National Hurricane Center specialists, after Hurricane Andrew smashed through in 1992, with winds of at least 140 mph, and gusts of 175 mph. Many homes there are similar in construction to southern California homes. Andrew destroyed or damaged virtually every building there, and his winds were weaker than those of Linda, his size was smaller, and his movement was faster. From my perspective, I can assure you Linda would have made the damage done by Andrew seem almost moderate. Most roofs cannot sustain continued winds in excess of 100 miles per hour. After the roof goes, the walls and rest of the house are blown apart like matchwood. I saw it in Andrew, a weaker storm than Linda; Linda would have steam-rollered Los Angeles. Clearly Linda would have the exceeded in Los Angeles the 25 billion dollars of damage that Andrew caused in Florida.

That should give you a little perspective when you watch news accounts of the rains and flooding this week. It could have been - should have been - far, far worse.

Peter Chaston is a professional meteorologist, weather consultant, and author of "Terror from the Skies" and "Hurricanes!" In 1995, Chaston predicted that the next El Niño would be abnormally strong.

SECTION 8: TSUNAMI HAZARDS

Why Are Tsunamis a Threat to El Segundo?

History has shown that the probability of a tsunami in the planning area is an extremely low threat. There is no historical research indicating any significant damage to the city of El Segundo from a tsunami. However, if a tsunami should occur, the consequences would be great. The impact could cause loss of life, destroy thousands of high priced homes and greatly affect the region's downtown and coastal businesses, and have a profound impact on tourism. Even if all residents and visitors were safely evacuated, the damage to property in this densely populated, high property value area would still be tremendous.

California's Tsunamis

"Since 1812, the California coast has had 14 tsunamis with wave heights higher than three feet; six of these were destructive. The Channel Islands were hit by a significant tsunami in the early 1800s. The worst tsunami resulted from the 1964 Alaskan Earthquake and caused 12 deaths and at least $17 million in damages in Northern California."
(Source: http://education.sdsc.edu/optiputer/htmlLinks/california_tsunami.html)

What are Tsunamis?

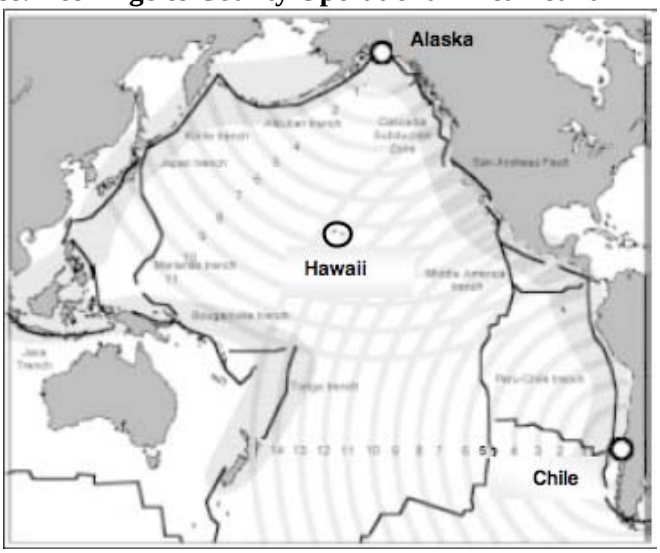
The phenomenon we call "tsunami" (soo-NAH-mee) is a series of traveling ocean waves of extremely long length generated primarily by earthquakes occurring below or near the ocean floor. Underwater volcanic eruptions and landslides can also generate tsunamis. In the deep ocean, the tsunami waves move across the deep ocean with a speed exceeding 500 miles per hour, and a wave height of only a few inches. Tsunami waves are distinguished from ordinary ocean waves by their great length between wave crests, often exceeding 60 miles or more in the deep ocean, and by the time between these crests, ranging from 10 minutes to an hour.

As they reach the shallow waters of the coast, the waves slow down and the water can pile up into a wall of destruction up to 30 feet or more in height. The effect can be amplified where a bay, harbor or lagoon funnels the wave as it moves inland. Large tsunamis have been known to rise over 100 feet. Even a tsunami 1-3 feet high can be very destructive and cause many deaths and injuries.

Tsunamis typically are classified as either local or distant. Tsunamis from local sources usually result from earthquakes occurring off nearby coats as shown in Figure 1: Potential Local Source Tsunami Regions along the Californian Coast. Tsunamis from distant sources are the most common type observed along the California Coast as seen in Figure 2: Potential Distant-source Tsunami Regions for the Californian Coast. Tsunamis generated by earthquakes in South America and the Aleutian-Alaskan region have posed a greater hazard to the West Coast of the United States than locally generated tsunamis. There is a history of Pacific-wide tsunamis occurring every 10 to 20 years. (Source: TyCom EIR, 9/2001).

Figure 8-1: Potential Local Source Tsunami Regions along the Californian Coast (Source: Los Angeles County Operational Area Tsunami Annex)

Figure 8-2: Potential Distant Source Tsunami Regions for the Californian Coast (Source: Los Angeles County Operational Area Tsunami Annex)



What causes Tsunami?

There are many causes of tsunamis but the most prevalent is earthquakes. In addition, landslides, volcanic eruptions, explosions, and even the impact of cosmic bodies, such as meteorites, can generate tsunamis.

Plate Tectonics

Plate Tectonic Theory is based on an earth model characterized by a small number of lithospheric plates, 40 to 150 miles thick that float on a viscous under-layer called the asthenosphere. These plates, which cover the entire surface of the earth and contain both the continents and sea floor, move relative to each other at rates of up to several inches per year. The region where two plates come in contact is called a plate boundary, and the way in which one plate moves relative to another determines the type of boundary: spreading, where the two plates move away from each other; subduction, where the two plates move toward each other and one slides beneath the other; and transform, where the two plates slide horizontally past each other. Subduction zones are characterized by deep ocean trenches, and the volcanic islands or volcanic mountain chains associated with the many subduction zones around the Pacific Rim are sometimes called the Ring of Fire.

Earthquakes and Tsunamis
An earthquake can be caused by volcanic activity, but most are generated by movements along fault zones associated with the plate boundaries. Most strong earthquakes, representing 80% of the total energy released worldwide by earthquakes, occur in subduction zones where an oceanic plate slides under a continental plate or another younger oceanic plate.

Not all earthquakes generate tsunamis. To generate a tsunami, the fault where the earthquake occurs must be underneath or near the ocean, and cause vertical movement of the sea floor over a large area, hundreds or thousands of square miles. "By far, the most destructive tsunamis are generated from large, shallow earthquakes with an epicenter or fault line near or on the ocean floor." The amount of vertical and horizontal motion of the sea floor, the area over which it occurs, the simultaneous occurrence of slumping of underwater sediments due to the shaking, and the efficiency with which energy is transferred from the earth's crust to the ocean water are all part of the tsunami generation mechanism. The sudden vertical displacements over such large areas, disturb the ocean's surface, displace water, and generate destructive tsunami waves.

Although all oceanic regions of the world can experience tsunamis, the most destructive and repeated occurrences of tsunamis are in the Pacific Rim region.

Tsunami Earthquakes
The September 2, 1992 Earthquake (M7.2) was barely felt by residents along the coast of Nicaragua. Located well off-shore, the severity of shaking on a scale of Modified Mercalli I to XII, was mostly II along the coast, and reached III at only a few places. Twenty to 70 minutes after the earthquake occurred, a tsunami struck the coast of Nicaragua with wave amplitudes up to 13 feet above normal sea level in most places and a maximum run-up height of 35 ft. The waves caught coastal residents by complete surprise and caused many casualties and considerable property damage.

This tsunami was caused by a tsunami earthquake, an earthquake that produces an unusually large tsunami relative to the earthquake magnitude. Tsunami earthquakes are characterized by a very shallow focus, fault dislocations greater than several meters, and fault surfaces that are smaller than for a normal earthquake.

Tsunami earthquakes are also slow earthquakes, with slippage along the fault beneath the sea floor occurring more slowly than it would in a normal earthquake. The only known method to quickly recognize a tsunami earthquake is to estimate a parameter called the seismic moment using very long period seismic waves (more than 50 seconds/cycle). Two other destructive and deadly tsunamis from tsunami earthquakes have occurred in recent years in Java, Indonesia (June 2, 1994) and Peru (February 21, 1996).

> "Less frequently, tsunami waves can be generated from displacements of water resulting from rock falls, icefalls and sudden submarine landslides or slumps. Such events may be caused impulsively from the instability and sudden failure of submarine slopes, which are sometimes triggered by the ground motions of a strong earthquake. For example in the 1980's, earth moving and construction work of an airport runway along the coast of Southern France, triggered an underwater landslide, which generated destructive tsunami waves in the harbor of Thebes." (Source: http://ioc3.unesco.org/itic/contents.php?id=160)

Tsunami Characteristics

How Fast?

Unnoticed tsunami waves can travel at the speed of a commercial jet plane, over 500 miles per hour. They can move from one side of the Pacific Ocean to the other in less than a day. This great speed makes it important to be aware of the tsunami as soon as it is generated. Scientists can predict when a tsunami will arrive at various places by knowing the source characteristics of the earthquake that generated the tsunami and the characteristics of the sea floor along the paths to those places. Tsunamis travel much slower in more shallow coastal waters where their wave heights begin to increase dramatically.

How Big?

Offshore and coastal features can determine the size and impact of tsunami waves. Reefs, bays, entrances to rivers, undersea features and the slope of the beach all help to modify the tsunami as it attacks the coastline. When the tsunami reaches the coast and moves inland, the water level can rise many feet. In extreme cases, water level has risen to more than 50 feet for tsunamis of distant origin and over 100 feet for tsunami waves generated near the earthquake's epicenter. The first wave may not be the largest in the series of waves. One coastal community may see no damaging wave activity while in another nearby community destructive waves can be large and violent. The flooding can extend inland by 1,000 feet or more, covering large expanses of land with water and debris.

How Frequent?

Since scientists cannot predict when earthquakes will occur, they cannot determine exactly when a tsunami will be generated. However, by looking at past historical tsunamis and run-up maps, scientists know where tsunamis are most likely to be generated. Past tsunami height measurements are useful in predicting future tsunami impact and flooding limits at specific coastal locations and communities.

Types of Tsunamis

Pacific-Wide and Regional Tsunamis

Tsunamis can be categorized as "local" and Pacific-Wide. Typically, a Pacific-Wide tsunami is generated by major vertical ocean bottom movement in offshore deep trenches. A "local" tsunami can be a component of the Pacific-Wide tsunami in the area of the earthquake or a wave that is confined to the area of generation within a bay or harbor and caused by movement of the bay itself or landslides.

On December 26, 2004 the second biggest earthquake in recorded history occurred off the coast of Indonesia. The Magnitude 9.3 earthquake unleashed a devastating tsunami that traveled thousands of kilometers across the Indian Ocean, taking the lives of nearly 300,000 people in countries as far apart as Indonesia, the Maldives, Sri Lanka and Somalia. The catastrophe was one of the deadliest events in modern history.

In 1960, a large tsunami caused widespread death and destruction throughout the Pacific was generated by an earthquake located off the coast of Chile. It caused loss of life and property damage not only along the Chile coast but also in Hawaii and as far away as Japan. The Great Alaskan Earthquake of 1964 killed 106 people and produced deadly tsunami waves in Alaska, Oregon and California.

In July 1993, a tsunami generated in the Sea of Japan killed over 120 people in Japan. Damage also occurred in Korea and Russia but spared other countries since the tsunami wave energy was confined within the Sea of Japan. The 1993 Japan Sea tsunami is known as a "regional event" since its impact was confined to a relatively small area. For people living along the northwestern coast of Japan, the tsunami waves followed the earthquake within a few minutes.

During the 1990's, destructive regional tsunamis also occurred in Nicaragua, Indonesia, the Philippines, Papua New Guinea, and Peru, killing thousands of people. Others caused property damage in Chile and Mexico. Some damage also occurred in the far field in the Marquesas Islands (French Polynesia) from the July 30, 1995, Chilean and February 21, 1996, Peruvian tsunamis.

In less than a day, tsunamis can travel from one side of the Pacific to the other. However, people living near areas where large earthquakes occur may find that the tsunami waves will reach their shores within minutes of the earthquake. For these reasons, the tsunami threat to many areas such as Alaska, the Philippines, Japan and the West Coast of the United States can be immediate (for tsunamis from nearby earthquakes which take only a few minutes to reach coastal areas) or less urgent (for tsunamis from distant earthquakes which take from three to 22 hours to reach coastal areas).

History of Regional Tsunamis

Local

A local tsunami may be the most serious threat as it strikes suddenly, sometimes before the earthquake shaking stops. Alaska has had six serious local tsunamis in the last 80 years and Japan has had many more.

Local History of Tsunamis

Tsunamis have been documented extensively in California since 1806. Although the majority of tsunamis have occurred in Northern California, Southern California has been impacted as well. In the 1930's, four tsunamis struck the Los Angeles County, Orange County, and San Diego County coastal areas. In Orange County the tsunami wave reached heights of 20 feet or more above sea level. In 1964, following the Alaska Earthquake (Magnitude 8.2), tidal surges of approximately 4 feet to 5 feet hit the Huntington Harbor area causing moderate damage.

Impact of Tsunamis in the City of El Segundo

Based on the risk assessment, it is evident that Tsunamis will continue to have potentially devastating economic impacts to certain areas of the city. Impacts that are not quantified, but can be anticipated in future events, include:

- Injury and loss of life;
- Commercial and residential structural damage;
- Disruption of and damage to public infrastructure;
- Secondary Health hazards e.g. mold and mildew;
- Damage to roads/bridges resulting in loss of mobility;
- Significant economic impact (jobs, sales, tax revenue) upon the community;
- Negative impact on commercial and residential property values; and
- Significant disruption to students and teachers as temporary facilities and relocations would likely be needed.

Table 8-1 Tsunami Events in California 1930-2004
(Source: Source: Worldwide Tsunami Database www.ngdc.noaa.gov)

Date	Location	Maximum Run-up*(m)	Earthquake Magnitude
08/31/1930	Redondo Beach	6.10	5.2
08/31/1930	Santa Monica	6.10	5.2
08/31/1930	Venice	6.10	5.2
03/11/1933	La Jolla	0.10	6.3
03/11/1933	Long Beach	0.10	6.3
08/21/1934	Newport Beach	12.00	Unknown
02/09/1941	San Diego	Unknown	6.6
10/18/1989	Monterey	0.40	7.1
10/18/1989	Moss Landing	1.00	7.1
10/18/1989	Santa Cruz	0.10	7.1
04/25/1992	Arena Cove	0.10	7.1
04/25/1992	Monterey	0.10	7.1
09/01/1994	Crescent City	0.14	7.1
11/04/2000	Point Arguello	5.00	

* Maximum Run-up (M) is the maximum water height above sea level in meters. The run-up is the height the tsunami reached above a reference level such as mean sea level. It is not always clear which reference level was used.

Tsunami Hazard Assessment

Hazard Identification
Although the Los Angeles County All-Hazard Mitigation Plan rates tsunamis as a "low" probability threat, the County's Threat Annex emphasizes the need to still plan for a worst-case scenario event. The recent studies indicate a possibility that an offshore landslide could generate a tsunami that could threaten the coastal areas. The probability of such an event is considered low and the impacts would be significant to many of the properties in the City. The City staff will continue to monitor projections and run-up studies pertaining to tsunami threats from offshore faults. The impacts to the community would be significant, although the impacted properties are beach area and oil refineries located in the City of Los Angeles.

