City of San Clemente Natural Hazard Mitigation Plan

September 3, 2004

NOTES OF SPECIAL RECOGNITION AND APPRECIATION

The City of San Clemente owes no small debt of gratitude to Clackamas County Oregon and its Natural Hazards Mitigation Committee.

Vicki Harguth, the County's Emergency Management Coordinator and Cindy Kolomechuck, their Hazard Mitigation Specialist graciously shared their plan with us and allowed us to use it as a basis for our plan.

While there are sometimes interesting differences between the climate and topography of Clackamas County, Oregon and the City of San Clemente, California, the plan was so well organized and it was easily adapted to suit the needs of our city.

The generosity of Clackamas County and its emergency management personnel is typical of the spirit of cooperation that pervades the emergency management profession.

In addition to the efforts of Clackamas County, Michael E. Martinet, C. E. M., Executive Director, Office of Disaster Management, Area G, Los Angeles County has been instrumental in development of our plan. From Orange County, Mary Ann Klenundt, Senior Emergency Management Program Coordinator as well as Jacob Green, Assistant to the Emergency Services Coordinator, City of Huntington Beach/Fountain Valley Hazard Mitigation Planning Committee have provided guidance and authorship as well as being great sources of information.

We also availed ourselves of data, reports and plans from a variety of cities, counties and states from across the country as part of the research in preparing this plan. Thank you to all those agencies so generous to their colleagues in the emergency management profession. The work of many of these agencies is cited in Section 1.

Special Thanks & Acknowledgments

Project Steering Committee:
- Mike Jorgensen, City of San Clemente Building and Safety Division
- Jim Russell, City of San Clemente Emergency Services Coordinator
- Tom Rendina, City of San Clemente Finance Department
- Juan (Pablo) Bargueno, City of San Clemente GIS, Information Services
- George Buell, City of San Clemente Planning Division
- Laura Ferguson, City of San Clemente Public Information, City Manager's Office
- David Lund, City of San Clemente Public Works Department
- Bill Cameron, City of San Clemente Engineering Division
- Lynne Fuller, City of San Clemente Public Works Administration
- Tom Bistline, Tom Bistline Construction Company
- Peter Borella, Ph.D. Borella Geology, Inc.
- Pat Wolfram, CEO, San Clemente Hospital
- Pat Hayes, General Manager, Talega Associates
- Michael Kaupp, President, Downtown Business Association of San Clemente
- Mike Burke, Consulting
- Dave Doomey, Capistrano Unified School District
- Mike Dunbar, General Manager, South Coast Water District
- Jim Yates, Talega Associates
- Barbara Culverhouse, Manager, Offsite Emergency Planning, San Onofre Generating Station

Geographic Information Systems (GIS) Maps

City of San Clemente Information Systems/GIS, in the Information Services Division, developed some of the maps included in this plan. The contributions from this department were essential in illustrating the extent and potential losses associated with the natural hazards affecting the City.

Care was taken in the creation of these maps, however, they are provided "as is." City of San Clemente 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 in this document before making any decisions.

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Plan Approval

Myrna Erway, City Clerk

STATE OF CALIFORNIA
COUNTY OF ORANGE
CITY OF SAN CLEMENTE

I, Myrna Erway, City Clerk of the City of San Clemente, do hereby certify that the City of San Clemente Natural Hazard Mitigation Plan was duly approved at a regular meeting of the City Council, on the _____ day of _____ , _____ , by the following vote, to wit:

AYES:
NOES:
ABSTAIN:
ABSENT:

_____
Myrna Erway
City Clerk

RECORD OF REVISIONS

DATE	SECTION REVISED	REVISED BY

PART 1 MITIGATION ACTION PLAN

I. Executive Summary

A. Five -Year Action Plan Matrix

The City of San Clemente Natural Hazards Mitigation Action Plan includes resources and information to assist City residents, public and private sector organizations, and others interested in participating in planning for natural hazards. The mitigation plan provides a list of activities that may assist the City in reducing risk and preventing loss from future natural hazard events. The action items address multi-hazard issues, as well as activities for earthquakes, landslides, flooding, tsunamis, wildfires and nuclear.

B. How the Plan is 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 City of San Clemente, sections on six natural hazards that occur within the City, and a number of appendices. All of the sections are described in detail in Section 1, the Plan Introduction.

C. Who Participated in Developing the Plan

The City of San Clemente Natural Hazards Mitigation Action Plan is the result of a collaborative effort between the City's 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. Interviews were conducted with stakeholders across the City, and two public workshops were held to include residents in the plan's development. A project Steering Committee guided the process of developing the plan.

The Steering Committee was comprised of representatives from:

- City of San Clemente Building & Safety Division
- City of San Clemente Public Works Department
- City of San Clemente Emergency Planning
- City of San Clemente Finance Department
- City of San Clemente GIS, Information Services Division
- City of San Clemente Planning Division
- City of San Clemente Public Information, City Manager's Office
- Tom Bistline Construction Company
- San Clemente Hospital

- Talega Associates

- Peter Borella, Ph. D., Borella Geology, Inc.
- Downtown Business Association of San Clemente
- RBF, Consulting
- Capistrano Unified School District
- South Coast Water District
- San Onofre Nuclear Generating Station

D. The Plan Mission

The mission of the City of San Clemente Natural Hazards Mitigation Plan is to promote sound public policy designed to protect citizens, critical facilities, infrastructure, private property, and the environment from natural 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 towards building a safer, more sustainable community.

E. The Plan Goals

The plan goals describe the overall direction that City of San Clemente agencies, organizations, and citizens can take to work toward mitigating risk from natural hazards. The goals are stepping-stones between the broad direction of the mission statement and the specific recommendations outlined in the action items.

1. 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 hazards.
- Reduce losses and repetitive damages for chronic hazard events while promoting insurance coverage for catastrophic hazards.
- Improve hazard assessment information to make recommendations for discouraging new development in high hazard areas and encouraging preventative measures for existing development in areas vulnerable to natural hazards.

2. Public Awareness

- Develop and implement education and outreach programs to increase public awareness of the risks associated with natural hazards.
- Provide information on tools; partnership opportunities, and funding

resources to assist in implementing mitigation activities.

3. Natural Systems

- Balance natural resource management, and land use planning with natural hazard mitigation to protect life, property, and the environment.
- Preserve, rehabilitate, and enhance natural systems to serve natural hazard mitigation functions.

4. Partnerships and Implementation

- Strengthen communication and coordinate participation among and within public agencies, citizens, non-profit organizations, business, and industry to gain a vested interest in implementation.
- Encourage leadership within public and private sector organizations to prioritize and implement local and regional hazard mitigation activities.

5. 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 natural hazard mitigation activities, where appropriate, with emergency operations plans and procedures.

F. How Action Items Are 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 time line for implementation. Short-term action items are activities that City agencies 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). The matrix includes the following information for each action item:

1. **Coordinating Organization**.

   The coordinating organization is the public agency with regulatory responsibility to address natural 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.

2. **Time line**.

   Action items include both short and long-term activities. Each action item includes an estimate of the time line for implementation. Short-term action items are activities which City agencies are capable of implementing 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.

3. **Ideas for Implementation**.

   Each action item includes ideas for implementation and potential resources, which may include grant programs or human resources. The matrix includes the page number within the mitigation plan where this information can be found.

4. **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

5. **Partner Organizations**.

   The Partner organizations are not listed with the individual action items or in

the plan matrix. Partner organizations are listed in Appendix A, of this plan

and are agencies or public/private sector organizations that may be able to assist in the implementation of action items by providing relevant resources to the coordinating organization. The partner organizations listed in the Resource Directory of the City of San Clemente Natural Hazards Mitigation plan are potential partners recommended by the project steering committee, but were not necessarily contacted during the development of the Mitigation Plan. Partner organizations should be contacted by the coordinating organization to establish commitment of time and resources to action items.

6. Constraints.

Constraints may apply to some of the action items. These constraints may be a lack of city staff, lack of funds, or vested property rights which might expose the City to legal action as a result of adverse impacts on private property.

G. How the Plan Will Be Implemented, Monitored, and Evaluated

The Plan Maintenance Section of this document details the formal process that will ensure that the City of San Clemente Natural Hazards 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 San Clemente government 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 & Safety Codes.

H. Plan Adoption

Adoption of the Natural Hazard Mitigation Plan by the local jurisdiction'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 San Clemente Natural Hazards Mitigation Plan. The local agency governing body has the authority to promote sound public policy regarding natural hazards. The adoption of the plan does not create a "mandatory duty" for the City to perform any of the action items or other suggested measures described in the plan with the meaning of Government Code §815.6. The City Council may periodically re-adopt the plan as it is revised to meet changes in the natural hazard risks and exposures in the community. The approved Natural Hazard Mitigation

Plan will be significant in the future growth and development of the community.

I. Coordinating Body

A City of San Clemente Hazard Mitigation Advisory Committee will be responsible for coordinating implementation of Plan action items and undertaking the formal review process. The City Manager will assign representatives from City agencies, including, but not limited to, the current Hazard Mitigation Steering Committee members.

J. Convener

The City Council will adopt the City of San Clemente Natural Hazard Mitigation Plan, and the Hazard Mitigation Advisory Committee will take responsibility for plan implementation. The Director, of Public Works will serve as a convener to facilitate the 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 Natural Hazard Advisory Committee Members.

K. Implementation through Existing Programs

The City addresses statewide planning goals and legislative requirements through its General Plan, Capital Improvement Plans, and Building & Safety Codes. The Natural Hazard Mitigation Plan provides a series of recommendations that are closely related to the goals and objectives of these existing planning programs. The City of San Clemente will have the opportunity to implement recommended mitigation action items through existing programs and procedures. The identified action items in the below matrix, when appropriate, will address the effects of hazards on both new and existing buildings.

L. Economic Analysis of Mitigation Projects

The Federal Emergency Management Agency's (FEMA) approaches to identify costs and benefits associated with natural 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 natural 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.

M. Formal Review Process

The Natural Hazards Mitigation Plan will be evaluated on a biennial 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 time line, and identifies the local agencies and organizations participating in plan evaluation. The convener will be responsible for contacting the Hazard Mitigation Advisory Committee members and organizing the biennial meeting. Committee members will be responsible for monitoring and evaluating the progress of the mitigation strategies in the Plan.

N. Continued Public Involvement

The City of San Clemente is dedicated to involving the public directly in the continual review and updates of the Hazard Mitigation Plan. Copies of the plan will be catalogued and made available at City Hall. The existence and location will be publicized in City newsletters. The plan also includes the address and the phone number of the City's Emergency Planning Services, responsible for keeping track of public comments on the Plan. 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.

MITIGATION ACTION ITEMS

Natural Hazard	Action Item	Coordinating Organization	Timeline	Ideas for Implementation	Plan Goals Addressed				
					Protect Life and Property	Public Awareness	Natural Systems	Partnership & Implementation	Emergency Services
Multi-Hazard Mitigation Action Items									
Short Term Multi Hazard #1	Integrate the goals and action items from the City of San Clemente Natural Hazard Mitigation Plan into existing regulatory documents and programs where appropriate	Hazard Mitigation Committee	Ongoing	Pg. 55				X	
Short Term Multi Hazard #2	Identify and pursue funding opportunities to develop and implement local and city mitigation activities	Emergency Planning and Public Works	Ongoing	Pg. 56				X	
Short Term Multi Hazard #3	Establish a formal role for the City of San Clemente Natural Hazards Mitigation Committee to develop a sustainable process for implementing, monitoring, and evaluating city wide mitigation activities.	Hazard Mitigation Committee	Ongoing	Pg. 57				X	
Short Term Multi Hazard #4	Develop public and private partnerships to foster natural hazard mitigation program coordination and collaboration in the City of San Clemente	Emergency Planning and Public Works	Ongoing	Pg. 58	X			X	
Short Term Multi Hazard #5	Identify, improve, and sustain collaborative programs focusing on the real estate and insurance industries, public and private sector organizations, and individuals to avoid activity that increases risk to natural hazards.	Emergency Planning and Public Works	Ongoing	Pg. 59				X	
Long Term Multi Hazard	Develop inventories of at risk buildings and infrastructure and prioritize mitigation	Emerg Plan, B & S and Eng	1-2 years	Pg. 60	X			X	

#1	projects.	Division							

Natural Hazard	Action Item	Coordinating Organization	Timeline	Ideas for Implementation	Plan Goals Addressed				
					Protect Life and Property	Public Awareness	Natural Systems	Partnership & Implementation	Emergency Services
Multi-Hazard Mitigation Action Items									
Long Term Multi Hazard #2	Strengthen emergency services preparedness and response by linking emergency services with natural hazard mitigation programs, and enhancing public education on a regional basis.	Emergency Planning and Public Works	Ongoing	Pg. 61	X				X
Long Term Multi Hazard #3	Develop, enhance and implement education programs aimed at mitigating natural hazards, and reducing risk to citizens, public agencies, private property owners, businesses, and schools.	Emergency Planning and Public Works	Ongoing	Pg. 62	X	X			
Long Term Multi Hazard #4	Use technical knowledge of natural ecosystems and events to link natural resource management and land use organizations to mitigation activities and technical assistance.	Hazard Mitigation Committee	Ongoing	Pg. 63			X		
Short Term Earthquake Hazard #1	Integrate new earthquake hazard mapping data for the City of San Clemente and improve technical analysis of earthquake hazards.	City GIS, Information Services Division	2 years	Pg. 96	X			X	
Short Term Earthquake Hazard #2	Incorporate the Regional Earthquake Transportation Evacuation Routes developed by the Regional Emergency Managers Group into appropriate planning documents.	City Emergency Planning Services	2 years	Pg. 96					X
Long Term	Identify funding resources for structural and	Hazard	Ongoing	Pg. 97				X	X

Earthquake Hazard #1	nonstructural retrofitting of structures that are identified as seismically vulnerable.	Mitigation Committee							
Natural Hazard	**Action Item**	**Coordinating Organization**	**Timeline**	**Ideas for Implementation**	**Plan Goals Addressed**				
					Protect Life and Property	**Public Awareness**	**Natural Systems**	**Partnership & Implementation**	**Emergency Services**
Multi-Hazard Mitigation Action Items									
Long Term Earthquake Hazard #2	Encourage purchase of earthquake insurance.	Hazard Mitigation Committee	Ongoing	Pg. 97	X	X			
Long Term Earthquake Hazard #3	Encourage seismic strength evaluations of critical facilities in the City of San Clemente to identify vulnerabilities for mitigation of public infrastructure, and critical facilities to meet current seismic standards	Hazard Mitigation Committee	5 years	Pg. 98	X				X
Long Term Earthquake Hazard #4	Encourage reduction of nonstructural and structural earthquake hazards in homes, schools, businesses, and government offices.	Hazard Mitigation Committee	Ongoing	Pg. 98	X	X			
Short Term Landslide Hazard #1	Improve City's knowledge of landslide hazard areas with the processing of development project approvals.	Engineering Division	Ongoing	Pg. 118				X	
Short Term Landslide Hazard #2	Encourage construction and subdivision design that can be applied to steep slopes to reduce the potential adverse impacts from development in accordance with the General Plan and Municipal Codes.	City Planning, Building and Safety, and Engineering Division	Ongoing	Pg. 118	X			X	
Short Term Landslide	Identify safe evacuation routes in high risk debris flow and landslide areas.	Emergency Planning and	2 years	Pg. 119					X

Hazard #3		Public Works							

Natural Hazard	Action Item	Coordinating Organization	Timeline	Ideas for Implementation	Plan Goals Addressed				
					Protect Life and Property	Public Awareness	Natural Systems	Partnership & Implementation	Emergency Services
Multi-Hazard Mitigation Action Items									
Long Term Landslide Hazard #1	Review local ordinances regarding building and development in landslide prone areas.	Engineering Division	2 years	Pg. 119	X	X			
Long Term Landslide Hazard #2	Regulate activities in identified potential and historical landslide areas through mitigation and focused outreach.	Engineering Division	2 years	Pg. 120		X		X	
Short Term Flood Hazard #1	Analyze each repetitive flood property within the City of San Clemente and identify feasible mitigation options..	Engineering Division	2 years	Pg. 148	X			X	
Short Term Flood Hazard #2	Recommend revisions to requirements for development within the floodplain, where appropriate.	Hazard Mitigation Advisory Committee and Engineering Division	2 years	Pg. 148	X				

Short Term Flood Hazard #3	Develop better flood warning systems.	County OES	2 years	Pg. 149	X				X

Natural Hazard	Action Item	Coordinating Organization	Timeline	Ideas for Implementation	Plan Goals Addressed				
					Protect Life and Property	Public Awareness	Natural Systems	Partnership & Implementation	Emergency Services
Multi-Hazard Mitigation Action Items									
Long Term Flood Hazard #1	Enhance data and mapping for floodplain information within the city, and identify and map flood prone areas outside of designated floodplains..	City GIS, Information Services Division	3 years	Pg. 149	X				
Long Term Flood Hazard #2	Encourage management strategies to preserve open space for flood mitigation, fish habitat, and water quality in the floodplain.	City Planning Division	Ongoing	Pg. 150	X		X		
Long Term Flood Hazard #3	Establish a framework to compile and coordinate surface water management plans and data throughout the city..	Engineering Division	5 years	Pg. 150	X			X	
Short Term Tsunami Hazard #1	Incorporate the voice capability of the new Community Alert Siren System to enhance notification of personnel on and immediately adjacent to the beach.	City Emergency Planning and Marine Safety	Beginning in 2005	Pg. 174	X	X			X
Short Term Tsunami Hazard #2	Warning Signs on the Beach	Emergency Planning Services and Marine Safety Division	2 years	Pg. 174	X	X	X	X	X

Natural Hazard	Action Item	Coordinating Organization	Timeline	Ideas for Implementation	Plan Goals Addressed				
					Protect Life and Property	Public Awareness	Natural Systems	Partnership & Implementation	Emergency Services
Multi-Hazard Mitigation Action Items									
Short Term Tsunami Hazard #3	Tsunami Public Education Campaign	City Emergency Planning and Marine Safety	As personnel hours and time permit	Pg. 175	X	X			X
Short Term Tsunami Hazard #4	Update the City of San Clemente Emergency Plan, Annex D-Storms, Floods, and Tsunamis	City Emergency Planning Services	As personnel hours and time permit	Pg. 175	X	X		X	X
Short Term Wildfire Hazard #1	Enhance emergency services to increase the efficiency of wildfire response and recovery activities.	Orange County Fire Authority	2 years	Pg. 194					X
Short Term Wildfire Hazard #2	Educate agency personnel on federal cost-share and grant programs, Fire Protection Agreements and other related federal programs so the full array of assistance available to local agencies is understood.	Orange County Fire Authority & Emergency Planning Services	1-2 years	Pg. 195	X	X			
Short Term Wildfire Hazard #3	Inventory alternative firefighting water sources and encourage the development of additional sources	Orange County Fire Authority and City GIS	1 year	Pg. 195	X				

Natural Hazard	Action Item	Coordinating Organization	Timeline	Ideas for Implementation	Plan Goals Addressed				
					Protect Life and Property	Public Awareness	Natural Systems	Partnership & Implementation	Emergency Services
Multi-Hazard Mitigation Action Items									
Long Term Wildfire Hazard #1	Encourage development and dissemination of maps relating to the fire hazard to help educate and assist builders and homeowners in being engaged in wildfire mitigation activities and to help guide emergency services during response.	Orange County Fire Authority	1-3 years	Pg. 196	X				
Long Term Wildfire Hazard #2	Enhance outreach and education programs aimed at mitigating wildfire hazards and reducing or preventing the exposure of citizens, public agencies, private property owners and businesses to natural hazards	Orange County Fire Authority	Ongoing	Pg. 196	X	X			
Long Term Wildfire Hazard #3	Increase communication, coordination and collaboration between wildland/urban interface property owners, local and county planners and fire prevention crews and officials to address risks, existing mitigation measures and federal assistance programs.	Orange County Fire Authority, City Planning and GIS, Information Services and Utilities Divisions	Ongoing	Pg. 197	X	X		X	X

Natural Hazard	Action Item	Coordinating Organization	Timeline	Ideas for Implementation	Plan Goals Addressed				
					Protect Life and Property	Public Awareness	Natural Systems	Partnership & Implementation	Emergency Services
Multi-Hazard Mitigation Action Items									
Short Term Nuclear Hazard #1	Participate in established Interjurisdictional Planning Committee at each monthly meeting, reporting minutes to Director of Public Works/Community Development. Ensure the Director is kept abreast of evolving activities at SONGS and their impact.	City of San Clemente Emergency Planning	Ongoing	Pg. 210	X	X			X
Short Term Nuclear Hazard #2	Closely coordinate with City of San Clemente Public Information Officer and SONGS Public Information Officer to ensure all public outreach is in agreement.	City of San Clemente Emergency Planning	1-3 years	Pg. 210	X	X			X
Long Term Nuclear Hazard #1	Retain emergency planning staff assignments to coordinate, prepare, and implement appropriate nuclear hazard plans. Individual(s) shall maintain close line of communication with appropriate representatives of the San Onofre Nuclear Generating Station and report to the City Council regarding the status of the facility, nuclear hazard plans, and safety issues and concerns.	Emergency Planning Services	Ongoing	Pg. 211	X			X	X
Long Term Nuclear	Closely coordinate with City of San Clemente Public Information Officer and SONGS Public	Public Works and	Ongoing	Pg. 211	X			X	X

Hazard #2	Information Officer to ensure all public outreach is in agreement	Emergency Planning Services							

SECTION 1 Introduction

I. Introduction

Throughout its history, the residents of City of San Clemente have dealt with the various natural hazards affecting the area. Photos, journal entries, and newspapers from the 1900's show that the residents of the area dealt with earthquakes, earth movements, flooding, and wildfires.

Although there were fewer people in the area, the natural hazards adversely affected the lives of those who depended on the land and climate conditions for food and welfare. As the population of the City continues to increase, the exposure to natural hazards creates an even higher risk than previously experienced.

The City of San Clemente population of 63,000 (estimated) is approximately 2 % of the total population of Orange County, and offers the benefits of living by the ocean in a Mediterranean type of climate. The City of San Clemente was incorporated in 1928, population at time of incorporation was 667. We currently comprise a land area of 18.45 square miles. Within the City we have 21 parks with an acreage of 228.35, there are 4.7 miles of beach with a beach acreage of 20 . Annual visitors (tourism) is 2 million. The major employers are San Clemente Hospital & Medical Center, Wal Mart, Lowes and the City of San Clemente. The City is characterized by the unique and attractive landscape that makes the area very popular. However, the potential impacts of natural hazards associated with the terrain make the environment and its population vulnerable to natural disaster situations.

The City is subject to earthquake activities, earth movements, flooding, tsunamis, wildfires and radiological exposures from a nearby nuclear powered generating station. It is impossible to predict when these disasters might occur, or the extent to which they might 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 could result from any of these natural disasters.

The City of San Clemente in 1993 experienced large-scale landslide and flooding damage due to a severe winter storm. The damage to City of San Clemente businesses, residences, and infrastructure was estimated at about $7 million. The City sought and received a Presidential Disaster Declaration to obtain federal assistance for its recovery effort. The City of San Clemente estimated that the event of the 1993 directly or indirectly affected 40% of the City's then 48,000 residents.

A. Why Develop a Mitigation Plan

As the costs of damage from natural disasters continue to increase throughout the country, the city realizes the importance of identifying effective ways to reduce vulnerability to disasters. Natural hazard mitigation plans assist communities in reducing risk from natural hazards by identifying resources, information, and strategies for risk reduction, while helping to guide and coordinate mitigation activities throughout the community.

The plan provides a set of action items to reduce risk from natural 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 natural hazards.

The resources and information within the Mitigation Plan:

- Establish a basis for coordination and collaboration among agencies and the public in City of San Clemente;
- Identify and prioritize future mitigation projects; and
- Assist in meeting the requirements of federal assistance programs.

The mitigation plan works in conjunction with other City plans, including the City General Plan and Emergency Operations Plans.

B. Whom Does the Mitigation Plan Effect

The City of San Clemente Natural Hazards Mitigation Plan affects the entire city. See Map 1-1Map1 shows major roads in the City of San Clemente. This plan provides a framework for planning for natural hazards. The resources and background information in the plan is applicable City-wide, and the goals and recommendations can lay groundwork for local mitigation plans and partnerships.

C. Natural Hazard Land Use Policy in California

Planning for natural 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.

This is particularly true in the case of planning for natural hazards where communities must balance development pressures with detailed information on the nature and extent of hazards.

Planning for Natural Hazards calls for local plans to include inventories, policies, and ordinances to guide development in hazard areas. These inventories should include the compendium of hazards facing the community, 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.

D. Support for Natural Hazard Mitigation

All mitigation is local, and the primary responsibility for development and implementation of risk reduction strategies and policies lies with local jurisdictions. 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 natural hazards and natural 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 lands, state lands, 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.

E. Plan Methodology

Information in the Mitigation Plan is based on research from a variety of sources. Staff from the City of San Clemente conducted data research and analysis, facilitated steering committee meetings and public workshops, and developed the final mitigation plan. The research methods and various contributions to the plan include:

a. Input from the steering committee:

The Hazard Mitigation Advisory Committee convened about every 6 to 8 weeks to guide development of the Mitigation Plan. The committee played an integral role in developing the mission, goals, and action items for the mitigation plan. The committee consisted of representatives of public and private agencies and organizations in City of San Clemente, including:

- City of San Clemente Building and Safety Division
- City of San Clemente Public Works Department
- City of San Clemente Emergency Planning Services
- City of San Clemente Finance Department
- City of San Clemente GIS, Information Services Division
- City of San Clemente Planning Division
- City of San Clemente Public Information, City Manager's Office
- Tom Bistline Construction Company
- San Clemente Hospital
- Talega Associates
- Downtown Business Association of San Clemente
- RBF & Associates
- Capistrano Unified School District
- South Coast Water District
- Peter Borella, Ph. D., Borella Geology, Inc.
- San Onofre Nuclear Generating Station

b. Stakeholder interviews:

City staff conducted multiple interviews with individuals and specialists from organizations interested in natural hazards planning. The interviews identified common concerns related to natural hazards and identified key long and short-term activities to reduce risk from natural hazards. A complete listing of all stakeholders is located in Appendix B. Stakeholders interviewed for the plan included representatives from:

- Water Providers
- School District
- Orange County Fire Authority
- Orange County Office of Emergency Management
- Utility Providers

F. State and federal guidelines and requirements for mitigation plans

Following are the Federal requirements for approval of a Natural Hazard 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, 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 community
- A comprehensive mitigation strategy, which describes the goals & 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 All Hazard Mitigation Plan into other planning mechanisms.
- Formal adoption by the City Council.
- Plan Review by both State OES and FEMA

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

A minimum of two public workshops (or other public forums) is recommended to meet the requirement for public participation, in addition to the inclusion of representatives from outside organizations on the planning committee itself. The timing and scheduling of the workshops may vary from one community to another depending on how each city's committee organizes its work and the particular needs of the community.

City staff examined existing mitigation plans from around the country, current FEMA hazard mitigation planning standards (386 series) and the State of California Natural Hazards Mitigation Plan Guidance.

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

- Clackamas County (Oregon) Natural Hazards Mitigation Plan
- Six County (Utah) Association of Governments
- Upper Arkansas Area Risk Assessment and Hazard Mitigation Plan
- Urbandale-Polk County, Iowa Plan
- Hamilton County, Ohio Plan
- Natural Hazard Planning Guidebook from Butler County, Ohio

The City staff collected data and compiled research on six hazards: earthquakes, earth movements, flooding, tsunamis, wildfires and nuclear. Research materials came from state agencies including OES, and CDF. The City staff also conducted research by referencing historical local newspapers, interviewing long time residents, long time City of San Clemente employees and locating information in historical documents.

Finally, the City staff identified current mitigation activities, resources and programs, and potential action items from research materials and stakeholder interviews.

G. Public workshops

The City staff facilitated two public workshops to gather comments and ideas from local citizens about mitigation planning and priorities for mitigation plan goals. The first workshop, held July 27, 2004, attracted 3 citizens, and the second, held September 2, 2004, brought 2 citizens.

The resources and information cited in the mitigation plan provide a strong local perspective and help identify strategies and activities to assist the City in dealing with possible future disasters.

H. 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 facing citizens, businesses, and the environment. Combined, the sections of the plan work together to create a document that guides the mission to reduce risk and prevent loss from future natural hazard events.

The structure of the plan enables people to use the information that pertains to a section of interest to them. It also allows City government 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 natural hazards mitigation plan that remains current and relevant to the City of San Clemente.

The mitigation plan is organized in three volumes. Volume I contains an executive summary, introduction, City profile, risk assessment and multi-hazard, plan maintenance Volume II contains the six natural hazard sections and Volume III includes the appendices. Each section of the plan is described below.

Volume I: Mitigation Action Plan

Executive Summary: Five-Year Action Plan

The Five-Year 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 natural hazard events.

Section 1: Introduction

The Introduction describes the background and purpose of developing the mitigation plan for City of San Clemente.

Section 2: Community Profile

This section presents the history, geography, demographics, and socioeconomics of City of San Clemente. It serves as a tool to provide an historical perspective of natural hazards in the City.

Section 3: Risk Assessment

This section provides information on hazard identification, vulnerability and risk associated with natural hazards in the City of San Clemente.

Section 4: Multi-Hazard Goals and Action Items

This section provides information on the process used to develop goals and action items that cut across the six natural hazards addressed in the mitigation plan.

Section 5: Plan Maintenance

This section provides information on plan implementation, monitoring and evaluation.

Volume II: Hazard Specific Information

Hazard-Specific Information on the six chronic hazards is addressed in this plan. Chronic hazards occur with some regularity and may be predicted through historic evidence and scientific methods. Multiple other hazards were considered in accordance with §201(c)(2)(i) 44 Code of Federal Regulations, Mitigation Planning for inclusion but rejected based on historical data and consensus. It is possible that following reviews in the future that additional hazards may be added. The chronic hazards addressed in the plan include:

Section 6: Earthquake
Section 7: Landslide
Section 8: Flooding
Section 9: Tsunami
Section 10: Wildfire
Section 11: Nuclear

Catastrophic hazards do not occur with the frequency of chronic hazards, but can have devastating impacts on life, property, and the environment. In Southern California, because of the geology and terrain, earthquake, earth movement, flooding and wildfire also have the potential to be catastrophic as well as chronic hazards. For the coastal areas of Southern California, tsunamis, while very rare,

have the potential to devastate low-lying coastal areas.

Each of the hazard-specific sections includes information on the history, hazard causes and characteristics, hazard assessment, goals and action items, and local, state, and national resources.

Volume III: Resources

The plan appendices are designed to provide users of the City of San Clemente Natural Hazards 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, regional, State, and Federal resources and programs that may be of technical and/or financial assistance to the City of San Clemente during plan implementation.

Appendix B: Public Participation Process

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 requirements for benefit cost analysis in natural 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, regional, State, and Federal agencies and organizations that may be referred to within the City of San Clemente Natural Hazards Mitigation Plan.

Appendix E: Glossary

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

SECTION 2 Community Profile

I. Community Profile

Natural hazards impact citizens, property, the environment, and the economy of the City of San Clemente. Earthquakes, earth movements, flooding, tsunamis, wildfires and nuclear have the potential to expose City of San Clemente residents and businesses to the financial and emotional costs of recovering after natural disasters. The risk associated with natural hazards increases as more people move to areas affected by natural 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 natural 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 natural hazard events. Identifying the risks posed by natural 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 natural hazards mitigation plan that addresses the potential impacts of hazard events.

A. Geography and the Environment

City of San Clemente has an area of 18.45 square miles and is located in Southern Orange County.

Elevations in the City range from sea level to 875 feet in elevation. The terrain of the city is hilly.

B. Community Profile

The City of San Clemente is rich in history. The land upon which San Clemente was built was originally Rancho Los Desechos. This rancho was part of the land, extending as far south as Mission San Louis Rey (which is now in the City of Oceanside), which was held originally by Mission San Juan Capistrano. In 1834, through the office of Pio Pico, the last Mexican governor of California, the Mission lands were secularized and deeded to private individuals. The area comprising the City of San Clemente was first settled in 1925 and the City itself was incorporated in 1928.

The City is served by the Interstate 5 Freeway, and the major arterial highway is Pacific Coast Highway which runs north to south through the city.

The Atchison Topeka and Santa Fe railroad serves the city with tracks in the beach area. Passenger transportation is provided by Amtrak, Metrolink and Orange County Transit Authority (OCTA).

C. Major Rivers

There are no major rivers in the City of San Clemente.

D. Climate

Temperatures in the City of San Clemente range from 58 degrees in the winter months to 68 degrees in the summer months. However the temperatures can vary over a wide range, particularly when the Santa Ana winds blow, bringing higher temperatures and very low humidity. Temperatures rarely exceed 90 degrees in the summer months (June - September), and rarely drop below 40 degrees in the winter months (November-March).

Rainfall in the city averages 12.85 inches of rain per year. However the term "average rainfall" is misleading because over the recorded history of rainfall in the City of San Clemente rainfall amounts have ranged from no rain at all in some years to 20 inches of rain in very wet years.

Further more, actual rainfall in Southern California tends to fall in large amounts during sporadic and often heavy storms rather than consistently during storms at somewhat regular intervals. In short, rain fall in Southern California might be characterized as feast or famine within a single year. Because the metropolitan basin is largely built out, water originating in higher elevation communities can have a sudden impact on adjoining communities that have a lower elevation.

E. Minerals and Soils

The characteristics of the minerals and soils present in City of San Clemente indicate the potential types of hazards that may occur. Rock hardness and soil characteristics can determine whether or not an area will be prone to geologic hazards such as earthquakes, liquefaction and landslides.

The surface soil and sediment in the City of San Clemente include unconsolidated clay, silt, sand and gravel size particles. The fine grained clay and silt are primarily derived from the weathering and erosion of the predominate formation in the area, The Capistrano Formation. Montmorillonite is the dominate clay mineral within this formation. These clays and silts are highly expansive, creep

prone and responsible for much of the earth movements that take place on slopes and bluffs in San Clemente.

Coarse silt, sand and gravel (alluvial) deposits are primarily found in ephemeral or seasonal stream channels. Heavy rains and flooding can transport large deposits of silt, sand and gravel downstream. Some of these flood deposits eventually contribute to the beach sands found along the shore.

Thick sandy deposits associated with groundwater levels shallower than 50 feet subsurface are subject to liquefaction in a seismic event.

Understanding the geologic characteristics of City of San Clemente is an important step in hazard mitigation and avoiding at-risk development.

F. Other Significant Geologic Features

The City of San Clemente, lies over the area of no known earthquake faults, there are potentially many more unknown faults, particularly so-called lateral or blind thrust faults.

The major faults that have the potential to affect the City of San Clemente are the:

- San Andreas
- Newport Inglewood
- Mission Viejo
- Christiantos
- Elsinore Whittier
- San Joaquin Hills Blind Thrust Fault

The Los Angeles Basin has a history of powerful and relatively frequent earthquakes, dating back to the powerful 8.0+ San Andreas earthquake of 1857 which did substantial damage to the relatively few buildings that existed at the time. Paleoseismological research indicates that large (8.0+) earthquakes occur on the San Andreas fault at intervals between 45 and 332 years with an average interval of 140 years[1]. Other lesser faults have also caused very damaging earthquakes since 1857. Notable earthquakes include the Long Beach Earthquake of 1933, the San Fernando Earthquake of 1971, the 1987 Whittier Narrows

[1] Peacock, Simon M., http://aamc.geo.lsa.umich.edu/eduQuakes/EQpredLab/EQprediction.peacock.html

Earthquake and the 1994 Northridge earthquake.

In addition, many areas in the Los Angeles Basin have sandy soils that are subject to liquefaction. The City of San Clemente has liquefaction zones as shown on Map 1-2MAP2.

The City of San Clemente also has areas with land movement potential. Currently, there are several areas of active land sliding within the City, including but not limited to portions of Via Amapola, Via Bellota, Avenida Columbo, and Verde Canyon.

G. Population and Demographics

The City of San Clemente, has a population of about 63,000 (estimated) in an area of 18.45 square miles. The population of the City of San Clemente has steadily increased from the 1800's through 2000, an increase of 60 per cent or 10,262 people between 1970 and 1980. Between 1980 and 1990, the City's population increased 50 per cent, according to the U.S. Census. As of April, 1990 San Clemente had 41,100 residents, which represented an increase of 13,775 residents in a ten year period between 1980 and 1990, and increased 21.34% from 1990 to 2000 according to the 2000 Census. This population increase reflects a relatively high growth rate when compared to the average 24.7 per cent increase for the entire County of Orange.

The population increase in City of San Clemente creates more community exposure, and changes how agencies prepare for and respond to natural hazards. For example, more people living on the urban fringe can increase risk of fire. Wildfire has an increased chance of starting due to human activities in the urban/rural interface, and has the potential to injure more people and cause more property damage. But an Urban/wildland interface fire is not the only major fire exposure to the City of San Clemente. In the 1987 publication, Fire Following Earthquake issued by the All Industry Research Advisory Council, Charles Scawthorn explains how a post-earthquake urban conflagration would develop. The conflagration would be started by fires resulting from earthquake damage, but made much worse by the loss of pressure in the fire mains, caused by either lack of electricity to power water pumps, and /or loss of water pressure resulting from broken fire mains.

Furthermore, increased density can affect risk. For example, narrower streets are more difficult for emergency service vehicles to navigate, the higher ratio of residents to emergency responders affects response times, and homes located

closer together increase the chances of fires spreading. The City of San Clemente is experiencing a great deal of in-fill construction activity, which is increasing the population density creating greater service loads on the built infrastructure, including roads, water supply, sewer services and storm drains.

Natural 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.[2]

According to the latest census figures, the demographic make up of the city is as follows:

- Caucasian 49,563
- Hispanic 10,042
- African American 405
- Asian 1637
- Other 1563

The ethnic and cultural diversity suggests a need to address multi-cultural needs and services. Vulnerable populations, including seniors, disabled citizens, women, and children, as well as those people living in poverty, may be disproportionately impacted by natural hazards.

Examining the reach of hazard mitigation policies to special needs populations may assist in increasing access to services and programs. FEMA 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 natural hazards recovery can place an unequal financial responsibility on the general population when only a small proportion may benefit from government funds used to rebuild private structures. Discussions about natural hazards that include local citizen groups, insurance companies, and other public

[2] www.fema.gov

and private sector organizations can help ensure that all members of the population are a part of the decision-making processes.

H. 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.

The City of San Clemente 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 Orange 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 natural hazards that affect all of Southern California.

I. Housing and Community Development

Southern California Association of Governments (SCAG) is hired by the State to prepare a regional housing need assessment (RHNA) every five years to determine housing needs by the City to update the Housing Element of the General Plan. Regional housing needs for San Clemente between 1998 and 2003 were determined to be 4,584 new housing units. During this time period a total of 4,178 units were built in the city with another 2,000 projected to be built by build-out in 2008.

The State Department of Finance reported in 2003 that there are 13,809 single family detached homes (56% of the total), 2,414 attached condominiums (10% of the total), 7,932 multi-family apartment units (32% of the total) and 403 mobile homes (2% of the total). The 2000 Census reported that 62.4% of the housing is owner occupied and 37.6% is renter occupied. The 2000 Census reported that the median value of housing was $372,400. The average value has appreciated

significantly over the past 4 years with the average housing sales price in San Clemente reported by the Orange County Board of Realtors to be $548,500 in 2003.

