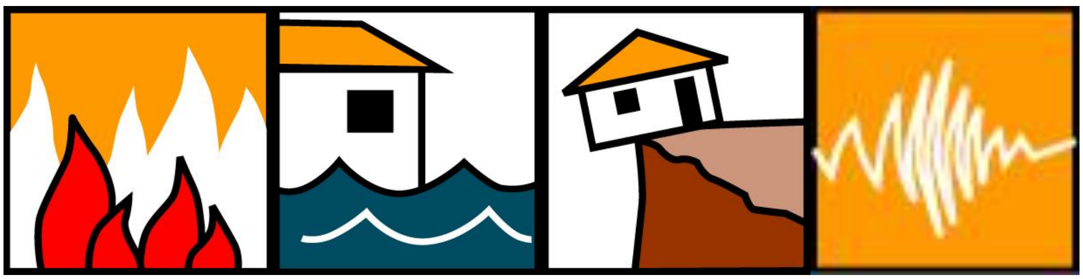
San Diego Unified School District



Natural Hazards Mitigation Plan

Final Draft 12.5.08

Prepared under contract with:

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San Diego, California
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Special Recognition

<u>Special Thanks</u>
Hazard Mitigation Planning Team:

San Diego Unified School District
- Lt. Rueben Littlejohn, School Police Services, Chair
- Arthur Triplette, Facilities Maintenance Department
- Kevin Ohlin, Facilities Maintenance Department
- Ed Perez, Facilities Maintenance Department
- Bernard Calangian, Facilities Maintenance Department
- Sue Weir, Office of the Superintendent
- Kassia Kossyta, Risk Management Department

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San Diego Unified School District

Board of Education
- Katherine Nakamura, President
- John de Beck, Vice President
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- Shelia Jackson, Member

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<u>Mapping</u>
Maps were acquired from San Diego Unified School District and the San Diego County Multi-Jurisdictional Hazard Mitigation Plan, as well as other public maps available on the Internet.

<u>Planning Guidance Materials</u>
The Disaster Management Area Coordinators (DMAC) of Los Angeles County prepared planning guidance materials that were utilized by the San Diego Unified School District in preparing this Natural Hazards Mitigation Plan.

<u>Consulting Services</u>
Emergency Planning Consultants:

Project Management Services:	Carolyn J. Harshman, President
Planning Services:	Carolyn J. Harshman, President
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List of Hazard Mitigation Plan Tables, Figures, Matrices, Maps, and Photos

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

San Diego Unified School District Natural Hazards Mitigation Plan

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Part I: Mitigation Actions
Executive Summary: Hazard Mitigation Action Plan

The San Diego Unified School District Natural Hazards Mitigation Plan includes resources and information to assist 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 San Diego Unified School District in reducing risk and preventing loss from future natural hazard events. The action items address multi-hazard issues, as well as activities for Earthquake, Flood, Wildfire, Landslide, and Tsunami.

How is the Plan Organized?

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

Who Participated in Developing the Plan?

The San Diego Unified School District Natural Hazards Mitigation Plan is the result of a collaborative planning effort between parents, faculty, staff, public agencies, non-profit organizations, the private sector, and regional and state organizations. Public participation played a key role in development of goals and action items. A project Planning Team guided the process of developing the plan and consisted of the following representatives:

Hazard Mitigation Planning Team
San Diego Unified School District
Arthur Triplette, Facilities Maintenance Department (Team Leader)
Kevin Ohlin, Facilities Maintenance Department
Ed Perez, Facilities Maintenance Department
Bernard Calangian, Facilities Maintenance Department
Lt. Rueben Littlejohn, School Police Services
Sue Weir, Office of the Superintendent
Kassia Kossyta, Risk Management Department

What is the Plan Mission?

The mission of the San Diego Unified School District Natural Hazards Mitigation Plan is to promote sound public policy designed to protect students, faculty, and staff of the

District, District 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 District in creating a more sustainable School District.

What are the Plan Goals?

The plan goals describe the overall direction that San Diego Unified School District administrators, staff, and parents 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.

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.
>
> 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.

Enhance 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.

Preserve Natural Systems

> Support management and land use planning practices with natural hazard mitigation to protect life.
>
> Preserve, rehabilitate, and enhance natural systems to serve natural hazard mitigation functions.

Encourage Partnerships and Implementation

> Strengthen communication and coordinate participation with public agencies, citizens, non-profit organizations, business, and industry to support implementation.
>
> Encourage leadership within the District and public organizations to prioritize and

implement local and regional hazard mitigation activities.

Strengthen Emergency Services

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

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

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

How are the Action Items Organized?

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

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

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

Coordinating Organization. The Mitigation Actions Matrix assigns primary responsibility for each of the action items. The hierarchies of the assignments vary – some are positions, others departments, and other committees. No matter, the primary responsibility for implementing the action items falls to the entity shown as the “Coordinating Organization”. The coordinating organization is the agency with regulatory responsibility to address 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 District, local, county, or regional agencies that are capable of or responsible for implementing activities and programs.

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

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

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

The Plan Maintenance Section of this document details the formal process that will ensure that the San Diego Unified School District 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 District will integrate public participation throughout the plan maintenance process. Finally, this section includes an explanation of how San Diego Unified School District government intends to incorporate the mitigation strategies outlined in this Plan into existing planning mechanisms such as the District's Facilities Master Plan, California Code of Regulations concerning School Facilities Construction, and local government General Plans.

Plan Adoption

Adoption of the Natural Hazards Mitigation Plan by the District's governing body is one of the prime requirements for approval of the plan. Once the plan is completed, the Board of Education will be responsible for adopting the San Diego Unified School District Natural Hazards Mitigation Plan. The governing body has the responsibility and authority to promote sound public policy regarding natural hazards. The District Superintendent will have the authority to periodically update the plan as it is revised to meet changes in the natural hazard risks and exposures in the District. The approved Natural Hazards Mitigation Plan will be significant in the future growth and development of the District.

Coordinating Body

The San Diego Unified School District Hazard Mitigation Advisory Committee (Committee) will be responsible for coordinating implementation of Plan action items and undertaking the formal review process. The District Superintendent will assign the existing Disaster Planning Team to perform the duties of the Committee. It will be within the Committee's authority to delegate responsibility for Plan maintenance and implementation to the Hazard Mitigation Planning Team (authors of the Plan).

Convener

The Board of Education will adopt the San Diego Unified School District Natural Hazards Mitigation Plan and the Hazard Mitigation Advisory Committee will take responsibility for plan maintenance and implementation. The existing Disaster Planning Team will serve as the Committee. The Chair of the Disaster Planning Team (Chief of School Police) will serve as a convener to facilitate the Committee meetings, and will assign tasks such as updating and presenting the Plan to the members of the Committee. Plan implementation and evaluation will be a shared responsibility among all of the Committee members.

Implementation through Existing Programs

San Diego Unified School District addresses statewide planning goals and legislative requirements through its Facilities Master Plan. The Natural Hazards Mitigation Plan provides a series of recommendations that are closely related to the goals and objectives of existing planning programs. San Diego Unified School District will have the opportunity to implement recommended mitigation action items through existing programs and procedures.

Economic Analysis of Mitigation Projects

At the Hazard Mitigation Advisory Committee's first meeting, the Committee will utilize the completed STAPLEE (Social, Technical, Administrative, Political, Legal, Economic, Environmental) Tool (Plan Maintenance – Table 3-1) as a guide in implementing the Mitigation Plan.

The Federal Emergency Management Agency's 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.

Formal Review Process

The San Diego Unified School District Natural Hazards Mitigation Plan will be evaluated on an annual basis to determine the effectiveness of programs, and to reflect changes in land development or programs that may affect mitigation priorities. The evaluation process includes a firm schedule and timeline, and identifies the agencies and organizations participating in plan evaluation. The convener will be responsible for contacting the Hazard Mitigation Advisory Committee members and organizing the annual meeting. Committee members will be responsible for monitoring and evaluating the progress of the mitigation strategies in the Plan. The Superintendent will have authority to update and revise the plan as needed.

Continued Public Involvement

San Diego Unified School District is dedicated to involving the public directly in the continual review and updates to the Natural Hazards Mitigation Plan. Copies of the plan will be available at School Police Services and Facilities Management.

Executive Summary - Table ES - 1
Mitigation Actions Matrix

Action Item Identifier	Action Item	Coordinating Organization	Timeline	Plan Goals Addressed: Protect Life and Property	Public Awareness	Natural Systems	Partnerships and Implementation	Emergency Services
Multi-Hazard Action Items								
MH #1	Integrate the goals and action items from the San Diego Unified School District Natural Hazards Mitigation Plan into existing regulatory documents and programs, where appropriate.	Hazard Mitigation Planning Team	Ongoing				X	
MH #2	Identify and pursue funding opportunities to develop and implement district mitigation activities.	Hazard Mitigation Planning Team	Ongoing				X	
MH #3	Establish a formal role for the San Diego City School District Hazard Mitigation Advisory Committee to recommend a sustainable process for implementing, monitoring, and evaluating District-wide mitigation activities. It is recommended that the District's existing Disaster Planning Team (meets quarterly) assume the role of overseeing the planning process, while delegating the responsibility for implementation to the Planning Team who wrote the Plan.	Hazard Mitigation Advisory Committee	Ongoing				X	
MH #4	Develop public and private partnerships to foster natural hazard mitigation program coordination and collaboration in the district.	Hazard Mitigation Planning Team	Ongoing				X	
MH #5	Develop inventories of at-risk buildings and infrastructure and prioritize mitigation projects.	Facilities Maintenance	1-2 Years	X			X	

Executive Summary - Table ES - 1
Mitigation Actions Matrix

Action Item Identifier	Action Item	Coordinating Organization	Timeline	Plan Goals Addressed: Protect Life and Property	Public Awareness	Natural Systems	Partnerships and Implementation	Emergency Services
MH #6	Develop, enhance, and implement education programs aimed at mitigating natural hazards, and reducing the risk to students, employees, and schools.	Hazard Mitigation Planning Team	Ongoing	X	X			
MH #7	Conduct a detailed vulnerability assessment in the future in order to accurately identify the extent of damages to vulnerable buildings, infrastructure, and critical facilities.	Hazard Mitigation Planning Team	Ongoing	X				
MH #8	Conduct site plan review for new constructions, repair and reconstruction of damaged structures.	Facilities Maintenance	Ongoing	X				
MH #9	Retrofit or relocate utility and communications systems supporting emergency services operations to withstand the impacts of disasters.	Hazard Mitigation Planning Team	1-2 years	X	X			X
MH #10	Identify opportunities for partnering with private contractors, and other jurisdictions to increase availability of equipment and manpower for efficiency of response efforts.	Facilities Maintenance	1-2 years	X		X	X	X
MH #11	Work with Site Governance Team and Councils and other neighborhood groups to establish community response teams.	Hazard Mitigation Planning Team	1-2 years	X	X		X	
MH #12	Familiarize district officials of requirements regarding public assistance for disaster response.	Hazard Mitigation Planning Team	1-2 years				X	

Executive Summary - Table ES - 1 Mitigation Actions Matrix								
				Plan Goals Addressed				
Action Item Identifier	**Action Item**	**Coordinating Organization**	**Timeline**	**Protect Life and Property**	**Public Awareness**	**Natural Systems**	**Partnerships and Implementation**	**Emergency Services**
MH #13	Conduct a full review of the Natural Hazards Mitigation Action Plan every 5 years by evaluating mitigation successes, failures, and areas that were not addressed. Submit updated Plan to FEMA.	Hazard Mitigation Planning Team	5 years	X	X	X	X	X
MH #14	Assess availability of backup power resources (generators) of facilities and upgrade resources as necessary.	Hazard Mitigation Planning Team	Ongoing					X
MH #15	Establish policy to ensure mitigation projects are in place to safeguard critical facilities.	Hazard Mitigation Planning Team	Ongoing				X	
MH #16	Ensure that repairs or construction funded by Federal disaster assistance conforms to applicable codes and standards.	Hazard Mitigation Planning Team	Ongoing				X	
MH #17	In advance of major storms, develop plans for temporary protection of contents of a building to protect against further damage.	Hazard Mitigation Planning Team	Ongoing				X	
MH #18	Monitor trees and branches at District facilities in risk of breaking or falling in stormy or high wind conditions. Prune or thin trees or branches when they would pose an immediate threat to property, utility lines or other significant structures or critical facilities in the district.	Facilities Maintenance	Ongoing				X	

Executive Summary - Table ES - 1 Mitigation Actions Matrix								
				Plan Goals Addressed				
Action Item Identifier	Action Item	Coordinating Organization	Timeline	Protect Life and Property	Public Awareness	Natural Systems	Partnerships and Implementation	Emergency Services
MH #19	Prepare a policy that guides the selection of temporary locations and arrangements for resumption of school related services.	Hazard Mitigation Planning Team	1-2 years				X	
MH #20	Promote public education to increase awareness of hazards and opportunities for mitigation.	Hazard Mitigation Planning Team, Risk Management	1-2 years		X			
MH #21	Encourage interested individuals to participate in the hazard mitigation planning process.	Hazard Mitigation Planning Team	1-2 years		X			
MH #22	Educate the Principals and Site Administrators about emergency sheltering and evacuation procedures.	Hazard Mitigation Planning Team	1-2 years		X			
MH #23	Provide opportunities for Principals and Site Administrators to be kept up to date on District's Emergency Procedures.	Hazard Mitigation Planning Team	1-2 years		X			
MH #24	Conduct annual disaster exercises with local law enforcement, fire department, and EMS staff.	Hazard Mitigation Planning Team	1-2 years		X			
MH	Purchase and deliver a NOAA Weather Radio in School	Hazard	1-2 years		X			