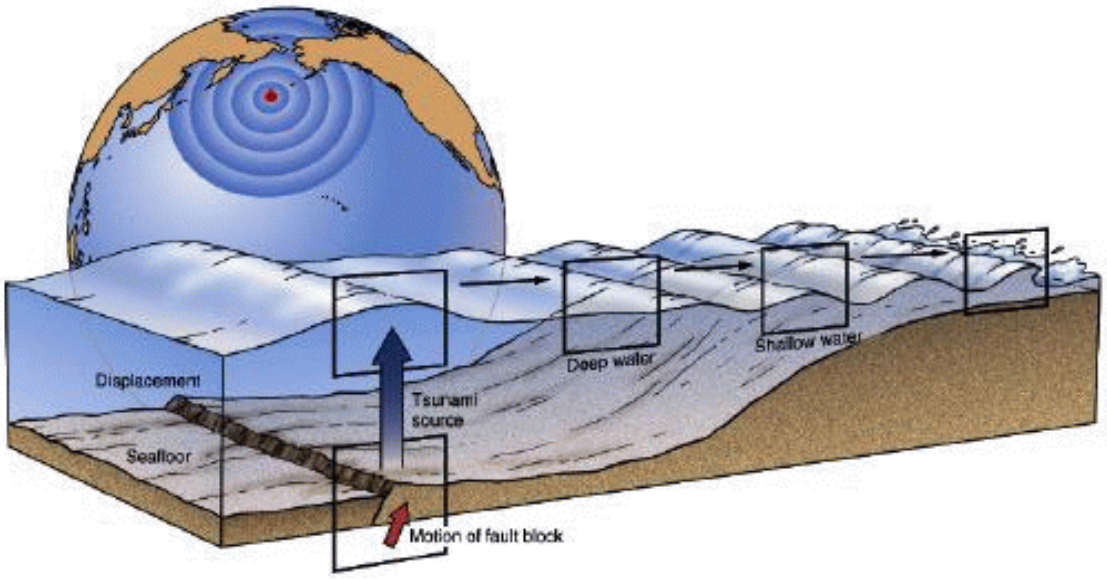
The area of the City south of El Segundo Boulevard and west of Sepulveda Boulevard is taken up mostly by the Chevron Refinery. The Refinery occupies approximately one-third of the City. The Refinery also occupies a portion of the coastal zone, along with a Southern California Edison Generating Station. The beach area is publicly owned and accessible.

Damage Factors of Tsunamis

Tsunamis cause damage in three ways: inundation, wave impact on structures, and erosion.

"Strong, tsunami-induced currents lead to the erosion of foundations and the collapse of bridges and sea walls. Flotation and drag forces move houses and overturn railroad cars. Considerable damage is caused by the resultant floating debris, including boats and cars that become dangerous projectiles that may crash into buildings, break power lines, and may start fires. Fires from damaged ships in ports or from ruptured coastal oil storage tanks and refinery facilities can cause damage greater than that inflicted directly by the tsunami. Of increasing concern is the potential effect of tsunami draw down, when receding waters uncover cooling water intakes of nuclear power plants."

Figure 8-3: Tsunami Formation



Tsunamis are due to large off-shore earthquakes and ocean landslides. Dangerous tsunamis would most likely originate in the Aleutian and Chilean offshore submarine trenches. The City's vulnerable properties have a west-southwest facing orientation that may be vulnerable to tsunamis or tidal surges from the south and from the west.

Tsunami Watches and Warnings

Warning System

The tsunami warning system in the United States is a function of the National Oceanic and Atmospheric Administration's (NOAA) National Weather Service. Development of the tsunami warning system was impelled by the disastrous waves generated in the 1964 Alaska Tsunami, which surprised Hawaii and the U.S. West Coast, taking a heavy toll in life and property.

The disastrous 1964 tsunami resulted in the development of a regional warning system in Alaska. The Alaska Tsunami Warning Center is in Palmer, Alaska. This facility is the nerve center for an elaborate telemetry network of remote seismic stations in Alaska, Washington, California, Colorado, and other locations. Tidal data is also telemetered directly to the ATWC from eight Alaskan locations. Tidal data from Canada, Washington, Oregon, and California are available via telephone, teletype, and computer readout.

Notification

The National Warning System (NAWAS) is an integral part of the Alaska Tsunami Warning Center. Reports of major earthquakes occurring anywhere in the Pacific Basin that may generate seismic sea waves are transmitted to the Honolulu Observatory for evaluation. An Alaska Tsunami Warning Center is also in place for public notification of earthquakes in the Pacific Basin near Alaska, Canada, and Northern California. The Observatory Staff determines action to be taken and relays warnings over the NAWAS circuits to inform and warn West Coast states. The State NAWAS circuit is used to relay the information to the Los Angeles Operational Area warning center which will in turn relay the information to local warning points in coastal areas. The same information is also transmitted to local jurisdictions over appropriate radio systems, teletype, and telephone circuits to ensure maximum dissemination.

A Tsunami Watch Bulletin is issued if an earthquake has occurred in the Pacific Basin and could cause a tsunami. A Tsunami Warning Bulletin is issued when an earthquake has occurred and a tsunami is spreading across the Pacific Ocean. When a threat no longer exists, a Cancellation Bulletin is issued.

Vulnerability and Risk

With an analysis of tsunami events depicted in the "Local History" section, it can be deduced that a tsunami would significantly impact life, property, infrastructure and transportation. The City of El Segundo has three known offshore faults that could produce damaging tsunamis; they are the Palos Verdes fault, Pedro Basin fault, and the Catalina Ridge fault. City staff will continue to monitor tsunami run-up studies in the future concerning the cities vulnerability to locally generated tsunamis.

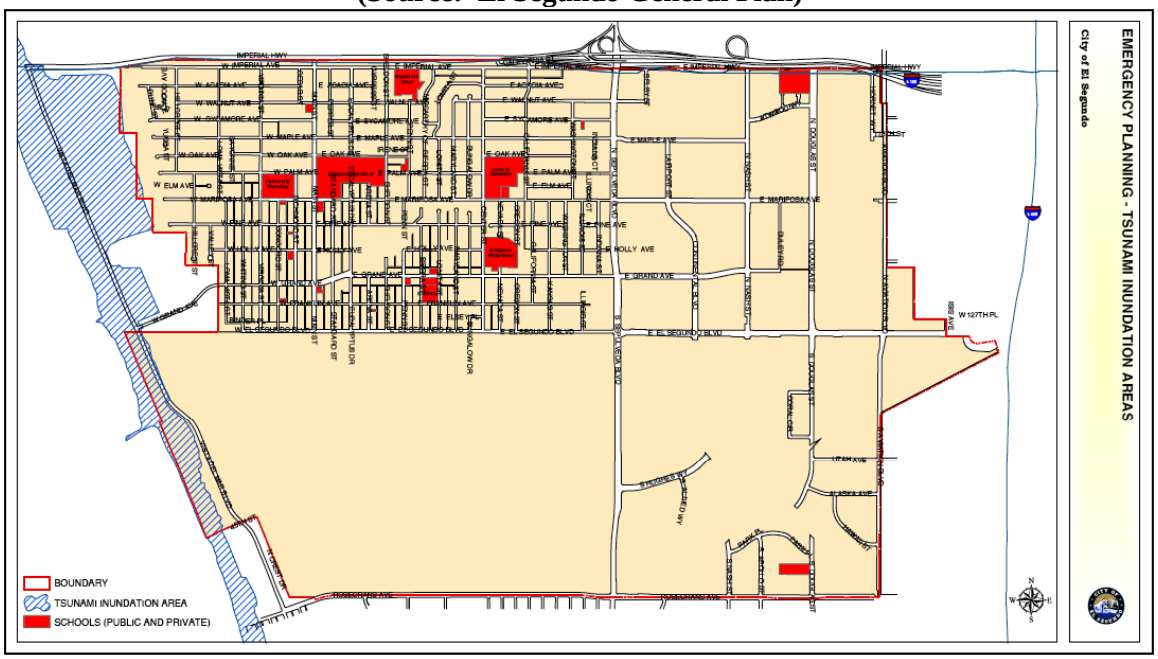
Community Tsunami Issues

What is Susceptible to Tsunami?

Electrical power generator plant and refinery operations are located in the potentially impacted areas.

Tsunami "maximum run-up" projections were modeled by the University of Southern California and distributed by the California Office of Emergency Services for the purposes of identifying tsunami hazards. The tsunami model was the result of a combination of inundation modeling and onsite surveys and shows maximum projected inundation levels from tsunamis along the entire coast of Los Angeles County. The maximum run-up for the maps below is approximately 42 feet. This means that based on the scenario tsunami, the displaced water level would be approximately 42 feet above the normal tide for that day and time.

Map 8-1: Tsunami Inundation Areas
(Source: El Segundo General Plan)



Life and Property
Based on the local history events and projected "run-up" modeling of tsunamis, it is estimated that less than 2% of the City would be directly impacted. None of the critical facilities are located in the projected run-up inundation areas. In addition to direct impacts, the City would be significantly impacted by regional damages to infrastructure.

Even though the risk of tsunami to the region is relatively low, the impacts could be very high. Mitigation measures including public awareness and posting of signs could have significant effects on the survivability of the impacted sites. It is contemplated that the City of El Segundo will initiate a tsunami awareness program in the near future to address the potential threats associated with the tsunami hazard.

Infrastructure
Tsunamis (and earthquakes) can damage buildings, power lines, and other property and infrastructure due to flooding. Tsunamis can result in collapsed or damaged buildings or blocked roads and bridges, damaged traffic signals, streetlights, and parks, among others. Damage to public water and sewer systems, transportation networks, and flood channels would greatly impact daily life for residents.

Roads blocked by objects during a tsunami may have severe consequences to people who are attempting to evacuate or who need emergency services. Emergency response operations can be complicated when roads are blocked or when power supplies are interrupted. Industry and commerce can suffer losses from interruptions in electric services and from extended road closures. They can also sustain direct losses to buildings, personnel, and other vital equipment. There are direct consequences to the local economy resulting from tsunamis related to both physical damages and interrupted services.

SECTION 9: TECHNOLOGICAL AND HUMAN-CAUSED HAZARDS

Although the following section identifies the potential for a significant Technological or Human-Caused event, the City of El Segundo has not experienced any significant events of this nature in the past.

Hazardous Materials Incident

Why are Hazardous Materials a Threat to the City of El Segundo?

The City of El Segundo maintains a Safety Element to the General Plan which provides an overview of the City's industrial locations and the potential involvement of hazardous materials incidents. Specific locations of hazardous materials are identified in the City of El Segundo Hazardous Materials Area Plan which is maintained by the Fire Department's Environmental Safety Division.

Hazardous materials are any substance or combination of substances that because of quantity, concentration, or characteristics may cause or significantly contribute to an increase in death or serious injury, or pose substantial hazards to humans and/or the environment.

Hazardous material incidents differ from other emergency response situations because of the wide diversity of causative factors and the pervasiveness of the potential threat. Circumstances such as the prevailing wind and geographic features in the vicinity of emergency incidents are relevant factors that may greatly increase the hazardous chemical dangers. Incidents may occur at fixed facilities where, most likely, the occupants have filed site-specific emergency response contingency and evacuation plans. However, incidents may also occur at any place along any land, water or air transportation routes, and (in event of vessel mishaps, aircraft accidents, misuse of agricultural chemicals and illegal dumping) may occur in unpredictable areas, relatively inaccessible by ground transportation.

In El Segundo the vast majority of hazardous material incidents are handled before they become a major disaster. Nevertheless, the emergency organization needs to be flexible and evolutionary in its response to a developing incident. The Hazardous Materials Area Plan is designed to accommodate both the large number of relatively routine minor spill incidents and the truly catastrophic hazardous material disaster.

The increasing volume and variety of hazardous materials that are generated, stored, or transported within the City is a concern to public officials and the community. A major hazardous material accident and/or spill could endanger public health and safety within two miles of the accident scene. Several fixed site industrial firms use potentially hazardous materials to operate their businesses. Other threats include commercial airliners which routinely takeoff and land in the Los Angeles International Airport and significantly increase the overall potential disaster threat.

Specific Hazards that Threaten the City of El Segundo

The threat of a major hazardous material incident in El Segundo exists from seven different sources: (1) commercial transport vehicles, (2) air transportation; (3) rail car, (4) airborne industrial chemical release, (5) pipeline; (6) fixed facility; and (7) clandestine dumping.

Freeway/Transportation
El Segundo is traversed by 2 major freeways; the San Diego Freeway (I-405) and the Glenn Anderson – Century Freeway (I-105). These freeways are heavily traveled by trucks moving many types of materials produced by chemical manufacturing facilities within El Segundo, many of them hazardous. Commercial routes include El Segundo Boulevard, Grand Avenue, Imperial Highway, and Sepulveda Boulevard (SR-1). An accident on any major commercial route involving a vehicle carrying hazardous materials could impact thousands of residents depending on wind conditions, and time of day.

Air Transportation
The City of El Segundo is near the flight pattern of arriving and departing commercial aircraft carriers at the Los Angeles International Airport and Hawthorne Municipal Airport. There is always a risk of an in-flight emergency and/or catastrophic failure of the aircraft over the City, or the Pacific Ocean. Such an incident would significantly impact the City.

Pipelines
Pipelines owned and operated by various companies run beneath the City's streets. Some pipelines enter from South and travel north along Sepulveda Boulevard and Aviation Street, and exit the City to the north, beneath Imperial Highway to the Los Angeles International Airport. The pipes vary in size from 6 to 18 inches in diameter, and buried at different depths. A rupture of any of these pipelines could pose major hazards to persons, property and environment. Ruptures in these lines have occurred at various locations outside the City, and will continue to pose risk to the community.

Fixed Facility
A serious hazardous material threat exists from an accidental spill and/or incident at one of the estimated 250 known facilities that manufacture, warehouse, and process toxic chemicals and/or generate hazardous waste materials within or next to City boundaries. Although there are numerous facilities involved with hazardous materials, they are less of a threat due to required plant contingency and evacuation plans.

Clandestine Dumping
Clandestine dumping is the criminal act of disposing of toxic materials and hazardous waste on public or private property. As the costs and restrictions increase for legitimate hazardous waste disposal sites, it can be anticipated that illegal dumping of hazardous materials will increase proportionately.

<u>Transportation Accidents</u>

Major Air Crash
A major air crash that occurs in a heavily populated residential area can result in considerable loss of life and property. The impact of a disabled aircraft as it strikes the ground creates the likely potential for multiple explosions, resulting in intense fires. The time of day when the crash occurs may significantly affect the extent of damage to persons and property. Damage assessment and disaster relief efforts associated with an air crash incident will require support from other local governments, private organizations and in certain instances from the state and federal governments.

The intense fires, until controlled, will limit search and rescue operations. Police barricades will be needed to block off the affected area. The crowds of onlookers and media personnel will have

to be controlled. Injured or displaced persons will require emergency medical care, food and temporary shelter. Many families may be separated, particularly if the crash occurs during working hours. Investigators from the National Transportation and Safety Board and the Los Angeles County Coroners Office will have short-term jurisdiction over the crash area and investigations will be completed before the area is released for clean up.