To address community needs, the Community Development Department has engaged in activities that promote the quality of life for the citizens of City of San Clemente. The large-scale effort is termed the City of San Clemente Neighborhood Pride Program which includes increased code enforcement, neighborhood and other public facility improvements, rehabilitation of existing housing, and new affordable housing rental development. The Redevelopment Agency, General Fund, and HUD provide funding for City of San Clemente Neighborhood Pride Program.

The City participates in the Community Development Block Grant (CDBG) program. The primary resource available to address the downtown target area community development needs is CDBG. The City of San Clemente CDBG allocation for the year 2004 is $471,000. The projects include the installation of new sidewalks and removal of impediments to improve disabled access to the sidewalks, housing and commercial rehabilitation, and support of non-profit organizations operating homeless shelters.

There is an increased concentration of resources and capital in the City of San Clemente. The best indicator of this fact is the increasing per capita personal income in the region since the 1970's. Per capita income is an estimate of total personal income divided by the total population.

This estimate can be used to compare economic areas as a whole, but it does not reflect how the income is distributed among residents of the area being examined. The City's per capita personal income is also increasing relative to California’s and the United State's average per capita incomes, resulting in a more affluent community than the average population.

Subtle but very measurable changes occur constantly in communities that increase the potential loss that will occur in a major disaster. There are number of factors that contribute to this increasing loss potential. First, populations continue to increase, putting more people at risk within a defined geographic space. Second, inflation constantly increases the worth of real property and permanent improvements. Third, the amount of property owned per capita increases over time. Information from the U.S. Census Bureau shows gains in average housing standards.

Amount of Property per person	1975	1998
Increased Size of new homes	1645 sq. ft.	2190 sq. ft.
% of homes with 4 + bedrooms	21%	33%
% of homes with 2 ½ or more baths	20%	52%
Source: U.S. Department of Census		

If we look at the greatest recorded earthquakes in American history, and compare the level of population and development today with that which existed at the time of the event, the scale of potential damage is staggering.

1886 Charleston EQM7.3 in Charleston, SC
Estimated insured damage if happened today $10 Billion

1906 San Francisco EQ M8.3 Significant fire following damage
Estimated insured damage if happened today $36 Billion

1811-12 New Madrid EQ1811-12, series of 4 EQs over 7 weeks
Estimated insured damage if happened today $88 Billion

Source: Risk Management Solutions

J. Employment and Industry

Tourism, service industries, manufacturing, and general commercial are the City of San Clemente principal employment and industrial activities. The City business climate has been strong and growing with concentrations of metals fabrication, machinery, and computer hardware and software firms. The City of San Clemente provided over 15,566 jobs in 2003 according to State of California Employment Development Department.

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 natural hazard event, large and small businesses can develop strategies to prepare for natural hazards, respond efficiently, and prevent loss of life and property.

K. Transportation and Commuting Patterns

Private automobiles are the dominant means of transportation in Southern California and in the City of San Clemente.

However, the City of San Clemente meets its public transportation needs through a mixture of a regional transit system (Orange County Transportation Authority). OCTA provides bus service to the City of San Clemente and to the Orange County metropolitan area. In addition to this service, the City promotes alternative transportation activities.

A Planned Bikeway System has been planned to encourage safe bicycling and walking as a significant means of transportation in City of San Clemente. Its goals include the development of a coordinated system of safe and convenient bikeways and walkways, the stimulation of public awareness and the examination of current and future financing options and budget strategies for bicycle and pedestrian projects.

The City of San Clemente is served by Interstate 5 Freeway, connecting the City to adjoining parts of Orange County to the North and San Diego County to the South. The City's 138.24 mile road system includes 5.81 miles of freeway, 132.43 miles of local roads, and 13 bridges. The future roadway system in San Clemente is defined using a classification system which describes a hierarchy of facility types. The categories of roadways included in this classification system differentiate the size, function and capacity of the roadway links for each type of roadway. There are five basic categories in the hierarchy, ranging from "freeway" with the highest capacity to "local" streets with the lowest capacity and can be summarized as follows:

- Freeway - A six to ten lane divided arterial roadway with full access control, grade separations at all intersections and a typical right of way width in excess of 150 feet, designed and maintained by the Caltrans.

- Major – A six lane divided roadway with a typical right of way width of 120 feet and a curb to curb pavement width of approximately 100 feet.

- Primary – A four lane divided roadway with a typical right of way width of 100 feet and curb to curb pavement width of approximately 84 feet.

- Secondary – A four lane undivided roadway, with a typical right of way width of 80 feet and a curb to curb width of approximately 64

feet.

- Local Collector – A two lane undivided roadway with a typical right of way width of 60 feet and a pavement width of approximately 40 feet. This category is designed to provide access to individual parcels in the City.

In addition to the five basic categories, roadways can be designated as "augmented," "commercial," or "augmented/commercial." These qualifiers are related to the amount of actual capacity on the individual roadway.

As daily transit rises, there is an increased risk that a natural 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.

Natural hazards can disrupt automobile traffic and shut down local and regional transit systems.

Section 3 Risk Assessment

I. 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 natural hazard events. Specifically, the three levels of a risk assessment are as follows:

A. Hazard Identification

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 San Clemente identified six major hazards that affect this geographic area. These hazards - earthquakes, earth movements, flooding, tsunamis, wildfires and nuclear - were identified through an extensive process that utilized input from the Hazard Mitigation Advisory Committee. The Hazard Analysis Summary is in Table 3-1. The geographic extent of each of the identified hazards has been identified by the City's GIS staff using the best available data, and is illustrated by the charts/maps listed in Table 3-2.

Table 3-1

HAZARD ANALYSIS SUMMARY

Probabilities and Danger Factors

Disaster Threat (Listed Alphabetically)	Probability of Occurrence			Danger Factor			Disaster Rating (P X D)
	L3	P2	U1	H3	A2	L1	
Civil Disturbance			1		2		2
Drought		2				1	2
Earthquake (1)	3			3			9
Energy Shortage		2				1	2
Flood/Storm/Tsunami (2)	3				2		6
Hazardous Mat'l Release	3				2		6
Marine Oil Spill		2			2		4
Mass Casualty (3) Transp. Accident		2			2		4
National Security Threat (4)			1	3			3
Nuclear Power Plant Accident		2		3			6
Terrorism (5)			1		2		2
Wild-land Fire		2		3			6

(1) This threat can lead to all of the other threats.
(2) This threat tends to be more regional; includes evacuation threats due to dam failure, hurricane, tornado, and/or tsunami.
(3) Includes aircraft, rail, or multi-vehicle accident.
(4) Includes acts of war and nuclear attack.
(5) Includes workplace violence.

*Information as per EPR CPG 1-8A/October 1992 "A Guide for the Review of State and Local Emergency Operations Plans." This information extracted from City of San Clemente Multi Hazard Plan dated March 21, 2001.

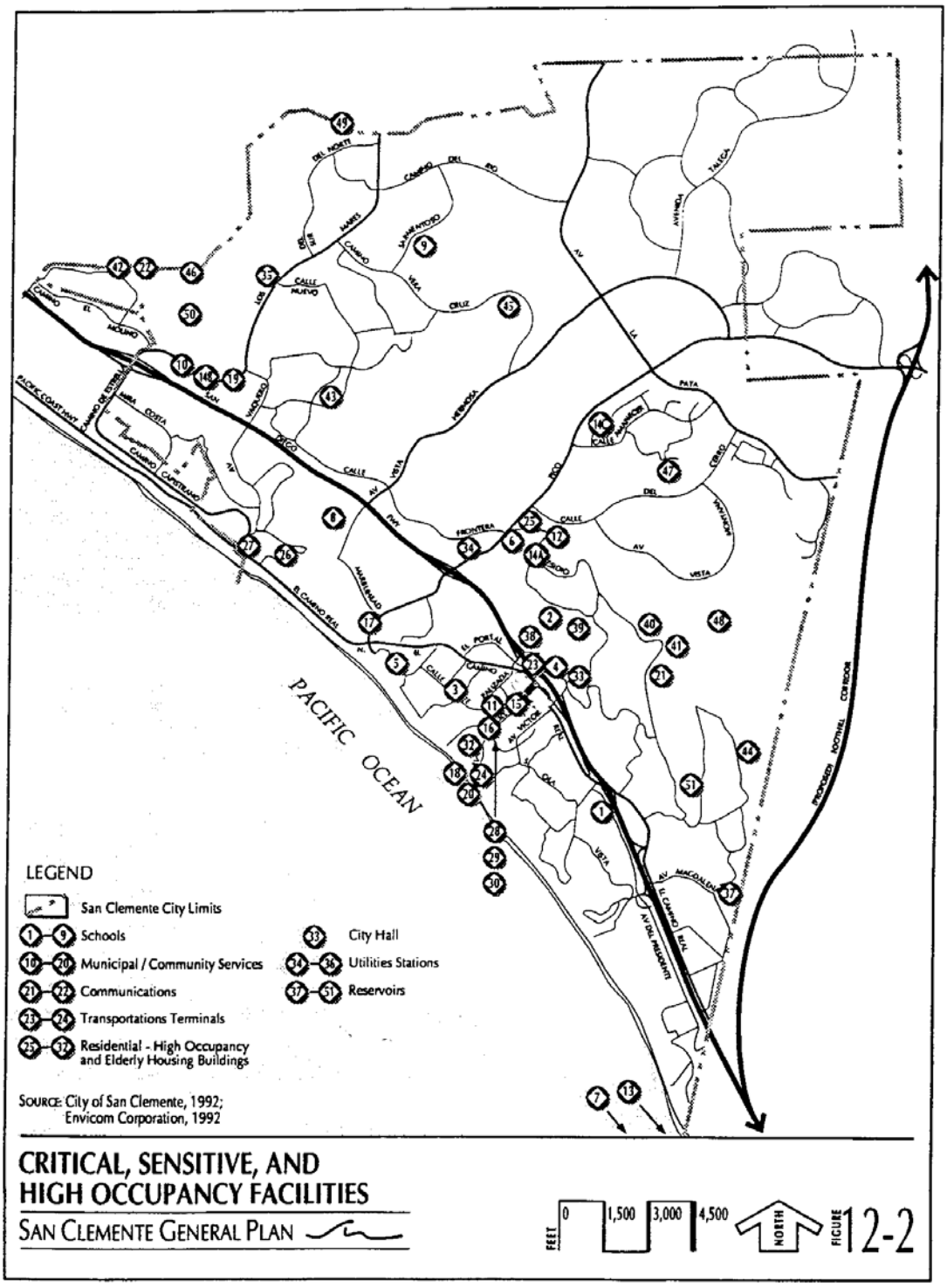
B. Profiling Hazard Events

This process describes the causes and characteristics of each hazard, how it has affected the City of San Clemente in the past, and what part of the City of San Clemente population, infrastructure, and environment has historically been vulnerable to each specific hazard. A profile of each hazard discussed in this plan is provided in each hazard section. For a full description of the history of hazard

specific events, please see the appropriate hazard chapter.

C. 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, mapped, and are illustrated in Figure 3-2. A description of the critical facilities in the City is also provided in this section. In addition, this plan includes a community issues summary in each hazard section to identify the most vulnerable and problematic areas in the City, including critical facilities, and other public and private property.


PACIFIC OCEAN
LEGEND
San Clemente City Limits
Schools
Municipal / Community Services
Communications
Transportations Terminals
Residential - High Occupancy and Elderly Housing Buildings
City Hall
Utilities Stations
Reservoirs
SOURCE: City of San Clemente, 1992; Envicom Corporation, 1992
CRITICAL, SENSITIVE, AND HIGH OCCUPANCY FACILITIES
SAN CLEMENTE GENERAL PLAN
FEET 0 1,500 3,000 4,500
NORTH
FIGURE 12-2

D. 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 are included in the hazard assessment.

E. Assessing Vulnerability/ Analyzing Development Trends

This step provides a general description of land uses and development trends within the community so that mitigation options can be considered in land use planning and future land use decisions. This plan provides a comprehensive description of the character of City of San Clemente 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 City of San Clemente 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.

Table 3-2. List of Hazard Mitigation Plan Maps

Map #	Type of Map	Section of the Plan
1-1	Base Map of City of San Clemente	Introduction
1-2	Liquefaction	Community Profile
1-3	Landslide	Earthquake
1-4	100/500 Year Flood	Flood
1-5	Dam Inundation	Earthquake
1-6	Sever Fire Area	Wildfire
1-7	San Onofre Data	Nuclear

Note: The information on the maps in this plan was derived from City of San Clemente GIS. Care was taken in the creation of these maps, but is provided "as is." The City of San Clemente 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 derived from this document before making any decisions.

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.

The vulnerability assessment for the earthquake hazard is addressed in part from FEMA HAZUS analysis model. Insufficient data exists to conduct vulnerability assessments and risk analyses for the other hazards addressed in the plan: earth movements, tsunamis, floods, wildfires, wind storms, and nuclear.

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 each hazard section of this Plan. 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. Action items throughout the hazard sections provide recommendations to collect further data to

map hazard locations and conduct hazard assessments.

F. Federal Requirements for Risk Assessment

Recent federal regulations for hazard mitigation plans outlined in 44 CFR Part 201 include a requirement for 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 six hazards profiled in the mitigation plan, including earthquakes, earth movements, flooding, tsunamis, wildfires and nuclear. The Federal criteria for risk assessment and information on how the City of San Clemente Natural Hazard Mitigation Plan meets those criteria is outlined in Table 3-3 below.

Table 3-3. 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 GIS data are available, the City developed maps identifying the location of the hazard in the City. 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 in the City in the Community Issues section. 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 and lifelines in the City and includes a map of these facilities. Vulnerability assessments 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 Profile Section of this plan provides a description of the development trends in the City, including the geography and environment, population and demographics, land use and development, housing and community development, employment and industry, and transportation and commuting systems.

G. Critical Facilities and Infrastructure

Facilities critical to government response and recovery activities (i.e., life safety and property and environmental protection) include: 911 centers, emergency operations centers, police and fire stations, public works facilities, communications centers, sewer and water facilities, hospitals, bridges and roads, which, if damaged, could cause serious secondary impacts.

Critical and essential facilities are those facilities that are vital to the continued delivery of key government services or that may significantly impact the public's ability to recover from the emergency. 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

H. Summary

Natural hazard mitigation strategies can reduce the impacts concentrated at large employment and industrial centers, public infrastructure, and critical facilities. Natural 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 natural hazards.

Section 4 Multi-Hazard Goals and Action Items

I. Multi-Hazard Goals and Action Items

This section provides information on the process used to develop goals and action items that pertain to the six natural hazards addressed in the mitigation plan. It also describes the framework that focuses the plan on developing successful mitigation strategies. The framework is made up of three parts: the Mission, Goals, and Action Items.

A. Mission

The mission of the City of San Clemente Natural Hazards Mitigation Plan is to promote sound public policy designed to protect citizens, critical facilities, infrastructure, private property, and the environment from natural 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 towards building a safer, more sustainable community.

B. Goals

The plan goals describe the overall direction that City of San Clemente agencies, organizations, and citizens can take to minimize the impacts of natural hazards. The goals are stepping-stones between the broad direction of the mission statement and the specific recommendations that are outlined in the action items.

C. Action Items

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 time line for implementation. Short-term action items are activities that City agencies 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.

D. Mitigation Plan Goals and Public Participation

The Plan goals help to guide direction of future activities aimed at reducing risk and preventing loss from natural hazards. The goals listed here serve as checkpoints as agencies and organizations begin implementing mitigation action items.

E. Protect Life and Property

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

Reduce losses and repetitive damages for chronic hazard events while promoting insurance coverage for catastrophic hazards.

Improve hazard assessment information to make recommendations for discouraging new development and encouraging preventative measures for existing development in areas vulnerable to natural hazards.

F. Public Awareness

Develop and implement education and outreach programs to increase public awareness of the risks associated with natural hazards.

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

G. Natural Systems

Balance watershed planning, natural resource management, and land use planning with natural hazard mitigation to protect life, property, and the environment.

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

H. Partnerships and Implementation

Strengthen communication and coordinate participation among and within public agencies, citizens, non-profit organizations, business, and industry to gain a vested interest in implementation.

Encourage leadership within public and private sector organizations to prioritize and implement local, county, and regional hazard mitigation activities.

I. 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 natural hazard mitigation activities, where appropriate, with emergency operations plans and procedures.

J. Public Participation

Public input during development of the mitigation plan assisted in creating plan goals. Meetings with the project steering committee, stakeholder interviews, and public workshops served as methods to obtain input and identify priorities in developing goals for reducing risk and preventing loss from natural hazards in the City of San Clemente

On July 27, 2004, the first public workshop was held to gather ideas from City of San Clemente residents regarding the goals for the City of San Clemente Natural Hazards Mitigation Plan. The attendees identified goals for the plan by examining the issues and concerns that they have had regarding natural hazards, and further discussed potential action items for the Plan.

The second public workshop was held September 2, 2004 to review mitigation plan action items and provide the participants with a chance to comment on the final plan recommendations. There were two members of the community at this workshop.

K. Natural Hazard Mitigation Plan Action Items

The mitigation plan identifies short and long-term action items developed through data collection and research, and the public participation process. Mitigation plan activities may be considered for funding through Federal and State grant programs, and when other funds are made available through the city. Action items address multi-hazard (MH) and hazard specific issues. To help ensure activity implementation, each action item includes information on the time line and coordinating organizations. Upon implementation, the coordinating organizations may look to partner organizations for resources and technical assistance. A description of the partner organizations is provided in Appendix A,

the resource directory of this plan.

L. Coordinating Organization

The coordinating organization is the organization that is willing and able to organize resources, find appropriate funding, or oversee activity implementation, monitoring, and evaluation. Coordinating organizations may include local, city, and/or regional agencies that are capable of or responsible for implementing activities and programs.

M. Timeline

Action items include both short and long-term activities. Each action item includes an estimate of the time line for implementation. Short-term action items are activities that city agencies 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.

N. Ideas for Implementation

Each action item includes ideas for implementation and potential resources, which may include grant programs or human resources.

O. 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.

P. Constraints

Constraints may apply to some of the action items. These constraints may be a lack of city staff, lack of funds, or vested property rights which might expose the City to legal action as a result of adverse impacts on private property.

Q. Project Evaluation Worksheets:

Each jurisdiction will have some limitations on the number and cost of mitigation activities that can be completed within a given period of time. There are likely to be multiple ideas to mitigate the effects of a given hazard. Therefore it will be

necessary for the committee to select the most cost effective mitigation projects and to further prioritize them. To assist the committee in the Benefit Cost Analysis (BCA) a Project Evaluation Worksheet is included as Appendix F. The data on these worksheets will help the committee determine the most cost effective mitigation solutions for the community. Some projects may need more detailed BCA, but this worksheet will provide a first screening methodology.

R. Multi-Hazard Action Items

Multi-hazard action items are those activities that pertain to two or more of the six hazards in the mitigation plan: earthquake, landslide, flood, tsunami, wildfire, and nuclear. There are six short-term and three long-term multi-hazard action items described below.

Natural Hazard	**SHORT TERM ACTIVITY - MULTI HAZARD #1**
Action Item	Integrate the goals and action items from the City of San Clemente Natural Hazard Mitigation Plan into existing regulatory documents and programs, where appropriate.
Coordinating Organization	Hazard Mitigation Advisory Committee
Ideas for Implementation	Use the mitigation plan to help the City's General Plan institutionalize guidelines for sustainable development in all new construction and development projects according to the hazards that impact the City of San Clemente Integrate the city's mitigation plan into current capital improvement plans to ensure that development does not encroach on known hazard areas: and Partner with other organizations and agencies with similar goals to promote Building & Safety Codes that are more disaster resistant at the state level.
Time line	Ongoing
Constraints	As personnel hours and time permit

Plan Goals Addressed			**Protect Life and Property**
	Public Awareness		**Natural Systems**
X	**Partnerships and Implementation**		**Emergency Services**

Natural Hazard	**SHORT TERM ACTIVITY - MULTI HAZARD #2**
Action Item	Identify and pursue funding opportunities to develop and implement local and City mitigation activities.
Coordinating Organization	City Planning Department and Public Works Department
Ideas for Implementation	Develop incentives for local governments, citizens, and businesses to pursue hazard mitigation projects: Allocate City resources and assistance to mitigation projects when possible: and partner with other organizations and agencies in San Clemente to identify grant programs and foundations that may support mitigation activities.
Time line	Ongoing
Constraints	As personnel hours and time permit

Plan Goals Addressed			**Protect Life and Property**
	Public Awareness		**Natural Systems**
X	**Partnerships and Implementation**		**Emergency Services**

Natural Hazard	**SHORT TERM ACTIVITY - MULTI HAZARD #3**
Action Item	Establish a formal role for the City of San Clemente Natural Hazards Mitigation Committee to develop a sustainable process for implementing, monitoring, and evaluating citywide mitigation activities
Coordinating Organization	Hazard Mitigation Advisory Committee
Ideas for Implementation	Use the mitigation plan to help the city's General Plan institutionalize guidelines for sustainable development in all new construction and development projects according to the hazards that impact the City of San Clemente Integrate the city's mitigation plan into current capital improvement plans to ensure that development does not encroach on known hazard areas: and Partner with other organizations and agencies with similar goals to promote Building & Safety Codes that are more disaster resistant at the state level.
Time line	Ongoing

Constraints	As personnel hours and time permit		
Plan Goals Addressed			**Protect Life and Property**
	Public Awareness		**Natural Systems**
X	**Partnerships and Implementation**		**Emergency Services**

Natural Hazard	**SHORT TERM ACTIVITY - MULTI HAZARD #4**
Action Item	Develop public and private partnerships to foster natural hazard mitigation program coordination and collaboration in City of San Clemente.
Coordinating Organizations	City Planning Division and Public Works Department
Ideas for Implementation	Distribute information about flood, fire, earthquake, and other forms of natural hazards insurance to property owners in areas identified to be at risk through hazard mapping. Develop a one-page handout on types of insurance and deliver through city utility or service agencies. Educate individuals and businesses on the benefit of engaging in mitigation activities such as developing impact analyses. Pinpoint areas of high risk and transfer the cost of risk to property owners through insurance (rather than to the public). Encourage the development of unifying organizations to ensure communication and dissemination of natural hazard mitigation information.
Time line	Ongoing
Constraints	As personnel hours and time permit

Plan Goals Addressed		**X**	**Protect Life and Property**
	Public Awareness		**Natural Systems**
X	**Partnerships and Implementation**		**Emergency Services**

Natural Hazard	**SHORT TERM ACTIVITY - MULTI HAZARD #5**
Action Item	Identify, improve, and sustain collaborative programs focusing on the real estate and insurance industries, public and private sector organizations, and individuals to avoid activity that increases risk to natural hazards
Coordinating Organization	City Planning Division and Public Works Department
Ideas for Implementation	Work with city governments to develop local Natural Hazards Mitigation Plans that are consistent with the goals and framework of the city plan. Identify all organizations within City of San Clemente that have programs or interests in natural hazards mitigation. Involve private businesses throughout the city in mitigation planning. Improve communication between Cal Trans and city road departments, and work together to prioritize and identify strategies to deal with road problems. Establish protocol for communication, electric providers and the Department of Transportation and Development to assure rapid restoration of transportation capabilities.
Time line	Ongoing
Constraints	As personnel hours and time permit

Plan Goals Addressed			**Protect Life and Property**
	Public Awareness		**Natural Systems**
X	**Partnerships and Implementation**		**Emergency Services**

Natural Hazard	**SHORT TERM ACTIVITY - MULTI HAZARD #6**		
Action Item	Develop inventories of at-risk buildings and infrastructure and prioritize mitigation projects.		
Coordinating Organizations	City Planning Division and Public Works Department		
Ideas for Implementation	Work with City agencies to develop local Natural Hazards Mitigation Plans that are consistent with the goals and framework of the city plan. Identify all organizations within City of San Clemente that have programs or interests in natural hazards mitigation. Involve private businesses throughout the City in mitigation planning. Improve communication between Caltrans and City Public Works Department, and work together to prioritize and identify strategies to deal with road problems.		
Time line	1-2 Years		
Constraints	As personnel hours and time permit		
Plan Goals Addressed		**X**	**Protect Life and Property**
	Public Awareness		**Natural Systems**
X	**Partnerships and Implementation**		**Emergency Services**

Natural Hazard	**LONG TERM ACTIVITY - MULTI HAZARD #1**
Action Item	Strengthen emergency services preparedness and response by linking emergency services with natural hazard mitigation programs, and enhancing public education on a regional scale.
Coordinating Organization	City Emergency Planning Department
Ideas for Implementation	Educate private property owners on limitations of bridges and dangers associated with them. Develop a process to encourage private property owners to upgrade their bridges to support weight of fire trucks and emergency vehicles. Encourage individual and family preparedness through public education projects such as safety fairs. Coordinate the maintenance of emergency transportation routes though communication among the City Roads Department, neighboring jurisdictions, and the California Department of Transportation. Identify opportunities for partnering with citizens, private contractors, and other jurisdictions to increase availability of equipment and manpower for efficiency of response efforts. Work with Community Planning Organizations (CPO's) and other neighborhood groups to establish community response teams. Familiarize public officials of requirements regarding public assistance for disaster response.
Time line	Ongoing
Constraints	As personnel hours and time permit

Plan Goals Addressed		**X**	**Protect Life and Property**
	Public Awareness		**Natural Systems**
	Partnerships and Implementation	**X**	**Emergency Services**

Natural Hazard	**LONG TERM ACTIVITY - MULTI HAZARD #2**		
Action Item	Develop, enhance, and implement education programs aimed at mitigating natural hazards, and reducing the risk to citizens, public agencies, private property owners, businesses, and schools.		
Coordinating Organizations	City Planning Division and Emergency Planning Services		
Ideas for Implementation	Make the City of San Clemente Natural Hazards Mitigation Plan available to the public by publishing the plan electronically on the City and emergency management websites. Develop and complete a baseline survey to gather perceptions of private citizens and the business community regarding natural hazard risks and identify mitigation needs. Repeat the survey in five years to monitor successes and failures of natural hazard mitigation programs. Develop outreach programs to business organizations that must prepare for emergency events. Develop adult and child educational programs to be used by local radio and cable stations. Use local radio and cable stations as a conduit for advertising public forums. Education: Develop curriculum for school programs and adult education on reducing risk and preventing loss from natural hazards. Conduct natural hazards awareness programs in schools and community centers. Conduct workshops for public and private sector organizations to raise awareness of mitigation activities and programs. Develop outreach materials for mitigation, preparedness, response and recovery.		
Time line	Ongoing		
Constraints	As personnel hours and time permit		
Plan Goals Addressed		**X**	**Protect Life and Property**

X	**Public Awareness**		**Natural Systems**
	Partnerships and Implementation		**Emergency Services**

Natural Hazard	**LONG TERM ACTIVITY - MULTI HAZARD #3**
Action Item	Use technical knowledge of natural ecosystems and events to link natural resource management and land use organizations to mitigation activities and technical assistance.
Coordinating Organizations	City Planning Division and Public Works Department
Ideas for Implementation	Review ordinances that protect natural systems and resources to mitigate for natural hazards for possible enhancements. Develop education and outreach programs that focus on protecting natural systems as a mitigation activity.
Time line	Ongoing
Constraints	As personnel hours and time permit

Plan Goals Addressed			**Protect Life and Property**
	Public Awareness	**X**	**Natural Systems**
	Partnerships and Implementation		**Emergency Services**

Section 5 Plan Maintenance

I. Plan Maintenance

The plan maintenance section of this document details the formal process that will ensure that the City of San Clemente Natural Hazards 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 San Clemente government intends to incorporate the mitigation strategies outlined in this Plan into existing planning mechanisms such as the General Plan, Capital Improvement Plans, and Building and Safety Codes.

II. Monitoring and Implementing the Plan

A. Plan Adoption

The City Council will be responsible for adopting the City of San Clemente Natural Hazards Mitigation Plan. This governing body has the authority to establish public policy regarding natural hazards. Once the plan has been adopted, the Director of Public Works 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. This review will address the federal criteria outlined in FEMA Interim Final Rule 44 CFR Part 201. Upon acceptance by FEMA, the City of San Clemente will gain eligibility for Hazard Mitigation Grant Program funds.

B. Coordinating Body

The City of San Clemente Hazard Mitigation Committee will be responsible for coordinating implementation of plan action items and undertaking the formal review process. The City Council (or other authority) will assign representatives from City agencies, including, but not limited to, the current Hazard Mitigation Advisory Committee members. The city has formed a Hazard Mitigation Committee that consists of members from local agencies, organizations, and citizens, and includes the following:

City of San Clemente Emergency Planning Services
City of San Clemente Finance Department
Orange County Fire Authority
City of San Clemente GIS, Information Services Division

City of San Clemente Planning Division
City of San Clemente Public Information Officer City Manger's Office
City of San Clemente Maintenance Division
City of San Clemente Building and Safety Division
City of San Clemente Utilities Division

In order to make this committee as broad and useful as possible, the City Manager will engage other relevant organizations and agencies in hazard mitigation. The recommendations for adding to the Hazard Mitigation Advisory Committee include:

An elected official
A representative from the Chamber of Commerce
An insurance company representative
Community Planning Organization representatives
A representative from the city Manager/Administrator's office
Representation from professional organizations such as the Home Builders Association

The Hazard Mitigation Advisory Committee will meet no less than quarterly. Meeting dates will be scheduled once the final 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.

C. Convener

The City Council will adopt the City of San Clemente Natural Hazard Mitigation Plan, and the Hazard Mitigation Advisory Committee will take responsibility for plan implementation. The Director Public Works will serve as a convener to facilitate the 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 Natural Hazard Advisory Committee Members.

D. Implementation through Existing Programs

The City addresses statewide planning goals and legislative requirements through its General Plan, Capital Improvement Plans, and Building and Safety Codes. Building and Safety Codes are part of the "San Clemente Municipal Code," as compiled, re-codified, edited and published by Book Publishing Company,

Seattle, Washington. (Ord. 1213 § 1, 1998) Within the Code are specific Ordinances relating to preparedness, response and recovery, they are:

- Title 8 Health and Safety, Chapter 8.12 Emergency Services
- Title 8 Health and Safety, Chapter 8.22 Very High Fire Hazard Severity Zones
- Title 13 Public Services, Chapter 13.24 Sewer Service System
- Title 13 Public Services, Chapter 13.28 Water Discharge Pretreatment and Source Control Program
- Title 13 Public Services, Chapter 13.40 Storm water Runoff
- Title 15 Buildings and Construction, Chapter 15.08 Building Code
- Title 15 Buildings and Construction, Chapter 15.36 Excavations and Grading
- Title 15 Buildings and Construction, Chapter 15.40 Hillside Development
- Title 15 Buildings and Construction, Chapter 15.48 Standards for Fire and Emergency Medical Services Response to New Developments
- Title 15 Buildings and Construction, Chapter 15.76 Flood Damage Prevention
- Title 17 Zoning, Chapter 17.24 General Development Standards
- Title 17 Zoning, Chapter 17.44 Open Space Zones and Standards
- Title 17 Zoning, Chapter 17.68 Landscape Standards

The Natural Hazard Mitigation Plan provides a series of recommendations many of which are closely related to the goals and objectives of existing planning programs. The City will have the opportunity to implement recommended mitigation action items through existing programs and procedures.

The Building and Safety Division is responsible for administering the Building Codes. In addition, the Hazard Advisory Committee will work with other agencies at the state level to review, develop and ensure Building Codes are adequate to mitigate or prevent damage by natural hazards. This is to ensure that life-safety criteria are met for new construction.

The goals and action items in the mitigation plan may be achieved through activities recommended in the city's Capital Improvement Plans (CIP). The Public Works Department develops CIP plans, and reviews them on an annual basis. Upon annual review of the CIP, the Hazard Mitigation Advisory Committee will work with the Public Works Department to identify that hazard mitigation plan action items are consistent with CIP planning 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 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.

E. Economic Analysis of Mitigation Projects

FEMA approaches to identifying the costs and benefits associated with natural 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 natural 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 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 of the Plan.

III. Evaluating and Updating the Plan

A. Formal Review Process

The City of San Clemente Natural Hazards Mitigation Plan will be evaluated on a biennial 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 time line, and identifies the local agencies and organizations participating in plan evaluation. The convener or designee will be responsible for contacting the Hazard Mitigation Advisory Committee members and organizing the biennial meeting.

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 Hazard Committee members, and presenting it to the City Council (or other authority). The 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.

B. Continued Public Involvement

The City of San Clemente is dedicated to involving the public directly in review and updates of the Hazard Mitigation Plan. The Hazard Mitigation Committee members are responsible for the biennial review and update of the plan.

The public will also have the opportunity to provide feedback about the Plan. Copies of the Plan will be catalogued and kept at the City Clerks Office and the City Library. The existence and location of these copies will be publicized in the quarterly City of San Clemente Magazine newsletter, which reaches every household in the city. The address and the phone number of the City Emergency Planning Services, who is responsible for keeping track of public comments on the Plan is: City of San Clemente Emergency Planning Services, 910 Calle Negocio, Suite 100, San Clemente, CA, 92673, Telephone number 949-361-6109.

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 biennial evaluation or when deemed necessary by the 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 Public Information Officer will be responsible for using city resources to publicize the annual public meetings and maintain public involvement through the public access channel, web page, and newspapers.

PART II SPECIFIC NATURAL HAZARDS

Section 6 Earthquakes

I. Why Are Earthquakes a Threat to the City of San Clemente

The most recent significant earthquake event affecting Southern California was the January 17, 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. The direct and indirect economic losses ran into the 10's of billions of dollars.

II. Historic Southern California Earthquakes

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."[a]

But San Andreas is only one of dozens of known earthquake faults that criss-cross Southern California. Some of the better known faults include the Newport-Inglewood, Whittier, Chatsworth, Elsinore, Hollywood, Los Alamitos, 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 Whittier Narrows earthquake in October 1987.

Although the most famous of the faults, the San Andreas, is capable of producing an earthquake with a magnitude of 8+ on the Richter scale, some of the "lesser" faults have the potential to inflict greater damage on the urban core of the Los Angeles Basin. Seismologists believe that a 6.0 earthquake on the Newport-Inglewood would result in far more death and destruction than a "great" quake on the San Andreas, because the San Andreas is relatively remote from the urban centers of Southern California.

For decades, partnerships have flourished between the United States Geological Society (USGS), Cal Tech, the California Geological Survey and universities to share research and educational efforts with Californians. 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 6-1: Table of Earthquake Events In the Southern California Region

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 Earthquake	1952	Kern County
1858	San Bernardino Region	1954	W. of Wheeler Ridge
1862	San Diego Region	1971	San Fernando
1892	San Jacinto or Elsinore Fault	1973	Point Mugu
1893	Pico Canyon	1986	North Palm Springs
1894	Lytle Creek Region	1987	Whittier Narrows
1894	E. of San Diego	1992	Landers
1899	Lytle Creek Region	1992	Big Bear
1899	San Jacinto and Hemet	1994	Northridge
1907	San Bernardino Region	1999	Hector Mine
1910	Glen Ivy Hot Springs		

Source:
http://geology.about.com/gi/dynamic/offsite.htm?site=http%3A%2F%2Fpasadena.wr.usgs.gov%2Finfo%2Fcahist_egs.html

To better understand earthquake hazards, 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 field 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 (7.9) and the Owens Valley in 1872 (7.6) are evidence of the

tremendously damaging potential of earthquakes in Southern California. In more recent times two 7.3 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.

Since seismologists started recording and measuring earthquakes, there have been tens of thousands of recorded earthquakes in Southern California, most with a magnitude below 3.0. No community in Southern California is beyond the reach of a damaging earthquake. Table 6-1 describes the historical earthquake events that have affected Southern California.

Although a great deal is known about where earthquakes are likely to occur, there is currently no reliable way to predict the days or months when an event will occur in any specific location.. The USGS is thus focusing its research efforts on developing long-range earthquake probability forecasts in seismically active urban areas. The only on-going USGS research in earthquake prediction is the Parkfield Prediction Experiment.