Executive Summary - Table ES - 1 Mitigation Actions Matrix								
				Plan Goals Addressed				
Action Item Identifier	Action Item	Coordinating Organization	Timeline	Protect Life and Property	Public Awareness	Natural Systems	Partnerships and Implementation	Emergency Services
#25	Police Dispatch and each administrative and school facility.	Mitigation Planning Team						
MH #26	Improve and maintain a District Emergency Operations Center (EOC) located at School Police Services. In the event the primary site is unavailable, an off-site alternate will be established.	School Police Services	1-2 years	X			X	X
MH #27	Ensure communications capability between the agencies in the EOC and all District facilities. Establish EOC redundant backups in voice and data communications.	School Police Services	1-2 years	X			X	X
MH #28	Conduct interim planning to locate, set up, and manage temporary sites where school sites can continue their operations during recovery.	Facilities Maintenance	Ongoing	X				
MH #29	Prepare a Recovery Plan. The Plan will include guidelines and authorities to make determination on the future of damaged buildings (i.e. which structures and/or facilities will not be allowed to be repaired/reconstructed).	Hazard Mitigation Planning Team	1-5 years	X				
MH #30	Post the District’s Hazard Mitigation Plan on the website.	Communications Office		X	X	X	X	X
MH #31	Develop a Speakers Bureau on natural disasters.	Communications Office	1-2 years		X			
MH	Educate faculty, staff, and parents about the hazards prevalent	School Police	Ongoing	X	X			

Executive Summary - Table ES - 1
Mitigation Actions Matrix

Action Item Identifier	Action Item	Coordinating Organization	Timeline	Plan Goals Addressed: Protect Life and Property	Public Awareness	Natural Systems	Partnerships and Implementation	Emergency Services
#32	to the area.	Services						
MH #33	Publicize the documents associated with emergency response and mitigation.	School Police Services	Ongoing	X	X			
MH #34	Consider purchase of hazard insurance (earthquake and flood insurance) for impacted sites.	Risk Management	Immediate	X				
MH #35	Advise sites on reducing non-structural earthquake hazards and seismic bracing for all schools with suspended ceilings, lights, bookcases, etc.	Facilities Maintenance	1 year	X	X		X	X
MH #36	In the event of damage, conduct a study of damaged vital district facilities and utilities and determine if they should be redesigned or relocated to avoid future disruptions.	Facilities Maintenance	Ongoing	X				
MH #37	Ensure compliance to rebuilding in conformance with applicable codes, specifications, and standards.	Facilities Maintenance	Ongoing	X				
MH #38	Develop and maintain Emergency Operations Plans, Site Emergency Plans, conduct trainings on the Plans, and conduct a range of exercises. These documents and associated training and exercises are critical to the successful disaster response and recovery.	School Police Services	Ongoing					X
MH #39	Develop strategies for debris management following major disasters.	Facilities Maintenance	1 year	X		X		

Executive Summary - Table ES - 1 Mitigation Actions Matrix								
				Plan Goals Addressed				
Action Item Identifier	Action Item	Coordinating Organization	Timeline	Protect Life and Property	Public Awareness	Natural Systems	Partnerships and Implementation	Emergency Services
MH #40	Promote the City of San Diego's Community Emergency Response Team (CERT) program with faculty, staff, and parents.	School Police Services	1 year	X	X			
MH #41	Add website links to FEMA, U.S. Department of Education, and American Red Cross.	School Police Services	1 year	X	X			
MH #42	Create displays for children's programs that teach safety. Utilize FEMA for Kids CD, the Sparky Fire Safety Program, and the American Red Cross's Masters of Disasters program.	School Police Services	1-2 years	X	X		X	
MH #43	Coordinate District EOP and Site Emergency Plans with local emergency response plans.	School Police Services	1 year	X	X		X	X
MH #44	Develop an "Animals in Disaster" Display that will be used at school sites and street fairs. The display will have information about protecting animals against disasters by making a disaster plan and a disaster supply kit for each animal. The display will encourage animal owners to decide ahead of time where animals will be sheltered and to familiarize themselves with the County Department of Animal Services protocols for dealing with animals during disasters.	Communications Office	1-2 years	X	X		X	
MH #45	Provide training to Facilities Management Division inspectors regarding identification of potential of structural failures to buildings following an earthquake or other disaster. This	Facilities Maintenance						X

Executive Summary - Table ES - 1
Mitigation Actions Matrix

Action Item Identifier	Action Item	Coordinating Organization	Timeline	Plan Goals Addressed: Protect Life and Property	Public Awareness	Natural Systems	Partnerships and Implementation	Emergency Services
	training is critical because the District's inspectors are expected to determine safety of occupancy following a disaster.							
MH #46	Prohibit the storage of hazardous materials in classrooms.	Office of the Superintendent	Ongoing	X	X			
MH #47	Enforce strict interpretation of the Mitigation Plan when rebuilding in hazard prone area.	Facilities Maintenance	Ongoing	X				
MH #48	Involve the City of San Diego on future updates to the Natural Hazards Mitigation Plan.	Hazard Mitigation Planning Team	Ongoing	X				
MH #49	Retrofit or relocate utility, data systems, and communications systems supporting emergency services operations to ensure effectiveness during and following a disaster.	Facilities Maintenance and School Police Services	Ongoing	X				
MH #50	Establish a list of demolition and debris removal service providers.	Facilities Maintenance	Ongoing					X
MH #51	Encourage the City of San Diego to maintain water systems that will assist during fire fighting, drought conditions, and other water related emergencies.	Facilities Maintenance	Ongoing					X
MH #52	Purchase a complete GIS/GPS setup and provide training on the system for all pertinent District staff.	Facilities Maintenance	Ongoing					X

Executive Summary - Table ES - 1 Mitigation Actions Matrix								
Action Item Identifier	**Action Item**	**Coordinating Organization**	**Timeline**	**Plan Goals Addressed**				
				Protect Life and Property	**Public Awareness**	**Natural Systems**	**Partnerships and Implementation**	**Emergency Services**
MH #53	Maintain the Site Hazard Assessments for use in future Hazard Mitigation Plan updates.	Facilities Maintenance	Ongoing					X
MH #54	Establish MOU or other agreements with the American Red Cross concerning the use of District facilities for use as shelters.	Facilities Maintenance	Ongoing					X
MH #55	Maintain a building inventory database that can be used to track the status of repair and reconstruction following a disaster.	Facilities Maintenance	Ongoing					X
MH #56	Install and improve back-up power in critical facilities.	Facilities Maintenance	Ongoing					X
MH #57	Incorporate new information pertaining to constructions standards and hazard identification into updates of the Natural Hazards Mitigation Plan.	Facilities Maintenance	Ongoing					X
MH #58	Maintain familiarity with the ongoing research efforts of the Department of the State Architect (DSA).	Facilities Maintenance	Ongoing					X
MH #59	Encourage the development of mutual aid or other assistance agreements with the City of San Diego and other school districts.	Facilities Maintenance	Ongoing					X
MH #60	Develop site plans that will ensure the placement of buildings away from threats associated with natural hazards.	Facilities Maintenance	Ongoing	X		X		X

Executive Summary - Table ES - 1 Mitigation Actions Matrix								
				Plan Goals Addressed				
Action Item Identifier	Action Item	Coordinating Organization	Timeline	Protect Life and Property	Public Awareness	Natural Systems	Partnerships and Implementation	Emergency Services
MH #61	Monitor opportunities for pre-disaster and post-disaster hazard mitigation grant funding.	Hazard Mitigation Planning Team	Ongoing	X	X	X	X	X
MH #62	Explore the possibility of developing a Teen CERT Chapter for the District.	School Police Services	1 year	X	X		X	X
MH #63	Develop a public awareness campaign to inform parents and guardians of their role during a disaster on a school campus.	Communications Office and School Police Services	1 year		X		X	X
MH #64	Maintain a set of evacuation maps from the various District administrative and school facilities for use in the District EOC.	School Police Services	1 year				X	X
Earthquake Action Items								
EQ #1	Encourage reduction of nonstructural and structural earthquake hazards in schools and district property.	Hazard Mitigation Planning Team	Ongoing	X	X			
EQ #2	Integrate new earthquake hazard mapping data for the District into the EOP Hazard Analysis, Site Hazard Assessments, and the Mitigation Plan.	Facilities Maintenance	Ongoing					X
EQ #3	Provide training and equipment to the Post-Earthquake Preparedness Plan (PEPP) Team. PEPP is the team of District	Hazard Mitigation	1 year	X			X	X

Executive Summary - Table ES - 1
Mitigation Actions Matrix

Action Item Identifier	Action Item	Coordinating Organization	Timeline	Plan Goals Addressed: Protect Life and Property	Public Awareness	Natural Systems	Partnerships and Implementation	Emergency Services
	inspectors responsible for conducting damage assessment inspections following an earthquake.	Planning Team						
EQ #4	Retrofit school buildings to highest earthquake standards according to the local Uniform Building Code.	Facilities Maintenance	Ongoing	X				
EQ #5	Prepare strategy for reduction of nonstructural earthquake hazards in schools and administrative District-owned properties.	Principals and Site Administrators	1-2 years	X	X			X
Flood Action Items								
FLD #1	Determine and maintain temporary protection measures for at risk structures; install plastic sheeting on roofs, cover exterior openings such as windows or doors, draining trapped water in ceilings or draining accumulated flood waters, temporary shoring to avoid imminent building collapse or damage, and installing barricades.	Facilities Maintenance	Ongoing	X				X
FLD #2	During the building design process, design proper catch basin/drains to accommodate run off.	Facilities Maintenance	Ongoing	X				
FLD #3	During the building design process, develop site plans that will ensure the safety of buildings from potential flood damages.	Hazard Mitigation Planning Team	Ongoing				X	
FLD #4	Develop and implement programs to maintain trees in order to minimize threats to life and property during windstorm	Facilities Maintenance	Ongoing	X		X		X

Executive Summary - Table ES - 1 Mitigation Actions Matrix								
Action Item Identifier	**Action Item**	**Coordinating Organization**	**Timeline**	**Plan Goals Addressed**				
				Protect Life and Property	**Public Awareness**	**Natural Systems**	**Partnerships and Implementation**	**Emergency Services**
	events.	Department						
FLD #5	Analyze repetitive flood properties in the District and identify feasible mitigation options.	Facilities Maintenance	2-5 years	X			X	
FLD #6	Prepare an inventory of all District structures and facilities located in a 100-year or 500-year floodplain.	Facilities Maintenance	1 year	X		X		X
FLD #7	Buy flood insurance on flood prone sites.	Risk Management	Immediate	X	X		X	
FLD #8	Become familiar with the National Flood Insurance Program (NFIP) requirements for new construction and substantially improved buildings.	Facilities Maintenance	Ongoing					X
FLD #9	Develop strategies for debris management for coastal storm/wind events.	Facilities Maintenance	Ongoing					
Landslide								
LND #1	During activities in slide-prone areas, implement stabilization practices.	Facilities Maintenance	Ongoing	X				
LND #2	Identify surface water drainage obstructions for all parts of the District.	Facilities Maintenance	Ongoing					

Executive Summary - Table ES - 1 Mitigation Actions Matrix								
				Plan Goals Addressed				
Action Item Identifier	**Action Item**	**Coordinating Organization**	**Timeline**	**Protect Life and Property**	**Public Awareness**	**Natural Systems**	**Partnerships and Implementation**	**Emergency Services**
Wildfire Action Items								
WF #1	Develop education programs aimed at mitigating wildfire hazards and reduce or prevent the exposure of students, parents, staff to the dangers associated with wildfires.	Communications Office	Ongoing	X	X			
WF #2	Incorporate hazard-specific emergency response protocols into Site Emergency Plans for sites vulnerable to wildfire threats.	Hazard Mitigation Planning Team	1-2 years	X	X		X	X
Tsunami Action Items								
TS #1	Develop and deliver an assembly presentation on the Tsunami threat for delivery at vulnerable sites in the District.	School Police Services	1 year	X	X			X
TS #2	Purchase and post Tsunami warning signs at vulnerable sites.	Facilities Maintenance	1 year	X	X		X	X
TS #3	Develop tsunami protocols and procedures for District EOP and Site Emergency Plans (vulnerable sites).	School Police Services	1 year	X	X		X	X

Section 1: Introduction

Throughout history, the structures and occupants of San Diego Unified School District have dealt with the various natural hazards affecting the area, including Earthquake, Flood, Wildfire, Landslide, and Tsunami.

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 region continues to increase, the exposure to natural hazards creates an even higher risk than previously experienced.

The San Diego Unified School District is located in the southwestern quadrant of San Diego County, and offers the benefits of living in a Mediterranean type of climate. The District is characterized by the unique and attractive landscape. However, the potential impacts of natural hazards associated with the terrain make the environment and its occupants vulnerable to natural disasters.

The District is subject to Earthquake, Flood, Wildfire, Landslide, and Tsunami. It is impossible to predict exactly when these disasters will occur, or the extent to which they will affect the District. However, with careful planning and collaboration among District faculty and staff, students and parents, and public agencies, it is possible to minimize the losses that can result from these natural disasters.

Why Develop a Mitigation Plan?

As the costs of damage from natural disasters continue to increase, the District realizes the importance of identifying effective ways to reduce vulnerability to disasters. Natural hazards mitigation plans assist educational facilities 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 District.