The clean-up operation may consist of the removal of large debris, clearing of roadways, demolishing unsafe structures and towing of demolished vehicles. It can be anticipated that the mental health needs of response personnel, survivors and the surrounding residents will greatly increase due to the trauma associated with such a catastrophe. A coordinated response team, comprised of mental health professionals, will take a proactive approach toward identifying and addressing mental health needs stemming from any traumatic disaster.

Air Traffic in the Vicinity of El Segundo

The City of El Segundo is located in the 14 miles southwest of downtown Los Angeles. The City is comprised primarily of commercial/industrial areas. The skies in the area of El Segundo are heavily occupied by aircraft originating and departing from a number of airports located in Southern California. The airports nearest to El Segundo, handling the greatest amount of air traffic are as follows:

> **Los Angeles International Airport (LAX):** LAX is the fourth busiest airport in the world and has experienced a four percent air traffic growth rate in recent years. Planes arrive and department at a rate of one per minute.
>
> **Long Beach Airport (LGB):** LGB is ranked the 12th busiest airport nationally in terms of air traffic that it handles and is experiencing a 0.5 percent decrease in the rate of traffic. Planes arrive and depart at a rate of 1.5 every two minutes.

Aircraft flying in the area of El Segundo are located in the Los Angeles Terminal Control Area (TCA). The TCA is airspace restricted to large, commercial airliners. Each TCA has an established maximum and minimum altitude in which a large aircraft must travel. Smaller aircraft desiring to transit the TCA may do so by obtaining Air Traffic Control clearance. The aircraft may then proceed to transit when traffic conditions permit. Aircraft departing from other than LAX, whose route of flight would penetrate the TCA, are required to give this information to Air Traffic Control on appropriate frequencies. Pilots operating small aircraft often rely on geographical landmarks, rather than charts, to indicate their locations. If a pilot is unfamiliar with the geographical landmarks of the Southern California basin, they may misinterpret a particular landmark and inadvertently enter the restricted TCA airspace. This misunderstanding may result in a mid-air collision.

Over the past ten years, there have been significant occurrences of near-miss collisions in or near Los Angeles International Airport. Each year, more than 20 average runway incursions occur on LAX runways. This threat continues to grow each year as passenger flights and cargo transports continue to increase, and the FAA flight control systems struggle to keep up.

Following are recorded crashes in and around the Los Angeles International Airport based on commercial and domestic flights into or out of LAX (on average, over 10 emergency landings occur due to in-flight emergencies yearly):

Table 9-1: Major Air Crashes near the Los Angeles International Airport

Year	Event
2000	Alaska Air Flight #261 enroute to LAX on an in-flight emergency and catastrophic instrument failure, crashed into the Pacific Ocean just 7 air minutes from LAX (88 passengers and crew killed);
2000	KLM 767 Passenger Jet dropped an engine cover due to bird strike onto Dockweiler State Beach immediately after takeoff and made a successful emergency landing;
1991	February 1991 – a collision between a US Air 737B and a Skywest Swearingen 226 Metroliner occurred on the runway of LAX killing 22 and injuring 87.
1980	2 single engine planes collided over El Segundo onto Mariposa Avenue and Sepulveda Blvd, killing 3 and injuring 6 people on the ground.
1978	Continental Airlines DC-10 blew both tires on takeoff and aborted takeoff, crashing 600 feet off the runway and coming to rest on Vista Del Mar at the Los Angeles/El Segundo border killing 2 and injuring 200 passengers.
1969	A B-26 crashed into an apartment complex on Sycamore Avenue in El Segundo killing 4 aboard, and 2 on the ground;
1969	A United 727 suffered catastrophic failure on takeoff and crashed into Santa Monica Bay killing all 28 passengers and crew;
1969	A Scandinavian DC-8 crashed 7 miles from the airport into Santa Monica Bay on pilot error – killing 15, injuring 28 passengers.
1963	A Western Airlines DC-6 crashed on a go-around in low visibility conditions.

Currently, an airport security plan is under consideration by the City of Los Angeles to increase the airport capacity of LAX to approximately 78 million annual passengers (MAP) per year. This substantially increases the potential of an aviation emergency occurring in or near El Segundo. The FAA has promised to improve its radar and navigational systems, yet system failures grow each year – increasing the risk of a catastrophic aviation emergency in or near El Segundo. Nearly all of the crashes involve pilot error or a combination of traffic control error, pilot error, judgment, maintenance oversight or mechanical failure – these situations substantially increase the risk of an aviation emergency in or near El Segundo.

Commercial Transportation Incident (Rail/Truck)

A major commercial transportation (rail/truck) incident that occurs in a heavily populated industrial area or residential area can result in considerable loss of life and property. When a commercial truck is involved in an accident, there is no longer control as to the direction the truck will travel. Potential hazards could be overturned tank trailers, direct impact either into a residence or industrial building, or entering into the normal flow of traffic. When a rail car is involved in an accident (BLEVE or rupture) or derailment, a combination of products and materials that are extremely hazardous and/or flammable may be released.

Each of these hazards encompasses many threats, such as hazardous materials incident, fire, explosion, severe damage to rail lines, roadways, adjacent buildings or vehicles, roadway closures, evacuations, and loss of life if pedestrians or those in either the adjacent buildings or vehicles are affected by the incident.

Civil Unrest

The spontaneous disruption of normal, orderly conduct and activities in urban areas, or outbreak of rioting or violence that is of a large nature is referred to as civil unrest. Civil unrest can be spurred by specific events, such as large sporting events or criminal trials, or can be the result of long-term disfavor with authority. Civil unrest is usually noted by the fact that normal on-duty police and safety forces cannot adequately deal with the situation until additional resources can be acquired. This is the period when civil unrest can grow to large proportions.

Threat to law enforcement and safety personnel can be severe and bold in nature. Securing of essential facilities and services is necessary. Looting and fires can take place because of perceived or actual non-intervention by authorities.

History of Civil Unrest in the City of El Segundo

Occasional civil unrest incidents have impacted areas within the City or the entire City. Following the Rodney King Trial in 1992, major incidents of looting, arson, and civil unrest from neighboring jurisdictions (Hawthorne, Gardena and Inglewood) affected the City of El Segundo for up to 72 hours. In the area within South Central Los Angeles and bordering communities near El Segundo, over 800 businesses burned to the ground, and personal property damages resulted in over 1 billion dollars in losses, 54 deaths, and numerous injuries occurred.

National Security Emergency

Because of international political changes, the possibility of full-scale nuclear war is significantly reduced. However, limited nuclear strikes by rogue nations, terrorist activities, and radiological materials accidents are still likely. Terrorist activities could result in the use nuclear weapons – a weapon of mass destruction (WMD) being detonated or incorporated into a non-nuclear explosive device ("dirty bomb") that would not provide a nuclear explosion, but spread nuclear materials and radiation in the area of the explosion.

The following is provided for information and planning purposes:

Air Burst

An air burst, by definition, is when a nuclear weapon is detonated and the fireball does not touch the surface of the earth. Usually, the weapon is set to detonate at a height of between 5,000 and 15,000 feet. Air bursts are generally selected for their capability to generate high over-pressure and shock effect over large areas, as well as to ignite fires for great distances. Neither radiation nor radioactive fallout is considered to be a significant factor in the event of an air burst.

Surface Burst

A nuclear detonation is considered a surface burst when the fireball generated touches the surface of the earth. Surface bursts could include water bursts, underwater bursts and underground bursts. Surface bursts produce large amounts of radioactive fallout. Therefore, some targets may be selected not only for destroying facilities, but to also use the downwind fallout to prevent access or restrict movement in large geographical areas.

Detonation of a nuclear bomb can produce various damaging effects. Included are blast and over-pressure, intense heat and light, nuclear radiation (fission and fusion), electromagnetic pulse, and for surface bursts, radioactive fallout.

Blast
When the weapon is detonated, a tremendous pressure is developed. This over-pressure rapidly expands outward in all directions, creating extremely high winds. The expansion continues until the over-pressure is reduced to normal pressure. The rapid outward expansion of air creates a vacuum that must equalize. The winds then reverse to the opposite direction and continue until the air pressure is equalized. Damage and injury are caused not only by the outward expansion phase of the wind and pressure, but also in the opposite direction when the air is rushing back to fill the vacuum. It is believed that an ordinary California home would be destroyed at about 1.5 to 2 psi, often 2 to 5 miles from the detonation.

Thermal Radiation
Thermal radiation is a burst of intense light and heat. This phenomenon can initiate fires as well as produce casualties. A one-megaton explosion can produce flash-blindness up to 13 miles on a clear day, or 53 miles on a clear night. Thermal radiation can cause skin and retinal burns many miles from the point of detonation. A one-megaton explosion can cause first-degree burns at distances of approximately 7 miles, second-degree burns at approximately 6 miles, and third-degree burns at approximately 5 miles from ground zero. Detonation of a single thermonuclear weapon could cause many thousands of burn casualties.

Initial Radiation
Defined as that radiation emitted during the first minute after detonation, it is comprised of gamma rays and neutrons. For large yield weapons, the range of the initial radiation is less than that of the lethal blast and thermal radiation effects. However, with respect to small yield weapons, the initial radiation may be the lethal effect with the greatest range.

Fallout
Produced by surface debris drawn into and irradiated by the fireball, then rising into the atmosphere and eventually returning to earth. When a nuclear detonation occurs, fission products and induced radioactive material from the weapon casing and debris that was pulled up into the fireball returns to earth as fallout. A source of ionizing radiation, fallout may be deposited miles from the point of detonation and thus affect people otherwise safe from the other effects of the weapon. The radiation danger associated with fallout decreases as the radioactive material decays. Decay rates range from several minutes to several years.

Electromagnetic Pulse (EMP)
Intense electric and magnetic fields that can damage unprotected electronic equipment. This effect is most pronounced in high altitude bursts (above 100,000 feet). Surface bursts typically produce significant EMP up to the 1 psi over-pressure range, while air bursts produce somewhat less. No evidence exists suggesting that EMP produces harmful effects in humans.

Dirty Bomb
A dirty bomb is a conventional explosive salted with radioactive isotopes — cesium, cobalt and iridium isotopes that are widely used for industrial and medical purposes-- in order to spew out nuclear material and contaminate a wide area. The military usefulness of such devices is widely disputed. The TNT in such a bomb may still be more dangerous than the nuclear material. Its destructive power would depend on the size of the conventional bomb and the volume and nature of the nuclear material.

Domestic Terrorism

Terrorism is the use of fear for intimidation, usually for political goals. Terrorism is a crime where the threat of violence is often as effective as the commission of the violent act itself. Domestic Terrorism focuses on local threats of terrorism using commonly used weapons; weapons of mass destruction; and civil unrest which may be designed to disrupt businesses and other services. Tactics of civil unrest may includes blockades, riots, acts of civil disobedience, trespassing, vandalism, disrupting transportation routes, and interfering with computer networks.

Persons employing terrorist activities ordinarily attack high profile targets in order to generate media coverage and widespread public attention and fear. Accordingly, health care clinics, government offices, public places with high concentrations of pedestrians, and other, similar, facilities are all potential terrorist targets.

Specific Situations
Obvious structural targets include:
• Government
• Religious groups
• Racial groups or of a specific national origin
• Business
• Public infrastructure including major shipping ports, major airport, and major rail terminals

A significant date to a particular terrorist group may be April 19th (based upon the 1993 Branch Davidian incident in Waco, Texas) and the April 19, 1995 Oklahoma City, OK Bombing of Federal Building, and the Columbine High School shootings on April 20, 1999. Other dates include 9-11, for the anniversary of the East Coast Terrorist attacks in New York, Washington D.C., and Pennsylvania on September 11, 2001.

Potential individual targets include:
• Government and school officials
• Religious or ethnic leaders
• Business persons
• Visiting dignitaries
• Leaders of radical groups

Special events held that might be a terrorist target:
• Conventions or meetings
• Newsworthy trials
• Religious or ethnic festivals

The greatest threat from terrorism is directly related to the City of El Segundo' proximity to the Los Angeles International Airport. The Airport ranked one of the top in the world with 61 million passengers and 2.1 million tons of goods in 2006 alone. In the event of a major crash, explosion, or biochemical release, the residents of El Segundo could be significantly impacted.

Public Health Emergency

The City of El Segundo, like most California cities, has no Public Health Office or Public Health Officer. The County of Los Angeles Department of Health and the State of California, under the Department of Health Services (DHS), manage local public health and safety issues nationally in coordination with the World Health Organization (WHO), and the Centers for Disease Control

(CDC). Local health departments and physicians are required to report on 83 different diseases. Public health labs are required to report 18 of the 83 reportable diseases.

Problems (infection or illness) would be identified by a variety of entities:
• Clinicians (urgent care, hospitals, clinics)
• Pharmacists
• Veterinarians
• Animal Control
• Vector Control
• Emergency medical personnel (first responders, EMT's, Paramedics, ER personnel)
• Laboratorians
• Pathologists
• Coroner

Under the direction of the Director of DHS, the Division of Communicable Disease Control (DCDC) would have primary responsibility for planning and coordinating the DHS (state) response to a public health emergency. The Emergency Preparedness Office (EPO) is a branch of DHS that is responsible for ensuring that the Department of Health Services is prepared to respond to disasters and for coordinating DHS disaster response activities.

The response activities at the State level would be carried out in collaboration with the Emergency Medical Services Authority (EMSA), the Health and Human Services Agency, and the Governor's Office of Emergency Services (OES).

The Los Angeles County Office of Emergency Management (OEM) and Department of Health would coordinate personnel and material resource acquisition and distribution in coordination with local, state, and federal agencies. In addition, potential pharmaceutical distribution sites have been identified in each locale within of Los Angeles County to assist in dispensing pharmaceuticals or vaccines if there is a credible public health threat.

A public health emergency could be linked to intentional exposure of a contagious disease that may be treated as an act of terrorism by law enforcement officials. However, the underlying public health emergency still must be addressed at the local level. The most realistic presentation of a public health emergency is a natural pandemic associated with influenza, or an intentional (terrorist) act of exposing the public to a bio-weaponized material (smallpox, anthrax, etc.)

The worst natural disaster in modern times was the infamous "Spanish flu" of 1918-1919, which caused 20 million deaths worldwide and over 500,000 deaths in the U.S. Although the Asian influenza pandemic of 1957 and the Hong Kong influenza pandemic of 1968 were not as deadly as the Spanish influenza pandemic, both were associated with high rates of illness and social disruption.

Influenza is a highly contagious viral disease. Pandemics occur because of the ability of the influenza virus to change into new types, or strains. People may be immune to some strains of the disease either because they have had that strain of influenza in the past or because they have recently received influenza vaccine. However, depending on how much the virus has changed, people may have little or no immunity to the new strain. Small changes can result in localized epidemics. But, if a novel and highly contagious strain of the influenza virus emerges, influenza pandemic can occur and affect populations around the world.

California, with its west coast location and several major ports of entry for flights (LAX) and shipping from Asia (a likely location for the development of a novel virus), would likely be among the first U.S. locations for influenza pandemic to establish a foothold.