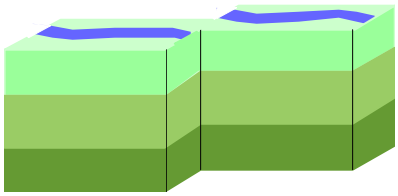
III. Causes and Characteristics of Earthquakes in Southern California

A. Earthquake Faults

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

B. Strike-slip

Figure 6-1

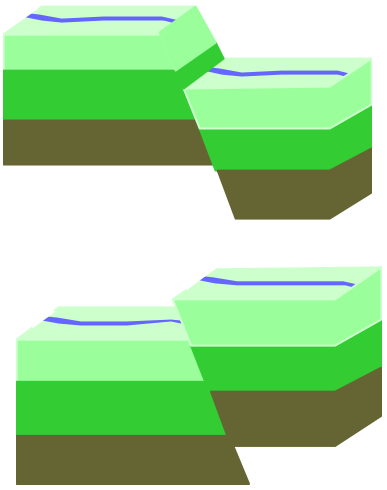


Strike-slip faults are vertical or almost vertical rifts where the earth's plates move mostly horizontally. From the observers perspective, if the opposite block looking across the fault moves to the right, the slip style is called a right lateral fault; if the block moves left, the shift is called a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

C. Dip-slip

Figure 6-2

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



Southern California Earthquake Fault Map

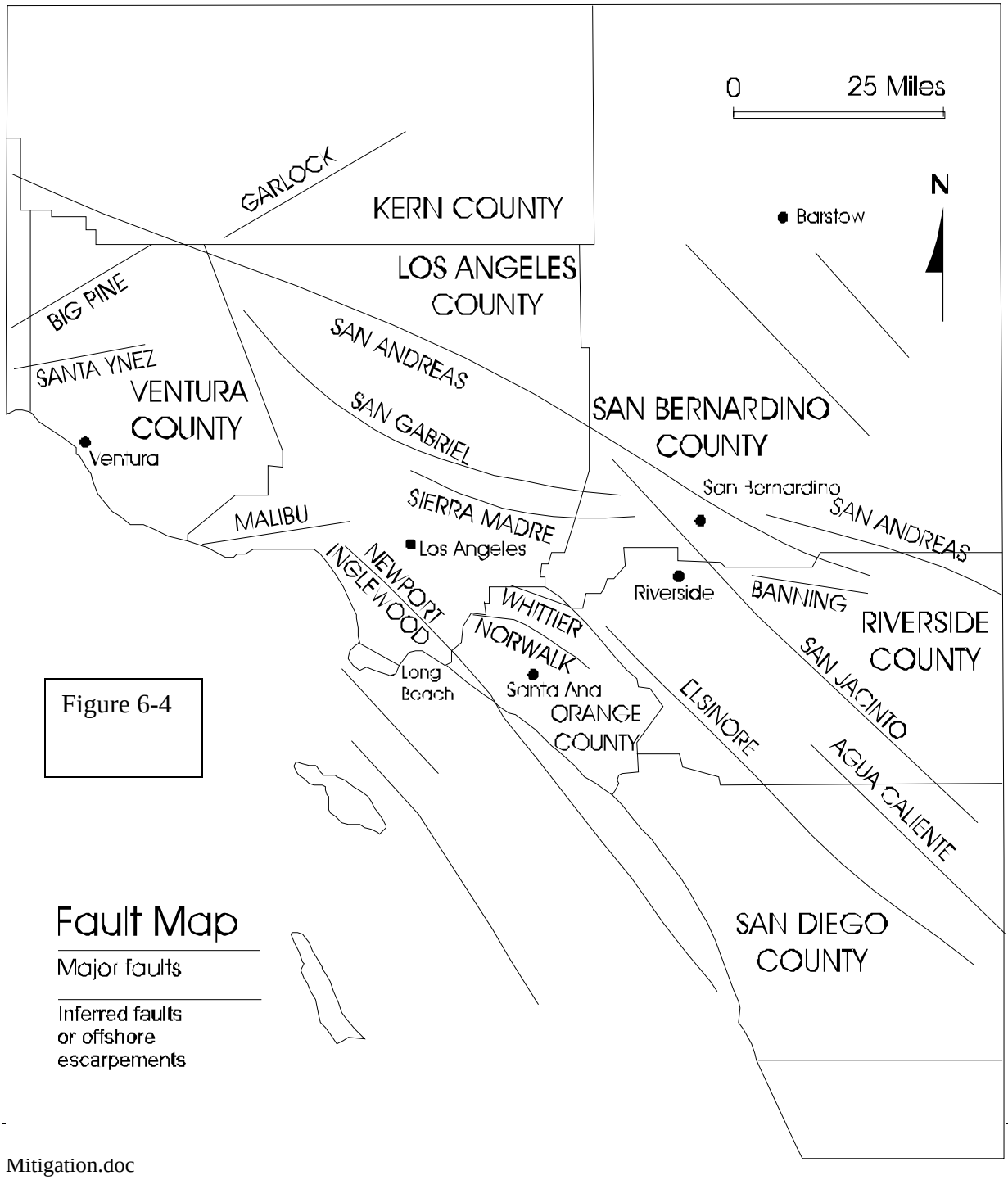


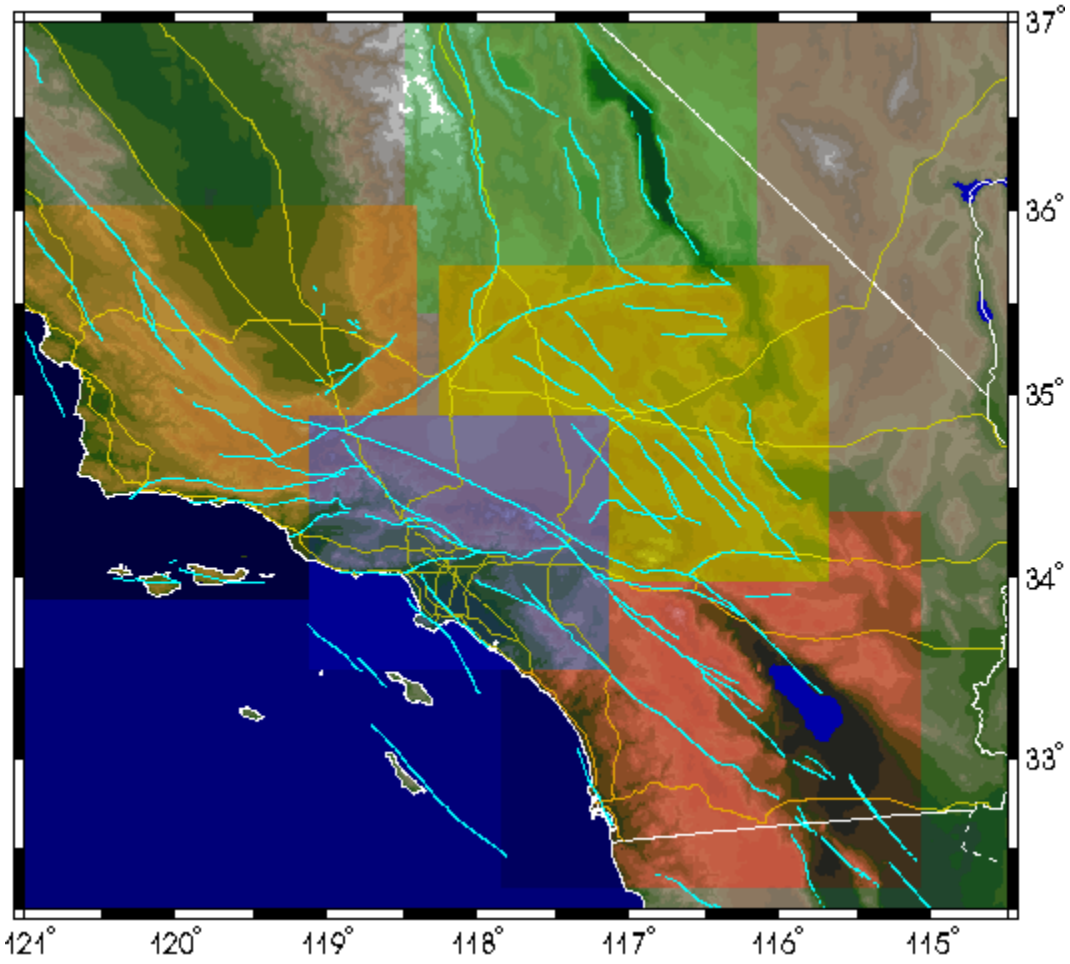
Figure 6-4

faults of Southern California

Figure 6-5

Below is a map of southern California, with five regions highlighted:

1. Southern Coast Ranges and Central Valley area is orange.
2. Sierra Nevada and Basin and Range area is green.
3. Mojave region is yellow.
4. Extreme southern end of California is red.
5. Los Angeles area is blue-violet.



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

IV. 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.

A. 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.

B. 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.

C. 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.

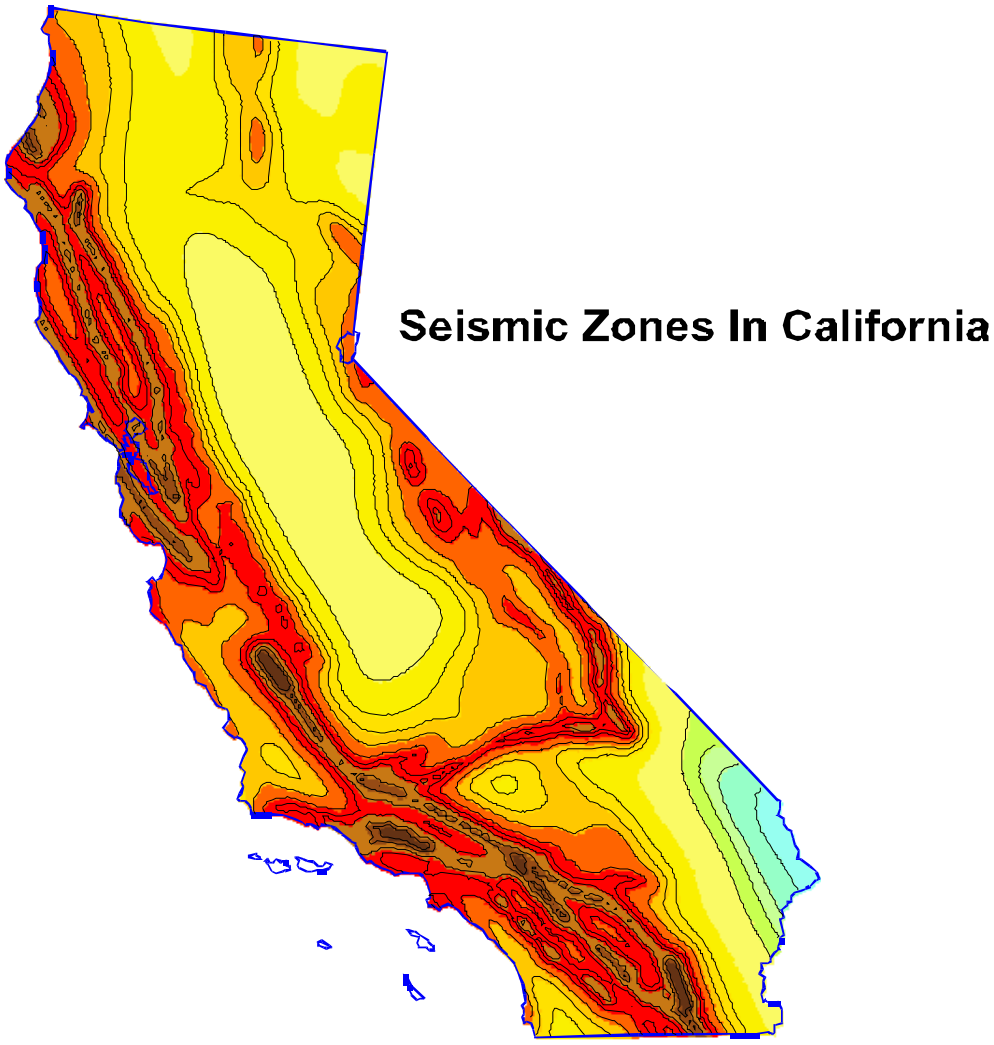
D. Amplification

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.[c] Amplification can also occur in areas with deep sediment filled basins and on ridge tops.

E. Tsunami

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.

Figure 6-6: Seismic Zones in California



Darker Shaded Areas indicate Greater Potential Shaking

Source: USGS Website

V. Earthquake Hazard Assessment

A. Hazard Identification

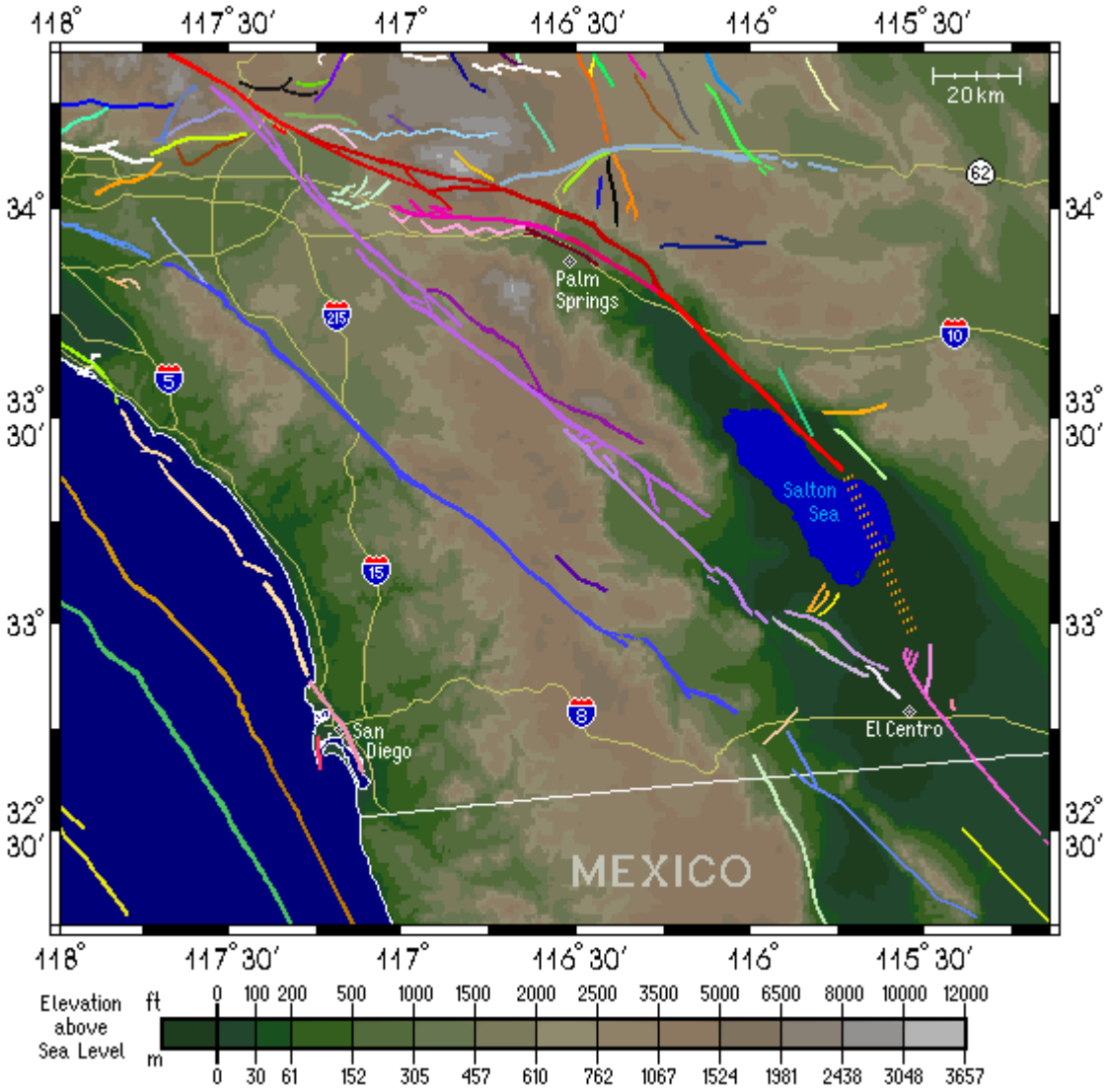
In California, many agencies are focused on seismic safety issues: the State's Seismic Safety Commission, the Applied Technology Council, Governor's Office of Emergency Services, United States Geological Survey, Cal Tech, the California Geological Survey as well as a number of universities and private 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. Figure 6-7 illustrates the known earthquake faults in Southern California.

Figure 6-7

Southern Region

The area covered by this map, which extends from the Transverse Ranges (the San Gabriel and San Bernadino Mountains) in the north to Baja California, Mexico, in the south is dominated primarily by northwest-trending faults, generally of a right-lateral strike-slip nature, though faults of every type and orientation can be found here. In this area is the Salton Trough, a great inland basin, much of which is below sea level, that harbors the Salton Sea, a dominant feature of the right-hand side of this map. Several offshore fault zones are shown as well.



The primary fault zone capable of generating earthquakes which could affect the City of San Clemente, is the Newport-Inglewood Fault Zone. This fault trends southeast form the Malibou Fault in western Los Angeles County, along the northern section of the Orange County coastline, heading offshore at approximately Newport Beach. This fault was the source of the destructive 1933 Long Beach Earthquake which measured 6.3 on the Richter Scale and caused numerous deaths and extensive property damage. This fault is believed to be capable of generating a maximum credible earthquake of magnitude 7.5, and poses a significant threat for a moderate to heavy damaging earthquake in the future.

Newport-Inglewood Fault
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, M6.4 (but no surface rupture)
Interval Between Major Ruptures: unknown
Probable Magnitudes: M6.0 - 7.4
See Figure 6-4
This represents a worst-case earthquake that could affect the urban areas of Orange County and Central - South Eastern Los Angeles County.

In California, each earthquake is followed by revisions and improvements in the Building Codes.

The 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 and 1994 Northridge earthquakes. 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.[d]

The Seismic Hazards Mapping Act, passed in 1990, addresses non-surface fault rupture earthquake hazards, including liquefaction and seismically induced landslides.[e] 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

B. Vulnerability Assessment

The effects of earthquakes span a large area, and large earthquakes occurring in many parts of the Southern California 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.

See Map 1-2 MAP2for liquefaction potential areas

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.

Southern California has many active landslide areas, and a large earthquake could trigger accelerated movement in these slide areas, in addition to jarring loose other unknown areas of landslide risk.

See Map 1-3 MAP3for potential landslide areas

C. 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[f] . 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.[g] The HAZUS software has been incorporated into the City of San Clemente mitigation, response and recovery planning.

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 epicenter of the earthquake, seismic waves may be transmitted through the ground to unsuspecting communities. In the Northridge 1994 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 unreinforced 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 San Clemente has two unreinforced masonry buildings.

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.

D. Community Earthquake Issues

a. 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 city.

b. Dams

There is one dam in the City of San Clemente, managed by South Coast Water District.[h] This is an earthen dam for storage of potable water. This dam holds 45-48 million of gallons of water. Seismic activity can compromise the dam structure, and the resultant flooding could cause catastrophic flooding. Engineers state the dam is capable of withstanding a 7.1 on the Richter Scale earthquake. See Map 1-5MAP5 Dam Inundation.

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 Van Norman dam has never been refilled.

c. 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 San Clemente, many buildings were built before 1933 when building codes were not as strict. In addition, retrofitting is not required except under certain conditions and can be expensive. Therefore, the number of buildings at risk remains high. The California Seismic Safety Commission makes annual reports on the progress of the retrofitting of unreinforced masonry buildings.

d. Infrastructure and Communication

Residents in the City of San Clemente 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,

e. Bridge Damage

Even modern bridges can sustain damage during earthquakes, leaving them unsafe for use. Some bridges have failed completely due to strong ground motion. Bridges are a vital transportation link - with even minor damages making some areas inaccessible. Because bridges vary in size, materials, location and design, any given earthquake will affect them differently. Bridges built before the mid-1970' s have a significantly higher risk of suffering structural damage during a moderate to large earthquake compared with those built after 1980 when design improvements were made.

Much of the interstate highway system was built in the mid to late 1960's. The bridges in the City of San Clemente are state, county or privately owned (including railroad bridges). Caltrans has retrofitted most bridges on the freeway system; however there are still some county maintained bridges that are not retrofitted. The FHWA requires that bridges on the National Bridge Inventory be inspected every 2 years. Caltrans checks when the bridges are inspected because they administer the Federal funds for bridge projects.

f. Damage to Lifelines

Lifelines are the connections between communities and outside services. They include water and gas lines, transportation systems, and 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.

g. Disruption of Critical Services

Critical facilities include police stations, fire stations, hospitals, shelters, and other facilities that provide important services to the community. These facilities and their services need to be functional after an earthquake event. Many critical facilities are housed in older buildings that are not up to current seismic codes.

h. 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.

Forty three percent of businesses do not reopen after a disaster and another twenty-nine percent fail within one year according to the 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.[i]

i. Individual Preparedness

Because the potential for earthquake occurrences and earthquake related property damage is relatively high in the City of San Clemente, 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.

j. 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,

k. Fire

Downed power lines or broken gas mains can 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.

l. Debris

After damage to a variety of structures, much time is spent cleaning up brick, 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. Occurrence of a disaster does not exempt the City of San Clemente from compliance with AB 939 (California Waste Management Act of 1989) regulations.

E. Existing Mitigation Activities

Existing mitigation activities include current mitigation programs and activities that are being implemented by county, regional, state, or federal agencies or organizations.

a. City of San Clemente Codes:

Implementation of earthquake mitigation policy most often takes place at the local government level. The City of San Clemente Building and Safety Division enforces building codes pertaining to earthquake hazards. The City of San Clemente adopts the State of California Building Codes, latest edition is 2001 with amendments that pertain only to the city. The state codes are based on the model Uniform Building Codes published by the International Conference of Building Officials, latest edition being 1997.

2001 California Building Code – Chapter 16 – Division IV addresses the earthquake hazard:

The City's Community Development Department evaluates, implements, and enforces the zoning and land use regulations relating to earthquake hazards.

Developers in hazard-prone areas may be required to retain a qualified professional engineer to evaluate level of risk on the site and recommend appropriate mitigation measures.

b. Coordination of Building Officials.

The City's Building Code sets the minimum design and construction standards for new buildings. In 2002 the City adopted the most recent

seismic standards in its building code, which requires that new buildings be built at a higher seismic standard.

Adopted Building Codes require that site-specific seismic hazard investigations be performed for new essential facilities, major structures, hazardous facilities, and special occupancy structures such as schools, hospitals, and emergency response facilities.

F. Businesses/Private Sector

Natural hazards have a devastating impact on businesses. In fact, of all businesses which close following a disaster, more than forty-three percent never reopen, and an additional twenty-nine percent close for good within the next two years.[j] The Institute of Business and Home Safety has developed "Open for Business", which is a disaster planning toolkit to help guide businesses in preparing for and dealing with the adverse affects natural hazards. The kit integrates protection from natural disasters into the company's risk reduction measures to safeguard employees, customers, and the investment itself. The guide helps businesses secure human and physical resources during disasters, and helps to develop strategies to maintain business continuity before, during, and after a disaster occurs.

a. Hospitals

"The Alfred E. Alquist Hospital Seismic Safety Act ("Hospital Act") was enacted in 1973 in response to the moderate Magnitude 6.6 Sylmar Earthquake in 1971 when four major hospital campuses were severely damaged and evacuated. Two hospital buildings collapsed killing forty seven people. Three others were killed in another hospital that nearly collapsed.

In approving the Act, the Legislature noted that:

Hospitals that house patients who have less than the capacity of normally healthy persons to protect themselves, and that must be reasonably capable of providing services to the public after a disaster, shall be designed and constructed to resist, insofar as practical, the forces generated by earthquakes, gravity and winds. (Health and Safety Code Section 129680)

When the Hospital Act was passed in 1973, the State anticipated that, based on the regular and timely replacement of aging hospital facilities, the majority of hospital buildings would be in compliance with the Act's

standards within 25 years. However, hospital buildings were not, and are not, being replaced at that anticipated rate. In fact, the great majority of the State's urgent care facilities are now more than 40 years old.

The moderate Magnitude 6.7 Northridge Earthquake in 1994 caused $3 billion in hospital-related damage and evacuations. Twelve hospital buildings constructed before the Act were cited (red tagged) as unsafe for occupancy after the earthquake. Those hospitals that had been built in accordance with the 1973 Hospital Act were very successful in resisting structural damage. However, nonstructural damage (for example, plumbing and ceiling systems) was still extensive in those post-1973 buildings

Senate Bill 1953 ("SB 1953"), enacted in 1994 after the Northridge Earthquake, expanded the scope of the 1973 Hospital Act. Under SB 1953, all hospitals are required, as of January 1, 2008, to survive earthquakes without collapsing or posing the threat of significant loss of life. The 1994 Act further mandates that all existing hospitals be seismically evaluated, and retrofitted, if needed, by 2030, so that they are in substantial compliance with the Act (which requires that the hospital buildings be reasonably capable of providing services to the public after disasters). SB 1953 applies to all urgent care facilities (including those built prior to the 1973 Hospital Act) and affects approximately 2,500 buildings on 475 campuses.

SB 1953 directed the Office of Statewide Health Planning and Development ("OSHPD"), in consultation with the Hospital Building Safety Board, to develop emergency regulations including "…earthquake performance categories with subgradations for risk to life, structural soundness, building contents, and nonstructural systems that are critical to providing basic services to hospital inpatients and the public after a disaster." (Health and Safety Code Section 130005)

In 2001, recognizing the continuing need to assess the adequacy of policies, and the application of advances in technical knowledge and understanding, the California Seismic Safety Commission created an Ad Hoc Committee to re-examine the compliance with the Alquist Hospital Seismic Safety Act. The formation of the Committee was also prompted by the recent evaluations of hospital buildings reported to OSHPD that revealed that a

large percentage (40%) of California's operating hospitals are in the highest category of collapse risk.".[k]

The City of San Clemente has one hospital, San Clemente Hospital and Medical Center. According to the Summary of Hospital Seismic Performance Ratings published by the California Office of Statewide Health Planning and Development by California's General Acute Care Hospitals in accordance with the Alquist Hospital Facility Seismic Safety Act dated April 2001, San Clemente Hospital and Medical Center has two buildings with the following ratings given:

- Structural Performance Rating 1, "These buildings pose a significant risk of collapse and a danger to the public after a strong earthquake. These buildings must be retrofitted, replaced or removed from acute care service by January 1, 2008."
- Structural Performance Rating 5, "These buildings are in compliance with the structural provisions of the Alquist Hospital Facilities Seismic Safety Act, and are reasonably capable of providing services to the public following strong ground motion. Buildings in this category will have been constructed or reconstructed under a building permit obtained through OSHPD. They may be used without restriction to 2030 and beyond."
- Non-structural Rating 1, "In these buildings, the basic systems essential to life safety and patient care are inadequately anchored to resist earthquake forces. Hospitals must brace the communications, emergency power, bulk medical gas and fire alarm systems in these buildings by January 1, 2002."
- Non-structural Rating 4, "In these buildings, the contents are braced in accordance with current code. If the building structure is not badly damaged, the hospital building should be able to function, although interruption of the municipal water supply or sewer system may impede operations.

G. California Earthquake Mitigation Legislation

California is painfully aware of the threats it faces from earthquakes. Dating back to the 19th century, Californians have been killed, injured, and lost property as a result of earthquakes. As the State's population continues to grow, and urban areas become even more densely built up, the risk will continue to increase. For decades the Legislature has passed laws to strengthen the built environment and

protect the citizens. Table 6-2 provides a sampling of some of the 200 plus laws in the State's codes.

Table 6-2: **Partial List of the Over 200 California Laws on Earthquake Safety**	
Government Code Section 8870-8870.95	Creates Seismic Safety Commission.
Government Code Section 8876.1-8876.10	Established the California Center for Earthquake Engineering Research.
Public Resources Code Section 2800-2804.6	Authorized a prototype earthquake prediction system along the central San Andreas fault near the City of Parkfield.
Public Resources Code Section 2810-2815	Continued the Southern California Earthquake Preparedness Project and the Bay Area Regional Earthquake Preparedness Project.
Health and Safety Code Section 16100-16110	The Seismic Safety Commission and State Architect, will develop a state policy on acceptable levels of earthquake risk for new and existing state-owned buildings.
Government Code Section 8871-8871.5	Established the California Earthquake Hazards Reduction Act of 1986.
Health and Safety Code Section 130000-130025	Defined earthquake performance standards for hospitals.
Public Resources Code Section 2805-2808	Established the California Earthquake Education Project.
Government Code Section 8899.10-8899.16	Established the Earthquake Research Evaluation Conference.
Public Resources Code Section 2621-2630 2621.	Established the Alquist-Priolo Earthquake Fault Zoning Act.
Government Code Section 8878.50-8878.52 8878.50.	Created the Earthquake Safety and Public Buildings Rehabilitation Bond Act of 1990.
Education Code Section 35295-35297 35295.	Established emergency procedure systems in kindergarten through grade 12 in all the public or private schools.
Health and Safety Code Section 19160-19169	Established standards for seismic retrofitting of unreinforced masonry buildings.
Health and Safety Code Section 1596.80-1596.879	Required all child day care facilities to include an Earthquake Preparedness Checklist as an attachment to their disaster plan.
Source: http://www.leginfo.ca.gov/calaw.html	

H. Earthquake Education

Earthquake research and education activities are conducted at several major universities in the Southern California region, including Cal Tech, USC, UCLA, UCI, and UCSB. The local clearinghouse for earthquake information is the Southern California Earthquake Center located at the University of Southern

California, Los Angeles, CA 90089, Telephone: (213) 740-5843, Fax: (213) 740-0011, Email: SCEinfo@usc.edu, Website: http://www.scec.org. The Southern California Earthquake Center (SCEC) is a community of scientists and specialists who actively coordinate research on earthquake hazards at nine core institutions, and communicate earthquake information to the public. SCEC is a National Science Foundation (NSF) Science and Technology Center and is co-funded by the United States Geological Survey (USGS).

In addition, Orange County along with other Southern California counties, sponsors the Emergency Survival Program (ESP), an educational program for learning how to prepare for earthquakes and other disasters. Many school districts have very active emergency preparedness programs that include earthquake drills and periodic disaster response team exercises.

VI. Earthquake Mitigation Action Items

The earthquake mitigation action items provide guidance on suggesting specific activities that agencies, organizations, and residents in the City of San Clemente can undertake to reduce risk and prevent loss from earthquake events. Each action item is followed by ideas for implementation, which can be used by the steering committee and local decision makers in pursuing strategies for implementation;

Natural Hazard	**SHORT TERM ACTIVITY - EARTHQUAKE #1**		
Action Item	Integrate new earthquake hazard mapping data for the City of San Clemente and improve technical analysis of earthquake hazards		
Coordinating Organization	The City of San Clemente Geographic Information Systems, Information Services Division		
Ideas for Implementation	Use the mitigation plan to help the city's General Plan institutionalize guidelines for sustainable development in all new construction and development projects according to the hazards that impact the City of San Clemente Integrate the city's mitigation plan into current capital improvement plans to ensure that development does not encroach on known hazard areas: and Partner with other organizations and agencies with similar goals to promote Building & Safety Codes that are more disaster resistant at the state level.		
Time line	2 years		
Constraints	As personnel hours and time permit		
Plan Goals Addressed		**X**	**Protect Life and Property**
	Public Awareness		**Natural Systems**
X	**Partnerships and Implementation**		**Emergency Services**
Natural Hazard	**SHORT TERM ACTIVITY - EARTHQUAKE #2**		
Action Item	Incorporate the Regional Earthquake Transportation Evacuation Routes developed by the Regional Emergency Managers Group into appropriate planning documents		
Coordinating Organization	The City of San Clemente Emergency Planning Services		
Ideas for Implementation	Update the transportation routes map in the City of San Clemente Natural Hazard Mitigation Plan with the evacuation routes data; and integrate the evacuation routes data into the City of San Clemente Emergency Operations Plan,		
Time line	2 years		
Constraints	As personnel hours and time permit		
Plan Goals Addressed			**Protect Life and Property**
	Public Awareness		**Natural Systems**
	Partnerships and Implementation	**X**	**Emergency Services**

Natural Hazard	**LONG TERM ACTIVITY - EARTHQUAKE #1**		
Action Item	Identify funding sources for structural and nonstructural retrofitting of structures that are identified as seismically vulnerable.		
Coordinating Organization	Hazard Mitigation Advisory Committee		
Ideas for Implementation	Provide information for property owners, small businesses, and organizations on sources of funds (loans, grants, etc.); and explore options for including seismic retrofitting in existing programs such as low-income housing, insurance reimbursements, and pre and post disaster repairs,		
Time line	Ongoing		
Constraints	As personnel hours and time permit		
Plan Goals Addressed			**Protect Life and Property**
X	**Public Awareness**		**Natural Systems**
X	**Partnerships and Implementation**	**X**	**Emergency Services**

Natural Hazard	**LONG TERM ACTIVITY - EARTHQUAKE #2**		
Action Item	Encourage purchase of earthquake hazard insurance.		
Coordinating Organization	Hazard Mitigation Advisory Committee		
Ideas for Implementation	Provide earthquake insurance information to the City of San Clemente residents; and coordinate with insurance companies to produce and distribute earthquake insurance information		
Time line	Ongoing		
Constraints	As personnel hours and time permit		
Plan Goals Addressed		**X**	**Protect Life and Property**
X	**Public Awareness**		**Natural Systems**
	Partnerships and Implementation		**Emergency Services**

Natural Hazard	**LONG TERM ACTIVITY - EARTHQUAKE #3**		
Action Item	Encourage seismic strength evaluations of critical facilities in the City of San Clemente to identify vulnerabilities for mitigation of public infra structure, and critical facilities to meet current seismic standards..		
Coordinating Organizations	Hazard Mitigation Advisory Committee and Building and Safety Division		
Ideas for Implementation	Develop an inventory of critical facilities that do not meet current seismic standards; Encourage owners of non-retrofitted structures to upgrade them to meet seismic standards; and Encourage water providers to replace old cast iron pipes with more ductile iron, and identify partnership opportunities with other agencies for pipe replacement,		
Time line	5 years		
Constraints	As personnel hours and time permit		
Plan Goals Addressed		**X**	**Protect Life and Property**
	Public Awareness		**Natural Systems**
	Partnerships and Implementation	**X**	**Emergency Services**

Natural Hazard	**LONG TERM ACTIVITY - EARTHQUAKE #4**		
Action Item	Encourage reduction of nonstructural and structural earthquake hazards in homes, schools, businesses, and government offices.		
Coordinating Organization	Hazard Mitigation Advisory Committee		
Ideas for Implementation	Provide information to government building and school facility managers and teachers on securing bookcases, filing cabinets, light fixtures, and other objects that can cause injuries and block exits; and encourage facility managers, business owners, and teachers to refer to FEMA's practical guidebook: "Reducing the Risks Nonstructural Earthquake Damage"; and encourage homeowners and renters to use "Is Your Home Protected from Earthquake Disaster? A Homeowner's Guide to Earthquake Retrofit" (IBHS) for economic and efficient mitigation techniques; and explore partnerships to provide retrofitting classes for homeowners, renters, building professionals, and contractors; and target development located in potential fault zones or in unstable soils for intensive education and retrofitting resources		
Time line	Ongoing		
Constraints	As personnel hours and time permit		
Plan Goals Addressed		**X**	**Protect Life and Property**
X	**Public Awareness**		**Natural Systems**
	Partnerships and Implementation		**Emergency Services**

VII. Earthquake Resource Directory

Local and Regional Resources

Orange County Resources and Development Management Department

Level: County Hazard: Multi http://www.ocpfrd.com/Services_PW.asp

H.G. Osborne Building - PFRD Headquarters
300 North Flower Street, Santa Ana, CA
92703-5000.
Santa Ana, CA 92703-5000. Ph: 714.834.2300

Notes: The Orange County Department of Resources and Development Management 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

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

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.

State Resources

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

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

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.

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

Notes: The California Geological Survey develops and disseminates technical information and advice on California's geology, geologic hazards, and mineral resources.

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	Hazard: Multi	www.calpin.ca.gov
Level: State	Ph:	
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.		
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	
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.		

Federal and National Resources

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.		
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 a number of programs and activities which provide citizens Protection, with flood insurance; Prevention, with mitigation measures and Partnerships, with communities throughout the country.

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.

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.

Institute for Business & Home Safety

Level: National Hazard: Multi http://www.ibhs.org/

4775 E. Fowler Avenue

Tampa, FL 33617 Ph: 813-286-3400 Fx: 813-286-9960

The Institute for Business & Home Safety (IBHS) is a nonprofit association that engages in communication, education, engineering and research. The Institute works to reduce deaths, injuries, property damage, economic losses and human suffering caused by natural disasters.

Publications

"Land Use Planning for Earthquake Hazard Mitigation: Handbook for Planners"
Wolfe, Myer R. et. aI., (1986) University of Colorado, Institute of Behavioral Science, National Science Foundation.
This handbook provides techniques that planners and others can utilize to help mitigate for seismic hazards, It provides information on the effects of earthquakes, sources on risk assessment, and effects of earthquakes on the built environment. The handbook also gives examples on application and implementation of planning techniques to be used by local communities.
Contact: Natural Hazards Research and Applications Information Center
Address: University of Colorado, 482 UCB,

Boulder, CO 80309-0482
Phone: (303) 492-6818
Fax: (303) 492-2151
Website: http://www,colorado.edu/UCB/Research/IBS/hazards

"Public Assistance Debris Management Guide", FEMA (July 2000).
The Debris Management Guide was developed to assist local officials in planning, mobilizing, organizing. and controlling large-scale debris clearance, removal, and disposal operations, Debris management is generally associated with post-disaster recovery. While it should be compliant with local and county emergency operations plans, developing strategies to ensure strong debris management is a way to integrate debris management within mitigation activities. The "Public Assistance Debris Management Guide" is available in hard copy or on the FEMA website.

End Notes

[1] http://pubs.usgs.gov/gip/earthq3/when.html

[b] http://www.gps.caltech.edu/~sieh/home.html

[c] Planning for Natural Hazards: The California Technical Resource Guide, Department of Land Conservation and Development (July 2000)

[d] http://www.consrv.ca.gov/CGS/rghm/ap/

[e] Ibid

[f] Burby, R. (Ed.) Cooperating with Nature: Confronting Natural Hazards with Land Use Planning for Sustainable Communities (1998), Washington D.C., Joseph Henry Press.

[g] FEMA HAZUS http://www.fema.gov/hazus/hazus2.htm (May 2001).

[h] Source: Los Angeles County Public Works Department, March 2004

[i] http://www.chamber101.com/programs_committee/natural_disasters/DisasterPreparedness/Forty.htm

[j] Institute for Business and Home Safety Resources (April 2001),

[k] http://www.seismic.ca.gov/pub/CSSC_2001-04_Hospital.pdf

SECTION 7 LANDSLIDES

I. WHY ARE LANDSLIDES A THREAT TO CITY OF SAN CLEMENTE

Landslides are a serious geologic hazard in almost every state in America. Nationally, landslides cause 25 to 50 deaths each year.[l] The best estimate of direct and indirect costs of landslide damage in the United States range between $1 and $2 billion annually.[m] As a seismically active region, California has had significant number of locations impacted by landslides. Some landslides result in private property damage; other landslides impact transportation corridors, fuel and energy conduits, and communication facilities. They can also pose a serious threat to human life.

Landslides can be broken down into two categories: (1) rapidly moving (generally known as debris flows), and (2) slow moving. Rapidly moving landslides or debris flows present the greatest risk to human life, and people living in or traveling through areas prone to rapidly moving landslides are at increased risk of serious injury. Slow moving landslides can cause significant property damage, but are less likely to result in serious human injuries.

II. HISTORIC SOUTHERN CALIFORNIA LANDSLIDES

- **1928 St. Francis Dam failure**
  Los Angeles County, California. The dam gave way on March 12, and its waters swept through the Santa Clara Valley toward the Pacific Ocean, about 54 miles away. Sixty five miles of valley was devastated, and over 500 people were killed. Damages were estimated at $672.1 million (year 2000 dollars).[n]

- **1956 Portuguese Bend, California**
  Cost, $14.6 million (2000 dollars) California Highway 14, Palos Verdes Hills. Land use on the Palos Verdes Peninsula consists mostly of single-family homes built on large lots, many of which have panoramic ocean views. All of the houses were constructed with individual septic systems, generally consisting of septic tanks and seepage pits. Landslides have been active here for thousands of years, but recent landslide activity has been attributed in part to human activity. The Portuguese Bend landslide began its modern movement in August 1956, when displacement was noticed at its northeast margin. Movement gradually extended downslope so that the entire eastern edge of the slide mass was moving within 6 weeks. By the summer of 1957, the entire slide mass was sliding towards the sea.[o]

- **1958-1971 Pacific Palisades, California**
  Cost, $29.1 million (2000 dollars) California Highway 1 and house damaged.[p]

- **1961 Mulholland Cut, California**
  Cost, $41.5 million (2000 dollars) On Interstate 405, 11 miles north of Santa Monica, Los Angeles County.[q]

- **1963 Baldwin Hills Dam Failure.**
  On December 14, the 650 foot long by 155 foot high earth fill dam gave way and sent 360 million gallons of water in a fifty foot high wall cascading onto the community below, killing five persons, and damaging 50 million (1963 dollars) of dollars in property.