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:

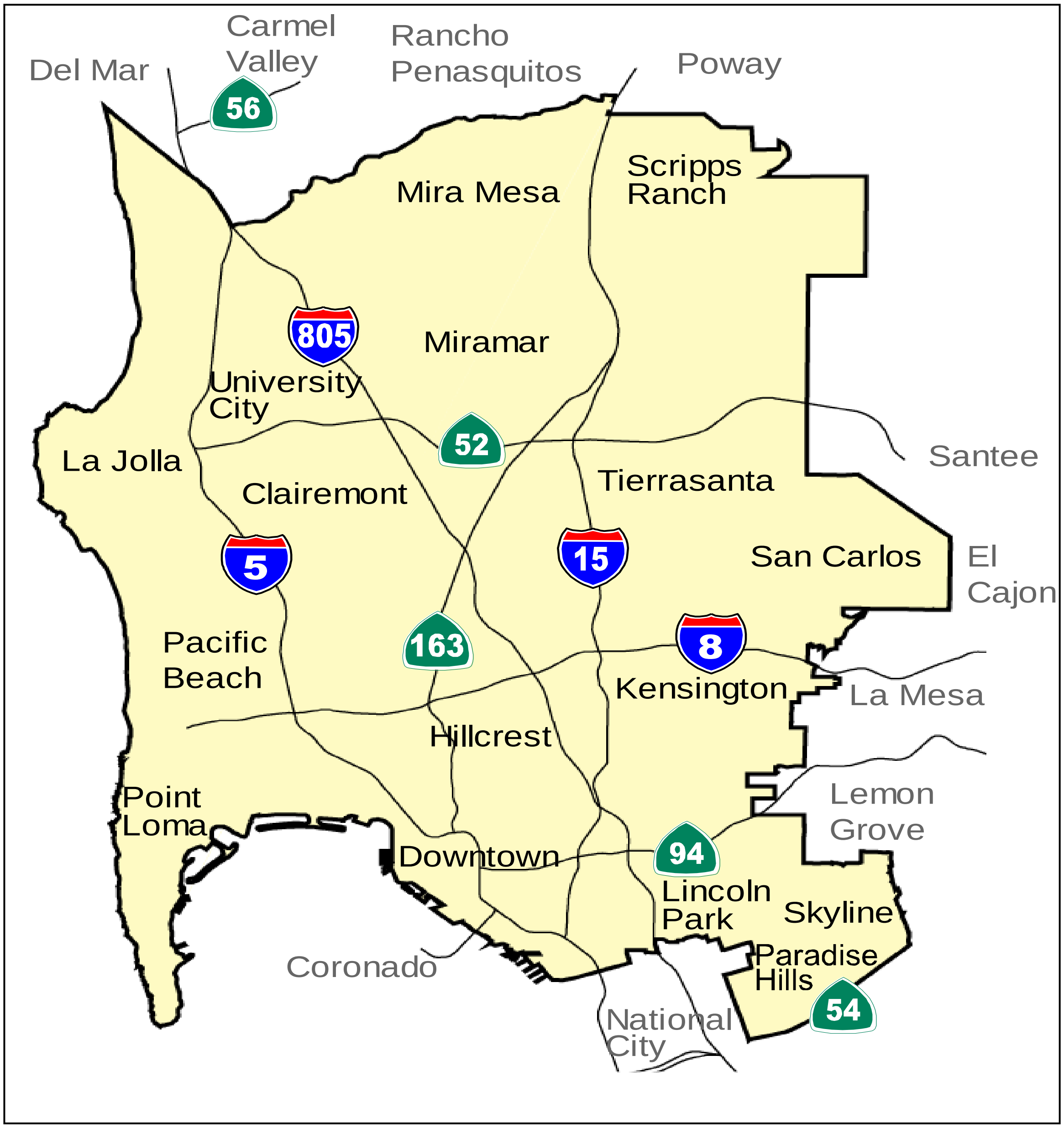
- Establish a basis for coordination and collaboration among the District, students, and parents in the San Diego Unified School District
- Identify and prioritize future mitigation projects
- Assist in meeting the requirements of federal assistance programs

The mitigation plan works in conjunction with other District plans, including the Facilities Master Plan, the District's Emergency Operations Plan, and the various Site Emergency Plans.

Whom Does the Mitigation Plan Affect?

The San Diego Unified School District Natural Hazards Mitigation Plan affects the entire District. Map 1-1 shows the areas contained within the boundaries of the San Diego Unified School District. This plan provides a framework for planning for natural hazards. The resources and background information in the plan is applicable District-wide, and the goals and recommendations can lay groundwork for other local mitigation plans and partnerships.

Map 1-1
Map of San Diego Unified School District
(Source: San Diego Unified School District Communications Office)



Natural Hazard Land Use Policy in California

Planning for natural hazards should be an integral element of any District'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. Although School Districts are exempt from local planning requirements, it is common for a District to work closely with local governments during the planning phase.

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

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

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 each local jurisdiction. Local jurisdictions, however, are not alone. Partners and resources exist at the regional, state and federal levels. Numerous California state agencies have a role in 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, state, 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

- 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 and serves local water needs by providing technical assistance

Plan Methodology

Information in the Mitigation Plan is based on research from a variety of sources. Staff from the San Diego Unified School District conducted data research and analysis, participated in Planning Team meetings, and developed the final mitigation plan. The research methods and various contributions to the plan include:

Input from the Planning Team:

The Hazard Mitigation Planning Team convened five times to guide development of the Mitigation Plan. The Team played an integral role in developing the mission, goals, and action items for the Mitigation Plan. The Team consisted of representatives of 4 agencies, including:

San Diego Unified School District – Facilities Maintenance Department
San Diego Unified School District – School Police Services
San Diego Unified School District – Office of the Superintendent
San Diego Unified School District – Risk Management Department

Stakeholder interviews:

Stakeholder interviews were conducted during the workshops and meetings identified above. The key stakeholders to the District were representatives from the San Diego Unified School District. The interviews identified common concerns related to natural hazards and identified key long and short-term activities to reduce risk from natural hazards. Additional Stakeholders interviewed included:

County of San Diego Office of Emergency Services

State and federal guidelines and requirements for mitigation plans

The following are the Federal requirements for approval of a Natural Hazards Mitigation Plan:

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

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 District
- A comprehensive mitigation strategy, which describes the goals and objectives, including proposed strategies, programs and actions to avoid long-term vulnerabilities.
- A plan maintenance process, which describes the method and schedule of monitoring, evaluating and updating the plan and integration of the Natural Hazards Mitigation Plan into other planning mechanisms.
- Formal adoption by the Board of Education.
- Plan Review by both State OES and FEMA.

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

Public participation opportunities were created through use of local media, the District's website, distribution of a natural hazards questionnaire, and the Board of Education public meeting. In addition, the makeup of a Hazard Mitigation Planning Team insured a constant exchange of data and input from outside organizations.

Through its consultant, Emergency Planning Consultants, the District had access to numerous existing mitigation plans from around the country, as well as current FEMA hazard mitigation planning standards (386 series) and the State of California Natural Hazards Mitigation Plan Guidance.

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

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

Hazard specific research: San Diego Unified School District staff collected data and compiled research on five hazards: Earthquake, Flood, Wildfire, Landslide, and Tsunami. Research materials came from the San Diego Unified School District Hazard Analysis contained in the District's Emergency Operations Plan and the San Diego County Multi-Jurisdictional Hazard Mitigation Plan.

Public Input

The San Diego Unified School District encouraged public participation and input in the Natural Hazards Mitigation Plan by posting its activities on the District's website. Staff and parents were encouraged to review the Plan Draft and participate in the Board of Education public meeting which was held on ________________________________. Following is a summary of the public comments gathered during the Board Meeting:

____
____
____
____
____
____

The resources and information cited in the mitigation plan provide a strong local perspective and help identify strategies and activities to make San Diego Unified School District more disaster resistant.

How Is the Plan Used?

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

The structure of the plan enables people to use a section of interest to them. It also allows the District 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 District. 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 San Diego Unified School District.

The mitigation plan is organized into three parts. Part I contains an executive summary, introduction, District profile, risk assessment, and hazards. Part II contains mitigation actions, plan maintenance, and implementation. Part III includes the appendices. Each section of the plan is described below.

Part I: Mitigation Actions

Executive Summary: Hazard Mitigation Action Plan

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

Section 1: Introduction

The Introduction describes the background and purpose of developing the mitigation plan for San Diego Unified School District.

Section 2: Plan Maintenance

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

Part II: Hazard Analysis

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

Section 3: District Profile

The section presents the history, geography, demographics, and socioeconomics of the San Diego Unified School District. It provides valuable information on the demographics and history of the region.

Sections 4: Risk Assessment

This section provides information on hazard identification, vulnerability and risk associated with natural hazards in San Diego Unified School District.

Section 5: Hazard-Specific Information

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

Section 5: Earthquake
Section 6: Flood
Section 7: Wildfire
Section 8: Landslide
Section 9: Tsunami

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

Part III: Resources

The plan appendices are designed to provide users of the San Diego Unified School District 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: Master Resource Directory

The resource directory includes District, local, regional, state, and national resources and programs that may be of technical and/or financial assistance to San Diego Unified School District 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's 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 District, local, regional, state, and federal agencies and organizations that may be referred to within the San Diego Unified School District Natural Hazards Mitigation Plan.

Appendix E: Glossary

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

Section 2: Plan Maintenance

The Plan Maintenance section of this document details the formal process that will ensure that the San Diego Unified School District 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 district will integrate public participation throughout the plan maintenance process. Finally, this section includes an explanation of how San Diego Unified School District government intends to incorporate the mitigation strategies outlined in this Plan into existing planning mechanisms such as the District's Facilities Master Plan.

Monitoring and Implementing the Plan

Plan Adoption

The Board of Education will be responsible for adopting the San Diego Unified School District Natural Hazards Mitigation Plan. This governing body has the authority to promote sound public policy regarding natural hazards. Once the plan has been adopted, the District Superintendent (or appointee) 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, San Diego Unified School District will gain eligibility for Hazard Mitigation Grant Program funds.

Coordinating Body

A San Diego Unified School District Hazard Mitigation Advisory Committee will be responsible for coordinating implementation of plan action items and undertaking the formal review process. The district will assign representatives from district agencies, including, but not limited to, the current Hazard Mitigation Planning Team members. The District's existing Disaster Planning Team will serve as the Hazard Mitigation Advisory Committee and consists of the following individuals:

Hazard Mitigation Advisory Committee
San Diego Unified School District
Chief Donald Braun, School Police Services (Chair)
Sue Weir, Office of the Superintendent
Lt. Rueben Littlejohn, School Police Services
Arthur Triplette, Facilities Maintenance Department

Jennifer Gorman, Nursing
Earlene Dunbar, Guidance and Counseling
Kassia Kossyta, Risk Management Department
Al Lamar, Transportation
Ursula Kroemer, Communications
Carolyn Nunes, Special Education
Lance Wade, IT
City of San Diego
Lt. Kerry Brookes, San Diego Police Department

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

Hazard Mitigation Planning Team (authored the Mitigation Plan)
A representative from the American Red Cross
A representative from a local government emergency response agency

The Hazard Mitigation Advisory Committee will meet at least once a year. 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.

Convener

The Board of Education will adopt the San Diego Unified School District Natural Hazard Mitigation Plan. Following adoption, the Hazard Mitigation Advisory Committee will take responsibility for plan implementation. The District Superintendent (or appointee) 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 Hazard Mitigation Advisory Committee members.

Implementation through Existing Programs

San Diego Unified School District addresses statewide planning goals and legislative requirements through its District Facilities Master Plan and other documents regulating development. The Natural Hazards Mitigation Plan provides a series of recommendations - many of which are closely related to the goals and objectives of existing planning programs. The San Diego Unified School District will have the opportunity to implement recommended mitigation action items through existing programs and procedures.

The San Diego Unified School District Facilities Maintenance Department is responsible for adhering to the State of California's Building & Safety Codes. In addition, the Hazard Mitigation Advisory Committee will work with other agencies at the state level to review, develop and ensure Building & Safety Codes that are adequate to mitigate or present damage by natural hazards. This is to ensure that life-safety criteria are met for new construction.

The majority of the goals and action items in the Mitigation Plan may be achieved through activities recommended in the District's Facilities Master Plan. Various district departments contribute to the Master Plan, and review them on an annual basis. Upon annual review of the Facilities Master Plan, the Hazard Mitigation Advisory Committee will work with the district departments to identify areas that the Natural Hazards Mitigation Plan action items are consistent with Facilities Master Plan 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 district 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 district planning documents and procedures.

Economic Analysis of Mitigation Projects

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

FEMA's approaches 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.

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: Benefit/Cost Analysis.

Evaluating and Updating the Plan

Formal Review Process

The San Diego Unified School District Natural Hazards Mitigation Plan will be evaluated on an annual basis to determine the effectiveness of programs, and to reflect changes in land development or programs that may affect mitigation priorities. The evaluation process includes a firm schedule and timeline, and identifies the agencies and organizations participating in plan evaluation. The convener or designee will be responsible for contacting the Hazard Mitigation Advisory Committee members and organizing the annual meeting.

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

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

The convener will assign the duty of updating the plan to one or more of the Committee members. The designated committee members will have three months to make appropriate changes to the Plan before submitting it to the Committee members, and presenting it to the District Superintendent. The Hazard Mitigation Advisory Committee will also notify all holders of the district plan when changes have been made. Every five years the updated plan will be submitted to the State Hazard Mitigation Officer and the Federal Emergency Management Agency for review.

Continued Public Involvement

San Diego Unified School District is dedicated to involving the public directly in review and updates of the Natural Hazards Mitigation Plan. The Hazard Mitigation Advisory Committee members are responsible for the annual review and update of the plan.