The California Department of Health Services (DHS) estimates that the impact of an influenza pandemic on California's population of 35 million could include:
• 8.8 million persons ill with influenza (estimated range: 5.3 million to 12.3 million);
• 4.7 million outpatient visits (estimated range: 2.8 million to 6.6 million);
• 97,200 persons hospitalized (estimated range: 58,300 to 136,000);
• 21, 500 deaths (estimated range: 12,900 to 30,200).

These estimates underscore the need for advance planning to lessen the impact of a pandemic.

Smallpox was declared eradicated in 1980, public health vaccines ended in 1972 in the United States. Live viruses were maintained as part of government weapons programs. These types of agents may be directed toward a civilian population in manner similar to the intentional release of Anthrax in domestic mail in October 2001 in Florida, Washington, and New Jersey, resulting in 5 deaths. Other Class "A" agents include: anthrax, plague, tularemia, botulism, and viral hemorrhagic fevers (filovirouses and arenaviruses).

Class B viruses include: Q fever, Brucellosis *(Brucella abortus, etc)*, Glanders *(Burkholderia mallei)*, Viral encephalitides (Venezuelan equine encephalitis), Staphylococcal enterotoxin B), Food/Waterborne (*Salmonella, Shigella,, Cholera*, *Cryptosporidium*.

Other viruses, like the West Nile virus (WNV), which was discovered in 1999 in New York City, and St. Louis Encephalitis (SLE) could impact the City of El Segundo. In just under 3 years, the WNV reached Los Angeles County (September 2002). SLE is endemic to Imperial County for over 20 years. There is no cure for these and most viruses. In 2002 alone, the WNV epidemic infected over 3400 victims across the United States; of those infected the CDC has reported over 200 deaths.

Vaccinations also present a potential risk to the public because a small percentage of those receiving vaccinations may have adverse reactions – which are sometimes fatal. Reactions may include allergies, disability, or development of actual illness as a direct result of preventive measures taken.

Public Health Emergencies in the City of El Segundo

A local crisis or disease cluster develops with an illness presented by patient onset that strains the resources of public safety in response, transport, and treatment of those infected with a disease or virus. Local health departments begin active surveillance, which may trigger a national surveillance. Major issues and challenges associated with this type of emergency are: identifying the disease, eliminating transmission of the disease (isolation, vector control, and possible quarantine), treatment of those already infected, surveillance of the disease, treatment of those exposed to an infection but not yet showing symptoms, and the potential for dealing with mass fatalities associated with a public health emergency (epidemic), and addressing the panic and fear associated with wide spread disease or epidemic.

California maintains plans to address public health emergencies: the Department of Health Services (CDHS) "Bioterrorism Surveillance and Epidemiologic Response Plan," and the Department of Health Services (DHS) "Influenza Pandemic Response Plan." The Federal

government and Office of Homeland Security have additional plans in place. Many are currently under development.

The Public Health Officer has the authority under California Health and Safety Code to institute a variety of measures, including, but limited to isolation, quarantine, and to order the destruction of public and private property declared to be a threat to the public health and safety (infection or contamination). These are generally extreme measures that are implemented when a severe crisis or state of emergency exists or is declared.

Pandemic

The California Influenza Pandemic Response Plan states "in California, an influenza pandemic (worldwide epidemic) could result in nine million persons ill with influenza. The number of persons hospitalized would probably be about 97,000 persons (compared with about 3,000 in a normal year) and 21,000 deaths (compared with about 200 in a normal year). In order to lessen the impact of a pandemic, the Department of Health Services (DHS) has developed the "*Influenza Pandemic Response Plan"* to promote an orderly and effective response, from the first novel virus alert through the conclusion of the last wave of the pandemic.

Biohazards and Bioterrorism

Bioterrorism and its potential for mass destruction have been subjects of increasing concern. Terrorist groups have used or threatened to use biological agents in a variety of circumstances, both domestically and internationally. Current concerns regarding the threat of bioterrorism result from the production of biological weapons for use in the 1991 Gulf War and from the increasing number of countries that are engaged in the proliferation of such weapons. Many foreign countries possess offensive biological weapons programs and the existence of these programs increases the likelihood that biological expertise will be transferred, directly or indirectly, to groups and individuals with grievances against the government or society.

The growth of religious cults and extremist political groups also increases the threat of bioterrorism today. In 1995, a Japanese doomsday cult released the nerve agent Sarin in a Tokyo subway following several failed bioterrorist attacks in Japan. The group had also planned similar attacks in the United States (U.S.). A significant biological attack in the U.S. was the intentional contamination of restaurant salad bars with *Salmonella* by a religious cult in Oregon in 1984, it was the first major bioterrorism act reported.

The most significant biological terrorist attack on US soil occurred on the east coast in October 2001 through December 2001. Military (weapons) grade anthrax was sent via the United States Postal system in letters addressed to elected officials and prominent members of the print and television media. When the letters were opened, millions of spores were released infecting all surfaces and people entering the area. Five people died and hundreds were exposed.

California is vulnerable to bioterrorist incidents. California has the largest population and the largest economy in the nation and continues to be a major port of entry for travelers to the U.S. One in every eight Americans lives in California and two-thirds of the population lives in the coastal urban areas surrounding the San Francisco and Los Angeles metropolitan areas. California is the home to numerous extremist groups, some motivated to bring about social disruption. In addition, numerous sophisticated biotechnology laboratories that could provide essential supplies and facilities for potential bioterrorists onsite or by theft are located in California.

The public health infrastructure at the local and state levels must be prepared to detect, control, and prevent illness and injury resulting from biological and chemical terrorism, especially a covert terrorist attack. Preparation for bioterrorism involves strengthening of the existing infrastructure for the surveillance of infectious diseases; detection, and investigation of outbreaks; identification of etiologic agents and their modes of transmission; the development of prevention and control strategies; and; the mobilization and management of resources required to respond to disease outbreaks and other health emergencies.

Bioterrorism Preparations

The County of Los Angeles and State of California maintains aggressive public health surveillance programs. In addition, the use of vaccines for influenza is encouraged for those at risk (children, elderly, and those with weakened immune systems. The United States through the CDC, Health and Human Services, and Office of Homeland Security are currently evaluating the use of vaccines for smallpox to public health workers.

There are concerns that the smallpox virus could be used for bioterrorism. The risk for smallpox occurring as a result of a deliberate release by terrorists is not known, but is considered very low. Members of the Advisory Committee on Immunization Practices (ACIP) and the National Vaccine Advisory Committee (NVAC), two groups that provide recommendations to CDC and the Department of Health and Human Services (DHHS) on vaccine use and policies, met to review current smallpox vaccine recommendations. There is an expected availability of about 286 million doses of smallpox vaccine by the end of the 2002. This stockpile would be enough to protect every United States citizen, if needed.

Impact of Technological and Human-Caused Hazard Issues on the City of El Segundo

Because of the nature of technological and human-caused hazards it is difficult to identify specific locations or populations clusters that would be vulnerable to a particular hazardous event. As such, no specific infrastructure, government structure, population centers have been identified as being targets or at any greater risk than any other location. Impacts that are not quantified, but can be anticipated in future events, include:

- Injury and loss of life;
- Commercial and residential structural damage;
- Disruption of and damage to public infrastructure;
- Secondary Health hazards e.g. mold and mildew;
- Damage to roads/bridges resulting in loss of mobility;
- Significant economic impact (jobs, sales, tax revenue) upon the community;
- Negative impact on commercial and residential property values; and
- Significant disruption to students and teachers as temporary facilities and relocations would likely be needed.

APPENDIX A: MASTER RESOURCE DIRECTORY

The Resource Directory provides contact information for local, regional, state, and federal programs that are currently involved in hazard mitigation activities. The Hazard Mitigation Advisory Committee may look to the organizations on the following pages for resources and technical assistance. The Resource Directory provides a foundation for potential partners in action item implementation.

The Hazard Mitigation Advisory Committee will continue to add contact information for organizations currently engaged in hazard mitigation activities. This section may also be used by various city members interested in hazard mitigation information and projects.

American Public Works Association			
Level: National	Hazard: Multi	http://www.apwa.net	
2345 Grand Boulevard		Suite 500	
Kansas City, MO 64108-2641		Ph: 816-472-6100	Fx: 816-472-1610
Notes: The American Public Works Association is an international educational and professional association of public agencies, private sector companies, and individuals dedicated to providing high quality public works goods and services.			
Association of State Floodplain Managers			
Level: Federal	Hazard: Flood	www.floods.org	
2809 Fish Hatchery Road			
Madison, WI 53713		Ph: 608-274-0123	Fx:
Notes: The Association of State Floodplain Managers is an organization of professionals involved in floodplain management, flood hazard mitigation, the National Flood Insurance Program, and flood preparedness, warning and recovery			
Building Seismic Safety Council (BSSC)			
Level: National	Hazard: Earthquake	www.bssconline.org	
1090 Vermont Ave., NW		Suite 700	
Washington, DC 20005		Ph: 202-289-7800	Fx: 202-289-109
Notes: The Building Seismic Safety Council (BSSC) develops and promotes building earthquake risk mitigation regulatory provisions for the nation.			

California Department of Transportation (CalTrans)			
Level: State	Hazard: Multi	http://www.dot.ca.gov/	
120 S. Spring Street			
Los Angeles, CA 90012		Ph: 213-897-3656	Fx:
Notes: CalTrans is responsible for the design, construction, maintenance, and operation of the California State Highway System, as well as that portion of the Interstate Highway System within the state's boundaries. Alone and in partnership with Amtrak, Caltrans is also involved in the support of intercity passenger rail service in California.			
California Resources Agency			
Level: State	Hazard: Multi	http://resources.ca.gov/	
1416 Ninth Street		Suite 1311	
Sacramento, CA 95814		Ph: 916-653-5656	Fx:
Notes: The California Resources Agency restores, protects and manages the state's natural, historical and cultural resources for current and future generations using solutions based on science, collaboration and respect for all the communities and interests involved.			
CAL FIRE - California Department of Forestry and Fire Protection			
Level: State	Hazard: Multi	http://www.fire.ca.gov/php/index.php	
210 W. San Jacinto			
Perris CA 92570		Ph: 909-940-6900	Fx:
Notes: The California Department of Forestry and Fire Protection (CAL FIRE) protects over 31 million acres of California's privately-owned wildlands. CAL FIRE emphasizes the management and protection of California's natural resources.			
California Division of Mines and Geology (DMG)			
Level: State	Hazard: Multi	www.consrv.ca.gov/cgs/index.htm	
801 K Street		MS 12-30	
Sacramento, CA 95814		Ph: 916-445-1825	Fx: 916-445-5718
Notes: The California Geological Survey develops and disseminates technical information and advice on California's geology, geologic hazards, and mineral resources.			
California Environmental Resources Evaluation System (CERES)			
Level: State	Hazard: Multi	http://ceres.ca.gov/	
900 N St.		Suite 250	
Sacramento, Ca. 95814		Ph: 916-653-2238	Fx:
Notes: CERES is an excellent website for access to environmental information and websites.			

California Department of Water Resources (DWR)			
Level: State	Hazard: Flood	http://www.dwr.water.ca.gov	
1416 9th Street			
Sacramento, CA 95814		Ph: 916-653-6192	Fx:
Notes: The Department of Water Resources manages the water resources of California in cooperation with other agencies, to benefit the State's people, and to protect, restore, and enhance the natural and human environments.			
California Department of Conservation: Southern California Regional Office			
Level: State	Hazard: Multi	www.consrv.ca.gov	
655 S. Hope Street		#700	
Los Angeles, CA 90017-2321		Ph: 213-239-0878	Fx: 213-239-0984
Notes: The Department of Conservation provides services and information that promote environmental health, economic vitality, informed land-use decisions and sound management of our state's natural resources.			
California Planning Information Network			
Level: State	Hazard: Multi	www.calpin.ca.gov	
		Ph:	Fx:
Notes: The Governor's Office of Planning and Research (OPR) publishes basic information on local planning agencies, known as the California Planners' Book of Lists. This local planning information is available on-line with new search capabilities and up-to-the- minute updates.			
EPA, Region 9			
Level: Regional	Hazard: Multi	http://www.epa.gov/region09	
75 Hawthorne Street			
San Francisco, CA 94105		Ph: 415-947-8000	Fx: 415-947-3553
Notes: The mission of the U.S. Environmental Protection Agency is to protect human health and to safeguard the natural environment through the themes of air and global climate change, water, land, communities and ecosystems, and compliance and environmental stewardship.			
Federal Emergency Management Agency, Region IX			
Level: Federal	Hazard: Multi	www.fema.gov	
1111 Broadway		Suite 1200	
Oakland, CA 94607		Ph: 510-627-7100	Fx: 510-627-7112
Notes: The Federal Emergency Management Agency is tasked with responding to, planning for, recovering from and mitigating against disasters.			

Federal Emergency Management Agency, Mitigation Division			
Level: Federal	Hazard: Multi	www.fema.gov/fima/planhowto.shtm	
500 C Street, S.W.			
Washington, D.C. 20472		Ph: 202-566-1600	Fx:
Notes: The Mitigation Division manages the National Flood Insurance Program and oversees FEMA's mitigation programs. It has of a number of programs and activities of which provide citizens Protection, with flood insurance; Prevention, with mitigation measures and Partnerships, with communities throughout the country.			
Floodplain Management Association			
Level: Federal	Hazard: Flood	www.floodplain.org	
P.O. Box 50891			
Sparks, NV 89435-0891		Ph: 775-626-6389	Fx: 775-626-6389
Notes: The Floodplain Management Association is a nonprofit educational association. It was established in 1990 to promote the reduction of flood losses and to encourage the protection and enhancement of natural floodplain values. Members include representatives of federal, state and local government agencies as well as private firms.			
Governor's Office of Emergency Services (OES)			
Level: State	Hazard: Multi	www.oes.ca.gov	
P.O. Box 419047			
Rancho Cordova, CA 95741-9047		Ph: 916 845- 8911	Fx: 916 845- 8910
Notes: The Governor's Office of Emergency Services coordinates overall state agency response to major disasters in support of local government. The office is responsible for assuring the state's readiness to respond to and recover from natural, manmade, and war-caused emergencies, and for assisting local governments in their emergency preparedness, response and recovery efforts.			
Landslide Hazards Program, USGS			
Level: Federal	Hazard: Landslide	http://landslides.usgs.gov/index.html	
12201 Sunrise Valley Drive		MS 906	
Reston, VA 20192		Ph: 703-648- 4000	Fx:
Notes: The NLIC website provides good information on the programs and resources regarding landslides. The page includes information on the National Landslide Hazards Program Information Center, a bibliography, publications, and current projects. USGS scientists are working to reduce long-term losses and casualties from landslide hazards through better understanding of the causes and mechanisms of ground failure both nationally and worldwide.			