- **1969 Glendora, California**
  Cost, $26.9 million (2000 dollars) Los Angeles County, 175 houses damaged, mainly by debris flows.[r]

- **1969 Seventh Ave., Los Angeles County, California**
  Cost, $14.6 million (2000 dollars) California Highway 60.[s]

- **1970 Princess Park, California**
  Cost, $29.1 million (2000 dollars) California Highway 14, 10 miles north of Newhall, near Saugus, northern Los Angeles County.[t]

- **1971 Upper and Lower Van Norman Dams, San Fernando, California**
  Earthquake-induced landslides Cost, $302.4 million (2000 dollars). Damage due to the February 9, 1971, magnitude 7.5 San Fernando, California, earthquake. The earthquake of February 9 severely damaged the Upper and Lower Van Norman Dams.[u]

- **1971 Juvenile Hall, San Fernando, California**
  Landslides caused by the February 9, 1971, San Fernando, California, earthquake Cost, $266.6 million (2000 dollars). In addition to damaging the San Fernando Juvenile Hall, this 1.2 km-long slide damaged trunk lines of the Southern Pacific Railroad, San Fernando Boulevard, Interstate Highway 5, the Sylmar, California, electrical converter station, and several pipelines and canals.[v]

- **1977-1980 Monterey Park, Repetto Hills, Los Angeles County, California**
  Cost, $14.6 million (2000 dollars) 100 houses damaged in 1980 due to debris flows.[w]

- **1978 Bluebird Canyon Orange County**
  California October 2, cost, $52.7 million (2000 dollars) 60 houses destroyed or damaged. Unusually heavy rains in March of 1978 may have contributed to

initiation of the landslide. Although the 1978 slide area was approximately 3.5 acres, it is suspected to be a portion of a larger, ancient landslide.[x]

- **1979 Big Rock, California, Los Angeles County**
  Cost, approximately $1.08 billion (2000 dollars) California Highway 1 rockslide.[y]

- **1978-1979, 1980 San Diego County, California**
  Experienced major damage from storms in 1978, 1979, and 1979-80, as did neighboring areas of Los Angeles and Orange County, California. One hundred and twenty landslides were reported to have occurred in San Diego County during these 2 years. Rainfall for the rainy seasons of 78-79 and 79-80 was 14.82 and 15.61 inches (37.6 and 39.6 cm) respectively, compared to a 125-year average (1850-1975) of 9.71 inches (24.7 cm). Significant landslides occurred in the Friars Formation, a unit that was noted as slide-prone in the Seismic Safety Study for the City of San Diego. Of the nine landslides that caused damage in excess of $1 million, seven occurred in the Friars Formation, and two in the Santiago Formation in the northern part of San Diego Count y.[z]

- **1980 Southern California slides**
  $1.1 billion in damage (2000 dollars) Heavy winter rainfall in 1979-90 caused damage in six Southern California counties. In 1980, the rainstorm started on February 8. A sequence of 5 days of continuous rain and 7 inches of precipitation had occurred by February 14. Slope failures were beginning to develop by February 15 and then very high-intensity rainfall occurred on February 16. As much as 8 inches of rain fell in a 6 hour period in many locations. Records and personal observations in the field on February 16 and 17 showed that the mountains and slopes literally fell apart on those 2 days.[aa]

- **1983 Big Rock Mesa, California**
  Cost, $706 million (2000 dollars) in legal claims condemnation of 13 houses, and 300 more threatened rockslide caused by rainfall [bb]

- **1993 San Clemente and Dana Point, California, Orange County**
  Cost, $7 million (2000 dollars), California Highway 1.

- **1994 Northridge, California earthquake landslides**
  As a result of the magnitude 6.7 Northridge, California, earthquake, more than 11,000 landslides occurred over an area of 10,000 km2. Most were in the Santa Susana Mountains and in mountains north of the Santa Clara River Valley. Destroyed dozens of homes, blocked roads, and damaged oil-field infrastructure. Caused deaths from Coccidioidomycosis (valley fever) the spore of which was

released from the soil and blown toward the coastal populated areas. The spore was released from the soil by the landslide activity.[cc]

- **March 1995 Los Angeles and Ventura Counties, Southern California**
  Above normal rainfall triggered damaging debris flows, deep-seated landslides, and flooding. Several deep-seated landslides were triggered by the storms, the most notable was the La Conchita landslide, which in combination with a local debris flow, destroyed or badly damaged 11 to 12 homes in the small town of La Conchita, about 20 km west of Ventura. There also was widespread debris-flow and flood damage to homes, commercial buildings, and roads and highways in areas along the Malibu coast that had been devastated by wildfire 2 years before.[dd]

III. LANDSLIDE CHARACTERISTICS

A. WHAT IS A LANDSLIDE

a. A landslide is defined as, the movement of a mass of rock, debris, or earth down a slope. Landslides are a type of "mass wasting" which denotes any down slope movement of soil and rock under the direct influence of gravity. The term "landslide" encompasses events such as rock falls, topples, slides, spreads, and flows. Landslides can be initiated by rainfall, earthquakes, volcanic activity, changes in groundwater, disturbance and change of a slope by man-made construction activities, or any combination of these factors. Landslides can also occur underwater, causing tidal waves and damage to coastal areas. These landslides are called submarine landslides.[ee]

b. The size of a landslide usually depends on the geology and the initial cause of the landslide. Landslides vary greatly in their volume of rock and soil, the length, width, and depth of the area affected, frequency of occurrence, and speed of movement. Some characteristics that determine the type of landslide are slope of the hillside, moisture content, and the nature of the underlying materials. Landslides are given different names, depending on the type of failure and their composition and characteristics.

c. Slides move in contact with the underlying surface. These movements include rotational slides where sliding material moves along a curved surface and translational slides where movement occurs along a flat surface. These slides are generally slow moving and can be deep. Slumps are small rotational slides that are generally shallow. Slow-moving

landslides can occur on relatively gentle slopes and can cause significant property damage, but are far less likely to result in serious injuries than rapidly moving landslides.[ff]

d. Failure of a slope occurs when the force that is pulling the slope downward (gravity) exceeds the strength of the earth materials that compose the slope. They can move slowly, (millimeters per year) or can move quickly and disastrously, as is the case with debris-flows. Debris-flows can travel down a hillside of speeds up to 200 miles per hour (more commonly, 30 – 50 miles per hour), depending on the slope angle, water content, and type of earth and debris in the flow. These flows are initiated by heavy, usually sustained, periods of rainfall, but sometimes can happen as a result of short bursts of concentrated rainfall in susceptible areas. Burned areas charred by wildfires are particularly susceptible to debris flows, given certain soil characteristics and slope conditions.[gg]

B. WHAT IS A DEBRIS FLOW?

A debris or mud flow is a river of rock, earth and other materials, including vegetation that is saturated with water. This high percentage of water gives the debris flow a very rapid rate of movement down a slope. Debris flows often with speeds greater than 20 miles per hour, and can often move much faster.[hh] This high rate of speed makes debris flows extremely dangerous to people and property in its path.

IV. LANDSLIDE EVENTS AND IMPACTS

Landslides are a common hazard in California. Weathering and the decomposition of geologic materials produces conditions conducive to landslides and human activity further exacerbate landslide problems. Many landslides are difficult to mitigate, particularly in areas of large historic movement with weak underlying geologic materials. As communities continue to modify the terrain and influence natural processes, it is important to be aware of the physical properties of the underlying soils as they, along with climate, create landslide hazards. Even with proper planning, landslides will continue to threaten the safety of people, property, and infrastructure, but without proper planning, landslide hazards will be even more common and more destructive.

The increasing scarcity of build-able land, particularly in urban areas, increases the tendency to build on geologically marginal land. Additionally, hillside housing developments in Southern California are prized for the view lots that they provide.

Rock falls occur when blocks of material come loose on steep slopes. Weathering,

erosion, or excavations, such as those along highways, can cause falls where the road has been cut through bedrock. They are fast moving with the materials free falling or bouncing down the slope. In falls, material is detached from a steep slope or cliff. The volume of material involved is generally small, but large boulders or blocks of rock can cause significant damage.

Earth flows are plastic or liquid movements in which land mass (e.g. soil and rock) breaks up and flows during movement. Earthquakes often trigger flows.[ii] Debris flows normally occur when a landslide moves downslope as a semi-fluid mass scouring, or partially scouring soils from the slope along its path. Flows are typically rapidly moving and also tend to increase in volume as they scour out the channel.[jj] Flows often occur during heavy rainfall, can occur on gentle slopes, and can move rapidly for large distances.

V. LANDSLIDE CONDITIONS

Landslides are often triggered by periods of heavy rainfall. Earthquakes, subterranean water flow and excavations may also trigger landslides. Certain geologic formations are more susceptible to landslides than others. Human activities, including locating development near steep slopes, can increase susceptibility to landslide events. Landslides on steep slopes are more dangerous because movements can be rapid.

Although landslides are a natural geologic process, the incidence of landslides and their impacts on people can be exacerbated by human activities. Grading for road construction and development can increase slope steepness. Grading and construction can decrease the stability of a hill slope by adding weight to the top of the slope, removing support at the base of the slope, and increasing water content. Other human activities effecting landslides include: excavation, drainage and groundwater alterations, and changes in vegetation.[kk]

Wildland fires in hills covered with chaparral are often a precursor to debris flows in burned out canyons. The extreme heat of a wildfire can create a soil condition in which the earth becomes impervious to water by creating a waxy-like layer just below the ground surface. Since the water cannot be absorbed into the soil, it rapidly accumulates on slopes, often gathering loose particles of soil in to a sheet of mud and debris. Debris flows can often originate miles away from unsuspecting persons, and approach them at a high rate of speed with little warning.

VI. NATURAL CONDITIONS

Natural processes can cause landslides or re-activate historical landslide sites. The

removal or undercutting of shoreline-supporting material along bodies of water by currents and waves produces countless small slides each year. Seismic tremors can trigger landslides on slopes historically known to have landslide movement. Earthquakes can also cause additional failure (lateral spreading) that can occur on gentle slopes above steep streams and riverbanks.

VII. PARTICULARLY HAZARDOUS LANDSLIDE AREAS

Locations at risk from landslides or debris flows include areas with one or more of the following conditions:

- On or close to steep hills;
- Steep road-cuts or excavations;
- Existing landslides or places of known historic landslides (such sites often have tilted power lines, trees tilted in various directions, cracks in the ground, and irregular-surfaced ground);
- Steep areas where surface runoff is channeled, such as below culverts, V - shaped valleys, canyon bottoms, and steep stream channels; and
- Fan-shaped areas of sediment and boulder accumulation at the outlets of canyons.
- Canyon areas below hillside and mountains that have recently (within 1-6 years) been subjected to a wildland fire.

VIII. IMPACTS OF DEVELOPMENT

Although landslides are a natural occurrence, human impacts can substantially affect the potential for landslide failures in the City of San Clemente. Proper planning and geotechnical engineering can be exercised to reduce the threat of safety of people, property, and infrastructure.

A. Excavation and Grading

Slope excavation is common in the development of home sites or roads on sloping terrain. Grading these slopes can result in some slopes that are steeper than the pre-existing natural slopes. Since slope steepness is a major factor in landslides, these steeper slopes can be at an increased risk for landslides. The added weight of fill placed on slopes can also result in an increased landslide hazard. Small landslides can be fairly common along roads, in either the road cut or the road fill.

Landslides occurring below new construction sites are indicators of the potential

impacts stemming from excavation.

IX. DRAINAGE AND GROUNDWATER ALTERATIONS

Water flowing through or above ground is often the trigger for landslides. Any activity that substantially increases the amount of water flowing into landslide-prone slopes can increase landslide hazards. Under certain circumstances, broken or leaking water or sewer lines can contribute to the water flowing into a landslide-prone slope, although the amount of water attributable to such sources is usually small. Drainage facilities that direct water onto slopes can increase landslide hazards, and property owners should direct all drainage outlets away from slopes. Landscape irrigation, and particularly lawn irrigation, is especially problematic. Many property owners over water in order to maintain their lawn's lush green appearance all year, and irrigation water applied to flat lawn areas can pond and percolate deep into the soil over time. Ineffective storm water management and excess runoff can also cause erosion and increase the risk of landslide hazards. Drainage can be affected naturally by the geology and topography of an area. Development that results in an increase in impervious surface impairs the ability of the land to absorb water and may redirect water to other areas. Channels, streams, ponding, and erosion on slopes all indicate potential slope problems.

Driveway drains, gutters, downspouts, and other constructed drainage facilities can concentrate and accelerate flow. Ground saturation and concentrated velocity flow are major causes of slope problems and may trigger landslides.[ll]

X. CHANGES IN VEGETATION

Removing vegetation from very steep slopes can increase landslide hazards. Areas that have experienced wildfire and land clearing for development may have long periods of increased landslide hazard. Also, certain types of ground cover have a much greater need for constant watering to remain green. Changing away from native ground cover plants may increase the risk of landslide.

XI. LANDSLIDE HAZARD ASSESSMENT

A. HAZARD IDENTIFICATION

Identifying hazardous locations is an essential step towards implementing more informed mitigation activities.

B. VULNERABILITY AND RISK

Vulnerability assessment for landslides will assist in predicting how different

types of property and population groups will be affected by a hazard.[mm] Data that includes specific landslide-prone and debris flow locations in the city can be used to assess the population and total value of property at risk from future landslide occurrences.

Map 1-3 shows that almost 100% of the land in City of San Clemente has potentially unstable soil according to the parameters of the software (GIS by Digital Map Central) used to create the map.

While a quantitative vulnerability assessment (an assessment that describes number of lives or amount of property exposed to the hazard) has not yet been conducted for the City of San Clemente landslide events, there are many qualitative factors that point to potential vulnerability. Landslides can impact major transportation arteries, blocking residents from essential services and businesses.

Past landslide events have caused major property damage or significantly impacted city residents, and continuing to map city landslide and debris flow areas will help in preventing future loss.

Factors included in assessing landslide risk include population and property distribution in the hazard area, the frequency of landslide or debris flow occurrences, slope steepness, soil characteristics, and precipitation intensity. This type of analysis could generate estimates of the damages to the city due to a specific landslide or debris flow event. At the time of publication of this plan, data was insufficient to conduct a risk analysis and the software needed to conduct this type of analysis was not available.

XII. COMMUNITY LANDSLIDE ISSUES

A. WHAT IS SUSCEPTIBLE TO LANDSLIDES

Landslides can affect utility services, transportation systems, and critical lifelines. Communities may suffer immediate damages and loss of service. Disruption of infrastructure, roads, and critical facilities may also have a long-term effect on the economy. Utilities, including potable water, wastewater, telecommunications, natural gas, and electric power are all essential to service community needs. Loss of electricity has the most widespread impact on other utilities and on the whole community. Natural gas pipes may also be at risk of breakage from landslide movements as small as an inch or two.

B. ROADS AND BRIDGES

Losses incurred from landslide hazards in the City of San Clemente have been associated with roads. The City of San Clemente Maintenance Division and outside sourcing is responsible for responding to slides that inhibit the flow of traffic or are damaging a road or a bridge. The department does its best to communicate with residents impacted by landslides, but can usually only repair the road itself, as well as the areas adjacent to the slide where the city has the right of way.

It is not cost effective to mitigate all slides because of limited funds and the fact that some historical slides are likely to become active again even with mitigation measures. Unfortunately, many property owners are unaware of slides and the dangers associated with them.

C. LIFELINES AND CRITICAL FACILITIES

Lifelines and critical facilities should remain accessible, if possible, during a natural hazard event. The impact of closed transportation arteries may be increased if the closed road or bridge is critical for hospitals and other emergency facilities. Therefore, inspection and repair of critical transportation facilities and routes is essential and should receive high priority. Losses of power and phone service are also potential consequences of landslide events. Due to heavy rains, soil erosion in hillside areas can be accelerated, resulting in loss of soil support beneath high voltage transmission towers in hillsides and remote areas. Flood events can also cause landslides, which can have serious impacts on gas lines that are located in vulnerable soils. A letter of request was sent to "The Gas Company", who serves our communities needs for gas service, requesting mapping of high pressure gas distribution lines within the City of San Clemente. A letter of denial for this request has been received citing security concerns in that these maps could be obtained by the general public. This letter of denial is included in this plan for reference.

XIII. LANDSLIDE MITIGATION ACTIVITIES

Landslide mitigation activities include current mitigation programs and activities that are being implemented by local or city organizations. The City has created landscaping maintenance guidelines for slopes and hillside properties. Those guidelines have been distributed to homeowners in areas with high landslide risk and can be obtained from the City upon rquest.

Landslide Building/Zoning Codes

The City of San Clemente General Plan, Objective 12.4, Policy 12.4.1 addresses development on steep slopes. This section outlines standards for steep slope hazard areas on slopes of 25 percent or more. Generally, the ordinance requires soils and engineering geologic studies for developments proposed on slopes of 25 percent or greater. More detailed surface and subsurface investigations shall be warranted if indicated by engineering and geologic studies to sufficiently describe existing conditions. This may include soils, vegetation, geologic formations, and drainage patterns. Site evaluations may also occur where stability might be lessened by proposed grading/filling or land clearing. In general, a soils analysis is required for all new construction and major reconstruction due to the city's susceptibility to landslides.

Chapter 70 of the Uniform Building Code, Excavation and Grading, is replaced by the following Grading Chapter to read as follows in Sections 15.36.020 through 15.36.420 of this chapter. (Ord. 1278 § 1, 2003)

15.36.030 Grading manual.

A. The City Engineer shall formulate such rules, procedures, and interpretations as may be necessary or convenient to administer this chapter. Such rules, procedures and interpretations shall be referred to as the City of San Clemente Grading Manual or the Grading Manual and any amendments to it, including the original Grading Manual, shall be approved by resolution of the City Council.

B. The Grading Manual shall include provisions to assure that water quality requirements relevant to activities subject to this article apply to all such activities.

C. In the event of any conflict between said Grading Manual and this chapter the provisions of this chapter shall govern. The provisions of said Grading Manual shall, to the extent that they are made conditions of any permit by the City Engineer, be binding on the permittee. (Ord. 1278 § 1, 2003)

XIV. HAZARD MAPPING

A. Mapping Software

The City of San Clemente employs a mapping software program City GIS by Digital Map Central. Within the program the following specific hazards are

available for use:

- US EPA NPL/Superfund Sites
- US EPA Cerelis Sites
- US EPA RCRA
- US EPA RCRA CORRACTS
- State Cal Sites
- State Leaking Underground Tanks
- State Solid Waste Landfills
- FEMA 100 year Flood Zone
- FEMA 500 year Flood Zone
- Seismic Fault Zone
- Dam Inundation Area
- Very High Fire Hazard Area
- Wildland Fire Area
- Seismic Landslide Zone
- Seismic Liquefaction Zone

B. Community Issues Summary

Landslides are a problem in the City of San Clemente, and often impact the city's infrastructure as well as private property. Map 1-4 shows some of the known landslide hazard area(s).

C. Landslide Mitigation Action Items

The landslide mitigation action items provide direction on specific activities that the city, organizations, and residents in the City of San Clemente can undertake to reduce risk and prevent loss from landslide events. Each action item is followed by ideas for implementation, which can be used by the steering committee and local decision makers in pursuing strategies for implementation.

Natural Hazard	**SHORT TERM ACTIVITY – LANDSLIDE #1**		
Action Item	Improve knowledge of landslide hazard areas and understanding of vulnerability and risk to life and property in hazard-prone areas		
Coordinating Organizations	The City of San Clemente Planning Division and Public Works Department		
Ideas for Implementation	Develop public information to emphasize economic risk when building on potential or historical landslide areas		
Time line	Ongoing		
Constraints	As personnel hours and time permit		
Plan Goals Addressed			**Protect Life and Property**
	Public Awareness		**Natural Systems**
X	**Partnerships and Implementation**		**Emergency Services**

Natural Hazard	**SHORT TERM ACTIVITY – LANDSLIDE #2**		
Action Item	Encourage construction and subdivision design that can be applied to steep slopes to reduce the potential adverse impacts from development in accordance with the General Plan and Municipal Codes.		
Coordinating Organizations	The City of San Clemente Planning , Building and Safety, and Engineering Divisions		
Ideas for Implementation	Increase communication and coordination between the city's Engineering, and Planning Departments.		
Time line	2 years		
Constraints	As personnel hours and time permit		
Plan Goals Addressed		**X**	**Protect Life and Property**
	Public Awareness		**Natural Systems**
X	**Partnerships and Implementation**		**Emergency Services**

Natural Hazard	**SHORT TERM ACTIVITY – LANDSLIDE #3**		
Action Item	Identify safe evacuation routes in high-risk debris flow and landslide areas. . .		
Coordinating Organization	The City of San Clemente Emergency Planning Services		
Ideas for Implementation	Identify potential debris removal resources. Increase participation in regional committee planning for emergency transportation routes. Identify and publicize information regarding emergency transportation routes.		
Time line	2 years		
Constraints	As personnel hours and time permit		
Plan Goals Addressed		**X**	**Protect Life and Property**
	Public Awareness		**Natural Systems**
	Partnerships and Implementation		**Emergency Services**

Natural Hazard	**LONG TERM ACTIVITY - LANDSLIDE #1**		
Action Item	Review local ordinances regarding building and development in landslide prone areas.		
Coordinating Organization	The City of San Clemente Planning Division		
Ideas for Implementation	Create committee of local stakeholders to study issue and make recommendations to staff.		
Time line	2 years		
Constraints	As personnel hours and time permit		
Plan Goals Addressed		**X**	**Protect Life and Property**
X	**Public Awareness**		**Natural Systems**
	Partnerships and Implementation		**Emergency Services**

Natural Hazard	**LONG TERM ACTIVITY - LANDSLIDE #2**		
Action Item	Regulate activities in identified potential and historical landslide areas, if any, through mitigation.		
Coordinating Organization	The City of San Clemente Planning Division		
Ideas for Implementation	Analyze existing regulations regarding development in landslide prone areas; and identify existing mechanisms for public outreach		
Time line	2 years		
Constraints	As personnel hours and time permit		
Plan Goals Addressed			**Protect Life and Property**
X	**Public Awareness**		**Natural Systems**
X	**Partnerships and Implementation**		**Emergency Services**

LANDSLIDE RESOURCE DIRECTORY (See details in Appendix A)

COUNTY RESOURCES

1. Orange County Resources & Development Management Department

STATE RESOURCES

2. Department of Conservation Headquarters
3. California Geological Survey Headquarters/Office of the State Geologist
4. California Division of Forestry
5. Department of Water Resources
6. Governor's Office of Emergency Services
7. California Department of Transportation (Cal Trans)

FEDERAL RESOURCES AND PROGRAMS

8. Federal Emergency Management Agency (FEMA)
9. Natural Resource Conservation Service (NRCS)
10. US Geological Survey, National Landslide Information Center

PUBLICATIONS

Olshansky, Robert B., Planning for Hillside Development (1996) American Planning Association.
This document describes the history, purpose, and functions of hillside development and regulation and the role of planning, and provides excerpts from hillside plans, ordinances, and guidelines from communities throughout the US.

Olshansky, Robert B. & Rogers, J. David, Unstable Ground: Landslide Policy in the United States (1987) Ecology Law Quarterly.
This is about the history and policy of landslide mitigation in the US.

Public Assistance Debris Management Guide (July 2000) Federal Emergency Management Agency.
The Debris Management Guide was developed to assist local officials in planning, mobilizing, organizing, and controlling large-scale debris clearance, removal, and disposal operations. Debris management is generally associated with post-disaster recovery. While it should be compliant with local and city emergency operations plans, developing strategies to ensure strong debris management is a way to integrate debris management within mitigation activities. The Guide is available in hard copy or on the FEMA website.

USGS Landslide Program Brochure. National Landslide Information Center (NLIC), United States Geologic Survey.
The brochure provides good, general information in simple terminology on the importance of landslide studies and a list of databases, outreach, and exhibits maintained by the NLLC. The brochure also includes information on the types and causes of landslides, rock falls, and earth flows.

LANDSLIDE ENDNOTES

l. Mileti, Dennis, *Disasters by Design: A Reassessment of Natural Hazards in the United States* (1999) Joseph Henry Press, Washington D.C.

m. Brabb, E.E., and B.L Harrod. (Eds) *Landslides: Extent and Economic Significance. Proceedings of the 28th International Geological Congress Symposium on Landslides.* (1989) Washington D.C., Rotterdam: Balkema.

n. Highland, L.M., and Schuster, R.L., *Significant Landslide Events in the United States.* (No Date) USGS, Washington D.C., http://landslides.usgs.gov.html_files/pubs/report1/Landslides_pass_508.pdf

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gg. Ibid.

hh. Barrows, Alan and Smith, Ted, DMG Note 13, http://www.consrv.ca.gov/cgs/information/publications/cgs_notes/note_33/

ii. Robert Olson Associates, *Metro Regional Hazard Mitigation and Planning Guide* (June 1999) Metro

jj. Ibid.

kk. Planning For Natural Hazards: *The Oregon Technical Resource Guide*, Department of Land Conservation and Development (2000), Ch 5.

ll. *Homeowners Guide for Landslide Control, Hillside Flooding, Debris Flows, Soil Erosion,* (March 1997)

mm. Burby, R. (Ed.) *Cooperating With Nature* (1998) Washington, D.C.: Joseph Henry Press.

SECTION 8 FLOOD

I. Why are Floods a Threat to the City of San Clemente?

Flooding poses a threat to life and safety, and can cause severe damage to public and private property. Within the City of San Clemente, two Federal Emergency Management Agency floodways and a coastal flood with a velocity hazard zone have been identified. They are **Prima Deshecha Canada** and **Segunda Deshecha Canada.** FEMA also designated the Pacific coastline along the length of San Clemente as a floodzone. Areas that could be affected by flooding from these tributaries and the approximate location of these floodways/floodzones, are shown in Map 1-4.

There are no rivers in the City of San Clemente. South Coast Water District owns and operates an earthen dam water storage reservoir located in the Northern section of the City. Failure of this dam could cause inundation as depicted in Map 1-5.

II. History of Flooding in the City of San Clemente

The City of San Clemente is susceptible to flooding from excessive runoff delivered by heavy rainfall into nineteen naturally formed canyons. Major floods have affected the citizens of the City since as early as 1827, when it was reported in the local newspaper, "El Heraldo de San Clemente," that the water line providing water to the newly formed city was washed away. In addition to the loss of the water line, pumps used to provide water through this water line from San Juan Creek were washed out and found down stream after the storm.

The City of San Clemente was most recently affected by the flooding in 1998 when approximately $1,000,000 in damage was incurred. The storm of 1998 was considerably less severe than the storm of 1993 when approximately $8,000,000 in damage was incurred. The storm damage of 1998 was primarily the result of storm surge whereas the storm damage of 1993 was the result of excessive rainfall causing runoff which was greater than the storm drainage system was capable of handling. The City sought and received a Presidential Disaster Declaration to obtain federal assistance for its flood recovery efforts for both the 1993 and 1998 storms.

III. What Factors Create Flood Risk?

Flooding occurs when climate, geology, and hydrology combine to create conditions where water flows outside of its usual course. In the City of San Clemente, geography and climate combine to create chronic seasonal flooding conditions

A. Winter Rainfall

Over the last 125 years, the average annual rainfall in San Clemente has been 14.9 inches. But the term "average" means very little 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. In fact, in only fifteen of the past 125 years, has the annual rainfall been within plus or minus 10% of the 14.9 inch average. And in only 38 years has the annual rainfall been within plus or minus 20% of the 14.9 inch average. This makes San Clemente a land of extremes in terms of annual precipitation.

B. Monsoons

Another relatively regular source for heavy rainfall, particularly in the mountains and adjoining cities is from summer tropical storms. Table 8-1 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 8-1 Tropical Monsoons that have affected Southern California during the 20th Century			
Month-Year	**Date(s)**	**Area(s) Affected**	**Rainfall**
July 1902	20th & 21st	Deserts & Southern Mountains	up to 2"
Aug. 1906	18th & 19th	Deserts & Southern Mountains	up to 5"
Sept. 1910	15th	Mountains of Santa Barbara County	2"
Aug. 1921	20th & 21st	Deserts & Southern Mountains	up to 2"
Sept. 1921	30th	Deserts	up to 4"
Sept. 1929	18th	Southern Mountains & Deserts	up to 4"
Sept. 1932	28th - Oct 1st	Mountains & Deserts, 15 Fatalities	up to 7
Aug. 1935	25th	Southern Valleys, Mountains & Deserts	up to 2"
Sept. 1939	4th – 7th	Southern Mountains, Southern & Eastern Deserts	up to 7
	11th & 12th	Deserts, Central & Southern Mountains	up to 4"
	19th - 21st	Deserts, Central & Southern Mountains	up to 3"
	25th	Long Beach, W/ Sustained Winds of 50 Mph	5"
		Surrounding Mountains	6 to 12"
Sept. 1945	9th & 10th	Central & Southern Mountains	up to 2”
Sept. 1946	30th - Oct 1st	Southern Mountains	up to 4"
Aug. 1951	27th - 29th	Southern Mountains & Deserts	2 to 5"
Sept. 1952	19th - 21st	Central & Southern Mountains	up to 2"
July 1954	17th - 19th	Deserts & Southern Mountains	up to 2"
July 1958	28th & 29th	Deserts & Southern Mountains	up to 2"
Sept. 1960	9th & 10th	Julian	3.40"
Sept. 1963	17th - 19th	Central & Southern Mountains	up to 7"
Sept. 1967	1st – 3rd	Southern Mountains & Deserts	2"
Oct. 1972	6th	Southeast Deserts	up to 2"
Sept. 1976	10th & 11th	Central & 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 & 7th	Southern Mountains & Deserts	up to 2

Table 8-1 Tropical Monsoons that have affected Southern California during the 20th Century			
Sept. 1978	5th & 6th	Mountains	3"
Sept. 1982	24th - 26th	Mountains	up to 4"
Sept. 1983	20th & 21st	Southern Mountains & Deserts	up to 3"
http://www.fema.gov/nwz97/eln_scal.shtm			

C. Geography and Geology

The greater Los Angeles Basin 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."[xl]

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.

Excepting the Talega Valley and Marblehead Coastal site, the City of San Clemente is for all intents and purposes built out. Increased urbanization reduces permeable surfaces and developed land to absorb rainfall. This lack of open ground forces water to remain on the surface and rapidly accumulate. If it were not for the massive flood control system, flooding would be a much more common occurrence. And the tendency is towards even less and less open land. 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.

IV. Flood Terminology

A. 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.

B. 100-Year Flood

The 100-year flooding event is the flood having a one percent 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. Map 1-4MAP4 illustrates the 100-year floodplain in the City of San Clemente.

C. 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 National Flood Insurance Program (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 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.

D. Flood Fringe

The flood fringe refers to the outer portions of the floodplain, beginning at the edge of the floodway and continuing outward. In Section 15.76.050 of the City of San Clemente Municipal Code, Building and Construction Ordinance, the flood fringe is defined as that area of the floodplain on either side of the "regulatory floodway" where encroachment may be permitted.

E. Development

For floodplain ordinance purposes, development is broadly defined by the City of San Clemente to mean "any manmade change to improved or unimproved real estate, including but not limited to buildings or other structures, mining, dredging, filling, grading, paving, excavation, or drilling operations located within the area of special flood hazard." The definition of development for floodplain purposes is generally broader and includes more activities than the definition of development used in other sections of local land use ordinances.

F. 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 choose to 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.

V. Characteristics of Flooding

Only two types of flooding affect the City of San Clemente: urban and coastal flooding (see description below). In addition, any low-lying area has the potential to flood. 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.

A. Riverine Flooding

Riverine flooding is the overbank flooding of rivers and streams. The natural processes of riverine flooding add sediment and nutrients to fertile floodplain areas. Flooding in large river systems typically results from large-scale weather systems that generate prolonged rainfall over a wide geographic area, causing flooding in hundreds of smaller streams, which then drain into the major rivers. The City of San Clemente is not subject to Riverine Flooding

Shallow area flooding is a special type of riverine flooding. FEMA defines shallow flood hazards as areas that are inundated by the 100-year flood with flood depths of only one to three feet. These areas are generally flooded by low velocity sheet flows of water.

B. 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.

Almost 80 percent of the area in the City of San Clemente 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. During intense storm events storm drains can back up with vegetative debris causing additional, localized flooding.

C. Coastal Flooding

Coastal Flooding is usually the result of a combination of abnormally high tides occurring during excessive rainfall. The result is essentially a storm surge with ocean water exceeding the normal high tide line. The increased surge blocks normal runoff and creates a backup. Improvements located at or near the high tide line can and have experienced flooding due to coastal flooding.

VI. Dam Failure Flooding

Loss of life and damage to structures, roads, and utilities may result from a dam failure. Economic losses can also result from a lowered tax base and reduced utility revenues These effects would certainly accompany the failure of the single dam in the City of San Clemente. There is one dam in the City of San Clemente which is located in the northwestern portion of the City and is owned and operated by South Coast Water District. It holds 45-48 million of gallons of water. Because dam failure can have severe consequences, FEMA requires that all dam owners develop Emergency Action Plans (EAP) for warning, evacuation, and post-flood actions. Although there may be coordination with county officials in the development of the EAP, the responsibility for developing potential flood inundation maps and facilitation of emergency response is the responsibility of the dam owner. For more detailed information regarding dam failure flooding, and potential flood inundation zones for the single dam in the city refer to the City of San Clemente Emergency Action Plan.

There have been a total of 45 dam failures in California, since the 19th century. The significant dam failures in Southern California are listed in Table 8-2

Table 8-2 Dam Failures in Southern California			
Sheffield	Santa Barbara	1925	Earthquake slide
Puddingstone	Pomona	1926	Overtopping during construction
Lake Hemet	Palm Springs	1927	Overtopping
Saint Francis	San Francisquito Canyon	1928	Sudden failure at full capacity through foundation, 426 deaths
Cogswell	Monrovia	1934	Breaching of concrete cover
Baldwin Hills	Los Angeles	1963	Leak through embankment turned into washout, 3 deaths
http://cee.engr.ucdavis.edu/faculty/lund/dams/Dam_History_Page/Failures.htm			

The two most significant dam failures are the St. Francis Dam in 1928 and the Baldwin Hills Dam in 1963.

"The failure of the St. Francis Dam, and the resulting loss of over 500 lives in the path of a roaring wall of water, was a scandal that resulted in the almost complete destruction of the reputation of its builder, William Mulholland.

Mulholland was an immigrant from Ireland who rose up through the ranks of the city's water department to the position of chief engineer. It was he who proposed, designed, and supervised the construction of the Los Angeles Aqueduct, which brought water from the Owens Valley to the city. The St. Francis Dam, built in 1926, was 180 feet high and 600 feet long; it was located near Saugus in the San Francisquito Canyon.

The dam gave way on March 12, 1928, three minutes before midnight. Its waters swept through the Santa Clara Valley toward the Pacific Ocean, about 54 miles away. 65 miles of valley was devastated before the water finally made its way into the ocean between Oxnard and Ventura. At its peak the wall of water was said to be 78 feet high; by the time it hit Santa Paula, 42 miles south of the dam, the water was estimated to be 25 feet deep. Almost everything in its path was destroyed: livestock, structures, railways, bridges, and orchards. By the time it was over, parts of Ventura County lay under 70 feet of mud and debris. Over 500 people were killed and damage estimates topped $20 million."[xli]

The Baldwin Hills dam failed during the daylight hours, and was one of the first disaster events documented a live helicopter broadcast.

The Baldwin Hills Dam collapsed with the fury of a thousand cloudbursts, sending a 50-foot wall of water down Cloverdale Avenue and slamming into homes and cars on Dec. 14, 1963.

Five people were killed. Sixty-five hillside houses were ripped apart, and 210 homes and apartments were damaged. The flood swept northward in a V-shaped path roughly bounded by La Brea Avenue and Jefferson and La Cienega boulevards.

Baldwin Hills Dam - Dark spot in upper right hand quadrant shows the beginning of the break in the dam.

The earthen dam that created a 19-acre reservoir to supply drinking water for West Los Angeles residents ruptured at 3:38 p.m. As a pencil-thin crack widened to a 75-foot gash, 292 million gallons surged out. It took 77 minutes for the lake to empty. But it took a generation for the neighborhood below to recover. And two decades passed before the Baldwin Hills ridge top was reborn.
The cascade caused an unexpected ripple effect that is still being felt in Los Angeles and beyond. It foreshadowed the end of urban-area earthen dams as a major element of the Department of Water and Power's water storage system. It prompted a tightening of Division of Safety of Dams control over reservoirs throughout the state.

The live telecast of the collapse from a KTLA-TV helicopter is considered the precursor to airborne news coverage that is now routine everywhere."[xlii]

VII. Debris Flows

Another flood related hazard that can affect certain parts of the Southern California region are debris flows. Most typically debris flows occur in mountain canyons and the foothills against the San Gabriel Mountains. However, any hilly or mountainous area with intense rainfall and the proper geologic conditions may experience one of these very sudden and devastating events.

> "Debris flows, sometimes referred to as mudslides, mudflows, lahars, or debris avalanches, are common types of fast-moving landslides. These flows generally occur during periods of intense rainfall or rapid snow melt. They usually start on steep hillsides as shallow landslides that liquefy and accelerate to speeds that are typically about 10 miles per hour, but can exceed 35 miles per hour. The consistency of debris flow ranges from watery mud to thick, rocky mud that can carry large items such as boulders, trees, and cars. Debris flows from many different sources can combine in channels, and their destructive power may be greatly increased. They continue flowing down hills and through channels, growing in volume with the addition of water, sand, mud, boulders, trees, and other materials. When the flows reach flatter ground, the debris spreads over a broad area, sometimes accumulating in thick deposits that can wreak havoc in developed areas."[xliii]

VIII. 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. The City of San Clemente is affected by coastal flooding, primarily during the winter months.

IX. 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. The City of San Clemente requires engineer certification to ensure that proposed developments will not adversely affect the flood carrying capacity of the Special Flood Hazard Area (SFHA). 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.

X. 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. In the City of San Clemente, the NFIP and related building code regulations went into effect on December 04, 1979. 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.

A development permit shall be obtained before construction or development begins within any area of special flood hazards, areas of flood-related erosion hazards or areas of mudslide (i.e., mudflow) established in Section 15.76.230. Application for a development permit shall be made on forms furnished by the Floodplain Administrator and may include, but not be limited to: plans in duplicate, drawn to scale showing the nature, location, dimensions, and elevation of the area in question; existing or proposed structures, fill, storage of materials, drainage facilities; and the location of the foregoing. Specifically, the following information is required:

A site plan, including but not limited to:

- For all proposed structures, spot ground elevations at building corners and twenty (20) foot or smaller intervals along the foundation footprint, or one (1) foot contour elevations throughout the building site; and
- Proposed locations of water supply, sanitary sewer, and utilities; and
- If available, the base flood elevation from the flood insurance study and/or flood insurance rate map; and
- If applicable, the location of the regulatory floodway; and

A foundation design detail, including but not limited to:

- Proposed elevation in relation to mean sea level, of the lowest floor (including basement) of all structures; and

- For a crawl-space foundation, location and total net area of foundation openings as required in Section 15.76.150(C)(4) and FEMA Technical Bulletins 1-93 and 7-93; and

- For foundations placed on fill, the location and height of fill, and compaction requirements (compacted to ninety-five (95) percent using the Standard Proctor Test method); and

- Proposed elevation in relation to mean sea level to which any nonresidential structure will be flood proofed, as required in Section 15.76.150(3) of this chapter and FEMA Technical Bulletin TB 3-93; and

All appropriate certifications listed in Section 15.76.140(D) of this chapter; and

Description of the extent to which any watercourse will be altered or relocated as a result of proposed development. (Ord. 1265 § 1 (part), 2002)

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. It is estimated that the flood maps have been prepared for all the populated area.

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 latest FEMA FIRM map for the City of San Clemente was

completed in February 18, 2004.

XI. 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. About 85% to 90% of all flood-related damage from past floods in the City of San Clemente is located outside the boundaries of the FEMA's FIRMs.

The use of GIS (Geographic Information System) is an important tool for flood hazard mapping. FIRM maps can be imported directly into GIS, which allows for GIS analysis of flood hazard areas.

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.

FEMA and the Environmental Systems Research Institute (ESRI), a private company, have formed a partnership to provide multi-hazard maps and information to the public via the Internet. ESRI produces GIS software, including ArcViewC9 and ArcInfoC9. The ESRI web site has information on GIS technology and downloadable maps. The hazards maps provided on the ESRI site are intended to assist communities in evaluating geographic information about natural hazards. Flood information for most communities is available on the ESRI web site. Visit www.esri.com for more information.

XII. Hazard Assessment

A. 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.

B. Data Sources

FEMA mapped the 100 -year and 500-year floodplains through the Flood

Insurance Study (FIS) in conjunction with the United States Army Corps of Engineers (USACE) in August of 1987. There were previous studies done, including a Housing and Urban Development (HUD) study, which mapped the floodplain in March of 1978. The county has updated portions of the USACE and FEMA maps through smaller drainage studies in the county since that time.