The public will also have the opportunity to provide feedback about the Plan. Copies of the Plan will be kept at the District Offices and in the Facilities Maintenance Department. The existence and location of these copies will be publicized on the District website. The plan also includes the address and the phone number of the District's Facilities Maintenance Department, 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 district website. This site will also contain an email address and phone number to which people can direct their comments and concerns.

A public meeting will also be held after each annual evaluation or when deemed necessary by the 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 District's Communications Office will be responsible for using district resources to publicize the annual public meetings and maintain public involvement through the public access channel, web page, and newspapers.

Table 2-1
STAPLEE Prioritization Tool
(Scoring: “+” = 1 point, “-” = -1 point, “n/a” = 0 point)

		S Social		**T Technical**			**A Administrative**			**P Political**			**L Legal**			**E Economic**				**E Environmental**					
Mitigation Action	$	Community Acceptance	Effect on Segment of Population	Technical Feasibility	Long-Term Solution	Secondary Impacts	Staffing	Funding Allocated	Maintenance/Operations	Political Support	Local Champion	Public Support	State Authority	Existing Local Authority	Potential Legal Challenge	Benefit of Action	Cost of Action	Contributes to Economic Goals	Outside Funding Required	Effect on Land / Water	Effect on Endangered Species	Effect on HAZMAT/Waste Sites	Consistent with Community Environmental Goals	Consistent with Federal Environmental Laws	Priority Total (net)
Multi-Hazard Mitigation Action Items																									
MH-1 Integrate the goals and action items from the San Diego Unified School District Natural Hazards Mitigation Plan into existing regulatory documents and programs, where appropriate.	n/a	+	+	+	+	+	+	-	+	+	-	+	+	+	+	+	+	+	-	n/a	n/a	n/a	n/a	n/a	16
MH-2 Identify and pursue funding opportunities to develop and implement district mitigation activities.	n/a	+	+	+	+	+	+	+	+	+	-	+	+	+	+	+	+	+	-	n/a	n/a	n/a	n/a	n/a	16

Table 2-1 STAPLEE Prioritization Tool (Scoring: "+" = 1 point, "-" = -1 point, "n/a" = 0 point)																										
		S Social		**T Technical**			**A Administrative**			**P Political**			**L Legal**			**E Economic**				**E Environmental**					
Mitigation Action	$	Community Acceptance	Effect on Segment of Population	Technical Feasibility	Long-Term Solution	Secondary Impacts	Staffing	Funding Allocated	Maintenance/Operations	Political Support	Local Champion	Public Support	State Authority	Existing Local Authority	Potential Legal Challenge	Benefit of Action	Cost of Action	Contributes to Economic Goals	Outside Funding Required	Effect on Land / Water	Effect on Endangered Species	Effect on HAZMAT/Waste Sites	Consistent with Community Environmental Goals	Consistent with Federal Environmental Laws	Priority Total (net)
MH-3 Establish a formal role for the San Diego City School District Hazard Mitigation Advisory Committee to recommend a sustainable process for implementing, monitoring, and evaluating District-wide mitigation activities. It is recommended that the District's existing District's Disaster Planning Team (meets quarterly) assume the role of	n/a	+	+	+	+	+	+	+	+	+	-	+	+	+	+	+	+	+	+	n/a	n/a	n/a	n/a	n/a	17

Table 2-1
STAPLEE Prioritization Tool
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		S Social		**T Technical**			**A Administrative**			**P Political**			**L Legal**			**E Economic**				**E Environmental**					
Mitigation Action	$	Community Acceptance	Effect on Segment of Population	Technical Feasibility	Long-Term Solution	Secondary Impacts	Staffing	Funding Allocated	Maintenance/Operations	Political Support	Local Champion	Public Support	State Authority	Existing Local Authority	Potential Legal Challenge	Benefit of Action	Cost of Action	Contributes to Economic Goals	Outside Funding Required	Effect on Land / Water	Effect on Endangered Species	Effect on HAZMAT/Waste Sites	Consistent with Community Environmental Goals	Consistent with Federal Environmental Laws	Priority Total (net)
overseeing the planning process, while delegating the responsibility for implementation to the Planning Team who wrote the Plan.																									
MH-4 Develop public and private partnerships to foster natural hazard mitigation program coordination and collaboration in the district.	n/a	+	+	+	+	+	+	+	+	+	-	+	+	+	+	+	+	+	+	n/a	n/a	n/a	n/a	n/a	17
MH-5 Develop inventories of at-risk buildings and infrastructure and prioritize mitigation projects.	n/a	+	+	+	+	+	-	+	+	+	-	+	+	+	+	+	+	+	+	n/a	n/a	n/a	n/a	n/a	16

Table 2-1
STAPLEE Prioritization Tool
(Scoring: “+” = 1 point, “-” = -1 point, “n/a” = 0 point)

		S Social		**T Technical**			**A Administrative**			**P Political**			**L Legal**			**E Economic**				**E Environmental**					
Mitigation Action	$	Community Acceptance	Effect on Segment of Population	Technical Feasibility	Long-Term Solution	Secondary Impacts	Staffing	Funding Allocated	Maintenance/Operations	Political Support	Local Champion	Public Support	State Authority	Existing Local Authority	Potential Legal Challenge	Benefit of Action	Cost of Action	Contributes to Economic Goals	Outside Funding Required	Effect on Land / Water	Effect on Endangered Species	Effect on HAZMAT/Waste Sites	Consistent with Community Environmental Goals	Consistent with Federal Environmental Laws	Priority Total (net)
MH-6 Develop, enhance, and implement education programs aimed at mitigating natural hazards, and reducing the risk to students, employees, and schools.	n/a	+	+	+	+	+	-	+	+	+	-	+	+	+	+	+	+	+	+	n/a	n/a	n/a	n/a	n/a	16
MH-7 Conduct a detailed vulnerability assessment in the future in order to accurately identify the extent of damages to vulnerable buildings, infrastructure, and	n/a	+	+	+	+	+	+	+	+	+	-	+	+	+	+	+	+	+	+	n/a	n/a	n/a	n/a	n/a	17

Table 2-1
STAPLEE Prioritization Tool
(Scoring: "+" = 1 point, "-" = -1 point, "n/a" = 0 point)

		S Social		**T Technical**			**A Administrative**			**P Political**			**L Legal**			**E Economic**				**E Environmental**					
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critical facilities.																									
MH-8 Conduct site plan review for new constructions, repair and reconstruction of damaged structures.	n/a	+	+	+	+	+	+	+	+	+	-	+	+	+	+	+	+	+	+	n/a	n/a	n/a	n/a	n/a	17
MH-9 Retrofit or relocate utility and communications systems supporting emergency services operations to withstand the impacts of disasters.	n/a	+	+	+	+	+	-	-	+	+	-	+	+	+	+	+	+	+	-	n/a	n/a	n/a	n/a	n/a	14
MH-10 Identify opportunities for partnering with private contractors, and other	n/a	+	+	+	+	+	-	+	+	+	-	+	+	+	+	+	+	+	+	n/a	n/a	n/a	n/a	n/a	16

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STAPLEE Prioritization Tool
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		S Social		**T Technical**			**A Administrative**			**P Political**			**L Legal**			**E Economic**				**E Environmental**					
Mitigation Action	$	Community Acceptance	Effect on Segment of Population	Technical Feasibility	Long-Term Solution	Secondary Impacts	Staffing	Funding Allocated	Maintenance/Operations	Political Support	Local Champion	Public Support	State Authority	Existing Local Authority	Potential Legal Challenge	Benefit of Action	Cost of Action	Contributes to Economic Goals	Outside Funding Required	Effect on Land / Water	Effect on Endangered Species	Effect on HAZMAT/Waste Sites	Consistent with Community Environmental Goals	Consistent with Federal Environmental Laws	Priority Total (net)
jurisdictions to increase availability of equipment and manpower for efficiency of response efforts.																									
MH-11 Work with Site Governance Team and Councils and other neighborhood groups to establish community response teams.	n/a	+	+	+	+	+	-	+	+	+	-	+	+	+	+	+	+	+	+	n/a	n/a	n/a	n/a	n/a	16
MH-12 Familiarize district officials of requirements regarding public assistance for disaster response.	n/a	+	+	+	+	+	+	+	+	+	-	+	+	+	+	+	+	+	+	n/a	n/a	n/a	n/a	n/a	17

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		S Social		**T Technical**			**A Administrative**			**P Political**			**L Legal**			**E Economic**				**E Environmental**					
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Establish and implement the National Incident Management System (NIMS) in each agency/department.	n/a	+	+	+	+	+	+	-	+	+	-	+	+	+	+	+	+	+	-	n/a	n/a	n/a	n/a	n/a	15
MH-13 Conduct a full review of the Natural Hazards Mitigation Action Plan every 5 years by evaluating mitigation successes, failures, and areas that were not addressed. Submit updated Plan to FEMA.	n/a	+	+	+	+	+	+	-	+	+	-	+	+	+	+	+	+	+	-	n/a	n/a	n/a	n/a	n/a	15
MH-14 Assess availability of	n/a	+	+	+	+	+	+	-	+	+	-	+	+	+	+	+	+	+	-	n/a	n/a	n/a	n/a	n/a	15

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Mitigation Action	$	Community Acceptance	Effect on Segment of Population	Technical Feasibility	Long-Term Solution	Secondary Impacts	Staffing	Funding Allocated	Maintenance/Operations	Political Support	Local Champion	Public Support	State Authority	Existing Local Authority	Potential Legal Challenge	Benefit of Action	Cost of Action	Contributes to Economic Goals	Outside Funding Required	Effect on Land / Water	Effect on Endangered Species	Effect on HAZMAT/Waste Sites	Consistent with Community Environmental Goals	Consistent with Federal Environmental Laws	Priority Total (net)
backup power resources (generators) of facilities and upgrade resources as necessary.																									
MH-15 Establish policy to ensure mitigation projects are in place to safeguard critical facilities.	n/a	+	+	+	+	+	+	+	+	+	-	+	+	+	+	+	+	+	+	n/a	n/a	n/a	n/a	n/a	17
MH-16 Ensure that repairs or construction funded by Federal disaster assistance conforms to applicable codes and standards.	n/a	+	+	+	+	+	+	+	+	+	-	+	+	+	+	+	+	+	+	n/a	n/a	n/a	n/a	n/a	17
MH-17 In advance of major storms,	n/a	+	+	+	+	+	+	+	+	+	-	+	+	+	+	+	+	+	+	n/a	n/a	n/a	n/a	n/a	17

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Mitigation Action	$	Community Acceptance	Effect on Segment of Population	Technical Feasibility	Long-Term Solution	Secondary Impacts	Staffing	Funding Allocated	Maintenance/Operations	Political Support	Local Champion	Public Support	State Authority	Existing Local Authority	Potential Legal Challenge	Benefit of Action	Cost of Action	Contributes to Economic Goals	Outside Funding Required	Effect on Land / Water	Effect on Endangered Species	Effect on HAZMAT/Waste Sites	Consistent with Community Environmental Goals	Consistent with Federal Environmental Laws	Priority Total (net)
develop plans for temporary protection of contents of a building to protect against further damage.																									
MH-18 Monitor trees and branches at District facilities in risk of breaking or falling in stormy or high wind conditions. Prune or thin trees or branches when they would pose an immediate threat to property, utility lines or other significant	n/a	+	+	+	+	+	+	+	+	+	-	+	+	+	+	+	+	+	+	n/a	n/a	n/a	n/a	n/a	17

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structures or critical facilities in the district.																									
MH-19 Prepare a policy that guides the selection of temporary locations and arrangements for resumption of school related services.	n/a	+	+	+	+	+	-	-	+	+	-	+	+	+	+	+	+	+	-	n/a	n/a	n/a	n/a	n/a	14
MH-20 Promote public education to increase awareness of hazards and opportunities for mitigation.	n/a	+	+	+	+	+	+	+	+	+	-	+	+	+	+	+	+	+	+	n/a	n/a	n/a	n/a	n/a	17
MH-21 Encourage interested individuals to participate in the	n/a	+	+	+	+	+	+	+	+	+	-	+	+	+	+	+	+	+	+	n/a	n/a	n/a	n/a	n/a	17

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hazard mitigation planning process.																									
MH-22 Educate the Principals and Site Administrators about emergency sheltering and evacuation procedures.	n/a	+	+	+	+	+	+	+	+	+	-	+	+	+	+	+	+	+	+	n/a	n/a	n/a	n/a	n/a	17
MH-23 Provide opportunities for Principals and Site Administrators to be kept up to date on District’s Emergency Procedures.	n/a	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	n/a	n/a	n/a	n/a	n/a	18
MH-24 Conduct annual disaster exercises with local law enforcement,	n/a	+	+	+	+	+	+	+	+	+	-	+	+	+	+	+	+	+	-	n/a	n/a	n/a	n/a	n/a	16

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fire department, and EMS staff.																									
MH-25 Purchase and deliver a NOAA Weather Radio in School Police Dispatch and each administrative and school facility.	n/a	+	+	+	+	+	+	+	+	+	-	+	+	+	+	+	+	+	+	n/a	n/a	n/a	n/a	n/a	17
MH-26 Improve and maintain a District Emergency Operations Center (EOC) located at School Police Services. In the event the primary site is unavailable, an off-site alternate will be established.	n/a	+	+	+	+	+	+	+	+	+	-	+	+	+	+	+	+	+	+	n/a	n/a	n/a	n/a	n/a	17