Los Angeles County Economic Development Corporation			
Level: Regional	Hazard: Multi	www.laedc.org	
444 S. Flower Street		34th Floor	
Los Angeles, CA 90071		Ph: 213-236-4813	Fx: 213- 623-0281
Notes: The LAEDC is a private, non-profit 501 I 3 organization established in 1981 with the mission to attract, retain and grow businesses and jobs in the Los Angeles region. The LAEDC is widely relied upon for its Southern California Economic Forecasts and Industry Trend Reports. Lead by the renowned Jack Kyser (Sr. Vice President, Chief Economist) his team of researchers produces numerous publications to help business, media and government navigate the LA region's diverse economy.			
Los Angeles County Public Works Department			
Level: County	Hazard: Multi	http://ladpw.org	
900 S. Fremont Ave.			
Alhambra, CA 91803		Ph: 626-458-5100	Fx:
Notes: The Los Angeles County Department of Public Works protects property and promotes public safety through Flood Control, Water Conservation, Road Maintenance, Bridges, Buses and Bicycle Trails, Building and Safety, Land Development, Waterworks, Sewers, Engineering, Capital Projects and Airports			
National Resources Conservation Service			
Level: Federal	Hazard: Multi	http://www.nrcs.usda.gov/	
14th and Independence Ave., SW		Room 5105-A	
Washington, DC 20250		Ph: 202-720-7246	Fx: 202-720-7690
Notes: NRCS assists owners of America's private land with conserving their soil, water, and other natural resources, by delivering technical assistance based on sound science and suited to a customer's specific needs. Cost shares and financial incentives are available in some cases.			
National Fire Protection Association (NFPA)			
Level: National	Hazard: Wildfire	http://www.nfpa.org/catalog/home/index.asp	
1 Batterymarch Park			
Quincy, MA 02169-7471		Ph: 617-770-3000	Fx: 617 770-0700
Notes: The mission of the international nonprofit NFPA is to reduce the worldwide burden of fire and other hazards on the quality of life by providing and advocating scientifically-based consensus codes and standards, research, training and education			

National Floodplain Insurance Program (NFIP)			
Level: Federal	Hazard: Flood	www.fema.gov/nfip/	
500 C Street, S.W.			
Washington, D.C. 20472		Ph: 202-566-1600	Fx:
Notes: The Mitigation Division manages the National Flood Insurance Program and oversees FEMA's mitigation programs. It has of a number of programs and activities of which provide citizens Protection, with flood insurance; Prevention, with mitigation measures and Partnerships, with communities throughout the country.			
National Oceanic /Atmospheric Administration			
Level: Federal	Hazard: Multi	www.noaa.gov	
14th Street and Constitution Ave NW		Rm 6013	
Washington, DC 20230		Ph: 202-482-6090	Fx: 202-482-3154
Notes: NOAA's historical role has been to predict environmental changes, protect life and property, provide decision makers with reliable scientific information, and foster global environmental stewardship.			
National Weather Service, Office of Hydrologic Development			
Level: Federal	Hazard: Flood	http://www.nws.noaa.gov/	
1325 East West Highway		SSMC2	
Silver Spring, MD 20910		Ph: 301-713-1658	Fx: 301-713-0963
Notes: The Office of Hydrologic Development (OHD) enhances National Weather Service products by: infusing new hydrologic science, developing hydrologic techniques for operational use, managing hydrologic development by NWS field office, providing advanced hydrologic products to meet needs identified by NWS customers			
National Weather Service			
Level: Federal	Hazard: Multi	http://www.nws.noaa.gov/	
520 North Elevar Street			
Oxnard, CA 93030		Ph: 805-988- 6615	Fx:
Notes: The National Weather Service is responsible for providing weather service to the nation. It is charged with the responsibility of observing and reporting the weather and with issuing forecasts and warnings of weather and floods in the interest of national safety and economy. Briefly, the priorities for service to the nation are: 1. protection of life, 2. protection of property, and 3. promotion of the nation's welfare and economy.			

Sanitation Districts of Los Angeles County			
Level: County	Hazard: Flood	http://www.lacsd.ora/	
1955 Workman Mill Road			
Whittier, CA 90607		Ph:562-699-7411 x2301	Fx:
Notes: The Sanitation Districts provide wastewater and solid waste management for over half the population of Los Angeles County and turn waste products into resources such as reclaimed water, energy, and recyclable materials.			
South Bay Economic Development Partnership			
Level: Regional	Hazard: Multi	www.southbaypartnership.com	
3858 Carson Street		Suite 110	
Torrance, CA 90503		Ph: 310-792-0323	Fx: 310-543-9886
Notes: The South Bay Economic Development Partnership is a collaboration of business, labor, education and government. Its primary goal is to plan an implement an economic development and marketing strategy designed to retain and create jobs and stimulate economic growth in the South Bay of Los Angeles County.			
South Coast Air Quality Management District (AQMD)			
Level: Regional	Hazard: Multi	www.aqmd.gov	
21865 E. Copley Drive			
Diamond Bar, CA 91765		Ph: 800-CUT-SMOG	Fx:
Notes: AQMD is a regional government agency that seeks to achieve and maintain healthful air quality through a comprehensive program of research, regulations, enforcement, and communication. The AQMD covers Los Angeles and Orange Counties and parts of Riverside and San Bernardino Counties.			
Southern California Earthquake Center (SCEC)			
Level: Regional	Hazard: Earthquake	www.scec.org	
3651 Trousdale Parkway		Suite 169	
Los Angeles, CA 90089-0742		Ph: 213-740-5843	Fx: 213/740-0011
Notes: The Southern California Earthquake Center (SCEC) gathers new information about earthquakes in Southern California, integrates this information into a comprehensive and predictive understanding of earthquake phenomena, and communicates this understanding to end-users and the general public in order to increase earthquake awareness, reduce economic losses, and save lives.			

Southern California Association of Governments (SCAG)			
Level: Regional	Hazard: Multi	www.scag.ca.gov	
818 W. Seventh Street		12th Floor	
Los Angeles, CA 90017		Ph: 213-236-1800	Fx: 213-236-1825
Notes: The Southern California Association of Governments functions as the Metropolitan Planning Organization for six counties: Los Angeles, Orange, San Bernardino, Riverside, Ventura and Imperial. As the designated Metropolitan Planning Organization, the Association of Governments is mandated by the federal government to research and draw up plans for transportation, growth management, hazardous waste management, and air quality.			
State Fire Marshal (SFM)			
Level: State	Hazard: Wildfire	http://osfm.fire.ca.gov	
1131 "S" Street			
Sacramento, CA 95814		Ph: 916-445-8200	Fx: 916-445-8509
Notes: The Office of the State Fire Marshal (SFM) supports the mission of the California Department of Forestry and Fire Protection (CDF) by focusing on fire prevention. SFM regulates buildings in which people live, controls substances which may, cause injuries, death and destruction by fire; provides statewide direction for fire prevention within wildland areas; regulates hazardous liquid pipelines; reviews regulations and building standards; and trains and educates in fire protection methods and responsibilities.			
The Community Rating System (CRS)			
Level: Federal	Hazard: Flood	http://www.fema.gov/nfip/crs.shtm	
500 C Street, S.W.			
Washington, D.C. 20472		Ph: 202-566-1600	Fx:
Notes: The Community Rating System (CRS) recognizes community floodplain management efforts that go beyond the minimum requirements of the NFIP. Property owners within the County would receive reduced NFIP flood insurance premiums if the County implements floodplain management practices that qualify it for a CRS rating. For further information on the CRS, visit FEMA's website.			
United States Geological Survey			
Level: Federal	Hazard: Multi	http://www.usgs.gov/	
345 Middlefield Road			
Menlo Park, CA 94025		Ph: 650-853-8300	Fx:
Notes: The USGS provides reliable scientific information to describe and understand the Earth; minimize loss of life and property from natural disasters; manage water, biological, energy, and mineral resources; and enhance and protect our quality of life.			

US Army Corps of Engineers			
Level: Federal	Hazard: Multi	http://www.usace.army.mil	
P.O. Box 532711			
Los Angeles CA 90053- 2325		Ph: 213-452- 3921	Fx:
Notes: The United States Army Corps of Engineers work in engineering and environmental matters. A workforce of biologists, engineers, geologists, hydrologists, natural resource managers and other professionals provide engineering services to the nation including planning, designing, building and operating water resources and other civil works projects.			
USGS Water Resources			
Level: Federal	Hazard: Multi	www.water.usgs.gov	
6000 J Street		Placer Hall	
Sacramento, CA 95819-6129		Ph: 916-278-3000	Fx: 916-278-3070
Notes: The USGS Water Resources mission is to provide water information that benefits the Nation's citizens: publications, data, maps, and applications software.			
Western States Seismic Policy Council (WSSPC)			
Level: Regional	Hazard: Earthquake	www.wsspc.org/home.html	
125 California Avenue		Suite D201, #1	
Palo Alto, CA 94306		Ph: 650-330-1101	Fx: 650-326-1769
Notes: WSSPC is a regional earthquake consortium funded mainly by FEMA. Its website is a great resource, with information clearly categorized – from policy to engineering to education.			
Westside Economic Collaborative C/O Pacific Western Bank			
Level: Regional	Hazard: Multi	http://www.westside-Ia.or	
120 Wilshire Boulevard			
Santa Monica, CA 90401		Ph: 310-458-1521	Fx: 310-458-6479
Notes: The Westside Economic Development Collaborative is the first Westside regional economic development corporation. The Westside EDC functions as an information gatherer and resource center, as well as a forum, through bringing business, government, and residents together to address issues affecting the region: Economic Diversity, Transportation, Housing, Workforce Training and Retraining, Lifelong Learning, Tourism, and Embracing Diversity.			

APPENDIX B: PUBLIC PARTICIPATION

Public participation is a key component to any strategic planning process. It is very important that such broad-reaching plans not be written in isolation. Agency participation offers an opportunity for impacted departments and organizations to provide expertise and insight into the planning process. Public participation offers citizens the chance to voice their ideas, interests, and opinions. The Federal Emergency Management Agency also requires public input during the development of mitigation plans.

The City of El Segundo Multi-Hazard Mitigation Plan integrated a cross-section of public input throughout the planning process. To accomplish this goal, the Multi-Hazard Mitigation Planning Team developed a public participation process through five components: (1) developing a Planning Team comprised of knowledgeable individuals representative of the City; (2) conducting a survey of "Levels of Concerns" (see Appendix B-Attachment 1) to verify the primary concerns of the community as it relates to hazards; (3) soliciting the assistance of local media representatives and local newspapers to announce the progress of the planning activities and to announce the availability of the Draft Mitigation Plan; (4) creating opportunities for the community as well as public agencies to review the Draft Mitigation Plan; (5) conducting a public meeting at the City Disaster Council and the City Council where the public had an opportunity to express their views concerning the Draft Mitigation Plan.

Integrating public participation during the development of the Mitigation Plan has ultimately resulted in increased public awareness. Through public involvement, the mitigation plan reflects community issues, concerns, and new ideas and perspectives on mitigation opportunities and plan action items.

Hazard Mitigation Planning Team

The preparation of the Mitigation Plan was the responsibility of the Hazard Mitigation Planning Team, which consisted of representatives from seven City departments and two El Segundo Unified School District Departments. The members had an understanding of how the City is organized and how the City, region, and environment might be affected by hazard events. The Planning Team guided the development of the Plan, and assisted in developing plan goals and action items, identifying stakeholders and plan reviewers, and sharing local expertise to create a more comprehensive plan.

Meetings

The following meetings were facilitated by City Consultant, Carolyn J. Harshman of Emergency Planning Consultants:

Meeting #1: Pre-Training May 29, 2007
Emergency Planning Consultants (EPC) delivered pre-training to the Planning Team. The pre-training consisted of the history of the Disaster Mitigation Act of 2000, the purpose and role of hazard mitigation, and the planning process. The Pre-Training lasted approximately 1 hour.

Meeting #2: Kick-Off May 29, 2007
EPC facilitated a workshop where participants had an opportunity to learn about various hazards, assess and rank the local threats, examine hazard maps, and complete the FEMA Worksheets contained in FEMA 386-2 Understanding Your Risks. Part of the discussion included a presentation by EPC of historical disaster events across the country. Those slides served as a

backdrop for discussing potential mitigation activities.

There was an extensive discussion on various methods of engaging the public in the mitigation process. The Planning Team prepared a draft media release and discussed a public opinion survey provided by EPC. The Kick-Off Meeting lasted approximately 1 hour.

Meeting #3: Pre-Training: Mitigation July 31, 2007
EPC delivered pre-training to the Planning Team. The pre-training consisted of the concepts and issues related to developing mitigation actions. The pre-training lasted approximately 2 hours.

Meeting #4: Mitigation Actions July 31, 2007
EPC delivered the Draft Hazard Analysis and the individual jurisdiction representatives discussed missing information, data, and maps. EPC distributed copies of the Mitigation Actions Planning Tools to assist the Team in developing Goals and Action Items appropriate to their hazards. The Planning Tools provided a process for collecting the mitigation actions presently in practice in the City, as well as identifying future mitigation actions.

A brainstorming process was then conducted to develop the goals for the Plan. The Planning Team discussed sample goal language then broke into individual jurisdictions to finalize goal language. Following a discussion on the alternatives available for ranking mitigation actions, the Team agreed to cluster the rankings of the Mitigation Actions by hazard as follows: #1 Multi-Hazard, #2 Earthquakes (including Liquefaction), #3 Flooding, #4 Tsunami, and #5 Technological and Human-Caused Hazards. Prioritization of the individual action items was accomplished using the STAPLEE model (see Meeting #5).

The next task was to examine a FEMA-approved Mitigation Plan to get an idea of how mitigation actions are written. Each of the jurisdictions was pleased to announce the broad range of mitigation actions already being practiced. In addition, EPC provided a list of actions that were identified in the Capital Improvement Plan or other planning documents.

To facilitate the creative process, EPC developed a list of nearly 300 mitigation actions gathered from dozens of Mitigation Plans across the country. Because of the easy access to mitigation actions already in practice as well as the opportunity to review the recommendations from other City's, the process of identifying appropriate mitigations actions was accomplished in a very efficient manner.

Meeting #5: STAPLEE September 10, 2007
The consultant introduced the Planning Team to the STAPLEE Tool (Social, Technical, Administrative, Political, Legal, Economic, and Environmental) as one of many means available to prioritize mitigation actions. The results of the STAPLEE ranking can be seen in Plan Maintenance – Table 1.

Public Meetings

City of El Segundo conducted two public meetings concerning the Draft Mitigation Plan. The City's Disaster Council heard the item on April 15, 2008. The City Council heard the item on May 6, 2008. The Council was supportive of the overall goal established by the Multi-Hazard Mitigation Planning Team to become a more Disaster Resistant community. The City Council commended the Planning Team representatives for its dedication and efforts to satisfy the DMA 2000 requirements.

Invitation Process

The Planning Team identified possible public notice sources. The City of El Segundo Multi-Hazard Mitigation Plan was posted on the City website on March 25th. The City Council Meeting Agenda was posted at City Hall on May 2, 2008. The City Council Meeting agenda packet was posted on the City's website. The local community access cable television channels carried the meeting City Council meeting announcement.

Results

The Planning Team began the presentation to the City Council on May 6, 2008 by providing an overview of the project objectives. The Planning Team Chair (Fire Chief) and Consultant presented the staff report on the Plan, including an overview of the Hazard Analysis, Mitigation Goals, and Mitigation Actions. The staff presentation concluded with a summary of the input received during the public review of the document. The meeting participants were encouraged to present their views and make suggestions on possible mitigation actions. The Chair then fielded questions from the City Council. The meeting lasted approximately 30 minutes and was aired on local community access cable television channels (Channels 3 and 22) for approximately one month.

The City Council was unanimous in its adoption of the City of El Segundo Multi-Hazard Mitigation Plan.