C. 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 natural 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.

XIII. 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 San Clemente 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. The data used to develop these models is based on hydrological analysis of landscape features. Changes in the landscape, often associated with human development, can alter the flow velocity and the severity of damage that can be expected from a flood event.

Using GIS technology and flow velocity models, it is possible to map the damage that can be expected from flood events over time. It is also possible to pinpoint the effects of certain flood events on individual properties. At the time of publication of this plan, data was insufficient to conduct a risk analysis for flood events in the City of San Clemente. However, the current mapping projects will result in better data that will assist in understanding risk. This plan includes recommendations for building partnerships that will support the development of a flood risk analysis in the City of San Clemente.

XIV. Community Flood Issues

A. 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 are extensive. Development in the floodplains of the City of San Clemente will continue to be at risk from flooding because flood damage occurs on a regular basis throughout the county. Property loss from floods strikes both private and public property. Losses in the City of San Clemente over the past 25 years have totaled approximately $9,000,000.

B. 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.

C. Manufactured Homes

Statewide, the 1996 floods destroyed 156 housing units. Of those units, 61 % were mobile homes and trailers. Many older manufactured home parks are located in floodplain areas. Manufactured homes have a lower level of structural stability than stick-built homes, and must be anchored to provide additional structural stability during flood events. Because of confusion in the late 1980s resulting from multiple changes in NFIP regulations, there are some communities that do not actively enforce anchoring requirements. Lack of enforcement of manufactured home construction standards in floodplains can contribute to severe damages from flood events.

According to the City of San Clemente Planning Division, there are no mobile home parks in the 100-year floodplain.

D. 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.

E. 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.

F. Roads

During natural hazard events, or any type of emergency or disaster, dependable road connections are critical for providing emergency services. Roads systems in the City of San Clemente 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.

G. Bridges

Bridges are key points of concern during flood events because they are important links in road networks, river crossings, and they can be obstructions in watercourses, inhibiting the flow of water during flood events. The bridges in the City of San Clemente are state, county, city, or privately owned. A state-designated inspector must inspect all state, counties, and city bridges every two years; but private bridges are not inspected, and can be very dangerous. The inspections are rigorous, looking at everything from seismic capability to erosion and scour.

There are no identified bridges in the City of San Clemente currently being upgraded by replacing the earthquake resistant bearing pads using county funds.

H. Storm Water Systems

Local drainage problems can occur where storm water runoff enters culverts or goes underground into storm sewers.

These identified drainage areas are natural canyons that drain to the ocean, some enter into culverts and underground drainage. A key mitigation action ongoing in the City is the employment of the Orange County Conservation Corps in the fall of each year to clean out the brush and other impediments to water drainage. An inspection is conducted after each significant rainfall event on approximately 85% of the drainage facilities to ensure no damage has occurred. If damage is identified, appropriate repairs are made.

The Utilities Department is responsible for all underground maintenance, while the Maintenance Department is responsible for above ground maintenance. The Utilities Department employs a system using remote television cameras that traverse the interior of piping to identify structural failures.

I. Water/Wastewater Treatment Facilities

The City of San Clemente provides water to the residents as part of its municipal services.

J. Water Quality

The San Diego Regional Water Quality Control Board has identified the Pacific shoreline of San Clemente as being impaired for bacterial indicators. Prima Deshecha Canada and Segunda Deshecha Canada have also been identified as being impaired for turbidity and phosphorus, according to the 2002 Clean Water Act Section 303(d) list of impaired waterbodies, available at http://swrcb.ca.gov/rwqcb9.

XV. Existing Flood Mitigation Activities

Flood mitigation activities listed here include current mitigation programs and activities that are being implemented by the City of San Clemente agencies or organizations.

A. City of San Clemente Codes

The City of San Clemente uses building codes, zoning codes, and various planning strategies to address the goals which aim at restricting development in areas of known hazards, and applying the appropriate safeguards. A development permit shall be obtained before construction

or development begins within any area of special flood hazards, areas of flood-related erosion hazards or areas of mudslide (i.e., mudflow) established in Section 15.76.230. Application for a development permit

shall be made on forms furnished by the Floodplain Administrator and may include, but not be limited to: plans in duplicate drawn to scale showing the nature, location, dimensions, and elevation of the area in question; existing or proposed structures, fill, storage of materials, drainage facilities; and the location of the foregoing. Specifically, the following information is required:

A site plan, including but not limited to:

- For all proposed structures, spot ground elevations at building corners and twenty (20) foot or smaller intervals along the foundation footprint, or one (1) foot contour elevations throughout the building site; and

- Proposed locations of water supply, sanitary sewer, and utilities; and

- If available, the base flood elevation from the flood insurance study and/or flood insurance rate map; and

- If applicable, the location of the regulatory floodway; and

A foundation design detail, including but not limited to:

- Proposed elevation in relation to mean sea level, of the lowest floor (including basement) of all structures; and

- For a crawl-space foundation, location and total net area of foundation openings as required in Section 15.76.150(C)(4) of this chapter and FEMA Technical Bulletins 1-93 and 7-93; and

- For foundations placed on fill, the location and height of fill, and compaction requirements (compacted to ninety-five (95) percent using the Standard Proctor Test method); and

- Proposed elevation in relation to mean sea level to which any nonresidential structure will be flood proofed, as required in Section 15.76.150(3) of this chapter and FEMA Technical Bulletin TB 3-93; and

- All appropriate certifications listed in Section 15.76.140(D) of this chapter; and

Description of the extent to which any watercourse will be altered or relocated as a result of proposed development. (Ord. 1265 § 1 (part), 2002)

B. Mitigation Requirements

Title 15 BUILDINGS AND CONSTRUCTION

Chapter 15.76 FLOOD DAMAGE PREVENTION*

15.76.080 Compliance.

No structure or land shall hereafter be constructed, located, extended, converted or altered without full compliance with the terms of this chapter and other applicable regulations. Violations of the provisions of this chapter by failure to comply with any of its requirements (including violations of conditions and safeguards established in this chapter in connection with conditions) shall constitute a misdemeanor. Nothing shall prevent the City Council from taking such lawful action as is necessary to prevent or remedy any violation. (Ord. 1265 § 1 (part), 2002)

C. Acquisition and Protection of Open Space in the Floodplain

Current efforts to increase public open space in the City of San Clemente have been paired with the need to restore and preserve natural systems that provide wildlife habitat and help to mitigate flood events. Public parks and publicly owned open spaces can provide a buffer between flood hazards and private property.

D. Water Districts

Ninety five per cent of the potable water for the City of San Clemente is provided by the Metropolitan Water District, the remaining five per cent is supplied by two wells owned and operated by the city. South Coast Water District operates the transmission main and most of the remainder of the piping is owned and maintained by the city. City owned distribution system is comprised of 70-80 per cent AC and 20 per cent is Ductile Iron. City maintained piping is approximately 180 miles in length. Within the city water distribution system are 28 different pressure zones, 14 storage reservoirs, 15 pumping stations and a 1.5 million gallons per day water filtration plant. The State of California Department of Health Services has rated the City Water System as D-4, a rating given based on system complexity and population, the highest level is a D-5 for which the city expects to achieve in the near future due to population growth.

XVI. Riparian Areas

There are no Riparian areas within the City of San Clemente

XVII. Wastewater Management

Wastewater Utilities is responsible for the operation, maintenance and repair of the City's wastewater collection, treatment and disposal facilities. Collection and transportation of the community's wastewater to the treatment facility is accomplished through an underground network of pipes and pump stations. At the treatment facility, the wastewater flows through a series of physical, biological and chemical treatment processes, which remove the wastes from the water to diminish its environmental impact. The facility can also manufacture up to 2.2 MGD of reclaimed water for delivery to two authorized use sites

XVIII. Wetlands

Many floodplain and stream-associated wetlands absorb and store storm water flows, which reduces flood velocities and stream bank erosion. Preserving these wetlands reduces flood damage and the need for expensive flood control devices such as levees. When the storms are over, many wetlands augment summer stream flows by slowly releasing the stored water back to the stream system. Wetlands are highly effective at removing nitrogen, phosphorous, heavy metals, and other pollutants from water. For this reason, artificial wetlands are often constructed for cleaning storm water runoff and for tertiary treatment (polishing) of wastewater.

XIX. Stormwater Systems

The United States Congress passed the Clean Water Act (33 USC Section 1251 et sq., as amended, including Section 402(p) therein) as a mandate, in part, that cities, obtain permits to "effectively prohibit non-storm water discharges into the storm sewers" and "require controls to reduce the discharge of pollutants to the maximum extent practicable." This permitting authority has been delegated by the United States Environmental Protection Agency (EPA) to the state of California, which has authorized the State Water Resources Control Board and its local regulatory agencies, the Regional Water Quality Control Boards, to control non-point source discharges to California's waterways.

The Santa Ana and San Diego Regional Water Quality Control Boards have addressed the obligation to implement the Clean Water Act by issuing waste discharge requirements for the County of Orange, Orange County Flood Control District and the incorporated cities of Orange County. These permits are collectively referred to as the National Pollution Discharge Elimination System Permits or NPDES permits.

San Clemente along with other cities in south Orange County is under the San Diego Regional Water Quality Control Board (SDRWQCB) jurisdiction. The permit can be read and printed from the SDRWQCB website

http://www.swrcb.ca.gov/rwqcb9/programs/oc_stormwater.html.

The mission of the City's Urban Runoff Management/Water Quality Program is to protect and preserve the community public health and the environment through implementation of activities to reduce and eliminate urban runoff pollution from industrial, commercial, new development/construction, and residential areas that may enter the storm drainage system. This program is part of the Storm Water Quality Management Programs developed by the Orange County Environmental management Agency, local cities, and other agencies which participate in the National Pollutant Discharge Elimination System (NPDES). Their responsibilities involve encouraging the public to help protect water quality, monitoring runoff in the storm drain system, managing the NPDES permit process for municipalities, investigating illegal disposal and maintaining storm drains. Detailed information about the City's Urban Runoff Management/Water Quality Program is located at http://www.projectsurf.org.

The City's goals are:

- Provide continuous pollution prevention public education and outreach to develop community awareness and environmental stewardship
- Protect and preserve streams, ocean, shoreline/beaches, and reef ecosystems from pollutants
- Provide Best Management Practices to the community on ways to reduce the amount of urban runoff pollution from various activities
- Achieve and maintain compliance with the storm water/urban runoff permit issued by the San Diego Regional Water Quality Control Board
- Implement a cost effective program that is sustainable
- Enforce urban runoff water regulations and the municipal code

The Storm Water Local Implementation Plan (LIP) is the City's local plan for implementing a variety of activities to comply with storm water permit requirements. The LIP is based on model programs and guidance developed jointly by the County of Orange and Orange County cities. The City's LIP is provided at http://www.projectsurf.org

XX. Flood Management Projects

Flood management structures can assist in regulating flood levels by adjusting water flows upstream of flood-prone areas.

Within Orange County are 13 watersheds. A watershed is "the geographic area draining into a river system, ocean or other body of water through a single outlet and include the receiving waters." Watersheds are usually bordered and separated from other watersheds, by mountain ridges or other naturally elevated areas.

The San Clemente watershed covers an area of 31.8 square miles in the southernmost corner of Orange County. Its main tributaries are Prima Deshecha Canada and Segunda Deshecha Canada.

Detailed street, storm drain & flood control maps for Orange County and the City of San Clemente are provided at http://www.ocwatersheds.com/watersheds/intro_highres_map.asp.

XXI. Community Issues Summary

The City of San Clemente works to mitigate problems regarding flood issues when they arise. Some areas in the City of San Clemente are more susceptible to flooding issues, and have incurred repetitive losses. The City of San Clemente Emergency Management has documented the problem areas in the community, and they are listed in Table 8-3.

Table 8-3 Locations of Some Identified Flooding Problems

LOCATIONS OF SOME IDENTIFIED FLOODING PROBLEMS
Marquita Canyon
Trafalgar Canyon
Boca Del Canyon
Lobos Marinos Canyon
Junipero Canyon
Montalvo Canyon
San Pablo Canyon
Salvador Canyon
Verde Canyon
El Levante Canyon
Avenida De La Estrella Canyon
Frontera Inlet
Vista Torito Canyon
W. San Antonio Canyon
Inclinado-Cadena Canyon
Vista Azul Canyon
Patero De Oro-De La Paz

Source: The City of San Clemente Emergency Planning Services, 2004.

XXII. Flood Mitigation Action Items

The flood mitigation action items provide direction on specific activities that organizations and residents in the City of San Clemente can undertake to reduce risk and prevent loss from flood events. Each action item is followed by ideas for implementation, which can be used by the steering committee and local decision makers in pursuing strategies for implementation.

Natural Hazard	**SHORT TERM ACTIVITY - FLOOD #1**
Action Item	Analyze repetitive flood property within the City of San Clemente and identify feasible mitigation options
Coordinating Organization	Hazard Mitigation Advisory Committee
Ideas for Implementation	Identify appropriate and feasible mitigation activities for identified repetitive flood properties. Funding may be available through FEMA' s Hazard Mitigation Grant and Flood Mitigation Assistance Programs and the Pre-disaster Mitigation Program; Contact repetitive loss property owners to discuss mitigation opportunities, and determine interest should future project opportunities arise; and Explore options for incentives to encourage property owners to engage in mitigation
Time line	2 years
Constraints	As personnel hours and time permit

Plan Goals Addressed		**X**	**Protect Life and Property**
	Public Awareness		**Natural Systems**
X	**Partnerships and Implementation**		**Emergency Services**

Natural Hazard	**SHORT TERM ACTIVITY - FLOOD #2**
Action Item	Recommend revisions to requirements for development within the floodplain, where appropriate.
Coordinating Organization	Hazard Mitigation Advisory Committee
Ideas for Implementation	Evaluate elevation requirements for new residential and nonresidential structures in the unincorporated floodplain area; Explore raising the base elevation requirement for new residential construction to two or three feet above base flood elevation, or greater. An increased elevation standard is one activity the county can engage in to receive credit from the NFIP Community Rating System Program; Identify opportunities to upgrade Federal Insurance Rate Map, and arrange for Cooperative Technical Partnership mapping upgrades for select areas; and Identify alternatives to reduce development in the floodplain
Time line	2 years
Constraints	As personnel hours and time permit

Plan Goals Addressed		**X**	**Protect Life and Property**
	Public Awareness		**Natural Systems**
	Partnerships and Implementation		**Emergency Services**

Natural Hazard	**SHORT TERM ACTIVITY - FLOOD #3**		
Action Item	Develop better flood warning systems.		
Coordinating Organizations	County Emergency Management, County Public and Government Relations, County Flood Control		
Ideas for Implementation	Coordinate with appropriate organizations to evaluate the need for more stream gauges; and Distribute information regarding flooding to the general public efficiently		
Time line	2 years		
Constraints	As personnel hours and time permit		
Plan Goals Addressed		**X**	**Protect Life and Property**
	Public Awareness		**Natural Systems**
	Partnerships and Implementation	**X**	**Emergency Services**

Natural Hazard	**LONG TERM ACTIVITY - FLOOD #1**		
Action Item	Enhance data and mapping for floodplain information within the city, and identify and map flood-prone areas outside of designated floodplains		
Coordinating Organization	City of San Clemente GIS, Information Services Division		
Ideas for Implementation	Apply for FEMA's cooperative technical partnership using the 2-foot contour interval floodplain mapping data acquired by the City of San Clemente GIS; Use WES inventory and mapping data to update the flood-loss estimates for the City of San Clemente; and		
Time line	3 years		
Constraints	As personnel hours and time permit		
Plan Goals Addressed		**X**	**Protect Life and Property**
	Public Awareness		**Natural Systems**
	Partnerships and Implementation		**Emergency Services**

Natural Hazard	**LONG TERM ACTIVITY - FLOOD #2**
Action Item	Encourage management strategies to preserve open space for flood mitigation, fish habitat, and water quality in the floodplain
Coordinating Organizations	City of San Clemente Planning Division and Public Works Department
Ideas for Implementation	Develop a comprehensive strategy for acquiring and managing floodplain open space in the City of San Clemente; Explore funding for property acquisition from federal (e,g" FEMA Hazard Mitigation Grant Program), state, regional, and local governments, as well as private and non-profit organizations, trails programs, fish programs as well as options for special appropriations; Develop a regional partnership between flood mitigation, fish habitat, and water quality enhancement organizations/programs to improve educational programs; Identify sites where environmental restoration work can benefit flood mitigation, fish habitat, and water quality; Work with landowners to develop flood management practices that provide healthy fish habitat; and Identify existing watershed education programs and determine which programs would support a flood education component
Time line	5 years
Constraints	As personnel hours and time permit

Plan Goals Addressed		**X**	**Protect Life and Property**
	Public Awareness	**X**	**Natural Systems**
	Partnerships and Implementation		**Emergency Services**

Natural Hazard	**LONG TERM ACTIVITY - FLOOD #3**
Action Item	Establish a framework to compile and coordinate surface water management plans and data throughout the city
Coordinating Organizations	City of San Clemente Planning Division and Public Works Department
Ideas for Implementation	Develop surface water management plans for areas that are not currently within surface water management plan boundaries.
Time line	5 years
Constraints	As personnel hours and time permit

Plan Goals Addressed		**X**	**Protect Life and Property**
	Public Awareness		**Natural Systems**
X	**Partnerships and Implementation**		**Emergency Services**

Flood Resource Directory

The following resource directory lists the resources and programs that can assist county communities and organizations. The resource directory will provide contact information for local, county, regional state and federal programs that deal with natural hazards.

County Resources

Orange County
Resources & Development Management Department

Level: County Hazard: Multi http://www.ocpfrd.com/Services_PW.asp

H.G. Osborne Building - PFRD Headquarters
300 North Flower Street, Santa Ana, CA
92703-5000.
Santa Ana, CA 92703-5000. Ph: 714.834.2300

Notes: The Orange 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

State Resources

Governor's Office of Emergency Services (OES)

Level: State Hazard: Multi http://www.oes.ca.gov/Operational/OESHome.nsf/1?OpenForm

P.O. Box 419047.

Rancho Cordova, CA 95741-9047 Ph: 916 845- 8911 Fx: 916 845- 8910

Notes: Ensures the state is ready and able to mitigate against, prepare for, respond to, and recover from the effects of emergencies that threaten lives, property, and the environment. Coordinates the activities of all state agencies relating to preparation and implementation of the State Emergency Plan. Also coordinates the response efforts of state and local agencies to ensure maximum effect with minimum overlap and confusion. Additionally, coordinates the integration of federal resources into state and local response and recovery operations.

California Resources Agency

Level: State Hazard: Multi http://resources.ca.gov/

1416 Ninth Street, Suite 1311..

Sacramento, CA 95814 Ph: 916-653-5656 Fx: 916 653-8102

Notes: Restore, protect and manage the state's natural, historical and cultural resources for current and future generations using creative approaches and solutions based on science, collaboration and respect for all the communities and interests involved.

California Department of Water Resources (DWR)

Level: State Hazard: Flood http://wwwdwr.water.ca.gov/

1416 9th Street..

Sacramento, CA 95814 Ph: 916-653-6192 Fx: 916 653-4684

Notes: 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 http://www.consrv.ca.gov/index/

655 S. Hope Street, #700

Los Angeles, CA 90017-2321 Ph: 213-239-0878 Fx: 213-239-0984

Notes: Provides services and information that promote environmental health, economic vitality, informed land-use decisions and sound management of our state's natural resources.

Federal Resources and Programs

Federal Emergency Management Agency, Region IX			
Level: Federal	Hazard: Multi	http://www.fema.gov/ /	
1111 Broadway, Suite 1200			
Oakland, CA 94607		Ph: 510-627-7100	Fx: 510-627-7112
Notes: FEMA provides maps of flood hazard areas, various publications related to flood mitigation, funding for flood mitigation projects, and technical assistance, FEMA also operates the National Flood Insurance Program. FEMA' s mission is to reduce loss of life and property and protect the nation's critical infrastructure from all types of hazards through a comprehensive, risk-based, emergency management program of mitigation, preparedness, response and recovery.			

Federal Emergency Management Agency, Mitigation Division			
Level: Federal	Hazard: Multi	http://www.fema.gov/fima/	
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.			

FEMA' s List of Flood Related Websites

This site contains a long list of flood related Internet sites from "American Heritage Rivers" to "The Weather Channel" and is a good starting point for flood information on the Internet.
Contact: Federal Emergency Management Agency, Phone: (800) 480-2520
Website: http://www.fema.gov/nfip/related.htm

National Flood Insurance Program (NFIP)

National Floodplain Insurance Program (NFIP)			
Level: Federal	Hazard: Flood	http://www.fema.gov/nfip/	
500 C Street, S.W.			
Washington, D.C. 20472		Ph: 202-566-1600	Fx:
Notes: Floodplain management is the operation of a community program of corrective and preventative measures for reducing flood damage. These measures take a variety of forms and generally include zoning, subdivision, or building requirements, and special-purpose floodplain ordinances. A community's agreement to adopt and enforce floodplain management ordinances, particularly with respect to new construction is an important element in making flood insurance available to home and businesses owners.			

In Southern California many cities lie within flood zones as defined in FEMA Flood Maps. The City of San Clemente is a community within a designated flood zone. Flood insurance is available to citizens in communities that adopt and implement NFIP building standards. The standards are applied to development that occurs within a delineated floodplain, a drainage hazard area, and properties' within 250 feet of a floodplain boundary. These areas are depicted on federal Flood Insurance Rate Maps available through the county.

The Floodplain Management Association

Floodplain Management Association			
Level: Federal	Hazard: Flood	http://www.floodplain.org/	
P.O. Box 50891			
Sparks, NV 89435-0891		Ph: 775-626-6389	Fx: 775-626-6389
Notes: The Floodplain Management website was established by the Floodplain Management Association (FMA) to serve the entire floodplain management community. It includes full-text articles, a calendar of upcoming events, a list of positions available, an index of publications available free or at nominal cost, a list of associations, a list of firms and consultants in floodplain management, an index of newsletters dealing with flood issues (with hypertext links if available), a section on the basics of floodplain management, a list of frequently asked questions (FAQs) about the Website, and a catalog of Web links.			

The Association of State Floodplain Managers

The Association of State Floodplain Managers			
Level: Federal	Hazard: Flood	http://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. ASFPM fosters communication among those responsible for flood hazard activities, provides technical advice to governments and other entities about proposed actions or policies that will affect flood hazards, and encourages flood hazard research, education, and training. The ASFPM Web site includes information on how to become a member, the organization's constitution and bylaws, directories of officers and committees, a publications list, information on upcoming conferences, a history of the association, and other useful information and Internet links..			

National Weather Service			
Level: Federal	Hazard: Multi	http://www.srh.noaa.gov/data/forecasts/CAZ040.php?warncounty=CAC111&city=Oxnard	
520 North Elevar Street			
Oxnard, CA 93030		Ph: 805-988- 6615	Fx:
Notes: The National Weather Service provides flood watches, warnings, and informational statements for the City of San Clemente...			

Office of Hydrology, National Weather Service			
Level: Federal	Hazard: Flood	http://www.nws.noaa.gov/oh/	
1325 East West Highway, SSMC2			
Silver Spring, MD 20910		Ph: 301-713-1658	Fx: 301-713-0963
Notes: The National Weather Service s Office of Hydrology (OH) and its Hydrological Information Center offer information on floods and other aquatic disasters, This site offers current and historical data including an archive of past flood summaries, information on current hydrologic conditions, water supply outlooks, an Automated Local Flood Warning Systems Handbook, Natural Disaster Survey Reports, and other scientific publications on hydrology and flooding.			

National Resources Conservation Service (NRCS), US Department of Agriculture

Hazard: Flood http://www.nws.noaa.gov/oh/

14th and Independence Ave., SW, Room 5105-A http://www.nrcs.usda.gov/

Washington, DC 20250 Ph: 202-720-7246 Fx: 202-720-7690

Notes: NRCS provides a suite of federal programs designed to assist state and local governments and landowners in mitigating the impacts of flood events. The Watershed Surveys and Planning Program and the Small Watershed Program provide technical and financial assistance to help participants solve natural resource and related economic problems on a watershed basis. The Wetlands Reserve Program and the Flood Risk Reduction Program provide financial incentives to landowners to put aside land that is either a wetland resource, or that experiences frequent flooding. The Emergency Watershed Protection Program (EWP) provides technical and financial assistance to clear debris from clogged waterways, restore vegetation, and stabilizing riverbanks. The measures taken under EWP must be environmentally and economically sound and generally benefit more that one property.

USGS Water Resources

Level: Federal/State Hazard: Flood http://water.usgs.gov/

6000 J Street Placer Hall

Sacramento, CA 95819-6129 Ph: 916-278-3000 Fx: 916-278-3070

Notes: This web page offers current US water news; extensive current (including real-time) and historical water data; numerous fact sheets and other publications; various technical resources; descriptions of ongoing water survey programs; local water information; and connections to other sources of water information.

Bureau of Reclamation Mid Pacific Regional Office
Federal Office Building

Level: Federal Hazard: Multi http://www.usbr.gov/

2800 Cottage Way

Sacramento CA 95825-1898 Ph: 916- 978-5000 Fx: 916- 978-5599

Notes: The mission of the Bureau of Reclamation is to manage, develop, and protect water and related resources in an environmentally and economically sound manner in the interest of the American public. The Bureau provides leadership and technical expertise in water resources development and in the efficient use of water through initiatives including conservation, reuse, and research. It protects the public and the environment through the adequate maintenance and appropriate operation of Reclamation's facilities and manages Reclamation's facilities to fulfill water user contracts and protect and/or enhance conditions for fish, wildlife, land, and cultural resources.

US Army Corps of Engineers

Level: Federal	Hazard: Multi	http://www.spl.usace.army.mil/
P.O. Box 532711		
Los Angeles CA 90053- 2325	Ph: 213-452- 3921	Fx:

Notes: The Corps of Engineers administers a permit program to ensure that the nation's waterways are used in the public interest. Any person, firm, or agency planning to work in waters of the United States must first obtain a permit from the Army Corps of Engineers. The Corps is responsible for the protection and development of the nation's water resources, including navigation, flood control, energy production through hydropower management, water supply storage and recreation.

Other National Resources

American Public Works Association

Level: Federal	Hazard: Multi	http://www.apwasandiego.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 committed to promoting the profession of public works. The San Diego/Imperial Chapter is committed to promoting sustainable public works projects in Southern California that improve the quality of life for the public.

Publications

NFlP Community Rating System Coordinator's Manual

Level: Federal	Hazard: Flood	http://www.fema.gov/nfip/crs
Indianapolis, IN	Ph: 800 480-2520	Fx:

Notes: This informative brochure explains how the Community Rating System works and what the benefits are to communities. It explains in detail the CRS point system, and what activities communities can pursue to earn points. These points then add up to the "rating" for the community, and flood insurance premium discounts are calculated based upon that "rating " The brochure also provides a table on the percent discount realized for each rating (1-10). Instructions on how to apply to be a CRS community are also included.

Floodplain Management: A Local Floodplain Administrator's Guide to the NFlP

Level: Federal Hazard: Flood : http://www.fema,gov/nfip/

National Flood Insurance Program

Indianapolis, IN Ph: 800 480-2520 Fx:

Notes: This document discusses floodplain processes and terminology. It contains floodplain management and mitigation strategies, as well as information on the NFIP, CRS, Community Assistance Visits, and floodplain development standards.

Flood Hazard Mitigation Planning: A Community Guide, (June 1997).

Level: Federal Hazard: Flood http://www.magnetstate.ma.us/dem/programs/mitigate

Massachusetts Flood Hazard Management Program

Ph: 617 626-1250 Fx:

Notes: This informative guide offers a 10-step process for successful flood hazard mitigation. Steps include: map hazards, determine potential damage areas, take an inventory of facilities in the flood zone, determine what is or is not being done about flooding, identify gaps in protection, brainstorm alternatives and actions, determine feasible actions, coordinate with others, prioritize actions, develop strategies for implementation, and adopt and monitor the plan.

Reducing Losses in High Risk Flood Hazard Areas: A Guidebook for Local Officials, (February 1987), FEMA-116.

Level: Federal Hazard: Flood http://www.fema,gov

Federal Emergency Management Agency

Ph: (800) 480-2520 Fx:

Notes: This guidebook offers a table on actions that communities can take to reduce flood losses. It also offers a table with sources for floodplain mapping assistance for the various types of flooding hazards, There is information on various types of flood hazards with regard to existing mitigation efforts and options for action (policy and programs, mapping, regulatory, non-regulatory). Types of flooding which are covered include alluvial fan, areas behind levees, areas below unsafe dams, coastal flooding, flash floods, fluctuating lake level floods, ground failure triggered by earthquakes, ice jam flooding, and mudslides.

Website: Flood Endnotes

xl. Ibid

xli. http://www.usc.edu/isd/archives/la/scandals/st_francis_dam.html

xlii. http://www.latimes.com/news/local/surroundings/la-me-surround11dec11,0,1754871.story?coll=la-adelphia-right-rail

xliii. http://www.fema.gov/rrr/talkdiz/landslide.shtm#what

SECTION 9 TSUNAMI

I. Why Are Tsunamis a Threat to Southern California?

History has shown that the probability of a tsunami in the City of San Clemente is an extremely low threat. As shown on the tsunami run-up map, the entire 4.7 miles of the City of San Clemente coastline could be impacted. The impact could cause loss of life, destruction of high priced homes and greatly affect the City's downtown and coastal businesses, and impact tourism. An analysis of a tsunami inundation potential was performed for the San Onofre Nuclear Generating Station. The findings suggest that if a 7.5 foot tsunami wave were to occur along the Doheny Beach area during a high tide, considerable damage would be expected to most public facilities on the beach and residences along the Capistrano Shores Trailer Park. Some loss of life may be possible. Reference City of San Clemente, Annex D, Storm/Flood/Tsunami Emergency Plan.

"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 big 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."[xliv]

II. 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.

III. What causes Tsunamis?

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.

A. 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.

B. 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.”[xlv] 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.[xlvi] Although all oceanic regions of the world can experience tsunamis, the most destructive and repeated occurrences of tsunamis are in the Pacific Rim region.

C. Tsunami Earthquakes

The September 2, 1992 earthquake (magnitude 7.2) was barely felt by residents along the coast of Nicaragua. Located well off-shore, the severity of shaking on a scale of I to XII, was mostly along the coast, and reached IIIat only a few places. Within a period of one hour 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."[xlvii]

IV. Tsunami Characteristics

A. 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.

B. 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 1000 feet or more, covering large expanses of land with water and debris.

C. 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.

V. Types of Tsunamis

A. 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.

The last large tsunami that caused widespread death and destruction throughout the Pacific was generated by an earthquake located off the coast of Chile in 1960. 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 United States West Coast 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).

B. History of Regional Tsunamis

a. Local

The 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.

b. Local History of Tsunamis

Tsunamis have been reported since ancient times. They 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 LA, Orange County, and San Diego coastal areas. In Orange County the tsunami wave reached heights of 20 feet or more above sea level. In 1964, following the Alaska 8.2 earthquake, tidal surges of approximately 4 feet to 5 feet hit the Huntington Harbor area causing moderate damage.

VI. Personal Interviews

Name: Bill Richardson
Title: City of Huntington Beach Lifeguard
Year: 1964 – Alaska Good Friday Earthquake and Tsunami
(paraphrased by Gloria Morrison)
I was on the lifeguard in the tower on the pier. We received warning by phone from the Fire Department who had received information from the National Weather Service. We were told to tell folks on the pier and beach that if the situation escalated they would be advised to evacuate the area and that they should be prepared to move quickly.

I witnessed heavy title surges on the beaches. The tide changed in 10 minutes from what it normally was to a very different tide. Normally it takes six hours to change and in 10 minutes it sucked water out and when it came in, it went over the berm, ¾ of the way across the beach. The accelerated tide within one hour came and went twice. The highs were extreme and the lows were extreme, very like our astronomical tides. I monitored the radio and heard of all the docks breaking loose in the harbor. The current was so strong and movement of water that the radio was being overwhelmed with calls for response. Only the two islands of Admiralty and Gilbert existed at the time.

Bill Richardson referred me to Walt Snyder, a Lifeguard Lt. at the time. Walt was in Huntington Harbor during this event.

Name: Walt Snyder
Title: City of Huntington Beach City Lifeguard, Lt. in the Harbor
Year: 1964 – Alaska Good Friday Earthquake and Tsunami
(paraphrased by Gloria Morrison)
I was called out at daybreak due to the tidal surges in the Huntington Harbour. I got in the City's only rescue boat. The tidal surges were huge and making whirlpools. They were moving at a much faster and higher rate than normal tide.

When the surges would come in, they would tear the boats away from their moorings. Then when the surges would go out, they would take the boats through the bridge at Pacific Coast Highway to the Seal Beach (Anaheim Landing Bridge) and when they hit the pilings it would tear the boats apart. The high tides were carrying the boats into the weapons station. When surges retreated, the boats would end up on dry land at the weapons station --- high and dry

and broken up.

In 1964 there were only about 200-300 boats in the harbor and today Walt estimated there are 3,500 plus boats. There were only 300-400 homes then and now he estimates an excess of 5,000. This occurred during a low tide. The sea wall in Huntington Harbour is 9'. Had this occurred during a high tide, Walt stated the surges would have easily gone over the sea walls and damaged many homes.

Table 9-1 Tsunami Events In California 1930-2004

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	Unknown

Source: Worldwide Tsunami Database www.ngdc.noaa.gov

* Maximum Run up (M)-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.

VII. Tsunami Hazard Assessment

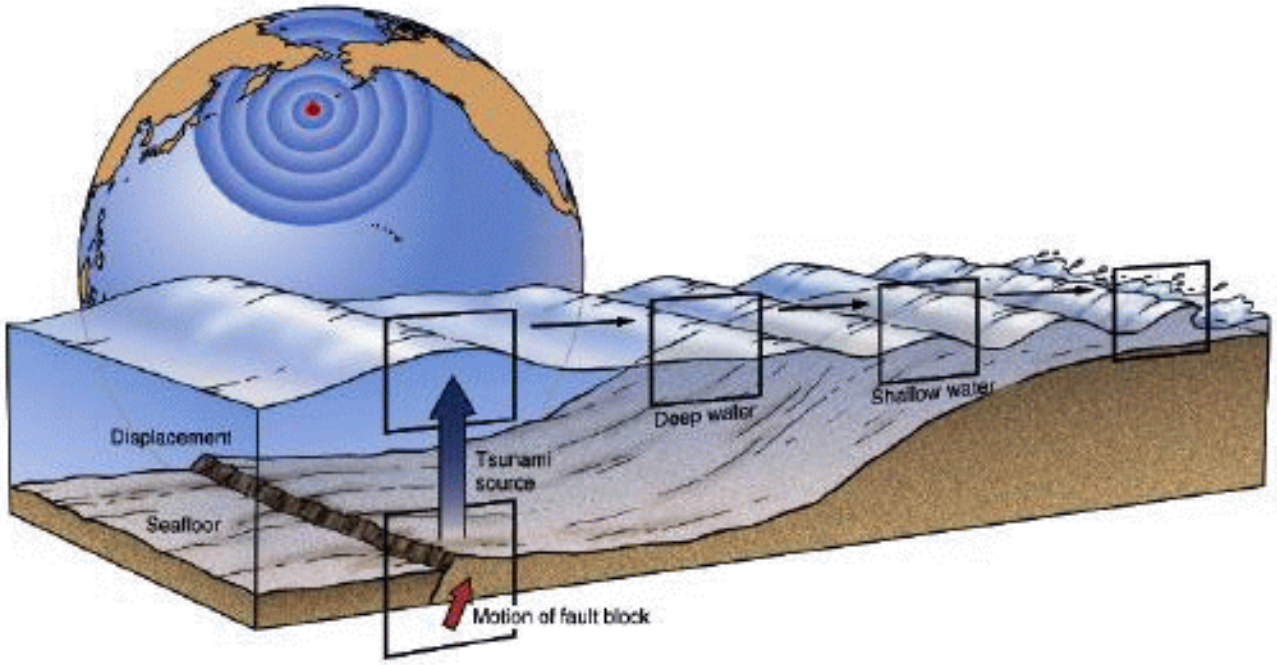
A. Hazard Identification

A tsunami threat to the City of San Clemente is considered low to moderate. The physiography of the area is typical of the region, with a rather narrow, gently sloping coastal plain extending seaward from the uplands. The plain ends at the beach. Bluffs and canyons, narrow beaches and rolling hills give way moving north, to the flat lands of the Los Angeles Basin.

B. 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."[xlviii]

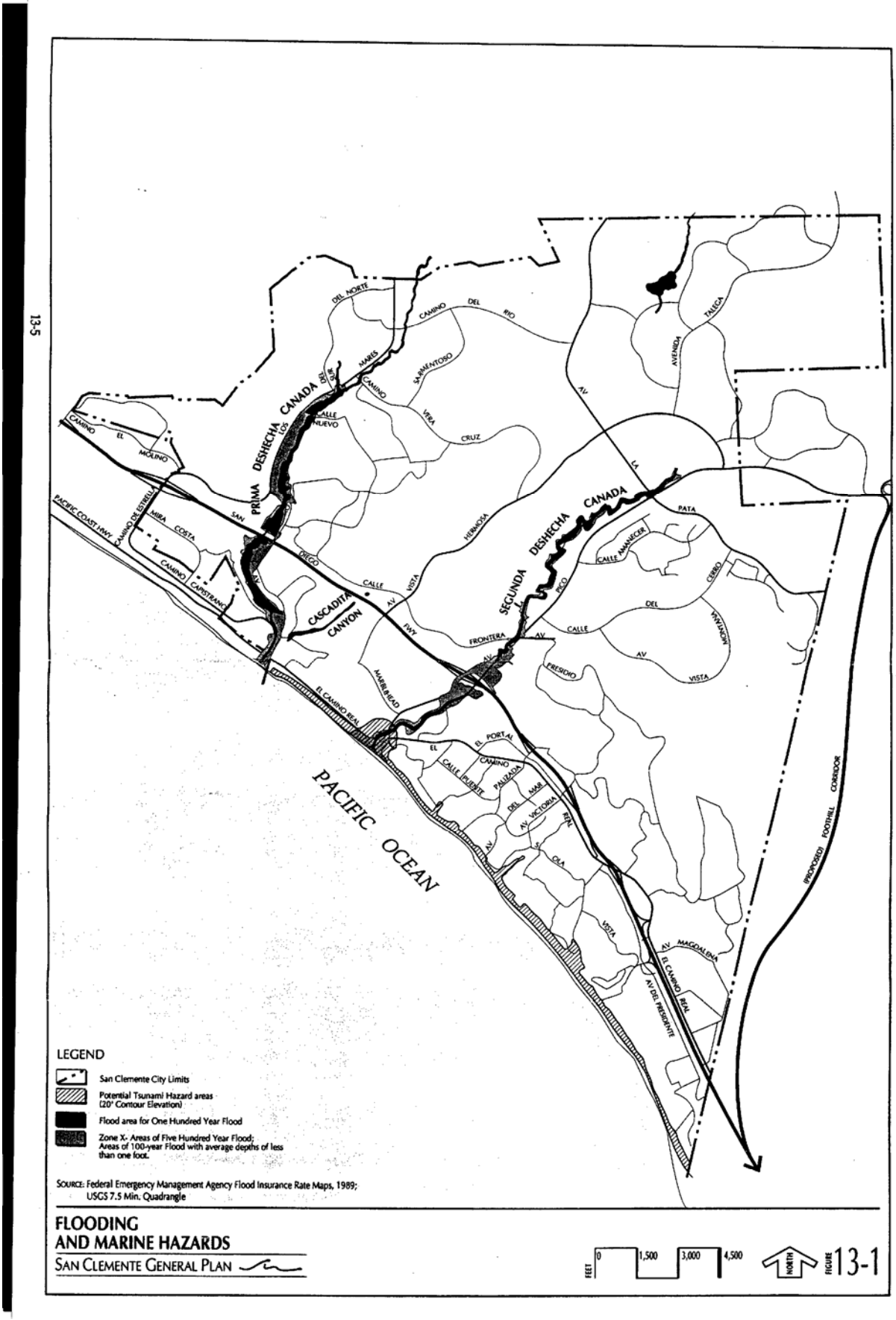
A United States Government study reports that, "Local earthquakes will not generate a tsunami, in this area". Tsunamis are due to large off-shore earthquakes and ocean landslides. Dangerous tsunamis would most likely originate in the Aleutian and Chilean offshore submarine trenches. The City of San Clemente has southwestern facing beaches that are vulnerable to tsunamis or tidal surges from the south and from the west.