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MH-27 Ensure communications capability between the agencies in the EOC and all District facilities. Establish EOC redundant backups in voice and data communications.	n/a	+	+	+	+	+	+	-	+	+	-	+	+	+	+	+	+	+	-	n/a	n/a	n/a	n/a	n/a	15
MH-28 Conduct interim planning to locate, set up, and manage temporary sites where school sites can continue their operations during recovery.	n/a	+	+	+	+	+	+	-	+	+	-	+	+	+	+	+	+	+	-	n/a	n/a	n/a	n/a	n/a	15
MH-29 Prepare a Recovery Plan. The Plan will include	n/a	+	+	+	+	+	-	-	+	+	-	+	+	+	+	+	+	+	-	n/a	n/a	n/a	n/a	n/a	14

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guidelines and authorities to make determination on the future of damaged buildings (i.e. which structures and/or facilities will not be allowed to be repaired/reconstructed).																									
MH-30 Post the District’s Hazard Mitigation Plan on the website.	n/a	+	+	+	+	+	+	+	+	+	-	+	+	+	+	+	+	+	+	n/a	n/a	n/a	n/a	n/a	17
MH-31 Develop a Speakers Bureau on natural disasters.	n/a	+	+	+	+	+	+	+	+	+	-	+	+	+	+	+	+	+	+	n/a	n/a	n/a	n/a	n/a	17
MH-32 Educate faculty, staff, and parents about the hazards prevalent to	n/a	+	+	+	+	+	+	+	+	+	-	+	+	+	+	+	+	+	+	n/a	n/a	n/a	n/a	n/a	17

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the area.																									
MH-33 Publicize the documents associated with emergency response and mitigation.	n/a	+	+	+	+	+	+	+	+	+	-	+	+	+	+	+	+	+	+	n/a	n/a	n/a	n/a	n/a	17
MH-34 Consider purchase of hazard insurance (earthquake and flood insurance) for impacted sites.	n/a	+	+	+	+	+	+	-	+	+	+	+	+	+	+	+	+	+	+	n/a	n/a	n/a	n/a	n/a	17
MH-35 Advise sites on reducing non-structural earthquake hazards and seismic bracing for all schools with suspended ceilings, lights, bookcases,	n/a	+	+	+	+	+	+	-	+	+	+	+	+	+	+	+	+	+	+	n/a	n/a	n/a	n/a	n/a	17

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etc.																									
MH-36 In the event of damage, conduct a study of damaged vital district facilities and utilities and determine if they should be redesigned or relocated to avoid future disruptions.	n/a	+	+	+	+	+	+	+	+	+	-	+	+	+	+	+	+	+	+	n/a	n/a	n/a	n/a	n/a	17
MH-37 Ensure compliance to rebuilding in conformance with applicable codes, specifications, and standards.	n/a	+	+	+	+	+	+	+	+	+	-	+	+	+	+	+	+	+	+	n/a	n/a	n/a	n/a	n/a	17

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MH-38 Develop and maintain Emergency Operations Plans, Site Emergency Plans, conduct trainings on the Plans, and conduct a range of exercises. These documents and associated training and exercises are critical to the successful disaster response and recovery.	n/a	+	+	+	+	+	+	+	+	+	-	+	+	+	+	+	+	+	+	n/a	n/a	n/a	n/a	n/a	17
MH-39 Develop strategies for debris management following major disasters.	n/a	+	+	+	+	+	+	+	+	+	-	+	+	+	+	+	+	+	+	n/a	n/a	n/a	n/a	n/a	17

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MH-40 Promote the City of San Diego's Community Emergency Response Team (CERT) program with faculty, staff, and parents.	n/a	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	n/a	n/a	n/a	n/a	n/a	18
MH-41 Add website links to FEMA, U.S. Department of Education, and American Red Cross.	n/a	+	+	+	+	+	+	+	+	+	-	+	+	+	+	+	+	+	+	n/a	n/a	n/a	n/a	n/a	17
MH-42 Create displays for children's programs that teach safety. Utilize FEMA for Kids CD, the Sparky Fire Safety	n/a	+	+	+	+	+	+	+	+	+	-	+	+	+	+	+	+	+	+	n/a	n/a	n/a	n/a	n/a	17

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Program, and the American Red Cross's Masters of Disasters program.																									
MH-43 Coordinate District EOP and Site Emergency Plans with local emergency response plans.	n/a	+	+	+	+	+	+	+	+	+	-	+	+	+	+	+	+	+	+	n/a	n/a	n/a	n/a	n/a	17
MH-44 Develop an "Animals in Disaster" Display that will be used at school sites and street fairs. The display will have information about protecting animals against disasters by making a disaster	n/a	+	+	+	+	+	+	+	+	+	-	+	+	+	+	+	+	+	+	n/a	n/a	n/a	n/a	n/a	17

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plan and a disaster supply kit for each animal. The display will encourage animal owners to decide ahead of time where animals will be sheltered and to familiarize themselves with the County Department of Animal Services protocols for dealing with animals during disasters.																									
MH-45 Provide training to Facilities Management Division inspectors regarding	n/a	+	+	+	+	+	+	+	+	+	-	+	+	+	+	+	+	+	+	n/a	n/a	n/a	n/a	n/a	17

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identification of potential of structural failures to buildings following an earthquake or other disaster. This training is critical because the District's inspectors are expected to determine safety of occupancy following a disaster.																									
MH-46 Prohibit the storage of hazardous materials in classrooms.	n/a	+	+	+	+	+	+	+	+	+	-	+	+	+	+	+	+	+	+	n/a	n/a	n/a	n/a	n/a	17
MH-47 Enforce strict interpretation of the Mitigation Plan when	n/a	+	+	+	+	+	+	+	+	+	-	+	+	+	+	+	+	+	+	n/a	n/a	n/a	n/a	n/a	17

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rebuilding in hazard prone area.																									
MH-48 Involve the City of San Diego on future updates to the Natural Hazards Mitigation Plan.	n/a	+	+	+	+	+	+	+	+	+	-	+	+	+	+	+	+	+	+	n/a	n/a	n/a	n/a	n/a	17
MH-49 Retrofit or relocate utility, data systems, and communications systems supporting emergency services operations to ensure effectiveness during and following a disaster.	n/a	+	+	+	+	+	-	-	+	+	-	+	+	+	+	+	+	+	-	n/a	n/a	n/a	n/a	n/a	14
MH-50 Establish a list of demolition and debris removal service providers.	n/a	+	+	+	+	+	+	+	+	+	-	+	+	+	+	+	+	+	+	n/a	n/a	n/a	n/a	n/a	17

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MH-51 Encourage the City of San Diego to maintain water systems that will assist during fire fighting, drought conditions, and other water related emergencies.	n/a	+	+	+	+	+	+	+	+	+	-	+	+	+	+	+	+	+	+	n/a	n/a	n/a	n/a	n/a	17
MH-52 Purchase a complete GIS/GPS setup and provide training on the system for all pertinent District staff.	n/a	+	+	+	+	+	+	-	+	+	-	+	+	+	+	+	+	+	-	n/a	n/a	n/a	n/a	n/a	15
MH-53 Maintain the Site Hazard Assessments for use in future Hazard Mitigation Plan	n/a	+	+	+	+	+	+	-	+	+	-	+	+	+	+	+	+	+	-	n/a	n/a	n/a	n/a	n/a	15

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updates.																									
MH-54 Establish MOU or other agreements with the American Red Cross concerning the use of District facilities for use as shelters.	n/a	+	+	+	+	+	+	+	+	+	-	+	+	+	+	+	+	+	+	n/a	n/a	n/a	n/a	n/a	17
MH-55 Maintain a building inventory database that can be used to track the status of repair and reconstruction following a disaster.	n/a	+	+	+	+	+	+	-	+	+	-	+	+	+	+	+	+	+	-	n/a	n/a	n/a	n/a	n/a	15
MH-56 Install and improve back-up power in critical facilities.	n/a	+	+	+	+	+	+	-	+	+	-	+	+	+	+	+	+	+	-	n/a	n/a	n/a	n/a	n/a	15

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MH-57 Incorporate new information pertaining to constructions standards and hazard identification into updates of the Natural Hazards Mitigation Plan.	n/a	+	+	+	+	+	+	-	+	+	-	+	+	+	+	+	+	+	-	n/a	n/a	n/a	n/a	n/a	15
MH-58 Maintain familiarity with the ongoing research efforts of the Department of the State Architect (DSA).	n/a	+	+	+	+	+	+	+	+	+	-	+	+	+	+	+	+	+	+	n/a	n/a	n/a	n/a	n/a	17
MH-59 Encourage the development of mutual aid or other assistance agreements with the	n/a	+	+	+	+	+	+	-	+	+	-	+	+	+	+	+	+	+	-	n/a	n/a	n/a	n/a	n/a	15

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City of San Diego and other school districts.																									
MH-60 Develop site plans that will ensure the placement of buildings away from threats associated with natural hazards.	n/a	+	+	+	+	+	+	+	+	+	-	+	+	+	+	+	+	+	+	n/a	n/a	n/a	n/a	n/a	17
MH-61 Monitor opportunities for pre-disaster and post-disaster hazard mitigation grant funding.	n/a	+	+	+	+	+	+	+	+	+	-	+	+	+	+	+	+	+	+	n/a	n/a	n/a	n/a	n/a	17
MH-62 Explore the possibility of developing a Teen CERT Chapter for	n/a	+	+	+	+	+	+	-	+	+	-	+	+	+	+	+	+	+	-	n/a	n/a	n/a	n/a	n/a	15

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STAPLEE Prioritization Tool
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		S Social		**T Technical**			**A Administrative**			**P Political**			**L Legal**			**E Economic**				**E Environmental**					
Mitigation Action	$	Community Acceptance	Effect on Segment of Population	Technical Feasibility	Long-Term Solution	Secondary Impacts	Staffing	Funding Allocated	Maintenance/Operations	Political Support	Local Champion	Public Support	State Authority	Existing Local Authority	Potential Legal Challenge	Benefit of Action	Cost of Action	Contributes to Economic Goals	Outside Funding Required	Effect on Land / Water	Effect on Endangered Species	Effect on HAZMAT/Waste Sites	Consistent with Community Environmental Goals	Consistent with Federal Environmental Laws	Priority Total (net)
the District.																									
MH-63 Develop a public awareness campaign to inform parents and guardians of their role during a disaster on a school campus.	n/a	+	+	+	+	+	+	-	+	+	-	+	+	+	+	+	+	+	+	n/a	n/a	n/a	n/a	n/a	16
MH-64 Maintain a set of evacuation maps from the various District administrative and school facilities for use in the District EOC.	n/a	+	+	+	+	+	+	-	+	+	-	+	+	+	+	+	+	+	+	n/a	n/a	n/a	n/a	n/a	16
Earthquake Mitigation Actions Items																									

Table 2-1
STAPLEE Prioritization Tool
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		S Social		**T Technical**			**A Administrative**			**P Political**			**L Legal**			**E Economic**				**E Environmental**					
Mitigation Action	$	Community Acceptance	Effect on Segment of Population	Technical Feasibility	Long-Term Solution	Secondary Impacts	Staffing	Funding Allocated	Maintenance/Operations	Political Support	Local Champion	Public Support	State Authority	Existing Local Authority	Potential Legal Challenge	Benefit of Action	Cost of Action	Contributes to Economic Goals	Outside Funding Required	Effect on Land / Water	Effect on Endangered Species	Effect on HAZMAT/Waste Sites	Consistent with Community Environmental Goals	Consistent with Federal Environmental Laws	Priority Total (net)
EQ-1 Encourage reduction of nonstructural and structural earthquake hazards in schools and district property.	n/a	+	+	+	+	+	+	+	+	+	-	+	+	+	+	+	+	+	+	n/a	n/a	n/a	n/a	n/a	16
EQ-2 Integrate new earthquake hazard mapping data for the District into the EOP Hazard Analysis, Site Hazard Assessments, and the Mitigation Plan.	n/a	+	+	+	+	+	-	-	+	+	-	+	+	+	+	+	+	+	-	n/a	n/a	n/a	n/a	n/a	14
EQ-3 Provide training and equipment to the Post-Earthquake Preparedness Plan	n/a	+	+	+	+	+	+	-	+	+	-	+	+	+	+	+	+	+	-	n/a	n/a	n/a	n/a	n/a	15

Table 2-1
STAPLEE Prioritization Tool
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		S Social		**T Technical**			**A Administrative**			**P Political**			**L Legal**			**E Economic**				**E Environmental**					
Mitigation Action	$	Community Acceptance	Effect on Segment of Population	Technical Feasibility	Long-Term Solution	Secondary Impacts	Staffing	Funding Allocated	Maintenance/Operations	Political Support	Local Champion	Public Support	State Authority	Existing Local Authority	Potential Legal Challenge	Benefit of Action	Cost of Action	Contributes to Economic Goals	Outside Funding Required	Effect on Land / Water	Effect on Endangered Species	Effect on HAZMAT/Waste Sites	Consistent with Community Environmental Goals	Consistent with Federal Environmental Laws	Priority Total (net)
(PEPP) Team. PEPP is the team of District inspectors responsible for conducting damage assessment inspections following an earthquake.																									
EQ-4 Retrofit school buildings to highest earthquake standards according to the local Uniform Building Code.	n/a	+	+	+	+	+	-	-	+	+	-	+	+	+	+	+	+	+	-	n/a	n/a	n/a	n/a	n/a	14
EQ-5 Prepare strategy for reduction of nonstructural earthquake hazards in schools and	n/a	+	+	+	+	+	+	-	+	+	-	+	+	+	+	+	+	+	-	n/a	n/a	n/a	n/a	n/a	15