Appendix B-Attachment 1
El Segundo Hazard Mitigation Plan Survey Results

Protecting Our Community: Challenges and Opportunities for Mitigating Hazards – Survey Results
A Survey by the City of El Segundo

1,304 surveys were returned to the City of El Segundo. Following are the detailed survey results:

1. How concerned are you about the possibility of the City of El Segundo being impacted by a disaster?

   Extremely concerned = **29%** Somewhat concerned = **60%** Not concerned = **11%**

2. Please rate each of the hazards below based on the threat that you believe they pose to you or your residence or business.

	No Threat	Minor Threat	Moderate Threat	Significant Threat	Severe Threat
Civil Disturbance	36%	44%	15%	4%	1%
Earthquake	1%	8%	33%	39%	18%
Flooding	39%	38%	17%	5%	2%
Hazardous Materials	6%	18%	30%	27%	18%
Hostage/Barricade	38%	39%	16%	5%	2%
Public Health Emergency	14%	35%	31%	14%	6%
Severe Storm	19%	44%	26%	9%	3%
Terrorism	10%	17%	28%	26%	19%
Tornado	71%	21%	4%	1%	2%
Transportation Accident	12%	25%	30%	21%	11%
Tsunami	43%	31%	15%	7%	3%

3. What are some steps the City of El Segundo could take to reduce or eliminate the risk of hazards to you or your residence or business? Answers were gathered and will be maintained for future use by the City.

4. A number of community-wide activities can reduce our risk from hazards. In general, these activities fall into one of the following five broad categories. Please tell us how important you think each one is for the City of El Segundo to consider pursuing.

Category	Very Important	Somewhat Important	Not Important
Prevention: Administrative or regulatory actions that influence the way land is developed and buildings are built. Examples include planning, zoning, and building codes.	64%	30%	6%
Property Protection: Actions that involve the modification of existing buildings to protect them from a hazard or removal from the hazard area. Examples include acquisition, relocation, elevation, and structural retrofits.	41%	47%	12%
Structural Projects: Actions intended to lessen the impact of a hazard by modifying the natural progression of the hazard. Examples include detention/retention basins, retaining walls, and storm sewers.	51%	43%	7%
Emergency Services: Actions that protect people and property during and immediately after a hazard event. Examples include warning systems, evacuation planning, emergency response training, and protection of critical emergency facilities or systems.	86%	12%	2%
Public Education and Awareness: Actions taken to inform community members about hazards and the techniques they can use to protect themselves and their property. Examples include outreach projects, Community Emergency Response Team (CERT), school education programs, library materials, and demonstration events.	98%	20%	5%

Please complete the survey and return in the envelope provided via U.S. mail by October 31, 2007. This survey is also available online at www.elsegundo.org.
Thank you for your participation!

Appendix B – Attachment 2
List of Plan Reviewers
(Excluding Planning Team Members)

Andrews, Dwayne	Los Angeles Air Force base
Arguelles, Cecilia	Mattel
Arkus, George	Aerospace Corporation
Bates, Jason	NC4
Bolton, Jeffery	Aerospace Corporation
Boulgarides, Jim	El Segundo City Councilmember
Brown, John	International Rectifier
Cardenas, David	LAX/LAWA
Colimitras, Katie	EDS Information Systems
Colin, Mark	Chevron Texaco
Cortez, Victor	Aerospace Corporation
Crowe, Bill	El Segundo Assistant City Manager
Cummings, Bob	Aerospace Corporation
Cummings, Dave	El Segundo Police Department
Davis, Rodney	Mattel
DeAnda, Richard	Mattel
deRocili, Roland	Raytheon
Fleming, Joseph	Computer Sciences Corporation
Garcia, Dan	El Segundo Public Works Department
Garey, Mike	Xerox Corporation
Gogliuzzo, Ralph	United Water
Groman, Craig	Los Angeles Air Force Base
Guyle, David	Northrop Grumman
Hailey, Eddie	Pacific Corporate Towers
Harrison, Jon	Boeing Corporation
Herron, Tyrone	Los Angeles Air Force Base
Hudson, Martin Ph.D., G.E.	Consultant in Geotechnical Earthquake Engineering
Hunter, Eric	Aerospace Corporation
Ibarra, L	Continental Development Corporation
Jacobson, Carl	El Segundo City Councilmember
Kelfer, Deborah	Candle Corporation
Kohn, Rita	Northrop Grumman
Ma, Hannah	DIRECTV
Marchewka, Terry	International Rectifier
McDowell, Kelly	El Segundo Mayor
Messinger, Jeffrey	Aerospace Corporation
Mickelson, Mary	ECFMG
Milley, Alexander	Computer Sciences Corporation
Navarette, David	Infonet
Nix, Diane	International Rectifier
Olds, Jerry R.	Northrop Grumman
O'Reilly, Dick	Infonet
Podganski, Jozef	Computer Sciences Corporation
Poe, Daryl	Raytheon
Post, Larry	Raytheon
Reina, Toni	Continental Development Corporation
Risk, Laurie	El Segundo Police Department

Ross, Ric	NC4
Sanchez, Alex	NRG
Scott-Martinet, Karen	Northrop Grumman
Sherman, Marilyn	Otis College
Simon Jr., Ed	DIRECTV
Singer, James	Xerox Corporation
Snyder, Alaina	Northrop Grumman
Snyder, Sam	Los Angeles County Office of Education
Sosa, David	Raytheon
Soter, Joseph	Aerospace Corporation
Sproul, Ralph	Chevron Texaco
Stenlake, Rick	Boeing Corporation
Stewart, Jeff	El Segundo City Manager
Tavera, Mitch	El Segundo Police Department
Wilkinson, Rhonda	DIRECTV
Yantz, Geoff	El Segundo Unified School District
Zahnow, Mitchell	Northrop Grumman

Appendix B – Attachment 3
City Council Resolution Adopting Multi-Hazard Mitigation Plan

RESOLUTION NO. 4549

A RESOLUTION ADOPTING THE EL SEGUNDO MULTI-HAZARD MITIGATION PLAN IN ACCORDANCE WITH 44 C.F.R. § 201.6.

The City Council of the City of El Segundo does resolve as follows:

SECTION 1: The City Council finds as follows:

A. The Federal Disaster Mitigation Act of 2000 requires local governments to draft a Hazard Mitigation Plan to receive certain federal funding;

B. Failure to comply with the timely submission of an approved Mitigation Plan could prevent the City from obtaining financial reimbursement from the federal government following a catastrophic event;

C. The City prepared the Hazard Mitigation Plan which is attached as Exhibit "A," and incorporated by reference ("Plan"). The Plan will assist City Council, City staff, and other El Segundo community leaders in making decisions that would enhance the safety of El Segundo residents, business owners, and City infrastructure.

SECTION 2: The Plan is adopted as set forth in Exhibit A. The City Manager, or designee, is authorized to execute any required documents to obtain additional federal or state approvals for the Plan.

SECTION 3: This Resolution will become effective immediately upon adoption.

PASSED AND ADOPTED this 6th day of May, 2008.

Kelly McDowell, Mayor

ATTEST:

STATE OF CALIFORNIA)
COUNTY OF LOS ANGELES) SS
CITY OF EL SEGUNDO)

I, Cindy Mortesen, City Clerk of the City of El Segundo, California, do hereby certify that the whole number of members of the City Council of said City is five; that the foregoing Resolution No. 4549 was duly passed and adopted by said City Council, approved and signed by the Mayor, and attested to by the City Clerk, all at a regular meeting of said Council held on the 6th day of May, 2008, and the same was so passed and adopted by the following vote:

AYES: McDowell, Busch, Brann, Fisher, Jacobson

NOES: None

ABSENT: None

ABSTAIN: None

Cindy Mortesen, City Clerk

APPROVED AS TO FORM:
MARK D. HENSLEY, CITY ATTORNEY

By: _____
Karl H. Berger, Assistant City Attorney

Appendix B – Attachment 4
Hazard Mitigation Planning Team
Sign-In Sheets

Hazard Mitigation Planning Team Meeting
May 29, 2007

Name	Organization/Department
Carolyn Harshman	Emergency Planning Consultants
Kevin Smith	El Segundo Fire
Eric Moore	El Segundo Fire
Walt Krumbach	El Segundo P.D.
Jeff Robinson	El Segundo Fire, Emergency Services Coordinator
Bruce Auld	ESUSD
Andrew Cox	E.S.U.S.D.
Mary Keener	ESUSD
Bill Crowe	City Manager's Office
Steve Jones	Finance
Dan Garcia	Engineering
Steve Finton	Public Works
Alexis Schupp	PBS

Emergency Planning Consultants

Hazard Mitigation Planning Team Meeting
July 31, 2007

Name	Organization/Department
CAROLINE HARTSFIELD	EMERGENCY PLANNING CONSULTANTS
KEVIN SMITH	EL SEGUNDO FIRE DEPT.
ERIC MOORE	EL SEGUNDO FIRE DEPT.
ALEXIS SCHOPP	PBS
Steve Jones	Admin. Svcs
Jeffrey R. Robinson	El Segundo Fire Dept - Emergency Services
Mary See Keener	El Segundo Unified School District
Andrew Cox	El Segundo Unified School Dist.
Steve Finton	Public Works Department
Maryam Jonas	Public Works Department

Hazard Mitigation Planning Team Meeting
September 10, 2007

Name	Organization/Department
CAROLYN HARSHMAN	EMERGENCY PLANNING CONSULTANTS
WALT KRUMBACH	EL SEGUNDO P.D
Jeff Robinson	El Segundo FD, Eric
[illegible]	PBS
[illegible]	Public Works
DAN GARCIA	Public Works
[illegible]	E.S.U.S.D.
Mary Keenan	ESUSD
ERIC MOORE	ESFD.
Steve Jones	Admin Services
KEVIN SMITH	ESFD

APPENDIX C: BENEFIT/COST ANALYSIS

Benefit/cost analysis is a key mechanism used by the state Office of Emergency Services (OES), the Federal Emergency Management Agency, and other state and federal agencies in evaluating hazard mitigation projects, and is required by the Robert T. Stafford Disaster Relief and Emergency Assistance Act, Public Law 93-288, as amended.

This appendix outlines several approaches for conducting economic analysis of hazard mitigation projects. It describes the importance of implementing mitigation activities, different approaches to economic analysis of mitigation strategies, and methods to calculate costs and benefits associated with mitigation strategies. Information in this section is derived in part from: The Interagency Hazards Mitigation Team, State Hazard Mitigation Plan, and Federal Emergency Management Agency Publication 331, Report on Costs and Benefits of Hazard Mitigation.

This section is not intended to provide a comprehensive description of benefit/cost analysis, nor is it intended to provide the details of economic analysis methods that can be used to evaluate local projects. It is intended to (1) raise benefit/cost analysis as an important issue, and (2) provide some background on how economic analysis can be used to evaluate mitigation projects.

Why Evaluate Mitigation Strategies?

Mitigation activities reduce the cost of disasters by minimizing property damage, injuries, and the potential for loss of life, and by reducing emergency response costs, which would otherwise be incurred.

Evaluating hazard mitigation provides decision-makers with an understanding of the potential benefits and costs of an activity, as well as a basis upon which to compare alternative projects. Evaluating mitigation projects is a complex and difficult undertaking, which is influenced by many variables. First, natural disasters affect all segments of the communities they strike, including individuals, businesses, and public services such as fire, police, utilities, and schools.

Second, while some of the direct and indirect costs of disaster damages are measurable, some of the costs are non-financial and difficult to quantify in dollars. Third, many of the impacts of such events produce “ripple-effects” throughout the community, greatly increasing the disaster’s social and economic consequences.

While not easily accomplished, there is value, from a public policy perspective, in assessing the positive and negative impacts from mitigation activities, and obtaining an instructive benefit/cost comparison. Otherwise, the decision to pursue or not pursue various mitigation options would not be based on an objective understanding of the net benefit or loss associated with these actions.

What are Some Economic Analysis Approaches for Mitigation Strategies?
The approaches used to identify the costs and benefits associated with hazard mitigation strategies, measures, or projects fall into two general categories: benefit/cost analysis and cost-effectiveness analysis. The distinction between the two methods is the way in which the relative costs and benefits are measured. Additionally, there are varying approaches to assessing the value of mitigation for public sector and private sector activities.

Benefit/Cost Analysis
Benefit/cost analysis is used in hazards mitigation to show if the benefits to life and property protected through mitigation efforts exceed the cost of the mitigation activity. Conducting benefit/cost analysis for a mitigation activity can assist communities in determining whether a project is worth undertaking now, in order to avoid disaster related damages later. Benefit/cost analysis is based on calculating the frequency and severity of a hazard, avoided future damages, and risk.

In benefit/cost analysis, all costs and benefits are evaluated in terms of dollars, and a net benefit/cost ratio is computed to determine whether a project should be implemented (i.e., if net benefits exceed net costs, the project is worth pursuing). A project must have a benefit/cost ratio greater than 1 in order to be funded.

Cost-Effectiveness Analysis
Cost-effectiveness analysis evaluates how best to spend a given amount of money to achieve a specific goal. This type of analysis, however, does not necessarily measure costs and benefits in terms of dollars. Determining the economic feasibility of mitigating hazards can also be organized according to the perspective of those with an economic interest in the outcome. Hence, economic analysis approaches are covered for both public and private sectors as follows.

Investing in public sector mitigation activities
Evaluating mitigation strategies in the public sector is complicated because it involves estimating all of the economic benefits and costs regardless of who realizes them, and potentially to a large number of people and economic entities. Some benefits cannot be evaluated monetarily, but still affect the public in profound ways. Economists have developed methods to evaluate the economic feasibility of public decisions that involve a diverse set of beneficiaries and non-market benefits.

Investing in private sector mitigation activities
Private sector mitigation projects may occur on the basis of one of two approaches: it may be mandated by a regulation or standard, or it may be economically justified on its own merits. A building or landowner, whether a private entity or a public agency, required to conform to a mandated standard may consider the following options:

1. Request cost sharing from public agencies;
2. Dispose of the building or land either by sale or demolition;
3. Change the designated use of the building or land and change the hazard mitigation compliance requirement; or
4. Evaluate the most feasible alternatives and initiate the most cost effective hazard mitigation alternative.

The sale of a building or land triggers another set of concerns. For example, real estate disclosure laws can be developed which require sellers of real property to disclose known defects and deficiencies in the property, including earthquake weaknesses and hazards to prospective purchasers. Correcting deficiencies can be expensive and time consuming,

but their existence can prevent the sale of the building. Conditions of a sale regarding the deficiencies and the price of the building can be negotiated between a buyer and seller.

How Can an Economic Analysis be Conducted?

Benefit/cost analysis and cost-effectiveness analysis are important tools in evaluating whether or not to implement a mitigation activity. A framework for evaluating alternative mitigation activities is outlined below:

1. Identify the Alternatives: Alternatives for reducing risk from hazards can include structural projects to enhance disaster resistance, education and outreach, and acquisition or demolition of exposed properties, among others. Different mitigation project can assist in minimizing risk to hazards, but do so at varying economic costs.

2. Calculate the Costs and Benefits: Choosing economic criteria is essential to systematically calculating costs and benefits of mitigation projects and selecting the most appropriate alternative. Potential economic criteria to evaluate alternatives include:

- **Determine the project cost.** This may include initial project development costs, and repair and operating costs of maintaining projects over time.