Predicted wave heights, exclusive of tide and storm generated wave heights are:

For a 100 year occurrence	For a 500 year occurrence
4.0 feet minimum	6.8 feet minimum

6.6 feet average	11.4 feet average
9.2 feet maximum	16.0 feet maximum

According to the Tsunami Run-up Map (see next page) the entire 4.7 miles of coastline would be severely impacted. During the summer months, the City of San Clemente can attract over 100,000 people a day to its beaches. If a tsunami were to occur it could devastate the entire coastal area.


PACIFIC OCEAN
PRIMA DESHECHA CANADA
SEGUNDA DESHECHA CANADA
CASCADITA CANYON
PACIFIC COAST HWY
CAMINO DEL RIO
AVENIDA TALEGA
CAMINO DE ESTRELLA
CAMINO CAPISTRANO
CALLE FRONTERA
AV PRESIDIO
AV VISTA
EL CAMINO REAL
AV MAGDALENA
AV DEL PRESIDENTE
PROPOSED FOOTHILL CORRIDOR
LEGEND
San Clemente City Limits
Potential Tsunami Hazard areas (20' Contour Elevation)
Flood area for One Hundred Year Flood
Zone X- Areas of Five Hundred Year Flood; Areas of 100-year Flood with average depths of less than one foot.
SOURCE: Federal Emergency Management Agency Flood Insurance Rate Maps, 1989; USGS 7.5 Min. Quadrangle
FLOODING AND MARINE HAZARDS
SAN CLEMENTE GENERAL PLAN
FEET 0 1,500 3,000 4,500
NORTH
FIGURE 13-1

VIII. Tsunami Watches and Warnings

A. 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 Alaska in April 1946, 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.

B. Watch vs. Warning

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 Orange County 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.

The Local Warning Points for the City of San Clemente is the Emergency Planning Officers Office. He/She is responsible for activating appropriate city departments and personnel and the City's Emergency Operations Center (EOC) if needed. The Emergency Operations Center and Police Services are responsible for alerting and warning the public of any imminent threat and evacuating the public to safe areas.

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.

When there is a high probability that a tsunami will reach the City of San Clemente, the City will activate its Community Alert Warning System which is a signal for residents to turn on their radio or television for reception of an Emergency Alert

System Message. Within the City there are nineteen sirens located throughout the city. The sirens are strategically placed throughout the city and will be heard by approximately 100% of the residents. When activated, the sirens alert the public to turn on their AM/FM radio and listen to the Emergency Alerting System (EAS). The sirens are simultaneously tested annually to ensure that they are working correctly. The City Public Information Officer will activate EAS and provide them with a prepared statement of who should evacuate, where to evacuate to and what routes to take.

C. Evacuation

Upon receipt of a Tsunami Watch/Warning Bulletin, an immediate evaluation will be made of the potential threat to the coastal areas of the City of San Clemente. After a thorough evaluation, a determination will be made as to the degree of evacuation necessary to eliminate any threats to the resident and visiting populations.

Once the degree of evacuation has been determined, Police Services and Marine Safety will begin an immediate evacuation of the low-lying areas that have been determined to be at risk. Approximately 20% of local residents will have to be evacuated. The population will be directed inland using the closest available northbound or eastbound arterial highway. It is imperative that the evacuation routes be kept open and clear at all times.

Additionally, if a large tsunami were to hit the City of San Clemente coastline, local residents may have to be evacuated to neighboring cities. These neighboring jurisdictions along with the American Red Cross would be called upon for care and shelter duties. Displacing residents, utilization of City resources, and disaster cleanup can cause an economic hardship on all impacted communities.

IX. Vulnerability and Risk

With an analysis of tsunami events depicted in the “Local History” section, we can deduce the common tsunami impact areas will include impacts on life, property, infrastructure and transportation.

A. Community Tsunami Issues

a. What is Susceptible to Tsunami?
The largest impact on the City from a tsunami event would be the loss of life and property.

B. Known risk areas include, but are not limited to:

- City and State Beaches
- City pier
- All buildings and apartments on the water side of Pacific Coast Highway (PCH)
- Vehicles and pedestrians on PCH in low lying areas

Using the Tsunami Warning and Watch Bulletin would provide time to allow coastal residents to evacuate and seek higher ground for shelter. This would greatly reduce injuries and loss of life.

C. Residential

Property along the coast could be devastated. The City of San Clemente is an affluent community; the median price of a home on the coastline is $800,000 to $1 million+ dollars. A large tsunami could potentially destroy or damage hundreds to thousands of homes spreading debris for miles.

D. Commercial

The City of San Clemente pier and beaches are world famous. During summer months up to 100,000 people a day come into the community to stay in the beautiful hotels and shop at the unique boutiques. The local government relies heavily on tourism and sales tax. A tsunami event would impact businesses by damaging property and by interrupting business and services. Any residential or commercial structure with weak reinforcement would be susceptible to damage.

X. 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.

XI. Existing Mitigation Activities

The City of San Clemente has implemented a number of tsunami mitigation activities over the years. Some of the current mitigation programs include:

- The City's Community Alert and Warning Siren System
- Public Information Plan for Emergency Alerting System (EAS)
- Disaster Preparedness Public Education

XII. Tsunami Mitigation Action Items

The tsunami mitigation action items provide direction on specific activities that organizations and residents in City of San Clemente can undertake to reduce risk and prevent loss from tsunami events. Each action item is followed by ideas for implementation, which can be used by the City of San Clemente Hazard Mitigation Planning Committee and local decision makers in pursuing strategies for implementation.

Natural Hazard	**SHORT TERM ACTIVITY – TSUNAMI #1**		
Action Item	Incorporate the voice capability of the new Community Alert Siren System to enhance notification of personnel on and immediately adjacent to the beach		
Coordinating Organization	City of San Clemente Emergency Planning Services and Marine Safety Division		
Ideas for Implementation	Prescript appropriate messages to be used in the event of a Tsunami.		
Time line	2 years		
Constraints	As personnel hours and time permit		
Plan Goals Addressed		**X**	**Protect Life and Property**
X	**Public Awareness**		**Natural Systems**
	Partnerships and Implementation	**X**	**Emergency Services**

Natural Hazard	**SHORT TERM ACTIVITY – TSUNAMI #2**		
Action Item	Warning Signs on Beach		
Coordinating Organization	City of San Clemente Emergency Planning Services and Marine Safety Division		
Ideas for Implementation	Prescript appropriate messages to be used in the event of a Tsunami.		
Time line	As soon as funding is made available..		
Constraints	Some City officials may be opposed to this because it may scare residents and tourists away from the city. Some individuals may believe the signs are unnecessary since no known tsunami has ever caused damage to the Orange County Coastline		
Plan Goals Addressed		**X**	**Protect Life and Property**
X	**Public Awareness**	**X**	**Natural Systems**
X	**Partnerships and Implementation**	**X**	**Emergency Services**

Natural Hazard	**SHORT TERM ACTIVITY – TSUNAMI #3**		
Action Item	Tsunami Public Education Campaign		
Coordinating Organization	City of San Clemente Emergency Planning Services and Marine Safety Division		
Ideas for Implementation	Develop a special Tsunami Education Campaign. Each year a different group of people is targeted. For example: Schools, Mobile Home Parks, Businesses, or Neighborhoods.		
Time line	As personnel hours and time permit.		
Constraints	Some individuals may believe this to be a waste of time due to the low probability of a tsunami hitting the Orange County Coastline.		
Plan Goals Addressed		**X**	**Protect Life and Property**
X	**Public Awareness**		**Natural Systems**
X	**Partnerships and Implementation**	**X**	**Emergency Services**

The City of San Clemente Emergency Planning Office has conducted numerous public education campaigns over the years including preparing residents for Terrorism, Power Outages, Y2K, and Earthquakes. In addition, they have conducted campaigns directed towards special target audiences such as mobile home owners, senior and disabled populations, non-English speaking, businesses, neighborhoods, etc.

Natural Hazard	**SHORT TERM ACTIVITY – TSUNAMI #4**		
Action Item	Update the City of San Clemente Emergency Plan. Annex D-Storms, Floods, Tsunamis		
Coordinating Organization	City of San Clemente Emergency Planning Services		
Ideas for Implementation	Form a Tsunami Planning Group to update and enhance the existing Annex D. Include representatives from, Marine Safety.		
Time line	As personnel hours and time permit.		
Constraints	As personnel hours and time permit.		
Plan Goals Addressed		**X**	**Protect Life and Property**
X	**Public Awareness**		**Natural Systems**
X	**Partnerships and Implementation**	**X**	**Emergency Services**

All included mitigation strategies were evaluated by the City of San Clemente Hazard Mitigation Committee to determine their appropriateness. Costs vs. benefits were analyzed and the appropriate recommended actions are the result of this planning project. Citizen input into the hazard and mitigation strategies was coordinated through community forums on July 22 and September 2, 2004.

XIII. Tsunami Resource Directory

County Resources

Orange County Sheriffs Department Emergency Management Bureau
Terre Duensing, Manager
2644 Santiago Canyon Road
Siverado, CA., 92676
Telephone: 714-628-7055

Federal Resources and Programs

West Coast & Alaska Tsunami Warning Center
910 S. Felton St.
Palmer, AK 99645
Ph: 907-745-4212
Fx: 907-745-6071
The West Coast/Alaska Tsunami Warning Center's objectives are to rapidly locate and size major earthquakes in the Pacific basin, determine their tsunami potential, predict tsunami arrival times and, when possible, runup on the coast, and provide timely and effective tsunami information and warning bulletins for the Pacific coastal populations of California, Oregon, Washington, British Columbia, and Alaska.

Additional Resources

University of Southern California
Department of Civil and Environmental Engineering
Tsunami Research Group
Dr. Costas E. Synolakis, Director
3620 S. Vermont Avenue
Kaprielian Hall 210
Los Angeles, CA 90089-2531
Ph: 213-740-0603
Fx: 213-744-1426
civileng@usc.edu

Tsunami Endnotes

xliv. http://education.sdsc.edu/optiputer/htmlLinks/california_tsunami.html

xlv. http://www.prh.noaa.gov/itic/library/about_tsu/faqs.html#1

xlvi. Ibid

xlvii. Ibid

xlviii. Ibid

SECTION 10 WILDFIRE

I. Why are Wildfires a Threat to Southern California

For thousands of years, fires have been a natural part of the ecosystem in Southern California. However, wildfires present a substantial hazard to life and property in communities built within or adjacent to hillsides and mountainous areas. There is a huge potential for losses due to wildland/urban interface fires in Southern California. According to the California Division of Forestry (CDF), there were over seven thousand reportable fires in California in 2003, with over one million acres burned.[xlix] According to CDF statistics, in the October, 2003 Firestorms, over 4,800 homes were destroyed and 22 lives were lost.[l]

II. The 2003 Southern California Fires

The fall of 2003 marked the most destructive wildfire season in California history. In a ten day period, 12 separate fires raged across Southern California in Los Angeles, Riverside, San Bernardino, San Diego and Ventura counties. The massive "Cedar" fire in San Diego County alone consumed of 2,800 homes and burned over a quarter of a million acres.

Table 10-1. October 2003 Firestorm Statistics

County	Fire Name	Date Began	Acres Burned	Homes Lost	Homes Damaged	Lives Lost
Riverside	Pass	10/21/03	2,397	3	7	0
Los Angeles	Padua	10/21/03	10,446	59	0	0
San Bernardino	Grand Prix	10/21/03	69,894	136	71	0
San Diego	Roblar 2	10/21/03	8,592	0	0	0
Ventura	Piru	10/23/03	63,991	8	0	0
Los Angeles	Verdale	10/24/03	8,650	1	0	0
Ventura	Simi	10/25/03	108,204	300	11	0
San Diego	Cedar	10/25/03	273,246	2,820	63	14
San Bernardino	Old	10/25/03	91,281	1,003	7	6
San Diego	Otay / Mine	10/26/03	46,000	6	11	0
Riverside	Mountain	10/26/03	10,000	61	0	0
San Diego	Paradise	10/26/03	56,700	415	15	2
Total Losses			749,401	4,812	185	22

Source: http://www.fire.ca.gov/php/fire_er_content/downloads/2003LargeFires.pdf

III. Historic Fires in Southern California

> Large fires have been part of the Southern California landscape for millennia. "Written documents reveal that during the 19th century human settlement of southern California altered the fire regime of coastal California by increasing the fire frequency. This was an era of very limited fire suppression, and yet like today, large crown fires covering tens of thousands of acres were not uncommon. One of the largest fires in Los Angeles County (60,000 acres) occurred in 1878, and the largest fire in Orange County's history, in 1889, was over half a million acres."[li]

Table 10-2. Large Historic Fires in California 1961-2003

20 Largest California Wildland Fires (Structures Destroyed) **(Southern California fires are shown in bold**)

	Fire Name	Date	County	Acres	Structures	Deaths
1	Tunnel	October 1991	Alameda	1,600	2,900	25
2	**Cedar**	October 2003	San Diego	273,246	2,820	14
3	**Old**	October 2003	San Bernardino	91,281	1,003	6
4	Jones	October 1999	Shasta	26,200	954	1
5	Paint	June 1990	Santa Barbara	4,900	641	1
6	Fountain	August 1992	Shasta	63,960	636	0
7	City of Berkeley	September 1923	Alameda	130	584	0
8	**Bel Air**	November 1961	Los Angeles	6,090	484	0
9	**Laguna Fire**	October 1993	Orange	14,437	441	0
10	**Paradise**	October 2003	San Diego	56,700	415	2
11	**Laguna**	September 1970	San Diego	175,425	382	5
12	**Panorama**	November 1980	San Bernardino	23,600	325	4
13	**Topanga**	November 1993	Los Angeles	18,000	323	3
14	49er	September 1988	Nevada	33,700	312	0
15	Simi	October 2003	Ventura	108,204	300	0
16	**Sycamore**	July 1977	Santa Barbara	805	234	0
17	Canyon	September 1999	Shasta	2,580	230	0
18	**Kannan**	October 1978	Los Angeles	25,385	224	0
19	**Kinneloa**	October 1993	Los Angeles	5,485	196	1

19	**Grand Prix**	October 2003	San Bernardino	59,448	196	0
20	**Old Gulch**	August 1992	Calaveras	17,386	170	0

http://www.fire.ca.gov/FireEmergencyResponse/HistoricalStatistics/PDF/20LSTRUCTURES.pdf

"Structures" is meant to include all loss - homes and outbuildings, etc.

During the 2002 fire season, more than 6.9 million acres of public and private lands burned in the US, resulting in loss of property, damage to resources and disruption of community services.[lii] Taxpayers spent more than $1.6 billion[liii] to combat more than 88,400 fires nationwide. Many of these fires burned in wildland/urban interface areas and exceeded the fire suppression capabilities of those areas. Table 10-3 illustrates fire suppression costs for state, private and federal lands.

Table 10-3. National Fire Suppression Costs

Year	Suppression Costs	Acres Burned	Structures Burned
2000	$1.3 billion	8,422,237	861
2001	$0.5 billion	3,570,911	731
2002	$1.6 billion	6,937,584	815

http://research.yale.edu/gisf/assets/pdf/ppf/wildfire_report.pdf

IV. Wildfire Characteristics

There are three categories of interface fire:[liv] The classic wildland/urban interface exists where well-defined urban and suburban development presses up against open expanses of wildland areas; the mixed wildland/urban interface is characterized by isolated homes, subdivisions and small communities situated predominantly in wildland settings; and the occluded wildland/urban interface exists where islands of wildland vegetation occur inside a largely urbanized area. Certain conditions must be present for significant interface fires to occur. The most common conditions include: hot, dry and windy weather; the inability of fire protection forces to contain or suppress the fire; the occurrence of multiple fires that overwhelm committed resources; and a large fuel load (dense vegetation). Once a fire has started, several conditions influence its behavior, including fuel topography, weather, drought and development.

Southern California has two distinct areas of risk for wildland fire. The foothills and lower mountain areas are most often covered with scrub brush or chaparral. The higher elevations of mountains also have heavily forested terrain. The lower elevations covered with chaparral create one type of exposure.

Past fire suppression is not to blame for causing large shrubland wildfires, nor has it proven effective in halting them."" said Dr. Jon Keeley, a USGS fire researcher who studies both southern California shrublands and Sierra Nevada forests. Under Santa Ana conditions, fires carry through all chaparral regardless of age class. Therefore, prescribed burning programs over large areas to remove old stands and maintain young growth as bands of firebreaks resistant to ignition are futile at stopping these wildfires.[lv]

The higher elevations of Southern California's mountains are typically heavily forested. The magnitude of the 2003 fires is the result of three primary factors: (1) severe drought, accompanied by a series of storms that produce thousands of lightning strikes and windy conditions; (2) an infestation of bark beetles that has killed thousands of mature trees; and (3) the effects of wildfire suppression over the past century that has led to buildup of brush and small diameter trees in the forests.

"When Lewis and Clark explored the Northwest, the forests were relatively open, with 20 to 25 mature trees per acre. Periodically, lightning would start fires that would clear out underbrush and small trees, renewing the forests.

Today's forests are completely different, with as many as 400 trees crowded onto each acre, along with thick undergrowth. This density of growth makes forests susceptible to disease, drought and severe wildfires. Instead of restoring forests, these wildfires destroy them and it can take decades to recover. This radical change in our forests is the result of nearly a century of well-intentioned but misguided management."[lvi]

V. The Interface

One challenge Southern California faces regarding the wildfire hazard is from the increasing number of houses being built on the urban/wildland interface. Every year the growing population has expanded further and further into the hills and mountains, including forest lands. The increased "interface" between urban/suburban areas and the open spaces created by this expansion has produced a significant increase in threats to life and property from fires and has pushed existing fire protection systems beyond original or current design and capability. Property owners in the interface are not aware of the problems and threats they face. Therefore, many owners have done very little to manage or offset fire hazards or risks on their own property. Furthermore, human activities increase the incidence of fire ignition and potential damage. See Map 1-6MAP6.

VI. Fuel

Fuel is the material that feeds a fire and is a key factor in wildfire behavior. Fuel is classified by volume and by type. Volume is described in terms of fuel loading, or the amount of available vegetative fuel.

The type of fuel also influences wildfire. Chaparral is a primary fuel of Southern California wildfires. Chaparral habitat ranges in elevation from near sea level to over 5,000' in Southern California. Chaparral communities experience long dry summers and receive most of their annual precipitation from winter rains. Although chaparral is often considered as a single species, there are two distinct types; hard chaparral and soft chaparral. Within these two types are dozens of different plants, each with its own particular characteristics.

"Fire has been important in the life cycle of chaparral communities for over 2 million years, however, the true nature of the "fire cycle" has been subject to interpretation. In a period of 750 years, it generally thought that fire occurs once every 65 years in coastal drainages and once every 30 to 35 years inland."[lvii]

"The vegetation of chaparral communities has evolved to a point it requires fire to spawn regeneration. Many species invite fire through the production of plant materials with large surface-to-volume ratios, volatile oils and through periodic die-back of vegetation. These species have further adapted to possess special reproductive mechanisms following fire. Several species produce vast quantities of seeds which lie dormant until fire triggers germination. The parent plant which produces these seeds defends itself from fire by a thick layer of bark which allows enough of the plant to survive so that the plant can crown sprout following the blaze. In general, chaparral community plants have adapted to fire through the following methods; a) fire induced flowering; b) bud production and sprouting subsequent to fire; c) in-soil seed storage and fire stimulated germination; and d) on plant seed storage and fire stimulated dispersal."[lviii]

An important element in understanding the danger of wildfire is the availability of diverse fuels in the landscape, such as natural vegetation, manmade structures and combustible materials. A house surrounded by brushy growth rather than cleared space allows for greater continuity of fuel and increases the fire's ability to spread. After decades of fire suppression "dog-hair" thickets have accumulated, which enable high intensity fires to flare and spread rapidly.

VII. Topography

Topography influences the movement of air, thereby directing a fire course. For example, if the percentage of uphill slope doubles, the rate of spread in wildfire will likely double. Gulches and canyons can funnel air and act as chimneys, which intensify fire behavior and cause the fire to spread faster. Solar heating of

dry, south-facing slopes produces up slope drafts that can complicate fire behavior. Unfortunately, hillsides with hazardous topographic characteristics are also desirable residential areas in many communities. This underscores the need for wildfire hazard mitigation and increased education and outreach to homeowners living in interface areas.

VIII. Weather

Weather patterns combined with certain geographic locations can create a favorable climate for wildfire activity. Areas where annual precipitation is less than 30 inches per year are extremely fire susceptible.[lix] High-risk areas in Southern California share a hot, dry season in late summer and early fall when high temperatures and low humidity favor fire activity. The so-called "Santa Ana" winds, which are heated by compression as they flow down to Southern California from Utah create a particularly high risk, as they can rapidly spread what might otherwise be a small fire.

IX. Drought

Recent concerns about the effects of climate change, particularly drought, are contributing to concerns about wildfire vulnerability. The term drought is applied to a period in which an unusual scarcity of rain causes a serious hydrological imbalance. Unusually dry winters, or significantly less rainfall than normal, can lead to relatively drier conditions and leave reservoirs and water tables lower. Drought leads to problems with irrigation and may contribute to additional fires, or additional difficulties in fighting fires.

X. Development

Growth and development in scrubland and forested areas is increasing the number of human-made structures in Southern California interface areas. Wildfire has an effect on development, yet development can also influence wildfire. Owners often prefer homes that are private, have scenic views, are nestled in vegetation and use natural materials. A private setting may be far from public roads, or hidden behind a narrow, curving driveway. These conditions, however, make evacuation and fire fighting difficult. The scenic views found along mountain ridges can also mean areas of dangerous topography. Natural vegetation contributes to scenic beauty, but it may also provide a ready trail of fuel leading a fire directly to the combustible fuels of the home itself.

XI. Wildfire Hazard Assessment

A. Wildfire Hazard Identification

Wildfire hazard areas are commonly identified in regions of the wildland/urban interface. Ranges of the wildfire hazard are further

determined by the ease of fire ignition due to natural or human conditions and the difficulty of fire suppression. The wildfire hazard is also magnified by several factors related to fire suppression/control such as the surrounding fuel load, weather, topography and property characteristics. Generally, hazard identification rating systems are based on weighted factors of fuels, weather and topography.

Table 10-4 Illustrates a rating system to identify wildfire hazard risk (with a score of 3 equaling the most danger and a score of 1 equaling the least danger.)

Table 10-4. Sample Hazard Identification Rating System

Category	Indicator	Rating
Roads and Signage	Steep; narrow; poorly signed	3
	One or two of the above	2
	Meets all requirements	1
Water Supply	None, except domestic	3
	Hydrant, tank, or pool over 500 feet away	2
	Hydrant, tank, or pool within 500 feet	1
Location of the Structure	Top of steep slope with brush/grass below	3
	Mid-slope with clearance	2
	Level with lawn, or watered groundcover	1
Exterior Construction	Combustible roofing, open eaves, Combustible siding	3
	One or two of the above	2
	Non-combustible roof, boxed eaves, non-combustible siding	1

In order to determine the "base hazard factor" of specific wildfire hazard sites and interface regions, several factors must be taken into account. Categories used to assess the base hazard factor include:

- Topographic location, characteristics and fuels;
- Site/building construction and design;
- Site/region fuel profile (landscaping);
- Defensible space;
- Accessibility;
- Fire protection response; and
- Water availability.

The use of Geographic Information System (GIS) technology in recent years has been a great asset to fire hazard assessment, allowing further

integration of fuels, weather and topography data for such ends as fire behavior prediction, watershed evaluation, mitigation strategies and hazard mapping.

B. Vulnerability and Risk

Southern California residents are served by a variety of local fire departments as well as county, state and federal fire resources. Data that includes the location of interface areas in the county can be used to assess the population and total value of property at risk from wildfire and direct these fire agencies in fire prevention and response.

Key factors included in assessing wildfire risk include ignition sources, building materials and design, community design, structural density, slope, vegetative fuel, fire occurrence and weather, as well as occurrences of drought.

The National Wildland/Urban Fire Protection Program has developed the Wildland/Urban Fire Hazard Assessment Methodology tool for communities to assess their risk to wildfire. For more information on wildfire hazard assessment refer to http://www.Firewise.org.

XII. Community Wildfire Issues

A. Growth and Development in the Interface

The hills and mountainous areas of Southern California are considered to be interface areas. The development of homes and other structures is encroaching onto the wildlands and is expanding the wildland/urban interface. The interface neighborhoods are characterized by a diverse mixture of varying housing structures, development patterns, ornamental and natural vegetation and natural fuels.

In the event of a wildfire, vegetation, structures and other flammables can merge into unwieldy and unpredictable events. Factors important to the fighting of such fires include access, firebreaks, proximity of water sources, distance from a fire station and available firefighting personnel and equipment. Reviewing past wildland/urban interface fires shows that many structures are destroyed or damaged for one or more of the following reasons:

- Combustible roofing material;
- Wood construction;
- Structures with no defensible space;
- Fire department with poor access to structures;
- Subdivisions located in heavy natural fuel types;

- Structures located on steep slopes covered with flammable vegetation;
- Limited water supply; and
- Winds over 30 miles per hour.

B. Road Access

Road access is a major issue for all emergency service providers. As development encroaches into the rural areas of the county, the number of houses without adequate turn-around space is increasing. In many areas, there is not adequate space for emergency vehicle turnarounds in single-family residential neighborhoods, causing emergency workers to have difficulty doing their jobs because they cannot access houses. As fire trucks are large, firefighters are challenged by narrow roads and limited access, when there is inadequate turn around space, the fire fighters can only work to remove the occupants, but cannot safely remain to save the threatened structures.

C. Water Supply

Fire fighters in remote and rural areas are faced by limited water supply and lack of hydrant taps. In our City adequate piping exists for fire fighting in all areas. Any new construction is reviewed to ensure adequacy of water supply prior to plan approval.

D. Interface Fire Education Programs and Enforcement

Fire protection in urban/wildland interface areas may rely heavily on the landowner's personal initiative to take measures to protect his or her own property. Therefore, public education and awareness may play a greater role in interface areas. In those areas with strict fire codes, property owners who resist maintaining the minimum brush clearances may be cited for failure to clear brush.

XIII. The Need for Mitigation Programs

Continued development into the interface areas will have growing impacts on the wildland/urban interface. Periodically, the historical losses from wildfires in Southern California have been catastrophic, with deadly and expensive fires going back decades. The continued growth and development increases the public need for natural hazards mitigation planning in Southern California.

XIV. Wildfire Mitigation Activities

Existing mitigation activities include current mitigation programs and activities that are being implemented by county, regional, state, or federal agencies or organizations.

A. Local Programs

In Southern California there are dozens of independent local fire departments as well as large county wide consolidated fire districts. Although each district or department is responsible for fire related issues in specific geographic areas, they work together to keep Southern California residents safe from fire. Although fire agencies work together to fight urban/wildland interface fires, each separate agency may have a somewhat different set of codes to enforce for mitigation activities. As required by law, the City has adopted Fire & Building Codes that identify and designate "Very High Fire Hazard Severity Zones."

The fire departments and districts provide essential public services in the communities they serve and their duties far surpass extinguishing fires. Most of the districts and departments provide other services to their jurisdictions, including Emergency Medical Services who can begin treatment and stabilize sick and injured patients in emergency situations. All of the fire service providers in the county are dedicated to fire prevention and use their resources to educate the public to reduce the threat of the fire hazard, especially in the wildland/urban interface. Fire prevention professionals throughout the county have taken the lead in providing many useful and educational services to Southern California residents, such as:

- Home fire safety inspection;
- Assistance developing home fire escape plans;
- Business Inspections;
- Citizen Emergency Response Team (CERT) training;
- Fire cause determination;
- Counseling for juvenile fire-setters;
- Teaching fire prevention in schools;
- Coordinating educational programs with other agencies, hospitals and schools;
- Answering citizens' questions regarding fire hazards.

XV. The Threat of Urban Conflagration

Although communities without an urban/wildland interface are much less likely to experience a catastrophic fire, in Southern California there is a scenario where any community might be exposed to an urban conflagration similar to the fires that occurred following the 1906 San Francisco earthquake.

"Large fires following an earthquake in an urban region are relatively rare phenomena, but have occasionally been of catastrophic proportions. The two largest peace-time urban fires in history, 1906 San Francisco and 1923 Tokyo, were both caused by earthquakes.

The fact that fire following earthquake has been little researched or considered in the United States is particularly surprising when one realizes that the conflagration in San Francisco after the 1906 earthquake was the single largest urban fire, and the single largest earthquake loss, in U.S. history. The loss over three days of more than 28,000 buildings within an area of 12 km^2 was staggering: $250 million in 1906 dollars, or about $5 billion at today's prices.

The 1989 Loma Prieta Earthquake, the 1991 Oakland hills fire, and Japan''s recent Hokkaido Nansei-oki Earthquake all demonstrate the current, real possibility of a large fire, such as a fire following an earthquake, developing into a conflagration. In the United States, all the elements that would hamper fire-fighting capabilities are present: density of wooden structures, limited personnel and equipment to address multiple fires, debris blocking the access of fire-fighting equipment, and a limited water supply."[lx]

In Southern California, this scenario highlights the need for fire mitigation activity in all sectors of the region, urban/wildland interface or not.

XVI. Fire Codes

CALIFORNIA FIRE CODE

New Construction structures fuel modification: Amended 2001, CFC Appendix II-A-1, Section 27.

Existing vegetation hazards: 2001, CFC Appendix II-A-1, Section 1103.2.4

CALIFORNIA PUBLIC RESOURCES CODE

DIVISION 4. FORESTS, FORESTRY AND RANGE AND FORAGE LANDS
PART 1. DEFINITIONS AND GENERAL PROVISIONS
CHAPTER 1. DEFINITIONS 4001-4004
CHAPTER 2. GENERAL PROVISIONS
Article 1. Penalties 4021-4022
Article 2. Purchase of Land 4031
PART 2. PROTECTION OF FOREST, RANGE AND FORAGE LANDS
CHAPTER 1. PREVENTION AND CONTROL OF FOREST FIRES
Article 1. Definitions 4101-4104
Article 2. General Provisions 4111-4123
Article 3. Responsibility for Fire Protection 4125-4136
Article 3.5. State Responsibility Area Fire Protection
Benefit Fees 4138-4140.7

http://www.ocsd.org/Operations/OCHazMit3.pdf

XVII. Federal Programs

The role of the federal land managing agencies in the wildland /urban interface is reducing fuel hazards on the lands they administer; cooperating in prevention and education programs; providing technical and financial assistance; and developing agreements, partnerships and relationships with property owners, local protection agencies, states and other stakeholders in wildland/urban interface areas. These relationships focus on activities before a fire occurs, which render structures and communities safer and better able to survive a fire occurrence.

Federal Emergency Management Agency (FEMA) Programs FEMA is directly responsible for providing fire suppression assistance grants and, in certain cases, major disaster assistance and hazard mitigation grants in response to fires. The role of FEMA in the wildland /urban interface is to encourage comprehensive disaster preparedness plans and programs, increase the capability of state and local governments and provide for a greater understanding of FEMA programs at the federal, state and local levels.[lxi]

A. Fire Suppression Assistance Grants

Fire Suppression Assistance Grants may be provided to a state with an approved hazard mitigation plan for the suppression of a forest or grassland fire that threatens to become a major disaster on public or private lands. These grants are provided to protect life and improved property and encourage the development and implementation of viable multi-hazard mitigation measures and provide training to clarify FEMA's programs. The grant may include funds for equipment, supplies and personnel. A Fire Suppression Assistance Grant is the form of assistance most often provided by FEMA to a state for a fire. The grants are cost-shared with states. FEMA’s US Fire Administration (USFA) provides public education materials addressing wildland/urban interface issues and the USFA's National Fire Academy provides training programs.

B. Hazard Mitigation Grant Program

Following a major disaster declaration, the FEMA Hazard Mitigation Grant Program provides funding for long-term hazard mitigation projects and activities to reduce the possibility of damages from all future fire hazards and to reduce the costs to the nation for responding to and recovering from the disaster.

C. National Wildland/Urban Interface Fire Protection Program

Federal agencies can use the National Wildland/Urban Interface Fire Protection Program to focus on wildland/urban interface fire protection issues and actions. The Western Governors' Association (WGA) can act as a catalyst to involve state agencies, as well as local and private stakeholders, with the objective of developing an implementation plan to achieve a uniform, integrated national approach to hazard and risk assessment and fire prevention and protection in the wildland/urban interface. The program helps states develop viable and comprehensive wildland fire mitigation plans and performance-based partnerships.

D. U.S. Forest Service

The U. S. Forest Service (USFS) is involved in a fuel-loading program implemented to assess fuels and reduce hazardous buildup on forest lands. The USFS is a cooperating agency and, while it has little to no jurisdiction in the lower valleys, it has an interest in preventing fires in the interface, as fires often burn up the hills and into the higher elevation US forest lands.

XVIII. Other Mitigation Programs and Activities

Some areas of the country are facing wildland/urban issues collaboratively. These are model programs that include local solutions. Summit County, Colorado, has developed a hazard and risk assessment process that mitigates hazards through zoning requirements. In California, the Los Angeles County Fire Department has retrofitted more than 100 fire engines with fire retardant foam capability and Orange County is evaluating a pilot insurance grading and rating schedule specific to the wildland/urban interface. All are examples of successful programs that demonstrate the value of pre-suppression and prevention efforts when combined with property owner support to mitigate hazards within the wildland/urban interface.

A. Prescribed Burning

The health and condition of a forest will determine the magnitude of wildfire. If fuels, slash, dry or dead vegetation, fallen limbs and branches - are allowed to accumulate over long periods of time without being methodically cleared, fire can move more quickly and destroy everything in its path. The results are more catastrophic than if the fuels are periodically eliminated. Prescribed burning is the most efficient method to get rid of these fuels. In California during 2003, various fire agencies conducted over 200 prescribed fires and burned over 33,000 acres to reduce the wildland fire hazard.[lxii]

B. Firewise

Firewise is a program developed within the National Wildland/ Urban Interface Fire Protection Program and it is the primary federal program addressing interface fire. It is administered through the National Wildfire Coordinating Group whose extensive list of participants includes a wide range of federal agencies. The program is intended to empower planners and decision makers at the local level. Through conferences and information dissemination, Firewise increases support for interface wildfire mitigation by educating professionals and the general public about hazard evaluation and policy implementation techniques. Firewise offers online wildfire protection information and checklists, as well as listings of other publications, videos and conferences. The interactive home page allows users to ask fire protection experts questions and to register for new information as it becomes available.

C. FireFree Program

FireFree is a unique private/public program for interface wildfire mitigation involving partnerships between an insurance company and local government agencies. It is an example of an effective non-regulatory approach to hazard mitigation. Originating in Bend, Oregon, the program was developed in response to the city's "Skeleton Fire" of 1996, which burned over 17,000 acres and damaged or destroyed 30 homes and structures. Bend sought to create a new kind of public education initiative that emphasized local involvement. SAFECO Insurance Corporation was a willing collaborator in this effort. Bend's pilot program included:

- A short video production featuring local citizens as actors, made available at local video stores, libraries and fire stations;
- Two city-wide yard debris removal events;
- A 3D-minute program on a model FireFree home, aired on a local cable television station; and
- Distribution of brochures, featuring a property owner evaluation checklist and a listing of fire-resistant indigenous plants.

XIX. Wildfire Mitigation Action Items

As stated in the Federal Wildland Fire Policy, **"The problem is not one of finding new solutions to an old problem but of implementing known solutions.** Deferred decision making is as much a problem as the fires themselves. If history is to serve us in the resolution of the wildland/urban interface problem, we must take action on these issues now. To do anything less is to guarantee another review process in the aftermath of future catastrophic fires."[lxiii]

The wildfire mitigation action items provide direction on specific activities that organizations and residents in Southern California can undertake to reduce risk and prevent loss from wildfire events. Each action item is followed by ideas for implementation, which can be used by the steering committee and local decision makers in pursuing strategies for implementation.[lxiv]

Natural Hazard	**SHORT TERM ACTIVITY – WILDFIRE #1**		
Action Item	Enhance emergency services to increase the efficiency of wildfire response and recovery activities.		
Coordinating Organization	Orange County Fire Authority		
Ideas for Implementation	Install more fire reporting stations for better access and coverage. Develop a county call list that includes all at-risk urban/wildland interface residents in the Southern California jurisdiction in order to contact them during evacuations.		
Time line	2 years		
Constraints			
Plan Goals Addressed			**Protect Life and Property**
	Public Awareness		**Natural Systems**
	Partnerships and Implementation	**X**	**Emergency Services**

Natural Hazard	**SHORT TERM ACTIVITY – WILDFIRE #2**		
Action Item	Educate agency personnel on federal cost-share and grant programs, Fire Protection Agreements and other related federal programs so the full array of assistance available to local agencies is understood.		
Coordinating Organization	Orange County Fire Authority		
Ideas for Implementation	Investigate potential funding opportunities for individual mitigation projects. Develop, approve and promote Fire Protection Agreements and partnerships to clarify roles and responsibilities and to provide for fire mitigation activities and suppression preparedness		
Time line	1-2 years.		
Constraints	.		
Plan Goals Addressed		**X**	**Protect Life and Property**
X	**Public Awareness**		**Natural Systems**
	Partnerships and Implementation		**Emergency Services**

Natural Hazard	**SHORT TERM ACTIVITY – WILDFIRE #3**		
Action Item	Inventory alternative firefighting water sources and encourage the development of additional sources.		
Coordinating Organization	Orange County Fire Authority and City GIS, Information Services Division		
Ideas for Implementation	Advocate for water storage facilities with fire-resistant electrical pump systems in developments outside of fire protection districts that are not connected to a community water or hydrant system. Develop a protocol for fire jurisdictions and water districts to communicate all hydrant outages and water shortage information.		
Time line	1 year		
Constraints	.		
Plan Goals Addressed		**X**	**Protect Life and Property**
	Public Awareness		**Natural Systems**
	Partnerships and Implementation		**Emergency Services**

Natural Hazard	**LONG TERM ACTIVITY – WILDFIRE #1**		
Action Item	Encourage development and dissemination of maps relating to the fire hazard to help educate and assist builders and homeowners in being engaged in wildfire mitigation activities and to help guide emergency services during response.		
Coordinating Organization	City GIS, Information Services Division		
Ideas for Implementation	Update wildland/urban interface maps. Conduct risk analysis incorporating data and the created hazard maps using GIS technology to identify risk sites and further assist in prioritizing mitigation activities Encourage coordination between fire jurisdictions and sanitary districts to make sure that the most accurate elevation maps are being used.		
Time line	1-3 years		
Constraints	.		
Plan Goals Addressed		**X**	**Protect Life and Property**
	Public Awareness		**Natural Systems**
	Partnerships and Implementation		**Emergency Services**

Natural Hazard	**LONG TERM ACTIVITY – WILDFIRE #2**		
Action Item	Enhance outreach and education programs aimed at mitigating wildfire hazards and reducing or preventing the exposure of citizens, public agencies, private property owners and businesses to natural hazards.		
Coordinating Organization	Orange County Fire Authority		
Ideas for Implementation	Encourage the hiring of fire prevention and education personnel to oversee education programs. Encourage city to become active member of Firewise Program. Visit urban interface neighborhoods and rural areas and conduct education and outreach activities. Conduct specific community-based demonstration projects of fire prevention and mitigation in the urban interface. Establish neighborhood "drive-through" activities that pinpoint site-specific mitigation activities. Fire crews can give property owners personal suggestions and assistance. Perform public outreach and information activities at fire stations by creating "Wildfire Awareness Week" activities, Fire stations can hold open houses and allow the public to visit, see the equipment and discuss wildfire mitigation with the station crews.		
Time line	Ongoing		
Constraints	.		
Plan Goals Addressed		**X**	**Protect Life and Property**
X	**Public Awareness**		**Natural Systems**
	Partnerships and Implementation		**Emergency Services**

Natural Hazard	**LONG TERM ACTIVITY – WILDFIRE #3**
Action Item	Increase communication, coordination and collaboration between wildland/urban interface property owners, local and county planners and fire prevention crews and officials to address risks, existing mitigation measures and federal assistance programs.
Coordinating Organization	Orange County Fire Authority, City of San Clemente Building and Safety, Planning and GIS, Divisions
Ideas for Implementation	Encourage single-family residences to have fire plans and practice evacuation routes. Encourage fire inspections in residential homes by OCFA to increase awareness among homeowners and potential fire responders. Encourage a standard for the State Fire Marshall to evaluate fire plans and emergency plans. Encourage the public to evaluate access routes to rural homes for fire-fighting vehicles and to develop passable routes if they do not exist.
Time line	Ongoing
Constraints	.