Table 2-1 STAPLEE Prioritization Tool (Scoring: "+" = 1 point, "-" = -1 point, "n/a" = 0 point)																									
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Mitigation Action	$	Community Acceptance	Effect on Segment of Population	Technical Feasibility	Long-Term Solution	Secondary Impacts	Staffing	Funding Allocated	Maintenance/Operations	Political Support	Local Champion	Public Support	State Authority	Existing Local Authority	Potential Legal Challenge	Benefit of Action	Cost of Action	Contributes to Economic Goals	Outside Funding Required	Effect on Land / Water	Effect on Endangered Species	Effect on HAZMAT/Waste Sites	Consistent with Community Environmental Goals	Consistent with Federal Environmental Laws	Priority Total (net)
administrative District-owned properties.																									
Flood Mitigation Action Items																									
FLD-1 Determine and maintain temporary protection measures for at risk structures; install plastic sheeting on roofs, cover exterior openings such as windows or doors, draining trapped water in ceilings or draining accumulated flood waters, temporary shoring to avoid	n/a	+	+	+	+	+	-	-	+	+	-	+	+	+	+	+	+	+	-	n/a	n/a	n/a	n/a	n/a	14

Table 2-1
STAPLEE Prioritization Tool
(Scoring: “+” = 1 point, “-” = -1 point, “n/a” = 0 point)

		S Social		**T Technical**			**A Administrative**			**P Political**			**L Legal**			**E Economic**				**E Environmental**					
Mitigation Action	$	Community Acceptance	Effect on Segment of Population	Technical Feasibility	Long-Term Solution	Secondary Impacts	Staffing	Funding Allocated	Maintenance/Operations	Political Support	Local Champion	Public Support	State Authority	Existing Local Authority	Potential Legal Challenge	Benefit of Action	Cost of Action	Contributes to Economic Goals	Outside Funding Required	Effect on Land / Water	Effect on Endangered Species	Effect on HAZMAT/Waste Sites	Consistent with Community Environmental Goals	Consistent with Federal Environmental Laws	Priority Total (net)
imminent building collapse or damage, and installing barricades.																									
FLD-2 During the building design process, design proper catch basin/drains to accommodate run off.	n/a	+	+	+	+	+	+	+	+	+	-	+	+	+	+	+	+	+	+	n/a	n/a	n/a	n/a	n/a	17
FLD-3 During the building design process, develop site plans that will ensure the safety of buildings from potential flood damages.	n/a	+	+	+	+	+	+	+	+	+	-	+	+	+	+	+	+	+	+	n/a	n/a	n/a	n/a	n/a	17
FLD-4 Develop and implement	n/a	+	+	+	+	+	-	-	+	+	-	+	+	-	+	+	+	+	-	n/a	n/a	n/a	n/a	n/a	13

Table 2-1
STAPLEE Prioritization Tool
(Scoring: "+" = 1 point, "-" = -1 point, "n/a" = 0 point)

		S Social		**T Technical**			**A Administrative**			**P Political**			**L Legal**			**E Economic**				**E Environmental**					
Mitigation Action	$	Community Acceptance	Effect on Segment of Population	Technical Feasibility	Long-Term Solution	Secondary Impacts	Staffing	Funding Allocated	Maintenance/Operations	Political Support	Local Champion	Public Support	State Authority	Existing Local Authority	Potential Legal Challenge	Benefit of Action	Cost of Action	Contributes to Economic Goals	Outside Funding Required	Effect on Land / Water	Effect on Endangered Species	Effect on HAZMAT/Waste Sites	Consistent with Community Environmental Goals	Consistent with Federal Environmental Laws	Priority Total (net)
programs to maintain trees in order to minimize threats to life and property during windstorm events.																									
FLD-5 Analyze repetitive flood properties in the District and identify feasible mitigation options.	n/a	+	+	+	+	+	-	-	+	+	-	+	+	+	+	+	+	+	-	n/a	n/a	n/a	n/a	n/a	14
FLD-6 Prepare an inventory of all District structures and facilities located in a 100-year or 500-year floodplain.	n/a	+	+	+	+	+	+	-	+	+	-	+	+	+	+	+	+	+	+	n/a	n/a	n/a	n/a	n/a	16
FLD-7 Buy flood insurance on flood prone sites.	n/a	+	+	+	+	+	+	-	+	+	-	+	+	+	+	+	+	+	+	n/a	n/a	n/a	n/a	n/a	16

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		S Social		**T Technical**			**A Administrative**			**P Political**			**L Legal**			**E Economic**				**E Environmental**					
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FLD-8 Become familiar with the National Flood Insurance Program (NFIP) requirements for new construction and substantially improved buildings.	n/a	+	+	+	+	+	+	-	+	+	-	+	+	+	+	+	+	+	+	n/a	n/a	n/a	n/a	n/a	16
FLD-9 Develop strategies for debris management for coastal storm/wind events.	n/a	+	+	+	+	+	+	-	+	+	-	+	+	+	+	+	+	+	-	n/a	n/a	n/a	n/a	n/a	15
Landslide Mitigation Action Items																									
LND-1 During activities in slide-prone areas, implement stabilization	n/a	+	+	+	+	+	+	+	+	+	-	+	+	+	+	+	+	+	+	+	n/a	n/a	+	+	20

Table 2-1
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practices.																									
LND-2 Identify surface water drainage obstructions for all parts of the District.	n/a	+	+	+	+	+	+	-	+	+	-	+	+	+	+	+	+	+	-	n/a	n/a	n/a	n/a	n/a	15
Wildfire Mitigation Action Items																									
WF-1 Develop education programs aimed at mitigating wildfire hazards and reduce or prevent the exposure of students, parents, staff to the dangers associated with wildfires.	n/a	+	+	+	+	+	+	-	+	+	-	+	+	+	+	+	+	+	-	n/a	n/a	n/a	n/a	n/a	15
WF-2 Incorporate hazard-specific	n/a	+	+	+	+	+	+	-	-	+	-	+	+	+	+	+	+	+	-	n/a	n/a	n/a	n/a	n/a	14

Table 2-1
STAPLEE Prioritization Tool
(Scoring: "+" = 1 point, "-" = -1 point, "n/a" = 0 point)

		S Social		**T Technical**			**A Administrative**			**P Political**			**L Legal**			**E Economic**				**E Environmental**					
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emergency response protocols into Site Emergency Plans for sites vulnerable to wildfire threats.																									
Tsunami Mitigation Action Items																									
TS-1 Develop and deliver an assembly presentation on the Tsunami threat for delivery at vulnerable sites in the District.	n/a	+	+	+	+	+	-	-	+	+	-	+	+	+	+	+	+	+	-	n/a	n/a	n/a	n/a	n/a	14
TS-2 Purchase and post Tsunami warning signs at vulnerable sites.	n/a	+	+	+	+	+	-	-	+	+	-	+	+	+	+	+	+	+	-	n/a	n/a	n/a	n/a	n/a	14
TS-3 Develop tsunami protocols and procedures for	n/a	+	+	+	+	+	-	-	+	+	-	+	+	+	+	+	+	+	-	n/a	n/a	n/a	n/a	n/a	14

Table 2-1
STAPLEE Prioritization Tool
(Scoring: "+" = 1 point, "-" = -1 point, "n/a" = 0 point)

		S Social		**T Technical**			**A Administrative**			**P Political**			**L Legal**			**E Economic**				**E Environmental**					
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District EOP and Site Emergency Plans (vulnerable sites).																									

Section 3: District Profile

Why Plan for Natural Hazards in San Diego Unified School District?

Natural hazards impact staff, students, parents, property, the environment, and the economy of San Diego Unified School District. Earthquake, Flood, Wildfire, Landslide, and Tsunami have exposed the San Diego Unified School District 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 District 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 District to create a natural hazards mitigation plan that addresses the potential impacts of hazard events.

Geography and the Environment

San Diego Unified School District has an area of 211 square miles and is located in southwestern region of San Diego County.

Elevations in the District range from sea level to a high of 500 feet above sea level. The terrain of the District ranges from coastline to foothills, including many canyon and plateaus.

Community Profile

The San Diego Unified School District is one of the oldest Districts in San Diego County. When the District was originally established in 1854, it encompassed one rented school building. Since its founding on July 1, 1854, the district has grown from a small, rented school building with one teacher to its current state—more than 221 educational facilities with 14,555 full-time equivalent staff positions representing more than 15,800 employees. The district's educational facilities include 118 elementary schools, 24 middle schools, 29 high schools, 35 charter schools, and 15 atypical or alternative schools.

The District is served by Interstate 8, Interstate 805, Interstate 5, and Interstate 15, as well as major arterial highways including State Highway 163 and State Highways 94 and 52.

The Coaster railroad serves the community with tracks running north/south along the coastal region of San Diego connecting with the Los Angeles Metro system. Local passenger transportation is provided by the San Diego Trolley. Amtrak serves the region in a variety of coastal locations.

Major Rivers

The largest river in the District is the San Diego River, however there are also several other large streams and rivers impacting the region. These rivers and streams pose a potential threat to the San Diego Unified School District. Riverine flooding, urban flooding, coastal flooding, and overflow from numerous water reservoirs all combine to pose a significant threat against district facilities.

Climate

Temperatures in the San Diego Unified School District range from 45 degrees in the winter months to 90 degrees in the summer months. However the temperatures can vary over a wide range, particularly when the Santa Ana winds blow, bringing higher temperatures, very low humidity, and strong winds.

Rainfall in the region averages 10 inches of rain per year. But the term “average” means very little in this region as the annual rainfall during this time period has ranged from only 4.35 inches in 2001-2002 to 38.2 inches in 1883-1884.

Furthermore, actual rainfall in the Southern California region tends to fall in large amounts during sporadic and often heavy storms rather than consistently over storms at somewhat regular intervals. In short rainfall in Southern California might be characterized as feast or famine within a single year. 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.

Minerals and Soils

Like any other area, the characteristics of the minerals and soils present in San Diego Unified School District indicates 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.

Other Significant Geologic Features

San Diego Unified School District, like most of Southern California, lies over the area of one or more known earthquake faults, and potentially many more unknown faults, particularly so-called lateral or blind thrust faults.

The major faults that have the potential to affect the greater San Diego region are the:

Rose Canyon Fault

Coronado Banks
La Nacion
Elsinore Fault
San Jacinto Fault

Southern California has a history of powerful and relatively frequent earthquakes, dating back to the powerful 8.0+ 1857 San Andreas Earthquake which did substantial damage to the relatively few buildings that existed at the time. Paleoseismological research indicates that large (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 1933 Long Beach Earthquake, the 1971 San Fernando Earthquake, the 1987 Whittier Earthquake and the 1994 Northridge Earthquake.

In addition, many areas in Southern California have sandy soils that are subject to liquefaction. The San Diego Unified School District has liquefaction zones that are discussed in Section 5: Earthquake.

Enrollment and Demographics

The San Diego Unified School District encompasses an area of 211 square miles. The District properties are inside of the boundaries of the City of San Diego and the County of San Diego. According to District records, by the school year 2022, student enrollment in the District is projected to increase 7**%** over the 2002 enrollment of 145,000. The student enrollment in the school year 2022 is projected to be 155,825 or 10,825 more students than in 2002.

According to the Great Schools.net website, the demographic make up of the District is as follows:

	San Diego Unified School District
Hispanic	44%
Caucasian	26%
African American	14%
Asian	9%
Other	7%

Land and Development

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

Transportation

San Diego Unified School District relies on parent-owned automobiles and District-provided buses as the dominant means of transporting students to and from school sites. In addition, Metropolitan Transit System local transit provides bus services throughout the District.

The District has a total daytime occupancy (students, faculty, and staff) of approximately 150,000.

The major road systems within the District are: Interstate 805, Interstate 15, Interstate 5, Interstate 8, State Highway 163, State Highway 52, and State Highway 94. The District is not responsible for maintaining any streets or roads.

Localized flooding can render roads unusable. A severe winter storm has the potential to disrupt the daily driving routine of parents and staff alike. Natural hazards can disrupt automobile traffic and shut down local and regional transit systems.

Section 4: Risk Assessment

What is a Risk Assessment?

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

1) Hazard Identification

The Planning Team considered a range of natural hazards facing the region including: Earthquakes, Flooding (coastal, urban, and riverine), Wildfire, Landslide, Tsunami, and Drought. The attached Ranking Your Hazards - Attachment 1 is the handout guided the Team in prioritizing the natural hazards with the highest probability of significantly impacting the San Diego Unified School District. The Team agreed that any hazards receiving a Team score higher than “3” would be included in the Natural Hazards Mitigation Plan. Utilizing the ranking technique, the Team identified Earthquake, Flood, Wildfire, Landslide, and Tsunami as the most prominent hazards facing the district.

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 San Diego Unified School District identified five major hazards that affect this geographic area. These hazards – Earthquake, Flood, Wildfire, Landslide, and Tsunami - were identified through an extensive process that utilized input from the Hazard Mitigation Planning Team. The geographic extent of each of the identified hazards has been identified by the San Diego Unified School District utilizing the maps contained in the District’s Emergency Operations Plan, the City of San Diego’s Multi-Hazard Functional Plan, and the County of San Diego’s Hazard Mitigation Plan. The vulnerabilities posed by these hazards are depicted on Table 4-1.