- **Estimate the benefits.** Projecting the benefits or cash flow resulting from a project can be difficult. Expected future returns from the mitigation effort depend on the correct specification of the risk and the effectiveness of the project, which may not be well known. Expected future costs depend on the physical durability and potential economic obsolescence of the investment. This is difficult to project. These considerations will also provide guidance in selecting an appropriate salvage value. Future tax structures and rates must be projected. Financing alternatives must be researched, and they may include retained earnings, bond and stock issues, and commercial loans.

- **Consider costs and benefits to society and the environment.** These are not easily measured, but can be assessed through a variety of economic tools including existence value or contingent value theories. These theories provide quantitative data on the value people attribute to physical or social environments. Even without hard data, however, impacts of structural projects to the physical environment or to society should be considered when implementing mitigation projects.

- **Determine the correct discount rate.** Determination of the discount rate can just be the risk-free cost of capital, but it may include the decision maker's time preference and also a risk premium. Including inflation should also be considered.

3. Analyze and Rank the Alternatives: Once costs and benefits have been quantified, economic analysis tools can rank the alternatives. Two methods for determining the best alternative given varying costs and benefits include net present value and internal rate of return.

- **Net present value.** Net present value is the value of the expected future returns of an investment minus the value of expected future cost expressed in

today's dollars. If the net present value is greater than the project costs, the project may be determined feasible for implementation. Selecting the discount rate, and identifying the present and future costs and benefits of the project calculates the net present value of projects.

- **Internal Rate of Return.** Using the internal rate of return method to evaluate mitigation projects provides the interest rate equivalent to the dollar returns expected from the project. Once the rate has been calculated, it can be compared to rates earned by investing in alternative projects. Projects may be feasible to implement when the internal rate of return is greater than the total costs of the project.

Once the mitigation projects are ranked on the basis of economic criteria, decision-makers can consider other factors, such as risk; project effectiveness; and economic, environmental, and social returns in choosing the appropriate project for implementation.

How are Benefits of Mitigation Calculated?

Economic Returns of Hazard Mitigation

The estimation of economic returns, which accrue to building or land owner as a result of hazard mitigation, is difficult. Owners evaluating the economic feasibility of mitigation should consider reductions in physical damages and financial losses. A partial list follows:

- Building damages avoided
- Content damages avoided
- Inventory damages avoided
- Rental income losses avoided
- Relocation and disruption expenses avoided
- Proprietor's income losses avoided

These parameters can be estimated using observed prices, costs, and engineering data. The difficult part is to correctly determine the effectiveness of the hazard mitigation project and the resulting reduction in damages and losses. Equally as difficult is assessing the probability that an event will occur. The damages and losses should only include those that will be borne by the owner. The salvage value of the investment can be important in determining economic feasibility. Salvage value becomes more important as the time horizon of the owner declines. This is important because most businesses depreciate assets over a period of time.

Additional Costs from Hazards

Property owners should also assess changes in a broader set of factors that can change as a result of a large natural disaster. These are usually termed "indirect" effects, but they can have a very direct effect on the economic value of the owner's building or land. They can be positive or negative, and include changes in the following:

- Commodity and resource prices
- Availability of resource supplies
- Commodity and resource demand changes
- Building and land values
- Capital availability and interest rates
- Availability of labor
- Economic structure

- Infrastructure
- Regional exports and imports
- Local, state, and national regulations and policies
- Insurance availability and rates

Changes in the resources and industries listed above are more difficult to estimate and require models that are structured to estimate total economic impacts. Total economic impacts are the sum of direct and indirect economic impacts. Total economic impact models are usually not combined with economic feasibility models. Many models exist to estimate total economic impacts of changes in an economy. Decision makers should understand the total economic impacts of natural disasters in order to calculate the benefits of a mitigation activity. This suggests that understanding the local economy is an important first step in being able to understand the potential impacts of a disaster, and the benefits of mitigation activities.

Additional Considerations

Conducting an economic analysis for potential mitigation activities can assist decision-makers in choosing the most appropriate strategy for their community to reduce risk and prevent loss from hazards. Economic analysis can also save time and resources from being spent on inappropriate or unfeasible projects. Several resources and models are listed on the following page that can assist in conducting an economic analysis for hazard mitigation activities.

Benefit/cost analysis is complicated, and the numbers may divert attention from other important issues. It is important to consider the qualitative factors of a project associated with mitigation that cannot be evaluated economically. There are alternative approaches to implementing mitigation projects. Many communities are looking towards developing multi-objective projects. With this in mind, opportunity rises to develop strategies that integrate hazard mitigation with projects related to watersheds, environmental planning, community economic development, and small business development, among others. Incorporating hazard mitigation with other community projects can increase the viability of project implementation.

Resources

CUREe Kajima Project, Methodologies For Evaluating The Socio-Economic Consequences Of Large Earthquakes, Task 7.2 Economic Impact Analysis, Prepared by University of California, Berkeley Team, Robert A. Olson, VSP Associates, Team Leader; John M. Eidinger, GandE Engineering Systems; Kenneth A. Goettel, Goettel and Associates Inc.; and Gerald L. Horner, Hazard Mitigation Economics Inc., 1997.

Federal Emergency Management Agency, Benefit/Cost Analysis of Hazard Mitigation Projects, Riverine Flood, Version 1.05, Hazard Mitigation Economics Inc., 1996.

Federal Emergency Management Agency Report on Costs and Benefits of Natural Hazard Mitigation. Publication 331, 1996.

Goettel and Horner Inc., Earthquake Risk Analysis Volume III: The Economic Feasibility of Seismic Rehabilitation of Buildings in The City of Portland, Submitted to the Bureau of Buildings, City of Portland, August 30, 1995.

Goettel and Horner Inc., Benefit/Cost Analysis of Hazard Mitigation Projects Volume V, Earthquakes, Prepared for FEMA's Hazard Mitigation Branch, October 25, 1995.

Horner, Gerald, Benefit/Cost Methodologies for Use in Evaluating the Cost Effectiveness of Proposed Hazard Mitigation Measures, Robert Olson Associates, Prepared for Oregon State Police, Office of Emergency Management, July 1999.

Interagency Hazards Mitigation Team, State Hazard Mitigation Plan, (Oregon State Police – Office of Emergency Management, 2000).

Risk Management Solutions, Inc., Development of a Standardized Earthquake Loss Estimation Methodology, National Institute of Building Sciences, Volume I and II, 1994.

VSP Associates, Inc., A Benefit/Cost Model for the Seismic Rehabilitation of Buildings, Volumes 1 and 2, Federal Emergency Management Agency, FEMA, Publication Numbers 227 and 228, 1991.

VSP Associates, Inc., Benefit/Cost Analysis of Hazard Mitigation Projects: Section 404 Hazard Mitigation Program and Section 406 Public Assistance Program, Volume 3: Seismic Hazard Mitigation Projects, 1993.

VSP Associates, Inc., Seismic Rehabilitation of Federal Buildings: A Benefit/Cost Model, Volume 1, Federal Emergency Management Agency, FEMA, Publication Number 255, 1994.

APPENDIX D: ACRONYMS

Federal Acronyms

AASHTO	American Association of State Highway and Transportation Officials
ATC	Applied Technology Council
b/ca	benefit/cost analysis
BFE	Base Flood Elevation
BLM	Bureau of Land Management
BSSC	Building Seismic Safety Council
CDBG	Community Development Block Grant
CFR	Code of Federal Regulations
CRS	Community Rating System
EDA	Economic Development Administration
EPA	Environmental Protection Agency
ER	Emergency Relief
EWP	Emergency Watershed Protection (NRCS Program)
FAS	Federal Aid System
FEMA	Federal Emergency Management Agency
FIRM	Flood Insurance Rate Map
FMA	Flood Mitigation Assistance (FEMA Program)
FTE	Full Time Equivalent
GIS	Geographic Information System
GNS	Institute of Geological and Nuclear Sciences (International)
GSA	General Services Administration
HAZUS	Hazards U.S.
HMGP	Hazard Mitigation Grant Program
HMST	Hazard Mitigation Survey Team
HUD	Housing and Urban Development (United States, Department of)
IBHS	Institute for Business and Home Safety
ICC	Increased Cost of Compliance
IHMT	Interagency Hazard Mitigation Team
NCDC	National Climate Data Center
NFIP	National Flood Insurance Program
NFPA	National Fire Protection Association
NHMP	Multi-Hazard Mitigation Plan (also known as “409 Plan”)
NIBS	National Institute of Building Sciences
NIFC	National Interagency Fire Center
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NPS	National Park Service
NRCS	Natural Resources Conservation Service
NWS	National Weather Service
SBA	Small Business Administration
SHMO	State Hazard Mitigation Officer
TOR	Transfer of Development Rights
UGB	Urban Growth Boundary
URM	Unreinforced Masonry
USACE	United States Army Corps of Engineers
USBR	United States Bureau of Reclamation
USDA	United States Department of Agriculture

USFA	United States Fire Administration
USFS	United States Forest Service
USGS	United States Geological Survey
WSSPC	Western States Seismic Policy Council

California Acronyms

AandW	Alert and Warning
AA	Administering Areas
AAR	After Action Report
ARC	American Red Cross
ARP	Accidental Risk Prevention
ATC20	Applied Technology Council20
ATC21	Applied Technology Council21
BCP	Budget Change Proposal
BSA	California Bureau of State Audits
CAER	Community Awareness and Emergency Response
CalARP	California Accidental Release Prevention
CalBO	California Building Officials
CalEPA	California Environmental Protection Agency
CalREP	California Radiological Emergency Plan
CALSTARS	California State Accounting Reporting System
CalTRANS	California Department of Transportation
CBO	Community Based Organization
CD	Civil Defense
CDF	California Department of Forestry and Fire Protection
CDMG	California Division of Mines and Geology
CEC	California Energy Commission
CEPEC	California Earthquake Prediction Evaluation Council
CESRS	California Emergency Services Radio System
CHIP	California Hazardous Identification Program
CHMIRS	California Hazardous Materials Incident Reporting System
CHP	California Highway Patrol
CLETS	California Law Enforcement Telecommunications System
CSTI	California Specialized Training Institute
CUEA	California Utilities Emergency Association
CUPA	Certified Unified Program Agency
DAD	Disaster Assistance Division (of the state Office of Emergency Svcs)
DFO	Disaster Field Office
DGS	California Department of General Services
DHSRHB	California Department of Health Services, Radiological Health Branch
DO	Duty Officer
DOC	Department Operations Center
DOE	Department of Energy (U.S.)
DOF	California Department of Finance
DOJ	California Department of Justice
DPA	California Department of Personnel Administration
DPIG	Disaster Preparedness Improvement Grant
DR	Disaster Response
DSA	Division of the State Architect
DSR	Damage Survey Report

DSW	Disaster Service Worker
DWR	California Department of Water Resources
EAS	Emergency Alerting System
EDIS	Emergency Digital Information System
EERI	Earthquake Engineering Research Institute
EMA	Emergency Management Assistance
EMI	Emergency Management Institute
EMMA	Emergency Managers Mutual Aid
EMS	Emergency Medical Services
EOC	Emergency Operations Center
EOP	Emergency Operations Plan
EPA	Environmental Protection Agency (U.S.)
EPEDAT	Early Post Earthquake Damage Assessment Tool
EPI	Emergency Public Information
EPIC	Emergency Public Information Council
ESC	Emergency Services Coordinator
FAY	Federal Award Year
FDAA	Federal Disaster Assistance Administration
FEAT	Governor's Flood Emergency Action Team
FEMA	Federal Emergency Management Agency
FFY	Federal Fiscal Year
FIR	Final Inspection Reports
FIRESCOPE	Firefighting Resources of Southern California Organized for Potential Emergencies
FMA	Flood Management Assistance
FSR	Feasibility Study Report
FY	Fiscal Year
GIS	Geographical Information System
HAZMAT	Hazardous Materials
HAZMIT	Hazardous Mitigation
HAZUS	Hazards United States (an earthquake damage assessment prediction tool)
HAD	Housing and Community Development
HEICS	Hospital Emergency Incident Command System
HEPG	Hospital Emergency Planning Guidance
HIA	Hazard Identification and Analysis Unit
HMEP	Hazardous Materials Emergency Preparedness
HMGP	Hazard Mitigation Grant Program
IDE	Initial Damage Estimate
IA	Individual Assistance
IFG	Individual and Family Grant (program)
IRG	Incident Response Geographic Information System
IPA	Information and Public Affairs (of State Office of Emergency Services)
LAN	Local Area Network
LEMMA	Law Enforcement Master Mutual Aid
LEPC	Local Emergency Planning Committee
MARAC	Mutual Aid Regional Advisory Council
MHFP	Multi-Hazard Functional Plan
MHID	Multi-Hazard Identification
MOU	Memorandum of Understanding
NBC	Nuclear, Biological, Chemical
NEMA	National Emergency Management Agency

NEMIS	National Emergency Management Information System
NFIP	National Flood Insurance Program
NOAA	National Oceanic and Atmospheric Association
NPP	Nuclear Power Plant
NSF	National Science Foundation
NWS	National Weather Service
OA	Operational Area
OASIS	Operational Area Satellite Information System
OCC	Operations Coordination Center
OCD	Office of Civil Defense
OEP	Office of Emergency Planning
OES	California Governor's Office of Emergency Services
OSHPD	Office of Statewide Health Planning and Development
OSPR	Oil Spill Prevention and Response
PA	Public Assistance
PC	Personal Computer
PDA	Preliminary Damage Assessment
PIO	Public Information Office
POST	Police Officer Standards and Training
PPA/CA	Performance Partnership Agreement/Cooperative Agreement (FEMA)
PSA	Public Service Announcement
PTAB	Planning and Technological Assistance Branch
PTR	Project Time Report
RA	Regional Administrator (OES)
RADEF	Radiological Defense (program)
RAMP	Regional Assessment of Mitigation Priorities
RAPID	Railroad Accident Prevention and Immediate Deployment
RDO	Radiological Defense Officer
RDMHC	Regional Disaster Medical Health Coordinator
REOC	Regional Emergency Operations Center
REPI	Reserve Emergency Public Information
RES	Regional Emergency Staff
RIMS	Response Information Management System
RMP	Risk Management Plan
RPU	Radiological Preparedness Unit (OES)
RRT	Regional Response Team
SAM	State Administrative Manual
SARA	Superfund Amendments and Reauthorization Act
SAVP	Safety Assessment Volunteer Program
SBA	Small Business Administration
SCO	California State Controller's Office
SEMS	Standardized Emergency Management System
SEPIC	State Emergency Public Information Committee
SLA	State and Local Assistance
SONGS	San Onofre Nuclear Generating Station
SOP	Standard Operating Procedure
SWEPC	Statewide Emergency Planning Committee
TEC	Travel Expense Claim
TRU	Transuranic
T-T-T	Train- the-Trainer
UPA	Unified Program Account

UPS	Uninterrupted Power Source
USAR	Urban Search and Rescue
USGS	United States Geological Survey
WC	California State Warning Center
WAN	Wide Area Network
WIPP	Waste Isolation Pilot Project

APPENDIX E: GLOSSARY

Acceleration	The rate of change of velocity with respect to time. Acceleration due to gravity at the earth's surface is 9.8 meters per second squared. That means that every second that something falls toward the surface of earth its velocity increases by 9.8 meters per second.
Asset	Any manmade or natural feature that has value, including, but not limited to people; buildings; infrastructure like bridges, roads, and sewer and water systems; lifelines like electricity and communication resources; or environmental, cultural, or recreational features like parks, dunes, wetlands, or landmarks.
Base Flood	Flood that has a 1 percent probability of being equaled or exceeded in any given year. Also known as the 100-year flood.
Base Flood Elevation (BFE)	Elevation of the base flood in relation to a specified datum, such as the National Geodetic Vertical Datum of 1929. The Base Flood Elevation is used as the standard for the National Flood Insurance Program.
Bedrock	The solid rock that underlies loose material, such as soil, sand, clay, or gravel.
Building	A structure that is walled and roofed, principally above ground and permanently affixed to a site. The term includes a manufactured home on a permanent foundation on which the wheels and axles carry no weight.
Coastal High Hazard Area	Area, usually along an open coast, bay, or inlet that is subject to inundation by storm surge and, in some instances, wave action caused by storms or seismic sources.
Coastal Zones	The area along the shore where the ocean meets the land as the surface of the land rises above the ocean. This land/water interface includes barrier islands, estuaries, beaches, coastal wetlands, and land areas having direct drainage to the ocean.
Community Rating System (CRS)	An NFIP program that provides incentives for NFIP communities to complete activities that reduce flood hazard risk. When the community completes specified activities, the insurance premiums of policyholders in these communities are reduced.
Computer-Aided Design And Drafting (CADD)	A computerized system enabling quick and accurate electronic 2-D and 3-D drawings, topographic mapping, site plans, and profile/cross-section drawings.
Contour	A line of equal ground elevation on a topographic (contour) map.
Critical Facility	Facilities that are critical to the health and welfare of the population and that are especially important following hazard events. Critical facilities include, but are not limited to, shelters, police and fire stations, and hospitals.
Debris	The scattered remains of assets broken or destroyed in a hazard event. Debris caused by a wind or water hazard event can cause additional damage to other assets.