Plan Goals Addressed		**X**	**Protect Life and Property**
X	**Public Awareness**		**Natural Systems**
X	**Partnerships and Implementation**	**X**	**Emergency Services**

XX. Wildfire Resource Directory

Local Resources/County Resources

Orange County Fire Authority
1 Fire Authority Road
Irvine, CA 92602
Telephone: 714.573.6000
http://www.ocfa.org/

State Resources

California Division of Forestry & Fire Protection
1416 9th Street
PO Box 944246
Sacramento California 94244-2460
(916)653-5123
http://www.fire.ca.gov/php/index.php

Office of the State Fire Marshal (OSFM)
1131 "S" Street
Sacramento, CA 95814
PO Box 944246
Sacramento, CA 94244-2460
Tel. (916) 445-8200

Fax. (916) 445-8509

Federal Resources and Programs

Federal Wildland Fire Policy, Wildland/Urban Interface Protection
This is a report describing federal policy and interface fire. Areas of needed improvement are identified and addressed through recommended goals and actions.
http://www.fs.fed.us/land/wdfire7c.htm

National Fire Protection Association (NFPA)
This is the principal federal agency involved in the National Wildland/Urban Interface Fire Protection Initiative. NFPA has information on the Initiatives programs and documents.
Public Fire Protection Division
1 Battery March Park.
P.O. Box 9101
Quincy, MA 02269-9101
Phone: (617) 770-3000

National Interagency Fire Center (NIFC)
The NIFC in Boise, Idaho is the nation's support center for wildland firefighting. Seven federal agencies work together to coordinate and support wildland fire and disaster operations. These agencies include the Bureau of Indian Affairs, Bureau of Land Management, Forest Service, Fish and Wildlife Service, National Park Service, National Weather Service and Office of Aircraft
National Interagency Fire Center
3833 S. Development Ave.
Boise, Idaho 83705
208-387-5512
http://www.nifc,gov/

United States Fire Administration (USFA) of the Federal Emergency Management Agency (FEMA)
As an entity of the Federal Emergency Management Agency, the mission of the USFA is to reduce life and economic losses due to fire and related emergencies through leadership, advocacy, coordination and support.
USFA, Planning Branch, Mitigation Directorate
16825 S. Seton Ave.
Emmitsburg, MD 21727
(301) 447-1000
http://www.fema.gov/hazards/fires/wildfires.shtm - Wildfire Mitigation
http://www.usfa.fema.gov/index.htm - U.S. Fire Administration

Additional Resources

Firewise - The National Wildland/Urban Interface Fire program
Firewise maintains a Website designed for people who live in wildfire prone areas, but it also can be of use to local planners and decision makers. The site offers online wildfire protection information and checklists, as well as listings of other publications, videos and conferences.
Firewise
1 Battery March Park.

P.O. Box 9101
Quincy, MA 02269-9101
Phone: (617) 770-3000
http://www.firewise.org/

Publications
National Fire Protection Association Standard 299: Protection of Life and Property from Wildfire, National Wildland/Urban Interface Fire Protection Program, (1991), National Fire Protection Association, Washington, D.
This document, developed by the NFPA Forest and Rural Fire Protection Committee, provides criteria for fire agencies, land use planners, architects, developers and local governments to use in the development of areas that may be threatened by wildfire. To obtain this resource:
National Fire Protection Association Publications
(800) 344-3555
http://www.nfpa.org or http://www.firewise.org

[xlix] http://www.fire.ca.gov/php/2003fireseasonstats_v2.asp

[l] http://www.fire.ca.gov/php/fire_er_content/downloads/2003LargeFires.pdf

[li] http://www.usgs.gov/public/press/public_affairs/press_releases/pr1805m.html

[lii] http://www.nifc.gov/stats/wildlandfirestats.html

[liii] http://research.yale.edu/gisf/assets/pdf/ppf/wildfire_report.pdf

[liv] Planning for Natural Hazards: The Oregon Technical Resource Guide, (July 2000) Department of Land Conservation and Development

[lv] http://www.usgs.gov/public/press/public_affairs/press_releases/pr1805m.html

[lvi] Overgrown Forests Require Preventive Measures, By Gale A. Norton (Secretary of the Interior), USA Today Editorial, August 21, 2002

[lvii] http://www.coastal.ca.gov/fire/ucsbfire.html

[lviii] Ibid

[lix] Planning for Natural Hazards: The Oregon Technical Resource Guide, (July 2000), Department of Land Conservation and Development

[lx] http://www.eqe.com/publications/revf93/firefoll.htm

[lxi] Source: National Interagency Fire Center, Boise ID and California Division of Forestry, Riverside Fire Lab.

[lxii] http://www.fs.fed.us/land/wdfire7c.htm

[lxiii] Source: National Interagency Fire Center, Boise ID and Karen Carroll;l, California Division of Forestry, Riverside Fire Lab

[lxiv] http://www.nifc.gov/fire_policy/docs/chp1.pdf

SECTION 11 NUCLEAR

I. WHY IS NUCLEAR A THREAT TO CITY OF SAN CLEMENTE

A. The San Onofre Nuclear Generating Station (SONGS) site is located on the coast of Southern California in San Diego County, approximately 2.5 miles southeast of San Clemente. This site, located entirely within the boundaries of the United States Marine Corps Base, Camp Pendleton, is approximately 4500 feet long and 800 feet wide, comprising 82.64 acres. There are two operating reactors (Units 2&3) at San Onofre. Combined they generate approximately 2,200 megawatts of power, enough power for 2.2 million homes and businesses. SONGS Unit 1 operated from 1968-1992 and is in the process of decommissioning. Units 2 and 3 began commercial operation in 1983 and 1984 respectively. The current Nuclear Regulatory Commission (NRC) licenses for Units 2 and 3 expire in 2022.

B. Release of radioactivity could represent a potential health hazard to the public. Controlled release of radioactive material to the environment and limitation of radiation dose to members of the public from operations involving nuclear power reactors are governed by Code of Federal Regulations, Title 10, Part 20. It must be assumed that when a nuclear power plant is operating, an accident with offsite consequences is possible. In an accident, physical barriers may be damaged and/or control of the radioactive material inventory may be reduced or lost. Such a release would most likely be to the atmosphere, although surface discharge of radioactive liquid is possible. The liquid would be expected to run into the ocean or be absorbed into the ground. An atmospheric release (called a "plume") would be dispersed by prevailing winds. The passage of this plume can result in a direct radiation exposure to those persons in its path, and in some cases may result in the contamination of environmental surfaces by fallout (a deposit of particulate matter which is radioactive). Such contamination may enter the food chain by involvement with pastureland, livestock, water supplies, or agricultural products, and would result in additional exposure to those persons within the affected area.

II. HISTORIC NUCLEAR ACCIDENTS

A. 1979 Three Mile Island

Harrisburg, Pennsylvania, the only significant nuclear accident in the history of Nuclear Power Generation in the United States. The results of the accident at TMI precipitated an exhaustive study and development of today's standards for emergency planning for neighboring communities.

B. San Onofre Nuclear Generating Station (SONGS)

San Onofre Nuclear Generating Station (SONGS) has never experienced an Emergency Classification Level greater than an Alert, the second of four classification levels since power generation was begun in the 70's.

III. RADIATION RELEASE CHARACTERISTICS

A. WHAT IS A RADIATION RELEASE

a. A release may be controlled or uncontrolled. In accordance with Code of Federal Regulations, Title 10, Part 20 SONGS may conduct a controlled release as long as it does not exceed the limits. An uncontrolled release could happen as a result of failure of protective barriers; containment dome, reactor vessel, fuel cladding.

b. The most probable release would be to the atmosphere where the controlling factors would be Physiography and Meteorology. The physiography of the area is typical of the region, with a rather narrow, gently sloping coastal plain extending seaward form the uplands. The plain ends at the beach at a line of sea cliffs. Sea cliffs in the immediate vicinity of the site are 60 to 80 feet above sea level, and are separated from the ocean by a narrow band of beach sand. Bluffs and canyons, narrow beaches and rolling hills give way, moving north, to the flat lands of the Los Angeles basin. Climatic conditions are typical of coastal southern California, with an average annual temperature of about 60 degrees F. Rainfall averages approximately 12 inches per year. Sea breezes are common during the daylight hours and land breezes during the night.

Wind direction determines the path to be taken by a radioactive plume and the wind speed determines the time of arrival at downwind points. Since wind direction and speed are influenced by both local and large scale factors, protective actions necessary will be conducted with the assistance of professional meteorologists.

IV. NUCLEAR HAZARD ASSESSMENT

A. Hazard Identification

a. Exposure to radiation is classified as either acute or chronic. Acute effects are those occurring soon after exposure. The chance of incurring early illness that might require treatment becomes negligible at doses below about 55 rem. The threshold of detectable changes in blood chemistry during the period shortly after irradiation is commonly associated with doses about 25 rem. At such dose levels, there is only a slight chance of even blood chemistry changes being observable.

Early fatalities are a function of irradiation dose to the body. Assuming supportive medical treatment is received, the individual risks of early fatalities within 60 days range from chances of 3 % at 400 rem, to 50 % at 510 rem (the so-called "LD-50 value), to 100 % at 615 rem.

c. Delayed chronic effects may be somatic (physical) or genetic origin. The most

common and visible delayed health effects are somatic in origin and include solid cancers of all varieties, as well as leukemia, and bone cancer.

Biological effects would be expected to occur at random and in relatively small numbers within a large population segment, if all were exposed to radiation. For example, even if an individual incurred a large dose (i.e., a dose sufficient to result in early illness), the potential risk of incurring delayed somatic fatalities would not be expected to exceed values of about 1:100. Lower exposures would result in proportionally lower risks. For example, five to eight additional cancer deaths would be expected if each of the approximately 100,000 people in the SONGS area received a dose of 0.5 rem (the general population whole body exposure lower limit). Of those 100,000 people, approximately 16,000 will die of cancer from other causes, even if the plant were not operational.

For a given radiation exposure, the total risk of incurring genetic effects is about the same low value that is projected for somatic effects. However, genetic effects may be expected to occur over very long time intervals (i.e., many generations). Fully half of the statistical total of projected genetic effects would be expected to occur after a 140 year period following exposure. Thus the relative number of genetic effects observed during the generation in which early or delayed somatic effects might occur would be much smaller than the number of observed somatic effects. Since the natural incidence of serious human disorders of genetic defects is quite large (roughly 20 percent of live-born offspring suffer from such defects). , the incremental effects of radiation-induced genetic risks resulting from accidental irradiation would be expected to be small and difficult to detect with confidence.

B. VULNERABILITY AND RISK

The plant is designed to use slightly enriched uranium dioxide as a fuel. This fuel does not pose a major concern in its non-irradiated form, since it is of very low radioactivity. However, after being in the core during operation of the reactor (fission process), the fuel becomes extremely radioactive by the production of fission by-products. These highly radioactive by-products, if released to the environment, are the main concern in a nuclear power plant accident.

The abnormal release of radioactivity during a catastrophic event could present a potential health hazard to the public.

a. High-Level Nuclear Waste

Each of the three individual units contain a stand-alone spent fuel pool located in specially engineered buildings designed to safely store the used nuclear fuel. Used nuclear fuel, sometimes referred to as high-level radioactive waste, is stored in 40-foot deep, seismically-designed pools

The fuel can be transferred to dry storage canisters. The Power Plant is in the process of transferring the used fuel from Unit 1 (in the process of decommissioning) to metal canisters; the filled canisters are then housed in multi-foot-thick, steel reinforced concrete modules stored inside a high security area of the plant called an Independent Spent Fuel Storage Installation (ISFSI) facility on site. The California Coastal Commission granted a development permit for Unit 1 independent dry storage facility in February 2000 and for Units 2 and 3 independent dry storage facility in June 2001.

- Unit 1 Transfer process began in August 2003, project completion May 2005
- Units 2 and 3 Scheduled to begin transfer process sometime around 2006

Eventually those dry storage canisters would be packaged further and transported by the Department of Energy (DOE) to the centralized federal repository (a deep geological burial site). Currently the DOE is attempting to license with the NRC a facility known as Yucca Mountain, located 100 miles northwest of Las Vegas, Nevada, adjacent to the Nevada Nuclear Weapons Test Site. Until then the canisters will safely remain on-site at SONGS in their specially designed storage modules.

b. Dry Cask Storage

The advanced NUHOMS® System for dry storage of spent fuel is designed by TransNuclear West and approved by the NRC in accordance with Title 10 of the Code of Federal Regulations part 72 subpart L. Units 1, 2 and 3 independent spent fuel storage facilities are being constructed and operated under the general licensing provisions of Title 10 of the Code of Federal Regulations part 72 subpart K. Fuel Storage Modules, canisters, and support pad comply with the standards and requirements in the NRC approved Certificate of Compliance and the TransNuclear West Safety Analysis Report. The storage system exceeds the NRC requirements for seismic design of SONGS.

Fuel is transferred in controlled conditions to a welded steel canister. The canister is verified sealed and transferred from spent fuel pool to horizontal storage modules. Transportation of used nuclear fuel canisters to central federal repository (such as Yucca Mountain), will be performed in accordance with Department of Transportation and NRC regulations.

Canisters are built to withstand earthquakes, fire, and corrosion and are compatible with fuel transfer, fuel storage, and fuel transportation systems. The confinement is completely welded. Concrete horizontal storage modules are erected on a steel-reinforced concrete pad and heat is removed by natural convection of air. A nuclear chain reaction in the used fuel is not possible.

c. Low Level Radioactive Waste (LLRW)

- At SONGS low-level radioactive waste might include paper, plastic, wiping cloths, filters, tools, water purification resins, and other items that contain small amounts of radioactive materials as well as nuclear reactor pressure vessels.
- SONGS Unit 1, which is undergoing decommissioning which produces larger volumes of low level radioactive wastes as the plant is dismantled including piping, valves and system components.
- The volume of low level radioactive waste being disposed of from SONGS Units 2 and 3 has been reduced by a factor of approximately 10 (10,000 cubic feet per year to less than 1,000 cubic feet per year) since Units 2 and 3 began operation in the early 1980s. The reduction has been through a combination of lower generation rates and improved treatment of waste prior to burial at a licensed disposal facility.
- SONGS has an on-site facility designed to process, package and ship LLRW.
- The nuclear reactor pressure vessel (RPV) from Unit 1 presently sits on site awaiting possible future shipment. SCE plans to eventually move the RPV to a licensed LLRW disposal site. Eventually, the entire SONGS site will be returned to its landlord the U.S. Federal Government.

d. Current LLRW Disposal Options

- LLRW has three sub-classifications- A, B, & C. Class A, is the least radioactive while Class C is the most radioactive. (The Unit 1 RPV is Class C Waste.);
- Envirocare (in Clive, Utah) can bury Class A waste and accepts such LLRW from SCE
- Barnwell, (in Barnwell, South Carolina) can bury LLRW Classes A, B & C waste.

e. Future LLRW Disposal Options

- Low Level Radioactive Waste Policy Act of 1980 created compacts for LLRW disposal;
- No compact disposal facilities have been constructed or opened since then;

- California is the host state for the Southwestern Low-Level Radioactive Waste Compact
- The California-approved company identified by the site, performed the requisite environmental assessment, and was granted a license by California
-

- Land transfer was not completed by California and the federal government
- September 2002 – California passed AB 2214 prohibiting use of Ward Valley as a low level radioactive waste disposal facility;
- Barnwell will close to waste from states that are not part of the Atlantic Compact in 2008;
- Texas is just starting the process of identifying potential site(s) for Texas Compact states
-

DOE sites do not accept LLRW from commercial generators

Radiological emergency response plans, in support of nuclear power plants, are developed using guidance from the Federal planning document titled NUREG-0654/FEMA-REP-1. Criteria for Preparation and Evaluation of Radiological Emergency Response Plans and Preparedness in Support of Nuclear Power Plants.

V. COMMUNITY NUCLEAR ISSUES

A. PROTECTIVE ACTIONS

Protection from radiation exposure during a catastrophic event requires sheltering or avoiding the source of exposure. Protective actions are decisions are made by Decision-makers in the Emergency Planning Zone (EPZ) and are based on accident classification, recommendations from the utility and recommendations from the Offsite Dose Assessment Center. The EPZ is approximately 10 miles in radius and includes the cities of Dana Point, San Clemente and San Juan Capistrano, those portions of unincorporated areas of Orange and San Diego Counties, Marine Corps Base, Camp Pendleton within the ten mile radius and the California Department of Parks and Recreation beaches and camping areas known as San Onofre, San Clemente Cristianitos, and Doheny. Once a consensus among the decision makers has been reached, the protective action recommendations can be implemented. See Map 1-7MAP7.

Several techniques are available to reduce or eliminate the effects of exposure to nuclear radiation. Such actions include, but are not limited to:

a. Sheltering (Shielding/Distance)

Sheltering involves keeping the radioactive material at a distance (on the outside of the structure) and use of whatever building material is involved as a shield against the radiation being emitted. This form of protection is especially viable where low levels of radioactivity will be encountered. Heavier construction materials provide better shielding, therefore, in many cases, a commercial structure (i.e., the bank building, the well-constructed shopping center, etc.), provides better protection. Sheltering will be considered as a protective action when:

- Low levels of radioactive materials are released into the environment and sheltering provides more than recommended protection to the population (i.e., unshielded exposures to the public would be negligible).
- A severe and rapidly deteriorating accident occurs and evacuation cannot be initiated successfully due to a lack of time.
- Evacuation is not feasible or effective due to local constraints, such as severe weather, bad roads, etc..
- It is the only means of protecting those people whose mobility may be impaired due to such factors as institutional confinement.
- The projected dose in the shelters is less than the projected dose due to evacuation.

b. EVACUATION

This is protection by avoidance. Evacuation is defined as the movement of the general public to new host areas out of the area impacted by the radioactive plume or contaminant. It is a complicated technique which requires in-depth planning and complete cooperation of those persons directly involved both as evacuees and as members of the host community. The decision to evacuate the City population is made by the City of San Clemente Director of Emergency Services based on recommendations of the County Health Officer, the Offsite Dose Assessment Center staff and/or SONGS. It is anticipated that, should evacuation be required, it should be implemented well in advance of a release of radiation. The objective of an evacuation is to protect the health and safety of the people from potentially harmful radiation doses, by asking them to leave the area before any continuous release begins. SONGS has explicit procedures and equipment in effect for monitoring any release of radiation. Changes in radiation are disseminated to the various EOCs via a dedicated communications network. The people being evacuated would be directed to the Reception and Decontamination Center located outside the affected area.

c. DECONTAMINATION

Decontamination is the physical removal of a contaminant from a person, an object, or an area once contamination has been identified by monitoring. Full monitoring and surveying functions will be performed in the monitoring area of the Reception and Decontamination Center. Decontamination is specialized work, done by properly trained individuals. There are hazards involved, as it is quite possible to inhale or ingest some of the radioactive material in the removal process. Special precautions available to persons working in decontamination include the use of special respirators to protect their lungs, anti-contamination clothing which is intended to keep radioactive particles off their skin; and special instrumentation which will allow them to keep track of actual radiation intensities and exposures dosages as they work.

d. USE OF THYROID BLOCKING AGENTS

When taken by individuals in the proper doses, stable, non-radioactive, thyroid-blocking agents limit the uptake of radioactive iodines into the thyroid gland. If the agent is taken prior to or immediately after radioiodines exposure, the agents are very effective.

Approved thyroid-blocking agents, such as potassium iodide (KI), may be taken by emergency workers and the general public. The County Health Officer, with recommendations from the Offsite Dose Assessment Center or the State Department of Health and Services, will recommend ingestion of such agents if there is release or potential release of radioactive iodine.

Sufficient supplies of KI are maintained by each EOC for the emergency workers. Additionally, in our City, a supply is maintained for City employees. Approximately 1 year ago the general public was afforded the opportunity to acquire KI via the California Office of Emergency Services, Radiological Preparedness Branch, provided by the Federal Emergency Management Agency, a minimum of two KI tablets for each resident per household. Statistics show approximately 35% of the residents of our City participated. In the event of an evacuation and a resident does not have KI available, an additional supply has been stockpiled at the Reception and Decontamination Center.

e. ALLOWING FOR RADIOACTIVE DECAY

Allowing time for radioactive decay by keeping the general population away from radioactive items and areas provides an effective countermeasure. The normal use of items and areas can be resumed when radiation and/or contamination levels meet acceptable standards.

VI. PREPARING FOR AN EMERGENCY

A. CITY EMERGENCY PLANNING OFFICER

The City employs a full time Emergency Planning Officer who is responsible for maintaining a current nuclear emergency response plan. He/she is also responsible for training assigned emergency workers for normal duties encountered in an Emergency Operations Center but also in radiological protection.

The Emergency Planning Officer is a member of the Interjurisdictional Planning Committee (IPC), an organization comprised of a representative from each of the cities and entities, as well as a representative from SONGS, located within 10-miles of SONGS. Monthly meetings are held to discuss planning and training issues.

A key planning issue is education of the public within the emergency planning zone. Education of the public is achieved through various means, but

primarily through an annually updated set of Nuclear Emergency Instructions provided in the SBC Telephone Directory. This education document is reinforced prior to an annual Community Alert Siren System Test. Prior to the test, mailers are sent to each residence and business address in the emergency planning zone. Included in the mailer are copies or reference to the Emergency Instructions.

Biennially, an Evaluated Exercise is conducted following a scenario developed by SONGS under the auspices of the Nuclear Regulatory Commission and the Federal Emergency Management Agency. During the course of the exercise FEMA evaluators are dispatched to each Emergency Operations Center to evaluate the EOC's performance, the results of their findings are published as "Final Report Biennial Exercise." FEMA is tasked with evaluation of offsite performance whereas the NRC is tasked with evaluating the performance of SONGS.

VII. NUCLEAR MITIGATION ACTION ITEMS

Natural Hazard	**SHORT TERM ACTIVITY – NUCLEAR #1**		
Action Item	Participate in established Interjurisdictional Planning Committee at each monthly meeting, reporting minutes to Director of Public Works/Community Development. Ensure the Director is kept abreast of evolving activities at SONGS and their impact.		
Coordinating Organization	City of San Clemente Emergency Planning Services		
Ideas for Implementation			
Time line	Ongoing.		
Constraints	None		
Plan Goals Addressed			**Protect Life and Property**
X	**Public Awareness**		**Natural Systems**
X	**Partnerships and Implementation**	**X**	**Emergency Services**

Natural Hazard	**SHORT TERM ACTIVITY – NUCLEAR #2**		
Action Item	Closely coordinate with City of San Clemente Public Information Officer and SONGS Public Information Officer to ensure all public outreach is in agreement.		
Coordinating Organization	City of San Clemente Emergency Planning Services, SONGS Public Information Officer		
Ideas for Implementation			
Time line	2005		
Constraints	None		
Plan Goals Addressed			**Protect Life and Property**
X	**Public Awareness**		**Natural Systems**

X	**Partnerships and Implementation**	**X**	**Emergency Services**

Natural Hazard	**LONG TERM ACTIVITY – NUCLEAR #1**		
Action Item	Retain emergency planning staff assignments to coordinate, prepare, and implement appropriate nuclear hazard plans. Individual(s) shall maintain close line of communication with appropriate representatives of the San Onofre Nuclear Generating Station and report to the City Council regarding the status of the facility, nuclear hazard plans, and safety issues and concerns.		
Coordinating Organization	City of San Clemente Emergency Planning Services		
Ideas for Implementation			
Time line	2005		
Constraints	None		
Plan Goals Addressed		**X**	**Protect Life and Property**
	Public Awareness		**Natural Systems**
X	**Partnerships and Implementation**	**X**	**Emergency Services**

Natural Hazard	**LONG TERM ACTIVITY – NUCLEAR #2**		
Action Item	Incorporate nuclear emergency safety and preparedness into other ongoing public education programs		
Coordinating Organization	City of San Clemente Public Works/Emergency Planning Officer		
Ideas for Implementation	Seek additional vehicles for communicating with the public		
Time line	2005		
Constraints	None		
Plan Goals Addressed		**X**	**Protect Life and Property**
	Public Awareness		**Natural Systems**
X	**Partnerships and Implementation**	**X**	**Emergency Services**

NUCLEAR RESOURCE DIRECTORY (See details in Appendix A)

COUNTY RESOURCES
County of Orange Emergency Response Plan

STATE RESOURCES
State of California Nuclear Response Plan

FEDERAL RESOURCES AND PROGRAMS

Federal Emergency Management Agency (FEMA)
Nuclear Regulatory Commission (NRC)

PUBLICATIONS

City of San Clemente Multi-Hazard Emergency Plan, March 21, 2001

City of San Clemente Annex A SONGS Emergency Plan May 19, 1999

Code of Federal Regulation, Title 10, Part 20.

Criteria for Preparation and Evaluation of Radiological Emergency Response Plans and Preparedness in Support of Nuclear Power Plants, NUREG-0654 FEMA-REP-1

PART III RESOURCES

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 community 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.			

California Division of Forestry (CDF)			
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 protects over 31 million acres of California's privately-owned wildlands. CDF 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://wwwdwr.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 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.			

Gateway Cities Partnership			
Level: Regional	Hazard: Multi	www.gatewaycities.org	
7300 Alondra Boulevard		Suite 202	
Paramount, CA 90723		Ph: 562-817-0820	Fx:
Notes: Gateway Cities Partnership is a 501 C 3 non-profit Community Development Corporation for the Gateway Cities region of southeast LA County. The region comprises 27 cities that roughly speaking extends from Montebello on the north to Long Beach on the South, the Alameda Corridor on the west to the Orange County line on the east.			

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.			

Greater Antelope Valley Economic Alliance			
Level: Regional	Hazard: Multi		
42060 N. Tenth Street West			
Lancaster, CA 93534		Ph: 661-945-2741	Fx: 661-945-7711
Notes: The Greater Antelope Valley Economic Alliance, (GA VEA) is a 501 (c)(6) nonprofit organization with a 501(c)(3) affiliated organization the Antelope Valley Economic Research and Education Foundation. GA VEA is a public-private partnership of business, local governments, education, non-profit organizations and health care organizations that was founded in 1999 with the goal of attracting good paying jobs to the Antelope Valley in order to build a sustainable economy.			

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 (c) 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 Wildland/Urban Interface Fire Program			
Level: Federal	Hazard: Wildfire	www.firewise.org/	
1 Batterymarch Park			
Quincy, MA 02169-7471		Ph: 617-770-3000	Fx: 617 770-0700
Notes: Firewise maintains a Website designed for people who live in wildfire- prone areas, but it also can be of use to local planners and decision makers. The site offers online wildfire protection information and checklists, as well as listings of other publications, videos, and conferences.			

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 Interagency Fire Center (NIFC)			
Level: Federal	Hazard: Wildfire	www.nifc.gov	
3833 S. Development Ave.			
Boise, Idaho 83705-5354		Ph: 208-387- 5512	Fx:
Notes: The NIFC in Boise, Idaho is the nation’s support center for wildland firefighting. Seven federal agencies work together to coordinate and support wildland fire and disaster operations.			

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 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 & Constitution Ave NW		Rm 6013	
Washington, DC 20230		Ph: 202-482-6090	Fx: 202-482-3154
Notes: NOAA 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.			

Orange County Resources & Development Management Department			
Level: County	Hazard: Flood	http://www.ocrdmd.com/services.asp	
300 North Flower Street			
Santa Ana, CA 92703-5000		Ph: (714) 834-2300	Fx:
Notes: RDMD serves all of Orange County by providing regional flood control, water quality enhancement, recreation, and agricultural services. These regional services are countywide and are provided equally within city boundaries as well as in unincorporated areas. For most of these services our clientele is the public at large. For example, everyone who lives or works in Orange County benefits from infrastructure that minimizes the threat of flooding. Property owners, businesses, and visitors all benefit and therefore are our clients, as are citizens in other counties through our involvement in cooperative projects with their local governments.			

San Gabriel Valley Economic Partnership			
Level: Regional	Hazard: Multi	www.valleynet.org	
4900 Rivergrade Road		Suite A310	
Irwindale, CA 91706		Ph: 626-856-3400	Fx: 626-856-5115
Notes: The San Gabriel Valley Economic Partnership is a non-profit corporation representing both public and private sectors. The Partnership is the exclusive source for San Gabriel Valley-specific information, expertise, consulting, products, services, and events. It is the single organization in the Valley with the mission to sustain and build the regional economy for the mutual benefit of all thirty cities, chambers of commerce, academic institutions, businesses and residents.			

Santa Monica Mountains Conservancy			
Level: Regional	Hazard: Multi	http://smmc.ca.gov/	
570 West Avenue Twenty-Six		Suite 100	
Los Angeles, CA 90065		Ph: 323-221-8900	Fx:
Notes: The Santa Monica Mountains Conservancy helps to preserve over 55,000 acres of parkland in both wilderness and urban settings, and has improved more than 114 public recreational facilities throughout Southern California.			

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 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.			
USDA Forest Service			
Level: Federal	Hazard: Wildfire	http://www.fs.fed.us	
1400 Independence Ave. SW			
Washington, D.C. 20250-0002		Ph: 202-205-8333	Fx:
Notes: The Forest Service is an agency of the U.S. Department of Agriculture. The Forest Service manages public lands in national forests and grasslands.			

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.			

Nuclear Regulatory Commission			
Level: Federal	Hazard: Nuclear	http://www.nrc.gov/	
U.S. Nuclear Regulatory Commission, Office of Public Affairs (OPA)			
Washington, D.C. 20555		Ph: Toll-free: 800-368-5642	Fx:

NRC's primary mission is to protect the public health and safety, and the environment from the effects of radiation from nuclear reactors, materials, and waste facilities. They also regulate these nuclear materials and facilities to promote the common defense and security. NRC carries out its mission by conducting the following activities:

Commission Direction-Setting and Policymaking - policy formulation, rulemaking, and adjudication oversight activities performed by NRC's five-member Commission.

Radiation Protection - information about radiation and NRC's role in ensuring protection of the public and radiation workers.

Appendix B The Public Participation Process

Public participation is a key component to strategic planning processes. Citizen 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 San Clemente Natural Hazards Mitigation Plan integrates a cross-section of citizen input throughout the planning process. To accomplish this goal, the City of San Clemente Hazard Mitigation Advisory Committee developed a public participation process through three components: (1) developing a project steering committee comprised of knowledgeable individuals representative of the community; (2) conducting stakeholder interviews to target the specialized knowledge of individuals working with populations or areas at risk from natural hazards; and (3) conducting two public workshops to identify common concerns and ideas regarding hazard mitigation and to discuss specific goals and actions of the mitigation plan.

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

Steering Committee

Hazard mitigation in City of San Clemente is overseen by the Hazard Mitigation Steering Committee, which consists of representatives from various city departments, representatives from local business and community organizations and the public. Steering committee members have an understanding of how the community is structured and how residents, businesses, and the environment may be affected by natural hazard events. The steering committee guided the development of the plan, and assisted in developing plan goals and action items, identifying stakeholders, and sharing local expertise to create a more comprehensive plan.

Table B.1 lists the various people and organizations that participated on the City of San Clemente Natural Hazard Mitigation Planning Steering Committee.

Table B.1. Hazard Mitigation Planning Steering Committee

City of San Clemente City Manager
City of San Clemente Director Public Works
City of San Clemente Emergency Services Coordinator
City of San Clemente Finance Division
City of San Clemente Planning Division
City of San Clemente Public Information, Office of City Manager
City of San Clemente Engineering Division
GIS Specialist, City of San Clemente GIS, Information Services Division
City of San Clemente Building and Safety Division
City of San Clemente Public Works Administration
Tom Bistline, Tom Bistline Construction Company
Peter Borella, Ph.D. Borella Geology, Inc
Pat Wolfram, CEO, San Clemente Hospital
Pat Hayes, General Manager, Talega Associates
Michael Kaupp, President, Downtown Business Association of San Clemente
Mike Burke, Consulting
Dave Doomey, Capistrano Unified School District
Mike Dunbar, General Manager, South Coast Water District
Jim Yates, Talega Associates
Barbara Culverhouse, Offsite Emergency Planning, San Onofre Nuclear Generating Station

Meeting #1: March 1, 2004

The Director Public Works convened the meeting and provided an overview to the committee about the Disaster Mitigation Act of 2000 and the planning process that was about to be undertaken.

The City of San Clemente Emergency Services Coordinator introduced the steering committee. Each committee member described the department or organization that they represented and their role in addressing hazard mitigation. There was a discussion of past and current mitigation activities undertaken in the city to provide the committee members with a knowledge historic community disaster issues. At this brainstorming meeting, a list of potential disaster events was compiled to be evaluated. Over the next two weeks, these events will be analyzed for risk, vulnerability, and examined for cost liability. From the below list, those with the highest risk factors will be addressed in the City's Natural Hazard Mitigation Plan:

Earthquake
Floods
Fires
Landslides
Terrorism

Hazmat
Nuclear
Hurricanes
Landfill
Tsunami

Specific areas of responsibilities were discussed, but no assignments were made. Assignments will be an agenda item for subsequent meeting.

Next meeting scheduled for March 15, 2004.

Meeting #2 March 15, 2004
The chairperson presented the project methodology and the draft framework for the Mitigation Plan. Steering Committee members were asked to provide input on key stakeholders to be included in the planning process. A brainstorming process was then conducted to develop the goals for the Plan. The Steering Committee was asked to identify goals for risk reduction, and potential outcomes for how the plan could be used in the future. Table B-2 lists the resulting goals and ideas.

Table B.2. Goal Areas and Ideas

Goal Area	Idea
Property Protection	Reduce insurance losses and repetitive claims for chronic hazard events while promoting insurance coverage for catastrophic hazards. Focus resources on activities involving property owners and that assist in protecting homes, structures, or property from natural hazards.
Natural Systems	Evaluate and make recommendations for city guidelines, codes, and permitting processes in addressing natural hazard mitigation and development in vulnerable areas. Link watershed planning, natural resource management, and land use planning with natural hazard mitigation activities to protect vital habitat and water quality. Preserve and rehabilitate natural systems to serve natural hazard mitigation functions.
Public Awareness	Develop and implement education programs that will increase property owners and developers awareness of natural hazards. Develop and conduct outreach programs to increase the number of local, county, and regional activities implemented by public and private sector organizations.
Partnerships	Strengthen communication and coordinate participation in and between public agencies, citizens, non-profit organizations, business, and industry. Document the process and resources that will reduce the administrative burden on the requestors/recipients of grant funds. Provoke congressional attention by identifying mitigation priorities.
Emergency Services	Establish policy to encourage mitigation for critical facilities, services, and infrastructure. Strengthen emergency operations by increasing collaboration and coordination among public agencies, non-profit organizations, business, and industry.

Implementation	Promote leadership within public agencies to implement natural hazard mitigation activities. Attain participation and funding to implement mitigation activities by creating a dynamic document, which is continually updated and revised.
Guide Development and Use of Vulnerable Areas	Identify a clear process by which planners can identify and illustrate to potential developers the natural hazards that are present, the threat they pose, and how their development will be mitigated, regulated, and possibly limited. Improve hazard identification, assessment and summarize hazards data and possible mitigation strategies to address those hazards in a palatable format
Source: City of San Clemente Natural Hazards Steering Committee, 2004	

May 25 and 26, 2004
Interview with Rita Mueller, Records Coordinator, City of San Clemente. Purpose of interview was to gain access to archived City Council Meeting Minutes in search of flooding history.

May 27, 2004
Interview with the Director, San Clemente Historical Society. Interview was to peruse historical pictures, newspaper articles and memorabilia from 1928 to present.

June 1, 2004
Interview with Maintenance Management personnel at the San Clemente Hospital. Purpose of interview was to obtain current earthquake preparedness information in accordance with the Alfred E. Alquist Act. San Clemente Hospital was well aware of their needs to fully meet the requirements and are diligently working to resolve those issues remaining.

June 3, 2004
Interviewed Mr. Jay Elston, Utility Operations Supervisor, City of San Clemente, concerning sewer and water services for the City. Mr. Elston was able to provide current and historical data on past and current operations.

June 4, 2004
Interview with Superintendent for South Coast Water District. South Coast Water District manages Reservoir #6, an open reservoir contained by an earthen dam. The large amount of information contained in this plan about our single earthen dam was gained during this meeting.

June 10, 2004
Interview with Mr. John Moore, Senior Plant Operator II, Water Division, City of San Clemente. The outcome of this meeting was greater understanding of water treatment and distribution within the City. Mr. Moore was able to provide historical data that was greatly beneficial in understanding our water system from its inception to current status.

Stakeholders Interviews
Stakeholders interviewed for the mitigation plan represented agencies and organizations throughout the city. The Committee staff integrated information provided by stakeholders into the sections of the

plan relating to current mitigation activities, new action items and in the resource directory.

Public Meetings
City of San Clemente coordinated two public workshops in the City to gather public ideas and opinions about the mitigation plan goals and activities.