2) Profiling Hazard Events

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

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

	Location (Where)	**Extent (How Big an Event)**	**Probability (How Often)***
Hazard			
Earthquake	Entire Project Area	The Southern California Earthquake Center (SCEC) in 1995 concluded that there is an 80-90 % probability that an earthquake of M7.0 or greater will hit Southern California before 2024.[1]	Moderate
Flood	Throughout Project Area	Coastal Flooding: Coastal Areas Urban Flooding: Urbanized Areas Riverine Flooding: 100-year floodplain[2]	Moderate
Wildfire	Throughout Project Area	Moderate/High/Severe/Extreme FRAP Ratings. The most dangerous areas are in the northeast quadrant of the project area.[2]	High
Landslide (Rain-Induced)	Throughout Project Area	Most of the northeast quadrant is designated as "Moderate" risk to rain-induced landslide. Other isolated locations along cliffs near coast and above river banks. [2]	Moderate-High
Tsunami	Coast	Up to 40 foot run-up along coastal region.[2]	Low
* Probability is defined as: Low = 1:500 years, Moderate = 1:100 years, High = 1:10 years			
[1] State of California Hazard Mitigation Plan			
[2] San Diego County Multi-Jurisdictional Hazard Mitigation Plan			

3) Vulnerability Assessment/Inventorying Assets

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

4) Risk Analysis

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

5) Assessing Vulnerability/ Analyzing Development Trends

This step provides a general description of District facilities and contents in relation to the identified natural hazards so that mitigation options can be considered in land use planning and future land use decisions. This plan provides comprehensive description of the character of San Diego Unified School District in the District 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 San Diego Unified School District can help in identifying potential problem areas and can serve as a guide for incorporating the goals and ideas contained in this mitigation plan into other community development plans.

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

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

Federal Requirements for Risk Assessment

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 three hazards profiled in the mitigation plan, including Earthquake, Flood, Wildfire, Landslide, and Tsunami. The Federal criteria for risk assessment and information on how the San Diego Unified School District Natural Hazards Mitigation Plan meets those criteria is outlined in Table 4-2 below.

Table 4-2: Federal Criteria for Risk Assessment

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

Critical and Essential Facilities

Facilities critical to government response and recovery activities (i.e., life safety and property and environmental protection) include: local government 911 centers, District and local government emergency operations centers, School Police, local police and fire stations, District's Facilities Maintenance Center, local public works facilities, District and local communications centers, sewer and water facilities, hospitals, bridges and major roads, and shelters. Also, facilities that, if damaged, could cause serious secondary impacts may also be considered "critical". A hazardous materials facility is one example of this type of critical facility.

Essential facilities are those facilities that are vital to the continued delivery of key District services or that may significantly impact the District's ability to recover from the disaster. Examples would include public infrastructure and school buildings. The following Table 4-3 illustrates the critical and essential facilities providing services to the San Diego Unified School District.

Table 4-3: San Diego Unified School District Critical and Essential Facilities Vulnerable to Hazards
(X = site's risk rating is "possible, likely, or highly likely")

EQ	Dam	Liq	Flood	Fire	Land	Tsu	Facility	Address
Elementary Schools * Child Development Center on school site								
X							Adams	4672 35th Street 92116
X							Alcott	4680 Hidalgo Avenue 92117
X							Angier	8450 Hurlbut Street 92123
X							Audubon	8111 San Vicente Street 92114
X							Baker	4041 T Street 92113
X							Balboa	1844 South 40th Street 92113
X	X						Barnard	2930 Barnard Street 92110
X							Bay Park	2433 Denver Street 92110
X		X					Bayview Terrace*	2445 Fogg Street 92109
X							Benchley/Weinberger	6269 Twin Lake Drive 92119
X							Bethune	6835 Benjamin Holt Road 92114
X							Bird Rock	5371 La Jolla Hermosa Avenue 92037
X							Birney	4345 Campus Avenue 92103
X							Boone	7330 Brookhaven Road 92114
X							Brooklyn*	1240 33rd Street 92102
X							Burbank	2146 Julian Avenue 92113
X							Cabrillo	3120 Talbot Street 92106
X							Cadman	4370 Kamloop Avenue 92117
X							Carson*	6905 Kramer Street 92111
X							Carver	3251 Juanita Street 92105
X							Central	4063 Polk Avenue 92105
X			X				Chavez	1404 So. 40th Street 92113
X							Cherokee Point	3735 38th Street 92105
X							Chesterton	7335 Wheatley Street 92111
X							Chollas/Mead	4525 Market Street 92102
X							Clay	6506 Solita Avenue 92115
X							Crown Point	4033 Ingraham Street 92109

EQ	Dam	Liq	Flood	Fire	Land	Tsu	Facility	Address
X							Cubberley	3201 Marathon Drive 92123
X							Curie	4080 Governor Drive 92122
X							Dailard	6425 Cibola Road 92120
X		X					Dewey*	3251 Rosecrans Street 92110
X				X			Dingeman	11840 Scripps Creek Drive 92131
X							Doyle	3950 Berino Court 92122
X				X			Ellen Browing Scripps	10380 Spring Canyon Road 92131
X							Edison	4077 35th Street 92104
X							Emerson/Bandini	3510 Newton Avenue 92113
X							Encanto	822 65th Street 92114
X				X			Ericson	11174 Westonhill Drive 92126
X							Euclid*	4166 Euclid Avenue 92105
X							Fay	4080 52nd Street, San Diego, CA 92105
X							Field*	4375 Bannock Avenue 92117
X							Fletcher*	7666 Bobolink Way 92123
X							Florence*	3914 First Avenue 92103
X							Foster	6550 51st Street 92120
X							Franklin	4481 Copeland Avenue 92116
X							Freese	8140 Greenlawn Drive 92114
X							Fulton	7055 Skyline Drive 92114
X							Gage	6811 Bisby Lake 92119
X							Garfield*	4487 Oregon Street 92116
X							Golden Hill	1240 33rd Street
X				X			Grant	1425 Washington Place 92103
X							Green	7030 Wandermere Place 92119
X				X			Hage	9750 Galvin Avenue 92126
X							Hamilton	2807 Fairmount Avenue 92105
X							Hancock	3303 Taussig Street 92124
X							Hardy	5420 Montezuma Road 92115
X							Hawthorne*	4750 Lehrer Drive 92117
X							Hearst	6230 Del Cerro Boulevard 92120
X				X			Hickman	10850 Montongo Street 92126
X							Holmes	4902 Mt. Ararat Drive 92111
X							Horton	5050 Guymon Street 92102

EQ	Dam	Liq	Flood	Fire	Land	Tsu	Facility	Address
X							Ibarra	4877 Orange Avenue 92115
X							Jackson	5465 El Cajon Boulevard 92115
X							Jefferson*	3770 Utah Street 92104
X		X		X			Jerabek	10050 Avenida Magnifica 92131
X							Johnson	1355 Kelton Road 92114
X							Jones	2751 Greyling Drive 92123
X							Joyner	4271 Myrtle Avenue 92105
X							Juarez	2633 Melbourne Drive 92123
X							Kimbrough	321 Hoitt Street 92102
X							Knox	1098 So. 49th Street 92113
X							Kumeyaay	6475 Antigua Boulevard 92124
X							La Jolla Elementary	1111 Marine Street 92037
X							Lafayette	6125 Printwood Way 92117
X							Lee	6196 Childs Avenue 92139
X							Linda Vista	2772 Ulric Street 92111
X							Linda Vista Annex	7260 Linda Vista Road 92111
X							Lindbergh Schweitzer	4133 Mt. Albertine Avenue 92111
X							Logan*	2875 Ocean View Boulevard 92113
X							Loma Portal	3341 Browning Street 92106
X				X			Marshall	3550 Altadena Avenue 92105
X							Marvin	5720 Brunswick Avenue 92120
X				X			Mason	10340 San Ramon Drive 92126
X							McKinley	3045 Felton Street 92104
X							Miller*	4343 Shields Street 92124
X				X			Miramar Ranch	10770 Red Cedar Drive 92131
X							Normal Heights	3750 Ward Road 92116
X							North Park	4041 Oregon Street 92104
X							Nye	981 Valencia Parkway 92114
X							Oak Park	2606 54th Street 92105
X							Ocean Beach*	4741 Santa Monica Avenue 92107
X							Pacific Beach	1234 Tourmaline Street 92109
X							Paradise Hills	5816 Alleghany Street 92139
X							Penn	2797 Utica Drive 92139
X						X	Perkins	1770 Main Street 92113

EQ	Dam	Liq	Flood	Fire	Land	Tsu	Facility	Address
X							Perry	6290 Oriskany Road 92139
X							Porter	4800 T Street 92113
X		X					Rodriguez	825 South 31st Avenue 92113
X							Rolando Park	6620 Marlowe Drive 92115
X							Rosa Parks	4510 Landis Street 92105
X							Ross*	7470 Bagdad Street 92111
X							Rowan*	1755 Rowan Street 92105
X							Sandburg*	11230 Avenida del Gato 92126
X							Sequoia	4690 Limerick Avenue 92117
X							Sessions	2150 Beryl Street 92109
X							Sherman	450 24th Street 92102
X							Silver Gate	1499 Venice Street 92107
X							Spreckels	6033 Stadium Street 92122
X							Sunset View	4365 Hill Street 92107
X							Tierrasanta	5450 La Cuenta Drive 92124
X							Toler	3350 Baker Street 92117
X				X			Torrey Pines	8350 Cliffridge Avenue 92037
X							Valencia Park	5880 Skyline Drive 92114
X							Vista Grande	5606 Antigua Boulevard 92124
X				X			Walker*	9225 Hillery Drive 92126
X							Washington	1789 State Street 92101
X							Webster	4801 Elm Street 92102
X							Wageforth*	3443 Ediwahr Avenue 92123
X							Whitman	4050 Appleton Street 92117
X							Zamorano	2655 Casey Street 92139
Middle/Junior High Schools								
X							Bell	620 Briarwood Road 92139
X				X			Challenger	10810 Parkdale Avenue 92126
X							Clark	4388 Thorn Street 92105
X	X						Correia	4302 Valeta Street 92107
X							Creative Performing Media Arts (CPMA)	5095 Arvinels Street 92119
X							Dana	1775 Chatsworth Boulevard 92106

EQ	Dam	Liq	Flood	Fire	Land	Tsu	Facility	Address
X							DePortola	11010 Clairemont Mesa Boulevard 92124
X							Farb	4880 La Cuenta Drive 92124
X							Keiller	7270 Lisbon Street 92114
X							Kroc	5050 Conrad Avenue 92117
X							Lewis	5170 Greenbrier Avenue 92120
X							Mann	4345 54th Street 92115
X			X	X			Thurgood Marshall	11778 Cypress Canyon Road 92131
X							Marston	3799 Clairemont Drive 92117
X				X			Montgomery	2470 Ulric Street 92111
X							Muirlands	1056 Nautilus Street 92037
X							Pacific Beach Middle	4676 Ingraham Street 92109
X							Pershing	8204 San Carlos Drive 92119
X				X			Roosevelt	3366 Park Boulevard 92103
X							Standley	6298 Radcliffe Drive 92122
X							Taft	9191 Gramercy Drive 92123
X	X			X			Wangenheim	9230 Gold Coast Drive 92126
X							Wilson	3838 Orange Avenue 92105
Senior High Schools								
X							Clairemont	4150 Ute Drive 92117
X							Crawford High Educational Complex	4191 Colts Way 92115
X							Henry	6702 Wandermere Drive 92120
X							Hoover	4474 El Cajon Boulevard 92115
X							Kearny High Educational Complex	7651 Wellington Street 92111
X							La Jolla	750 Nautilus Street 92037
X							Lincoln	150 South 49th Street 92113
X							Madison	4833 Doliva Drive 92117
X				X			Mira Mesa	10510 Reagan Road 92126
X		X	X			X	Mission Bay	2475 Grand Avenue 92109
X							Morse	6905 Skyline Drive 92114
X							Point Loma	2335 Chatsworth Boulevard 92106
X							San Diego High Educational Complex	1405 Park Boulevard 92101
X	X			X			Scripps Ranch	10410 Treena Street 92131

EQ	Dam	Liq	Flood	Fire	Land	Tsu	Facility	Address
X							Serra	5156 Santo Road 92124
X				X			University City	6949 Genesee Avenue 92122
Atypical (grade configurations) and Alternative Schools								
X							Alternative Learning for Behavior and Attitude (ALBA)	5510 Trojan Avenue 92115
X							Del Sol Academy (K-12)	3401 Clairemont Drive 92117
X							Garfield High School (9-12)	1255 16th Street 92101
X							Gompers High School (10-12)	1110 Carolina Lane 92102
X							John Muir (K-12)	4431 Mt. Herbert Avenue 92117
X							Longfellow (K-8)	5055 July Street 92110
X							Mt. Everest Academy (K-12)	4350 Mt. Everest Boulevard 92117
X							Language Academy (K-8)	4961 64th Street 92115
X							New Dawn (at Riley)	5650 Mt. Ackerly Drive 92111
X							Riley (K-9 Special Ed)	5650 Mt. Ackerly Drive 92111
X		X					San Diego Metropolitan Regional & Technical (MET) – (9-10)	7250 Mesa College Drive 92111
X							School of Creative & Performing Arts (SCPA) (6-12)	2425 Dusk Drive 92139
X	X						TRACE (12+)	9230 Goldcoast Drive 92126
X							Twain Senior High School (7-12)	6402 Linda Vista Road 92111
X							Twain Mesa Satellite	10444 Reagan Road 92126
X							Albert Einstein Academy (K-5)	3035 Ash Street 92102
X							Albert Einstein Academy Middle (6)	3035 Ash Street 92102
X							Audeo (6-12) Ind. Study	10170 Huennekens Street 92121
X							Chanc. William McGill School of Success (K-2)	3025 Fir Street 92102
X							Charter School of San Diego	10170 Huennekens Street 92121
X							City Arts Academy	611 35th Street 92113
X							Children's Conservation Academy (K-6)	3910 University Avenue 92115
X							Cortez Hill Academy (9-12)	201 A Street 92101
X							Darnall (K-6)	6020 Hughes Street 92115
X							Explorer Elementary (K-5)	2320 Truxton Road 92106