Digitize	To convert electronically points, lines, and area boundaries shown on maps into x, y coordinates (e.g., latitude and longitude, universal transverse mercator (UTM), or table coordinates) for use in computer applications.
Displacement Time	The average time (in days) which the building's occupants typically must operate from a temporary location while repairs are made to the original building due to damages resulting from a hazard event.
Duration	How long a hazard event lasts.
Earthquake	A sudden motion or trembling that is caused by a release of strain accumulated within or along the edge of earth's tectonic plates.
Erosion	Wearing away of the land surface by detachment and movement of soil and rock fragments, during a flood or storm or over a period of years, through the action of wind, water, or other geologic processes.
Erosion Hazard Area	Area anticipated being lost to shoreline retreat over a given period of time. The projected inland extent of the area is measured by multiplying the average annual long-term recession rate by the number of years desired.
Essential Facility	Elements important to ensure a full recovery of a community or state following a hazard event. These would include: government functions, major employers, banks, schools, and certain commercial establishments, such as grocery stores, hardware stores, and gas stations.
Extent	The size of an area affected by a hazard or hazard event.
Extratropical Cyclone	Cyclonic storm events like Nor'easters and severe winter low-pressure systems. Both West and East coasts can experience these non-tropical storms that produce gale-force winds and precipitation in the form of heavy rain or snow. These cyclonic storms, commonly called Nor'easters on the East Coast because of the direction of the storm winds, can last for several days and can be very large – 1,000-mile wide storms are not uncommon.
Fault	A fracture in the continuity of a rock formation caused by a shifting or dislodging of the earth's crust, in which adjacent surfaces are differentially displaced parallel to the plane of fracture.
Federal Emergency Management Agency (FEMA)	Independent agency created in 1978 to provide a single point of accountability for all Federal activities related to disaster mitigation and emergency preparedness, response and recovery.
Fire Potential Index (FPI)	Developed by USGS and USFS to assess and map fire hazard potential over broad areas. Based on such geographic information, national policy makers and on-the-ground fire managers established priorities for prevention activities in the defined area to reduce the risk of managed and wildfire ignition and spread. Prediction of fire hazard shortens the time between fire ignition and initial attack by enabling fire managers to pre-allocate and stage suppression forces to high fire risk areas.
Flash Flood	A flood event occurring with little or no warning where water levels rise at an extremely fast rate.

Flood	A general and temporary condition of partial or complete inundation of normally dry land areas from (1) the overflow of inland or tidal waters, (2) the unusual and rapid accumulation or runoff of surface waters from any source, or (3) mudflows or the sudden collapse of shoreline land.
Flood Depth	Height of the flood water surface above the ground surface.
Flood Elevation	Elevation of the water surface above an established datum, e.g. National Geodetic Vertical Datum of 1929, North American Vertical Datum of 1988, or Mean Sea Level.
Flood Hazard Area	The area shown to be inundated by a flood of a given magnitude on a map.
Flood Insurance Rate Map (FIRM)	Map of a community, prepared by the Federal Emergency Management Agency that shows both the special flood hazard areas and the risk premium zones applicable to the community.
Flood Insurance Study (FIS)	A study that provides an examination, evaluation, and determination of flood hazards and, if appropriate, corresponding water surface elevations in a community or communities.
Floodplain	Any land area, including watercourse, susceptible to partial or complete inundation by water from any source.
Frequency	A measure of how often events of a particular magnitude are expected to occur. Frequency describes how often a hazard of a specific magnitude, duration, and/or extent typically occurs, on average. Statistically, a hazard with a 100-year recurrence interval is expected to occur once every 100 years on average, and would have a 1 percent chance – its probability – of happening in any given year. The reliability of this information varies depending on the kind of hazard being considered.
Fujita Scale of Tornado Intensity	Rates tornadoes with numeric values from F0 to F5 based on tornado wind speed and damage sustained. An F0 indicates minimal damage such as broken tree limbs or signs, while and F5 indicated severe damage sustained.
Functional Downtime	The average time (in days) during which a function (business or service) is unable to provide its services due to a hazard event.
Geographic Area Impacted	The physical area in which the effects of the hazard are experienced.
Geographic Information Systems (GIS)	A computer software application that relates physical features on the earth to a database to be used for mapping and analysis.
Ground Motion	The vibration or shaking of the ground during an earthquake. When a fault ruptures, seismic waves radiate, causing the ground to vibrate. The severity of the vibration increases with the amount of energy released and decreases with distance from the causative fault or epicenter, but soft soils can further amplify ground motions

Hazard	A source of potential danger or adverse condition. Hazards in this how to series will include naturally occurring events such as floods, earthquakes, tornadoes, tsunami, coastal storms, landslides, and wildfires that strike populated areas. A natural event is a hazard when it has the potential to harm people or property.
Hazard Event	A specific occurrence of a particular type of hazard.
Hazard Identification	The process of identifying hazards that threaten an area.
Hazard Mitigation	Sustained actions taken to reduce or eliminate long-term risk from hazards and their effects.
Hazard Profile	A description of the physical characteristics of hazards and a determination of various descriptors including magnitude, duration, frequency, probability, and extent. In most cases, a community can most easily use these descriptors when they are recorded and displayed as maps.
HAZUS (Hazards U.S.)	A GIS-based nationally standardized earthquake loss estimation tool developed by FEMA.
Hurricane	An intense tropical cyclone, formed in the atmosphere over warm ocean areas, in which wind speeds reach 74-miles-per-hour or more and blow in a large spiral around a relatively calm center or "eye." Hurricanes develop over the north Atlantic Ocean, northeast Pacific Ocean, or the south Pacific Ocean east of 160°E longitude. Hurricane circulation is counter-clockwise in the Northern Hemisphere and clockwise in the Southern Hemisphere.
Hydrology	The science of dealing with the waters of the earth. A flood discharge is developed by a hydrologic study.
Infrastructure	Refers to the public services of a community that have a direct impact on the quality of life. Infrastructure includes communication technology such as phone lines or Internet access, vital services such as public water supplies and sewer treatment facilities, and includes an area's transportation system such as airports, heliports; highways, bridges, tunnels, roadbeds, overpasses, railways, bridges, rail yards, depots; and waterways, canals, locks, seaports, ferries, harbors, dry docks, piers and regional dams.
Intensity	A measure of the effects of a hazard event at a particular place.
Landslide	Downward movement of a slope and materials under the force of gravity.
Lateral Spreads	Develop on gentle slopes and entail the sidelong movement of large masses of soil as an underlying layer liquefies in a seismic event. The phenomenon that occurs when ground shaking causes loose soils to lose strength and act like viscous fluid. Liquefaction causes two types of ground failure: lateral spread and loss of bearing strength.
Liquefaction	Results when the soil supporting structures liquefies. This can cause structures to tip and topple.

Lowest Floor	Under the NFIP, the lowest floor of the lowest enclosed area (including basement) of a structure.
Magnitude	A measure of the strength of a hazard event. The magnitude (also referred to as severity) of a given hazard event is usually determined using technical measures specific to the hazard.
Mitigation Plan	A systematic evaluation of the nature and extent of vulnerability to the effects of hazards typically present in the state and includes a description of actions to minimize future vulnerability to hazards.
National Flood Insurance Program (NFIP)	Federal program created by Congress in 1968 that makes flood insurance available in communities that enact minimum floodplain management regulations in 44 CFR §60.3.
National Geodetic Vertical Datum of 1929 (NGVD)	Datum established in 1929 and used in the NFIP as a basis for measuring flood, ground, and structural elevations, previously referred to as Sea Level Datum or Mean Sea Level. The Base Flood Elevations shown on most of the Flood Insurance Rate Maps issued by the Federal Emergency Management Agency are referenced to NGVD.
National Weather Service (NWS)	Prepares and issues flood, severe weather, and coastal storm warnings and can provide technical assistance to Federal and state entities in preparing weather and flood warning plans.
Nor'easter	An extra-tropical cyclone producing gale-force winds and precipitation in the form of heavy snow or rain.
Outflow	Follows water inundation creating strong currents that rip at structures and pound them with debris, and erode beaches and coastal structures.
Planimetric	Describes maps that indicate only Human-Caused features like buildings.
Planning	The act or process of making or carrying out plans; the establishment of goals, policies and procedures for a social or economic unit.
Probability	A statistical measure of the likelihood that a hazard event will occur.
Recurrence Interval	The time between hazard events of similar size in a given location. It is based on the probability that the given event will be equaled or exceeded in any given year.
Repetitive Loss Property	A property that is currently insured for which two or more National Flood Insurance Program losses (occurring more than ten days apart) of at least $1000 each have been paid within any 10-year period since 1978.
Replacement Value	The cost of rebuilding a structure. This is usually expressed in terms of cost per square foot, and reflects the present-day cost of labor and materials to construct a building of a particular size, type and quality.
Richter Scale	A numerical scale of earthquake magnitude devised by seismologist C.F. Richter in 1935.

Risk	The estimated impact that a hazard would have on people, services, facilities, and structures in a community; the likelihood of a hazard event resulting in an adverse condition that causes injury or damage. Risk is often expressed in relative terms such as a high, moderate or low likelihood of sustaining damage above a particular threshold due to a specific type of hazard event. It also can be expressed in terms of potential monetary losses associated with the intensity of the hazard.
Riverine	Of or produced by a river.
Scale	A proportion used in determining a dimensional relationship; the ratio of the distance between two points on a map and the actual distance between the two points on the earth's surface.
Scarp	A steep slope.
Scour	Removal of soil or fill material by the flow of flood waters. The term is frequently used to describe storm-induced, localized conical erosion around pilings and other foundation supports where the obstruction of flow increases turbulence.
Seismicity	Describes the likelihood of an area being subject to earthquakes.
Special Flood Hazard Area (SFHA)	An area within a floodplain having a 1 percent or greater chance of flood occurrence in any given year (100-year floodplain); represented on Flood Insurance Rate Maps by darkly shaded areas with zone designations that include the letter A or V.
Stafford Act	The Robert T. Stafford Disaster Relief and Emergency Assistance Act, PL 100-107 was signed into law November 23, 1988 and amended the Disaster Relief Act of 1974, PL 93-288. The Stafford Act is the statutory authority for most Federal disaster response activities, especially as they pertain to FEMA and its programs.
State Hazard Mitigation Officer (SHMO)	The representative of state government who is the primary point of contact with FEMA, other state and Federal agencies, and local units of government in the planning and implementation of pre- and post-disaster mitigation activities.
Storm Surge	Rise in the water surface above normal water level on the open coast due to the action of wind stress and atmospheric pressure on the water surface.
Structure	Something constructed. (See also Building)
Substantial Damage	Damage of any origin sustained by a structure in a Special Flood Hazard Area whereby the cost of restoring the structure to its before-damaged condition would equal or exceeds 50 percent of the market value of the structure before the damage.
Super Typhoon	A typhoon with maximum sustained winds of 150 mph or more.
Surface Faulting	The differential movement of two sides of a fracture – in other words, the location where the ground breaks apart. The length, width, and displacement of the ground characterize surface faults.

Tectonic Plate	Torsionally rigid, thin segments of the earth's lithosphere that may be assumed to move horizontally and adjoin other plates. It is the friction between plate boundaries that cause seismic activity.
Topographic	Characterizes maps that show natural features and indicate the physical shape of the land using contour lines. These maps may also include manmade features.
Tornado	A violently rotating column of air extending from a thunderstorm to the ground.
Tropical Cyclone	A generic term for a cyclonic, low-pressure system over tropical or subtropical waters.
Tropical Depression	A tropical cyclone with maximum sustained winds of less than 39 mph.
Tropical Storm	A tropical cyclone with maximum sustained winds greater than 39 mph and less than 74 mph.
Tsunami	Great sea wave produced by submarine earth movement or volcanic eruption.
Typhoon	A special category of tropical cyclone peculiar to the western North Pacific Basin, frequently affecting areas in the vicinity of Guam and the North Mariana Islands. Typhoons whose maximum sustained winds attain or exceed 150 mph are called super typhoons.
Vulnerability	Describes how exposed or susceptible to damage an asset is. Vulnerability depends on an asset's construction, contents, and the economic value of its functions. Like indirect damages, the vulnerability of one element of the community is often related to the vulnerability of another. For example, many businesses depend on uninterrupted electrical power – if an electric substation is flooded, it will affect not only the substation itself, but a number of businesses as well. Often, indirect effects can be much more widespread and damaging than direct ones.
Vulnerability Assessment	The extent of injury and damage that may result from a hazard event of a given intensity in a given area. The vulnerability assessment should address impacts of hazard events on the existing and future built environment.
Water Displacement	When a large mass of earth on the ocean bottom sinks or uplifts, the column of water directly above it is displaced, forming the tsunami wave. The rate of displacement, motion of the ocean floor at the epicenter, the amount of displacement of the rupture zone, and the depth of water above the rupture zone all contribute to the intensity of the tsunami.
Wave Run-up	The height that the wave extends up to on steep shorelines, measured above a reference level (the normal height of the sea, corrected to the state of the tide at the time of wave arrival).
Wildfire	An uncontrolled fire spreading through vegetative fuels, exposing and possibly consuming structures.

Zone	A geographical area shown on a Flood Insurance Rate Map (FIRM) that reflects the severity or type of flooding in the area.