First Public Workshop: July 27, 2004
The first public workshop provided information on the mitigation plan to workshop participants and garnered input on issues related to natural hazards in the community. One of the participants, a retired Nuclear Engineer formerly employed at the San Onofre Nuclear Generating Station, stated that several years ago the nuclear power plant conducted an in depth study of Tsunamis and the anticipated impacts. Subsequent to this meeting a search was done for the study. The study was located and pertinent portions were incorporated into this plan. Three citizens attended the meeting..

Invitation Process
The City Public Information Officer worked with the Chairperson to identify all possible public notice sources. A press release was submitted to the local daily and weekly print media.

Results
The Chairperson began the presentation by providing an overview of workshop objectives to the participants. The citizens were provided with copies of Mitigation Action Items for Multi Hazard, Earthquake, Floods, Landslides, Tsunamis, Wildfire, and Nuclear. Agreement was reached on the six hazards for inclusion in the plan. An in depth explanation of both short and long term action items was provided and who was tasked with the assignments and the planned monitoring process for assurance of completion. Future public involvement and a tentative time frame for review and approval of the plan prior to its submission to City Council were provided.

3 August, 2004
Hard copies of the Draft Mitigation Plan were provided to the Steering Committee for review and comment, all comments are to be completed by August 18, 2004.

25 August, 2004
A luncheon/meeting was conducted with the Steering Committee. The Chairperson reiterated the decision by the City to develop a Hazard Mitigation Plan and the necessities for doing so. Discussion was held regarding the identified six hazards seeking any additions or deletions, Committee is in agreement on the hazards identified. The Chairperson briefly outlined the submission process and the timeline established in order to meet the submission deadline. At this time, the Chairperson then opened the floor for questions and concerns. Mr. Peter Borella, Ph. D. Borella Geology, Inc. offered several comments; some of the figures being used to depict earthquake faults were dated and he will provide updates within the week. Peter had several comments as to terminology and rather than delay the meeting he agreed to meet after the meeting and provide his concerns. Mr. Bill Cameron contested some assignments to Engineering Division and the terminology used to describe the actions assigned, the Chairperson stated the City Staff would meet immediately after the planned meeting to resolve these issues. Subsequent to the planned meeting these issues were discussed at length and resolution reached as to their current wording and assignments.

Second Public Workshop: September 2, 2004
City of San Clemente held the second public workshop to gather public input on issues related to

natural hazards in the city, as well as ideas for strategies to reduce risk. The workshop was successful in attaining public input, with 2 citizens, 2 steering committee members, in attendance.

Invitation Process

The city Public Information Officer worked with the Chairperson to identify all possible public notice sources. A press release was submitted to the City Manager, local daily and weekly print media.

Results

After the Chairperson presented the workshop objectives, participants and steering committee members discussed at length how each hazard action item was derived and the rationale for assignments to various departments for action. Several questions were asked by the public on some technical terms and specific programs referenced, these questions were answered to their satisfaction. The attendees were well satisfied with the contents of the plan and the direction the City has selected to initiate our mitigation program

Appendix C Economic Analysis of Natural Hazard Mitigation Projects

Economic Analysis of Natural Hazard Mitigation Projects

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 natural 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: Federal Emergency Management Agency Publication 331, Report on Costs and Benefits of Natural 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 natural 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 natural 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 natural 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 natural 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, requiring conforming 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 natural hazards can include structural projects to enhance disaster resistance, education and outreach, and acquisition or demolition of exposed properties, among others. Different mitigation projects can assist in minimizing risk to natural 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 benefit, 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 Natural Hazard Mitigation

The estimation of economic returns, which accrue to building or land owner as a result of natural 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 Natural 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 natural 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 natural 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 natural hazard mitigation with projects related to watersheds, environmental planning, community economic development, and small business development, among others. Incorporating natural hazard mitigation with other community projects can increase the viability of project implementation.

Resources

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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	Natural 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
SEAO	Structural Engineers Association of Oregon
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

A&W	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 & 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
EPZ	Emergency Planning Zone
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 So. Calif 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 & Family Grant (program)

IRG	Incident Response Geographic Information System
IPA	Information and Public Affairs (of state Office of Emergency Services)
KI	Potassium Iodide
LAN	Local Area Network
LEMMA	Law Enforcement Master Mutual Aid
LD-50	Lethal Dose
LEPC	Local Emergency Planning Committee
LLRW	Low Level Radioactive Waste
MARAC	Mutual Aid Regional Advisory Council
MHID	Multihazard 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
NRC	Nuclear Regulatory Commission
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
OCFA	Orange County Fire Authority
OCTA	Orange County Transportation Authority
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 & Immediate Deployment
RDO	Radiological Defense Officer
RDMHC	Regional Disaster Medical Health Coordinator
REM	Roentgen Equivalent Man
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)
RPV	Reactor Pressure Vessel
RRT	Regional Response Team
SAM	State Administrative Manual
SARA	Superfund Amendments & 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
TTT	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 to be 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 that are 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.
Fission	A nuclear reaction in which an atom splits into fragments
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 windspeed 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, drydocks, 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 natural 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 man-made 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.
Plume	An airborne radioactive mass
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 exceed 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 Runup	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.

Appendix F Project Evaluation Worksheet

Project Evaluation Worksheet

Jurisdiction:						Contact:					
Project Title						Phone:					
Agency:						E-mail:					
Hazard(s):											
Flood Zone:			Base Flood Elevation:			Erosion Rate:					
Critical Facility/Population At Risk:											
Environmental Impact:						Historic Preservation Impact:					
High		Medium		Low		High		Medium		Low	
Importance to Protection of Life/Property and Disaster Recovery						Risk of Hazard Impact:					
High		Medium		Low		High		Medium		Low	
Estimated Cost:						Project Duration:					
Value of Facility:						Value of Contents:					
Source(s) of Financing:											
Project Objectives:											
Project Description:											
Proposal Date:											

Evaluation Category	Considerations	Comments
Social	Community Acceptance	
	Adversely Affects Segments of the Population	
Technical	Technical Feasibility	
	Long Term Solution	
	Secondary Impacts	
Administrative	Staffing	
	Funding Allocated	
	Maintenance / Operations	
Political	Political Support	
	Plan Proponent	
	Public Support	
Legal	Authority	
	Action Subject to Legal Challenge	
Economic	Benefit	
	Cost of Action	
	Contributes to Economic Goals	
	Outside Funding Required	
Environmental	Affects Land / Water Bodies	
	Affects Endangered Species	
	Affects Hazardous Materials and Waste Sites	
	Consistent with Community Environmental Goals	
	Consistent with Federal Laws	

Instructions for Using the Plan Review Crosswalk for Review of Local Mitigation Plans

Attached is a Plan Review Crosswalk based on the ***Multi-Hazard Mitigation Planning Guidance Under the Disaster Mitigation Act of 2000***, published by FEMA, dated March 2004. This Plan Review Crosswalk is consistent with the *Disaster Mitigation Act of 2000* (P.L. 106-390), enacted October 30, 2000 and *44 CFR Part 201 – Mitigation Planning, Interim Final Rule* (the Rule), published February 26, 2002.

SCORING SYSTEM

N – Needs Improvement: The plan does not meet the minimum for the requirement. Reviewer's comments must be provided.

S – Satisfactory: The plan meets the minimum for the requirement. Reviewer's comments are encouraged, but not required.

Each requirement includes separate elements. All elements of a requirement must be rated "Satisfactory" in order for the requirement to be fulfilled and receive a summary score of "Satisfactory." A "Needs Improvement" score on elements shaded in gray (recommended but not required) will not preclude the plan from passing.

When reviewing single jurisdiction plans, reviewers may want to put an N/A in the boxes for multi-jurisdictional plan requirements. When reviewing multi-jurisdictional plans, reviewers may want to put an N/A in the prerequisite box for single jurisdiction plans.

States that have additional requirements can add them in the appropriate sections of the *Multi-Hazard Mitigation Planning Guidance* or create a new section and modify this Plan Review Crosswalk to record the score for those requirements.

Optional matrices for assisting in the review of sections on profiling hazards, assessing vulnerability, and identifying and analyzing mitigation actions are found at the end of the Plan Review Crosswalk.

The example below illustrates how to fill in the Plan Review Crosswalk.

Example

Assessing Vulnerability: Overview

Requirement §201.6(c)(2)(ii): *[The risk assessment **shall** include a] description of the jurisdiction's vulnerability to the hazards described in paragraph (c)(2)(i) of this section. This description **shall** include an overall summary of each hazard and its impact on the community.*

Element	Location in the Plan (section or annex and page #)	Reviewer's Comments	SCORE N	SCORE S
A. Does the plan include an **overall summary** description of the jurisdiction's **vulnerability** to each hazard?	Section II, pp. 4-10	The plan describes the types of assets that are located within geographically defined hazard areas as well as those that would be affected by winter storms.		✓
B. Does the plan address the **impact** of each hazard on the jurisdiction?	Section II, pp. 10-20	The plan does not address the impact of two of the five hazards addressed in the plan. **Required Revisions:** • Include a description of the impact of floods and earthquakes on the assets. **Recommended Revisions:** • This information can be presented in terms of dollar value or percentages of damage.	✓	
		SUMMARY SCORE	✓	

Local Mitigation Plan Review and Approval Status

Jurisdiction: **City of San Clemente, State of California**	**Title of Plan:** **Natural Hazard Mitigation Plan**	**Date of Plan:** **September 3, 2004**
Local Point of Contact: **David N. Lund**	**Address:** **Suite 100** **910 Calle Negocio** **San Clemente, CA 92673**	
Title: **Director, Public Works and Economic Development**		
Agency: **City of San Clemente**		
Phone Number: **949-361-8391**	**E-Mail:** **lundd@san-clemente.org**	

State Reviewer:	**Title:**	**Date:**

FEMA Reviewer:	**Title:**	**Date:**
Date Received in FEMA Region [Insert #]		
Plan Not Approved		
Plan Approved		
Date Approved		

Jurisdiction:	NFIP Status*			
	Y	**N**	**N/A**	**CRS Class**
1. City of San Clemente	Y			10
2.				
3.				
4.				
5. [ATTACH PAGE(S) WITH ADDITIONAL JURISDICTIONS]				

*** Notes:** **Y = Participating** **N = Not Participating** **N/A = Not Mapped**

Jurisdiction: City of San Clemente

LOCAL MITIGATION PLAN REVIEW SUMMARY

The plan cannot be approved if the plan has not been formally adopted.

Each requirement includes separate elements. All elements of the requirement must be rated "Satisfactory" in order for the requirement to be fulfilled and receive a score of "Satisfactory." Elements of each requirement are listed on the following pages of the Plan Review Crosswalk. A "Needs Improvement" score on elements shaded in gray (recommended but not required) will not preclude the plan from passing. Reviewer's comments must be provided for requirements receiving a **"Needs Improvement"** score.

SCORING SYSTEM

Please check one of the following for each requirement.

N – Needs Improvement: The plan does not meet the minimum for the requirement. Reviewer's comments must be provided.

S – Satisfactory: The plan meets the minimum for the requirement. Reviewer's comments are encouraged, but not required.

Prerequisite(s) (Check Applicable Box)	**NOT MET**	**MET**
Adoption by the Local Governing Body: §201.6(c)(5) **OR**		
Multi-Jurisdictional Plan Adoption: §201.6(c)(5) **AND**		
Multi-Jurisdictional Planning Participation: §201.6(a)(3)		

Planning Process	**N**	**S**
Documentation of the Planning Process: §201.6(b) and §201.6(c)(1)		
Local Capabilities Assessment §201.4(c)(ii) and §201.6(c)(1)		

Risk Assessment	**N**	**S**
Identifying Hazards: §201.6(c)(2)(i)		
Profiling Hazards: §201.6(c)(2)(i)		
Assessing Vulnerability: Overview: §201.6(c)(2)(ii)		
Assessing Vulnerability: Identifying Structures: §201.6(c)(2)(ii)(A)		
Assessing Vulnerability: Estimating Potential Losses: §201.6(c)(2)(ii)(B)		
Assessing Vulnerability: Analyzing Development Trends: §201.6(c)(2)(ii)(C)		
Multi-Jurisdictional Risk Assessment: §201.6(c)(2)(iii)		

Mitigation Strategy	**N**	**S**
Local Hazard Mitigation Goals: §201.6(c)(3)(i)		
Identification and Analysis of Mitigation Actions: §201.6(c)(3)(ii)		
Implementation of Mitigation Actions: §201.6(c)(3)(iii)		
Multi-Jurisdictional Mitigation Actions: §201.6(c)(3)(iv)		

Plan Maintenance Process	**N**	**S**
Monitoring, Evaluating, and Updating the Plan: §201.6(c)(4)(i)		
Incorporation into Existing Planning Mechanisms: §201.6(c)(4)(ii)		
Continued Public Involvement: §201.6(c)(4)(iii)		

Additional State Requirements*	**N**	**S**
See **Planning Process**, Local Capabilities Assessment		
Insert State Requirement		
Insert State Requirement		

LOCAL MITIGATION PLAN APPROVAL STATUS

PLAN NOT APPROVED	
PLAN APPROVED	

*States that have additional requirements can add them in the appropriate sections of the *Multi-Hazard Mitigation Planning Guidance* or create a new section and modify this Plan Review Crosswalk to record the score for those requirements.

See Reviewer's Comments

PREREQUISITE(S)

Adoption by the Local Governing Body

Requirement §201.6(c)(5): *[The local hazard mitigation plan **shall** include] documentation that the plan has been formally adopted by the governing body of the jurisdiction requesting approval of the plan (e.g., City Council, County Commissioner, Tribal Council).*

Element	Location in the Plan (section or annex and page #)	Reviewer's Comments	SCORE NOT MET	SCORE MET
A. Has the local governing body adopted the plan?	Preface, pg. xiii CW1			
B. Is supporting documentation, such as a resolution, included?	Preface, pg. xiii CW1			
		SUMMARY SCORE		

Multi-Jurisdictional Plan Adoption

Requirement §201.6(c)(5): *For multi-jurisdictional plans, each jurisdiction requesting approval of the plan **must** document that it has been formally adopted.*

Element	Location in the Plan (section or annex and page #)	Reviewer's Comments	SCORE NOT MET	SCORE MET
A. Does the plan indicate the specific jurisdictions represented in the plan?	N/A Not a Multi jurisdictional plan			
B. For each jurisdiction, has the local governing body adopted the plan?	N/A Not a Multi jurisdictional plan			
C. Is supporting documentation, such as a resolution, included for each participating jurisdiction?	N/A Not a Multi jurisdictional plan			
		SUMMARY SCORE		

Multi-Jurisdictional Planning Participation

Requirement §201.6(a)(3): *Multi-jurisdictional plans (e.g., watershed plans) may be accepted, as appropriate, as long as each jurisdiction has participated in the process … Statewide plans will not be accepted as multi-jurisdictional plans.*

Element	Location in the Plan (section or annex and page #)	Reviewer's Comments	SCORE NOT MET	SCORE MET

A. Does the plan describe **how** each jurisdiction participated in the plan's development?	N/A Not a Multi jurisdictional plan			
		SUMMARY SCORE		

PLANNING PROCESS: ***§****201.6(b): An open public involvement process is essential to the development of an effective plan.*

Documentation of the Planning Process

Requirement §201.6(b): *In order to develop a more comprehensive approach to reducing the effects of natural disasters, the planning process* ***shall*** *include:*

(1) An opportunity for the public to comment on the plan during the drafting stage and prior to plan approval;

(2) An opportunity for neighboring communities, local and regional agencies involved in hazard mitigation activities, and agencies that have the authority to regulate development, as well as businesses, academia and other private and non-profit interests to be involved in the planning process; and

(3) Review and incorporation, if appropriate, of existing plans, studies, reports, and technical information.

Requirement §201.6(c)(1): *[The plan* ***shall*** *document] the planning process used to develop the plan, including how it was prepared, who was involved in the process, and how the public was involved.*

Element	Location in the Plan (section or annex and page #)	Reviewer's Comments	SCORE N	SCORE S
A. Does the plan provide a narrative description of the process followed to prepare the plan?	Part One, Pgs. 2,3 CW2			
B. Does the plan indicate who was involved in the planning process? (For example, who led the development at the staff level and were there any external contributors such as contractors? Who participated on the plan committee, provided information, reviewed drafts, etc.?)	Part One, Pg. 2 CW29 CW30			
C. Does the plan indicate how the public was involved? (Was the public provided an opportunity to comment on the plan during the drafting stage and prior to the plan approval?)	Appendix B, Pg. 234 CW31			
D. Was there an opportunity for neighboring communities, agencies, businesses, academia, nonprofits, and other interested parties to be involved in the planning process?	Part One, Pg.2 CW49, Appendix B, Pgs. 225-232 CW50			
E. Does the planning process describe the review and incorporation, if appropriate, of existing plans, studies, reports, and technical information?	Part One, Pg. 7 CW32			
		SUMMARY SCORE		

Local Capabilities Assessment (Optional, Additional State OES Requested Information)

Requirement §201.4(c)(3)(ii): *– Of the Federal Register Interim Final Rule 44 CFR Parts 201 and 206 states, "[The State mitigation strategy shall include] a general description and analysis of the effectiveness of local mitigation policies, programs, and capabilities.*

. . . .

Element	Location in the Plan (section or annex and page #)	Reviewer's Comments	SCORE N	SCORE S
A. Does the plan provide a description of the human, technical and financial resources available within this jurisdiction to engage in a mitigation planning process and to develop a local hazard mitigation plan? (These resources are described in Section 2.2 of the OES LHMP Development Guide).	Part One, Pg. 63 CW53	***Note: This section is optional. A "Needs Improvement" score on this requirement will not preclude the plan from being approved by FEMA.***		
B. Does the plan list local mitigation funding sources (taxes, fees, assessments or fines) which affect or promote mitigation within the reporting jurisdiction?	Part One, Pg. 52 and 67 CW54 CW55	***Note: This section is optional. A "Needs Improvement" score on this requirement will not preclude the plan from being approved by FEMA.***		
C. Does the plan list local ordinances which affect or promote disaster mitigation, preparedness, response or recovery within the reporting jurisdiction?	Part One, Pg. 64 CW56	***Note: This section is optional. A "Needs Improvement" score on this requirement will not preclude the plan from being approved by FEMA.***		
D. Does the plan describe the details of ongoing mitigation projects and programs within the reporting jurisdiction?	Part One, Pgs. 9 CW57, CW58, CW59 CW60 CW61 10 CW62 CW63 CW64 CW65 11 CW66 CW67 13 CW68 15 CW69 CW70 16 CW71 CW72 CW73	***Note: This section is optional. A "Needs Improvement" score on this requirement will not preclude the plan from being approved by FEMA.***		

RISK ASSESSMENT: *§201.6(c)(2): The plan shall include a risk assessment that provides the factual basis for activities proposed in the strategy to reduce losses from identified hazards. Local risk assessments must provide sufficient information to enable the jurisdiction to identify and prioritize appropriate mitigation actions to reduce losses from identified hazards.*

Identifying Hazards

Requirement §201.6(c)(2)(i): *[The risk assessment **shall** include a] description of the type … of all natural hazards that can affect the jurisdiction.*

Element	Location in the Plan (section or annex and page #)	Reviewer's Comments	SCORE N	SCORE S
A. Does the plan include **a description** of the types of **all natural hazards** that affect the jurisdiction? If the hazard identification omits (without explanation) any hazards commonly recognized as threats to the jurisdiction, this part of the plan cannot receive a Satisfactory score. Consult with the State Hazard Mitigation Officer to identify applicable hazards that may occur in the planning area.	Part One, Pg. 25 CW9			
		SUMMARY SCORE		

Profiling Hazards

Requirement §201.6(c)(2)(i): *[The risk assessment **shall** include a] description of the … location and extent of all natural hazards that can affect the jurisdiction. The plan **shall** include information on previous occurrences of hazard events and on the probability of future hazard events.*

Element	Location in the Plan (section or annex and page #)	Reviewer's Comments	SCORE N	SCORE S
A. Does the risk assessment identify the **location** (i.e., geographic area affected) of each natural hazard addressed in the plan?	Part Two, Pg. 80CW10 Part Two, Pg. 107 CW11 Part Two, Pg. 118 CW12 Part Two, Pg. 156 CW13 Part Two, Pg. 174 CW14 Part Two, Pg. 193 CW15			

B. Does the risk assessment identify the **extent** (i.e., magnitude or severity) of each hazard addressed in the plan?	Part Two, Pg. 80 CW16 Part Two, Pg. 108 CW17 Part Two, Pg. 132 CW18 Part Two, Pg. 164 CW19 Part Two, Pg. 170 CW20 Part Two, Pg. 192 CW21			
C. Does the plan provide information on **previous occurrences** of each hazard addressed in the plan?	Part Two, Pg. 67 CW22 Part Two, Pg. 100 CW23 Part Two, Pg. 118 CW24 Part Two, Pg. 158 CW25 Part Two, Pg. 170 CW26 Part Two, Pg. 192 CW27			
D. Does the plan include the **probability of future events** (i.e., chance of occurrence) for each hazard addressed in the plan?	Part Two, Earthquake Pg. 70 CW28 Part Two, Landslide, Pg. 114 CW74 Part Two, Floods, Pg 138 CW75 Part Two, Tsunamis, Pg. 167 CW76 Part Two, Wildfire, Pg. 186 CW77 Part Two, Nuclear, Pg. 202 CW78			
		SUMMARY SCORE		

Assessing Vulnerability: Overview

Requirement §201.6(c)(2)(ii): *[The risk assessment **shall** include a] description of the jurisdiction's vulnerability to the hazards described in paragraph (c)(2)(i) of this section. This description **shall** include an overall summary of each hazard and its impact on the community.*

Element	Location in the Plan (section or annex and page #)	Reviewer's Comments	SCORE N	SCORE S
A. Does the plan include an **overall summary** description of the jurisdiction's **vulnerability** to each hazard?	Part Two, Earthquake, Pg. 85 CW33 Part Two, Landslide, Pg. 113 CW34 Part Two, Floods, Pg. 138 CW35 Part Two, Tsunamis, Pg. 162 CW36 Part Two, Wildfires, Pg. 178 CW37 Part Two, Nuclear, Pg. 202 CW38			
B. Does the plan address the **impact** of each hazard on the jurisdiction?	Part Two, Earthquake, Pg. 72 CW39 Part Two, Landslide, Pg. 106 CW40 Part Two, Floods, Pg. 125 CW41 Part Two, Tsunamis, Pg. 162 CW42 Part Two, Wildfires, Pg. 178 CW43 Part Two, Nuclear, Pg. 200 CW44			
		SUMMARY SCORE		

Assessing Vulnerability: Identifying Structures

Requirement §201.6(c)(2)(ii)(A): *The plan **should** describe vulnerability in terms of the types and numbers of existing and future buildings, infrastructure, and critical facilities located in the identified hazard area … .*

			SCORE N	SCORE S
A. Does the plan describe vulnerability in terms of the **types and numbers** of **existing** buildings, infrastructure, and critical facilities located in the identified hazard areas?	N/A Not an Enhanced Plan	***Note: A "Needs Improvement" score on this requirement will not preclude the plan from passing.***		
B. Does the plan describe vulnerability in terms of the **types and numbers** of **future** buildings, infrastructure, and critical facilities located in the identified hazard areas?	N/A Not an Enhanced Plan	***Note: A "Needs Improvement" score on this requirement will not preclude the plan from passing.***		
		SUMMARY SCORE		

Assessing Vulnerability: Estimating Potential Losses

Requirement §201.6(c)(2)(ii)(B): *[The plan **should** describe vulnerability in terms of an] estimate of the potential dollar losses to vulnerable structures identified in paragraph (c)(2)(i)(A) of this section and a description of the methodology used to prepare the estimate … .*

Element	Location in the Plan (section or annex and page #)	Reviewer's Comments	SCORE N	SCORE S
A. Does the plan estimate **potential dollar losses** to vulnerable structures?	N/A Not an Enhanced Plan	***Note: A "Needs Improvement" score on this requirement will not preclude the plan from passing.***		
B. Does the plan describe the **methodology** used to prepare the estimate?	N/A Not an Enhanced Plan	***Note: A "Needs Improvement" score on this requirement will not preclude the plan from passing.***		
		SUMMARY SCORE		

Assessing Vulnerability: Analyzing Development Trends

Requirement §201.6(c)(2)(ii)(C): *[The plan **should** describe vulnerability in terms of] providing a general description of land uses and development trends within the community so that mitigation options can be considered in future land use decisions.*

Element	Location in the Plan (section or annex and page #)	Reviewer's Comments	SCORE N	SCORE S
A. Does the plan describe land uses and development trends?	N/A Not an Enhanced Plan	***Note: A "Needs Improvement" score on this requirement will not preclude the plan from passing.***		
		SUMMARY SCORE		

Multi-Jurisdictional Risk Assessment

Requirement §201.6(c)(2)(iii): *For multi-jurisdictional plans, the risk assessment **must** assess each jurisdiction's risks where they vary from the risks facing the entire planning area.*

Element	Location in the Plan (section or annex and page #)	Reviewer's Comments	SCORE N	SCORE S
A. Does the plan include a risk assessment for each participating jurisdiction as needed to reflect unique or varied risks?	N/A Not a Multi Jurisdictional Plan			
		SUMMARY SCORE		

MITIGATION STRATEGY: *§201.6(c)(3): The plan shall include a mitigation strategy that provides the jurisdiction's blueprint for reducing the potential losses identified in the risk assessment, based on existing authorities, policies, programs and resources, and its ability to expand on and improve these existing tools.*

Local Hazard Mitigation Goals

Requirement §201.6(c)(3)(i): *[The hazard mitigation strategy **shall** include a] description of mitigation goals to reduce or avoid long-term vulnerabilities to the identified hazards.*

Element	Location in the Plan (section or annex and page #)	Reviewer's Comments	SCORE N	SCORE S
A Does the plan include a description of mitigation **goals** to reduce or avoid long-term vulnerabilities to the identified hazards? (**GOALS** are long-term; represent what the community wants to achieve, such as "eliminate flood damage"; and are based on the risk assessment findings.)	Part One, Pg. 9 CW45			
		SUMMARY SCORE		

Identification and Analysis of Mitigation Actions

Requirement §201.6(c)(3)(ii): *[The mitigation strategy **shall** include a] section that identifies and analyzes a comprehensive range of specific mitigation actions and projects being considered to reduce the effects of each hazard, with particular emphasis on new and existing buildings and infrastructure.*

Element	Location in the Plan	Reviewer's Comments	SCORE N	SCORE S
A. Does the plan identify and analyze a **comprehensive range** of specific mitigation actions and projects for each hazard?	Part One, Pgs.9-16 CW8			
B Do the identified actions and projects address reducing	Part One, Pg. 7			

the effects of hazards on **new** buildings and infrastructure?	CW51			
C. Do the identified actions and projects address reducing the effects of hazards on **existing** buildings and infrastructure?	Part One, Pg. 7 CW52			
		SUMMARY SCORE		

Implementation of Mitigation Actions

Requirement: §201.6(c)(3)(iii): *[The mitigation strategy section **shall** include] an action plan describing how the actions identified in section (c)(3)(ii) will be prioritized, implemented, and administered by the local jurisdiction. Prioritization **shall** include a special emphasis on the extent to which benefits are maximized according to a cost benefit review of the proposed projects and their associated costs.*

Element	Location in the Plan	Reviewer's Comments	SCORE N	SCORE S
A. Does the mitigation strategy include how the actions are **prioritized**? (For example, is there a discussion of the process and criteria used?)	Part One, Pg. 54 CW47			
B. Does the mitigation strategy address how the actions will be **implemented and administered**? (For example, does it identify the responsible department, existing and potential resources, and timeframe?)	Part One, Pg. 9 CW79			
C. Does the prioritization process include an emphasis on the use of a **cost-benefit review** (see page 3-36 of *Multi-Hazard Mitigation Planning Guidance*) to maximize benefits?	Part One, Pg. 7 CW46			
		SUMMARY SCORE		

Multi-Jurisdictional Mitigation Actions

Requirement §201.6(c)(3)(iv): *For multi-jurisdictional plans, there **must** be identifiable action items specific to the jurisdiction requesting FEMA approval or credit of the plan.*

Element	Location in the Plan (section or annex and page #)	Reviewer's Comments	SCORE N	SCORE S
A Does the plan include at least one identifiable **action item** for each jurisdiction requesting FEMA approval of the plan?	N/A Not a Multi Jurisdictional Plan			
		SUMMARY SCORE		

PLAN MAINTENANCE PROCESS

Monitoring, Evaluating, and Updating the Plan

Requirement §201.6(c)(4)(i): *[The plan maintenance process **shall** include a] section describing the method and schedule of monitoring, evaluating, and updating the mitigation plan within a five-year cycle.*

Element	Location in the Plan	Reviewer's Comments	SCORE N	SCORE S
A. Does the plan describe the method and schedule for **monitoring** the plan? (For example, does it identify the party responsible for monitoring and include a schedule for reports, site visits, phone calls, and meetings?)	Part One, Pg. 60 CW3			
B. Does the plan describe the method and schedule for **evaluating** the plan? (For example, does it identify the party responsible for evaluating the plan and include the criteria used to evaluate the plan?)	Part One, Pg. 63 CW4			
C. Does the plan describe the method and schedule for **updating** the plan within the five-year cycle?	Part One, Pg. 63 CW5			
		SUMMARY SCORE		

Incorporation into Existing Planning Mechanisms

Requirement §201.6(c)(4)(ii): *[The plan **shall** include a] process by which local governments incorporate the requirements of the mitigation plan into other planning mechanisms such as comprehensive or capital improvement plans, when appropriate.*

			N	S
A. Does the plan identify other local planning mechanisms available for incorporating the requirements of the mitigation plan?	Part One, Pg. 7 CW6			
B. Does the plan include a process by which the local government will incorporate the requirements in other plans, when appropriate?	Part One, Pg. 9 CW48			
		SUMMARY SCORE		

Continued Public Involvement

Requirement §201.6(c)(4)(iii): *[The plan maintenance process **shall** include a] discussion on how the community will continue public participation in the plan maintenance process.*

			N	S
A. Does the plan explain how **continued public participation** will be obtained? (For example, will there be public notices, an on-going mitigation plan committee, or annual review meetings with stakeholders?)	Part One, Pg. 8 CW7			
		SUMMARY SCORE		

Matrix A: Profiling Hazards

This matrix can assist FEMA and the State in scoring each hazard. Local jurisdictions may find the matrix useful to ensure that their plan addresses each natural hazard that can affect the jurisdiction. **Completing the matrix is not required**.

Note: First, check which hazards are identified in requirement §201.6(c)(2)(i). Then, place a checkmark in either the N or S box for each** applicable **hazard. An "N" for any element of any identified hazard will result in a "Needs Improvement" score for this requirement. List the hazard and its related shortcoming in the comments section of the Plan Review Crosswalk.

Hazard Type	Hazards Identified Per Requirement §201.6(c)(2)(i)	A. Location		B. Extent		C. Previous Occurrences		D. Probability of Future Events	
	Yes	N	S	N	S	N	S	N	S
Avalanche	☐	☐	☐	☐	☐	☐	☐	☐	☐
Coastal Erosion	☐	☐	☐	☐	☐	☐	☐	☐	☐
Coastal Storm	☐	☐	☐	☐	☐	☐	☐	☐	☐
Dam Failure	☐	☐	☐	☐	☐	☐	☐	☐	☐
Drought	☐	☐	☐	☐	☐	☐	☐	☐	☐
Earthquake	☒	☐	☐	☐	☐	☐	☐	☐	☐
Expansive Soils	☐	☐	☐	☐	☐	☐	☐	☐	☐
Extreme Heat	☐	☐	☐	☐	☐	☐	☐	☐	☐
Flood	☒	☐	☐	☐	☐	☐	☐	☐	☐
Hailstorm	☐	☐	☐	☐	☐	☐	☐	☐	☐
Hurricane	☐	☐	☐	☐	☐	☐	☐	☐	☐
Land Subsidence	☐	☐	☐	☐	☐	☐	☐	☐	☐
Landslide	☒	☐	☐	☐	☐	☐	☐	☐	☐
Severe Winter Storm	☐	☐	☐	☐	☐	☐	☐	☐	☐
Tornado	☐	☐	☐	☐	☐	☐	☐	☐	☐
Tsunami	☒	☐	☐	☐	☐	☐	☐	☐	☐
Volcano	☐	☐	☐	☐	☐	☐	☐	☐	☐
Wildfire	☒	☐	☐	☐	☐	☐	☐	☐	☐
Windstorm	☐	☐	☐	☐	☐	☐	☐	☐	☐
Other Nuclear_____	☒	☐	☐	☐	☐	☐	☐	☐	☐
Other _____	☐	☐	☐	☐	☐	☐	☐	☐	☐
Other _____	☐	☐	☐	☐	☐	☐	☐	☐	☐

To check boxes, double click on the box and change the default value to "checked."

Legend:

§201.6(c)(2)(i) Profiling Hazards
A. Does the risk assessment identify the location (i.e., geographic area affected) of each hazard addressed in the plan?

B. Does the risk assessment identify the extent (i.e., magnitude or severity) of each hazard addressed in the plan?
C. Does the plan provide information on previous occurrences of each natural hazard addressed in the plan?
D. Does the plan include the probability of future events (i.e., chance of occurrence) for each hazard addressed in the plan?

Matrix B: Assessing Vulnerability

This matrix can assist FEMA and the State in scoring each hazard. Local jurisdictions may find the matrix useful to ensure that their plan addresses each requirement. **Completing the matrix is not required**.

*Note: First, check which hazards are identified in requirement §201.6(c)(2)(i). Then, place a checkmark in either the N or S box for each **applicable** hazard. An "N" for any element of any identified hazard will result in a "Needs Improvement" score for this requirement. List the hazard and its related shortcoming in the comments section of the Plan Review Crosswalk.*

Note: Receiving an N in the shaded columns will not preclude the plan from passing.

To check boxes, double click on the box and change the default value to "checked."

Hazard Type	Hazards Identified Per Requirement §201.6(c)(2)(i)	§201.6(c)(2)(ii) Assessing Vulnerability: Overview					§201.6(c)(2)(ii) Assessing Vulnerability: Identifying Structures				§201.6(c)(2)(ii) Assessing Vulnerability: Estimating Potential Losses							
		A. Overall Summary Description of Vulnerability		B. Hazard Impact			A. Types and Number of Existing Structures in Hazard Area (Estimate)		B. Types and Number of Future Structures in Hazard Area (Estimate)		A. Loss Estimate		B. Methodology					
	Yes	N	S	N	S		N	S	N	S	N	S	N	S				
Avalanche	☐	☐	☐	☐	☐		☐	☐	☐	☐	☐	☐	☐	☐				
Coastal Erosion	☐	☐	☐	☐	☐		☐	☐	☐	☐	☐	☐	☐	☐				
Coastal Storm	☐	☐	☐	☐	☐		☐	☐	☐	☐	☐	☐	☐	☐				
Dam Failure	☐	☐	☐	☐	☐		☐	☐	☐	☐	☐	☐	☐	☐				
Drought	☐	☐	☐	☐	☐		☐	☐	☐	☐	☐	☐	☐	☐				
Earthquake	☒	☐	☐	☐	☐		☐	☐	☐	☐	☐	☐	☐	☐				
Expansive Soils	☐	☐	☐	☐	☐		☐	☐	☐	☐	☐	☐	☐	☐				
Extreme Heat	☐	☐	☐	☐	☐		☐	☐	☐	☐	☐	☐	☐	☐				
Flood	☒	☐	☐	☐	☐		☐	☐	☐	☐	☐	☐	☐	☐				
Hailstorm	☐	☐	☐	☐	☐		☐	☐	☐	☐	☐	☐	☐	☐				
Hurricane	☐	☐	☐	☐	☐		☐	☐	☐	☐	☐	☐	☐	☐				
Land Subsidence	☐	☐	☐	☐	☐		☐	☐	☐	☐	☐	☐	☐	☐				
Landslide	☒	☐	☐	☐	☐		☐	☐	☐	☐	☐	☐	☐	☐				
Severe Winter Storm	☐	☐	☐	☐	☐		☐	☐	☐	☐	☐	☐	☐	☐				
Tornado	☐	☐	☐	☐	☐		☐	☐	☐	☐	☐	☐	☐	☐				
Tsunami	☒	☐	☐	☐	☐		☐	☐	☐	☐	☐	☐	☐	☐				
Volcano	☐	☐	☐	☐	☐		☐	☐	☐	☐	☐	☐	☐	☐				
Wildfire	☒	☐	☐	☐	☐		☐	☐	☐	☐	☐	☐	☐	☐				
Windstorm	☐	☐	☐	☐	☐		☐	☐	☐	☐	☐	☐	☐	☐				
Other Nuclear_____	☒	☐	☐	☐	☐		☐	☐	☐	☐	☐	☐	☐	☐				
Other _____	☐	☐	☐	☐	☐		☐	☐	☐	☐	☐	☐	☐	☐				
Other _____	☐	☐	☐	☐	☐		☐	☐	☐	☐	☐	☐	☐	☐				

Legend:
§201.6(c)(2)(ii) Assessing Vulnerability: Overview
A. Does the plan include an overall summary description of the jurisdiction's vulnerability to each hazard?
B. Does the plan address the impact of each hazard on the jurisdiction?
B. Does the plan describe vulnerability in terms of the types and numbers of future buildings, infrastructure, and critical facilities located in the identified hazard areas?

§201.6(c)(2)(ii)(A) Assessing Vulnerability: Identifying Structures
A. Does the plan describe vulnerability in terms of the types and numbers of existing buildings, infrastructure, and critical facilities located in the identified hazard areas?

§201.6(c)(2)(ii)(B) Assessing Vulnerability: Estimating Potential Losses
A. Does the plan estimate potential dollar losses to vulnerable structures?
B. Does the plan describe the methodology used to prepare the estimate?

Matrix C: Identification and Analysis of Mitigation Actions

This matrix can assist FEMA and the State in scoring each hazard. Local jurisdictions may find the matrix useful to ensure consideration of a range of actions for each hazard. **Completing the matrix is not required.**

*Note: First, check which hazards are identified in requirement §201.6(c)(2)(i). Then, place a checkmark in either the N or S box for each **applicable** hazard. An "N" for any identified hazard will result in a "Needs Improvement" score for this requirement. List the hazard and its related shortcoming in the comments section of the Plan Review Crosswalk.*

Hazard Type	Hazards Identified Per Requirement §201.6(c)(2)(i)	A. Comprehensive Range of Actions and Projects	
	Yes	N	S
Avalanche	☐	☐	☐
Coastal Erosion	☐	☐	☐
Coastal Storm	☐	☐	☐
Dam Failure	☐	☐	☐
Drought	☐	☐	☐
Earthquake	☒	☐	☐
Expansive Soils	☐	☐	☐
Extreme Heat	☐	☐	☐
Flood	☒	☐	☐
Hailstorm	☐	☐	☐
Hurricane	☐	☐	☐
Land Subsidence	☐	☐	☐
Landslide	☒	☐	☐
Severe Winter Storm	☐	☐	☐
Tornado	☐	☐	☐
Tsunami	☒	☐	☐
Volcano	☐	☐	☐
Wildfire	☒	☐	☐
Windstorm	☐	☐	☐
Other Nuclear_____	☒	☐	☐
Other _____	☐	☐	☐
Other _____	☐	☐	☐

To check boxes, double click on the box and change the default value to "checked."

Legend:

§201.6(c)(3)(ii) Identification and Analysis of Mitigation Actions

A. Does the plan identify and analyze a comprehensive range of specific mitigation actions and projects for each hazard?