EQ	Dam	Liq	Flood	Fire	Land	Tsu	Facility	Address
X							Fanno Academy (K-6)	730 45th Street 92102
X							Gompers Charter Middle (6-9)	1005 47th Street 92102
X							Harriett Tubman Village (K-8)	6880 Mohawk Street 92115
X		X					High Tech High (9-12)	2861 Womble Road 92106
X		X					High Tech High International (9-12)	2855 Farragut Road 92106
X		X					High Tech Media Arts (9-12)	2230 Truxton Road 92106
X		X					High Tech Middle (6-8)	2291 Truxton Road 92106
X							Holly Drive Leadership Academy (K-8)	4999 Holly Drive 92113
X							Iftin (K-6)	6605 University Avenue 92115
X							Keiller Leadership Academy (6-8)	7270 Lisbon Street 92114
X							King/Chavez Arts Academy (3-5)	415 31st Street 92102
X							King/Chavez Excellence Academy (K-8)	735 Cesar East Chavez Parkway 92113
X							KIPP Adelante Prep Academy (5-8)	1475 Sixth Avenue 92101
X	X	X					Learning Choice Academy (K-12)	9950 Scripps Lake Drive 92131
X							Memorial Academy of Learning & Technology (6-9)	2850 Logan Avenue 92113
X							Momentum Middle School (6-7)	6365 Lake Atlin Avenue 92119
X							Museum School (3-6)	211 Maple Street 92103
X							Nubia Leadership Academy (K-6)	6134 Benson Avenue 92114
X							O'Farrell Community School (6-8)	6130 Skyline Drive 92114
X							Preuss School UCSD (6-12)	9500 Gilman Drive 92093
X							Promise Charter School (K-7)	730 45th Street 92102
X							San Diego Cooperative (K-8)	2850 Sixth Avenue 92103
Child Development Centers (not located on school site)								
X							DeAnza	6525 Estrella Avenue 92120
X							Kennedy	4715 T Street 92113
X							Los Altos	1201 Turquoise Street 92109
X							Mead	750 45th Street 92102
X							Montezuma	4950 Curry Drive 92115
X							Salomon	1789 State Street 92101
X							Whittier	3604 Waco Street 92117

EQ	Dam	Liq	Flood	Fire	Land	Tsu	Facility	Address
							Special Programs	
X							Alvarado Parkway Institute	7050 Parkway Drive, La Mesa 91942
X							Aurora Behavioral Health Care	11878 Avenue of Industry 92128
X							Comprehensive Adolescent Center	4307 Third Avenue 92103
X							County Mental Health	3485 Kenyon Street 92110
X							Mesa Vista	7850 Vista Hill Avenue 92123
X	X	X					Midway Transition Program	3249 Fordham 92110
X							Off-Campus Integrated Learning Experience (OCILE) Balboa Park Program	3366 1/2 Zoo Drive 92103
X				X			Off-Campus Integrated Learning Experience (OCILE) Camp Palomar	Palomar Mountain 92060
X		X					Off-Campus Integrated Learning Experience (OCILE) Old Town Park Program	3939 Conde Street 92110
X							San Diego Center for Children (STEPS)	3002 Armstrong Street 92111
X							Vista SD Residential Treatment Center	3003 Armstrong Street 92111
							Administrative Offices	
X							Eugene Brucker Education Center (District Headquarters)	4100 Normal Street 92103
X		X					Harold J. Ballard Parent Center	2375 Congress Street 92110
X							Instructional Media Center (IMC)	2441 Cardinal Lane 92123
X							Facilities Maintenance Center	4860 Ruffner Road 92111
X		X	X			X	Mission Beach Center / District Intern Programs	818 Santa Barbara Place 92109
X							Pacific Beach Center	4606 Ingraham Street 92109
X							Revere Center	6734 Gifford Way 92111
X							Supply Center / Warehouse	2351 Cardinal Lane 92123
X							Whittier Center / SEEC/RSA Programs	3401 Clairemont Drive 92117

Table 4-4: San Diego Unified School District Calculated Priority Risk Index Summary
(Note: Detailed CPRI results are maintained in each individual Site Emergency Plan)

		Dam Failure	Earthquake	Liquefaction	Flood	Landslide	Tsunami	Wildfire	Total
High Schools	Clairemont	0	3.45	0	0	0	0	1.75	5.2
	Crawford	0	2.85	0	0	0	0	1.75	4.6
	Patrick Henry	0	2.85	0	0	0	0	2.5	5.35
	Hoover	0	3.15	0	0	0	0	1.75	4.9
	Kearny	0	3.45	0	0	0	0	1.75	5.2
	La Jolla	0	3.45	0	0	0	0	1.75	5.2
	Lincoln	0	3.15	0	0	0	0	1.75	4.9
	Madison	0	3.15	0	0	0	0	1.75	4.9
	Mira Mesa	0	2.85	0	0	0	0	2.65	5.5
	Mission Bay	0	3.45	3.15	2.45	0	2.5	1.75	13.3
	Morse	0	2.85	0	0	1.45	0	1.75	6.05
	Point Loma	0	3.45	0	0	0	0	1.75	5.2
	San Diego	0	3.45	0	0	0	0	1.75	5.2
	Scripps Ranch	2.7	2.85	0	0	0	0	2.95	8.5
	Serra	0	2.85	0	0	0	0	1.75	4.6
	University City	0	3.45	0	0	0	0	2.95	6.4

		Dam Failure	Earthquake	Liquefaction	Flood	Landslide	Tsunami	Wildfire	Total
Middle Schools	Bell	0	2.85	0	0	0	0	1.75	4.6
	Challenger	0	2.85	0	0	0	0	2.95	5.8
	Clark	0	3.15	0	0	0	0	1.75	4.9
	Correia	2.7	3.45	0	0	0	0	1.75	7.9
	CPMA	0	3.15	0	0	0	0	1.75	4.9
	Dana	0	3.15	0	0	0	0	1.75	4.9
	DePortola	0	2.85	0	0	0	0	2.05	4.9
	Farb	0	2.85	0	0	0	0	1.75	4.6
	Keiller	0	2.85	0	0	0	0	1.75	4.6
	Kroc	0	3.15	0	0	0	0	1.75	4.9
	Lewis	0	2.85	0	0	0	0	1.75	4.6
	Mann	0	3.15	0	0	0	0	1.75	4.9
	Thurgood Marshall	0	2.85	0	2.9	0	0	2.95	8.7
	Marston	0	3.15	0	0	0	0	1.75	4.9
	Montgomery	0	3.45	0	0	0	0	2.5	5.95
	Muirlands	0	3.45	0	0	0	0	1.75	5.2
	Pacific Beach	0	3.45	0	0	0	0	1.75	5.2
	Pershing	0	2.85	0	0	0	0	1.75	4.6
	Roosevelt	0	3.45	0	0	0	0	2.5	5.95
	Standley	0	3.45	0	0	0	0	1.75	5.2
	Taft	0	3.15	0	0	0	0	1.75	4.9

		Dam Failure	Earthquake	Liquefaction	Flood	Landslide	Tsunami	Wildfire	Total
	Wangenheim	2.8	2.85	0	0	0	0	2.95	8.6
	Wilson	0	3.15	0	0	0	0	1.75	4.9
Elementary Schools	Adams	0	3.15	0	0	0	0	1.75	4.9
	Alcott	0	3.45	0	0	0	0	1.75	5.2
	Angier	0	3.15	0	0	0	0	1.75	4.9
	Audubon	0	2.85	0	0	0	0	1.75	4.6
	Baker	0	3.15	0	0	0	0	1.75	4.9
	Balboa	0	3.15	0	0	0	0	1.75	4.9
	Bandini	0	3.15	0	0	0	0	1.75	4.9
	Barnard	2.8	3.45	0	0	0	1.75	1.75	9.75
	Bay Park	0	3.45	0	0	0	0	1.75	5.2
	Bayview Terrace	0	3.45	3.15	0	0	1.75	1.75	10.1
	Benchley-Weinberger	0	2.85	0	0	0	0	1.75	4.6
	Bethune	0	2.85	0	0	1	0	1.75	5.6
	Bird Rock	0	3.15	0	0	0	0	1.75	4.9
	Birney	0	3.45	0	0	0	0	1.75	5.2
	Boone	0	2.85	0	0	1	0	1.75	5.6
	Brooklyn	0	3.15	0	0	0	0	1.75	4.9
	Burbank	0	3.15	0	0	0	0	1.75	4.9
	Cabrillo	0	3.45	0	0	0	1.75	1.75	6.95
	Cadman	0	3.45	0	0	0	0	1.75	5.2
	Carson	0	3.45	0	0	0	0	1.75	5.2

		Dam Failure	Earthquake	Liquefaction	Flood	Landslide	Tsunami	Wildfire	Total
	Carver	2.05	2.85	0	0	0	0	1.75	6.65
	Central	0	3.15	0	0	0	0	1.75	4.9
	Chavez	0	3.15	0	2.45	0	0	1.75	7.35
	Cherokee Point	0	3.15	0	0	0	0	1.75	4.9
	Chesterton	0	3.45	0	0	0	0	1.75	5.2
	Chollas-Mead	0	3.15	0	0	0	0	1.75	4.9
	Clay	0	2.85	0	0	0	0	1.75	4.6
	Crown Point	0	3.45	0	0	0	1.75	1.75	6.95
	Cubberley	0	3.15	0	0	0	0	1.75	4.9
	Curie	0	3.45	0	0	0	0	1.75	5.2
	Dailard	0	2.85	0	0	0	0	1.75	4.6
	Dewey	2.05	3.45	3.15	0	0	1.75	1.75	12.15
	Dingeman	0	2.85	0	0	0	0	2.95	5.8
	Doyle	0	3.45	0	0	0	0	1.75	5.2
	Ellen Browning Scripps	0	2.85	0	0	0	0	2.95	5.8
	Edison	0	3.15	0	0	0	0	1.75	4.9
	Emerson	0	3.15	0	0	0	0	1.75	4.9
	Encanto	0	2.85	0	0	1	0	1.75	5.6
	Ericson	0	2.85	0	0	0	0	2.95	5.8
	Euclid	0	3.15	0	0	0	0	1.75	4.9
	Fay	0	3.15	0	0	0	0	1.75	4.9
	Field	0	3.45	0	0	0	0	1.75	5.2

		Dam Failure	Earthquake	Liquefaction	Flood	Landslide	Tsunami	Wildfire	Total
	Fletcher	0	3.45	0	0	0	0	1.75	5.2
	Florence	0	3.45	0	0	0	0	1.75	5.2
	Foster	0	2.85	0	0	0	0	1.75	4.6
	Franklin	0	3.15	0	0	0	0	1.75	4.9
	Freese	0	2.85	0	0	0	0	1.75	4.6
	Fulton	0	2.85	0	0	1	0	1.75	5.6
	Gage	0	2.85	0	0	0	0	1.75	4.6
	Garfield	0	3.45	0	0	0	0	1.75	5.2
	Golden Hill	0	3.15	0	0	0	0	1.75	4.9
	Grant	0	3.15	0	0	0	0	1.75	4.9
	Green	0	2.85	0	0	0	0	1.75	4.6
	Hage	0	2.85	0	0	0	0	2.5	5.35
	Hamilton	0	3.15	0	0	0	0	1.75	4.9
	Hancock	0	2.85	0	0	0	0	1.75	4.6
	Hardy	0	2.85	0	0	0	0	1.75	4.6
	Hawthorne	0	3.15	0	0	0	0	1.75	4.9
	Hearst	0	2.85	0	0	0	0	1.75	4.6
	Hickman	0	2.85	0	0	0	0	2.95	5.8
	Holmes	0	3.15	0	0	0	0	2.05	5.2
	Horton	0	3.15	0	0	0	0	1.75	4.9
	Ibarra	0	3.15	0	0	0	0	1.75	4.9
	Jackson	0	2.85	0	0	0	0	1.75	4.6

		Dam Failure	Earthquake	Liquefaction	Flood	Landslide	Tsunami	Wildfire	Total
	Jefferson	0	3.45	0	0	0	0	1.75	5.2
	Jerabek	0	2.85	3.15	0	0	0	2.95	8.95
	Johnson	0	3.15	0	0	0	0	1.75	4.9
	Jones	0	3.15	0	0	0	0	1.75	4.9
	Joyner	0	3.15	0	0	0	0	1.75	4.9
	Juarez	0	3.15	0	0	0	0	1.75	4.9
	Kimbrough	0	3.15	0	0	0	0	1.75	4.9
	Knox	0	3.15	0	0	0	0	1.75	4.9
	Kumeyaay	0	2.85	0	0	1	0	1.75	5.6
	La Jolla (E)	0	3.45	0	0	0	0	1.75	5.2
	Lafayette	0	3.15	0	0	0	0	1.75	4.9
	Lee	0	2.85	0	0	0	0	1.75	4.6
	Linda Vista	0	3.45	0	0	0	0	1.75	5.2
	Lindbergh	0	3.15	0	0	0	0	1.75	4.9
	Logan	0	3.15	0	0	0	0	1.75	4.9
	Loma Portal	0	3.45	0	0	0	0	1.75	5.2
	Marshall	0	3.15	0	0	0	0	1.75	4.9
	Marvin	0	2.85	0	0	0	0	1.75	4.6
	Mason	0	2.85	0	0	0	0	2.95	5.8
	McKinley	0	3.15	0	0	0	0	1.75	4.9
	Miller	0	2.85	0	0	0	0	1.75	4.6
	Miramar Ranch	0	2.85	0	0	0	0	2.95	5.8

	Dam Failure	Earthquake	Liquefaction	Flood	Landslide	Tsunami	Wildfire	Total
Normal Heights	0	3.15	0	0	0	0	1.75	4.9
North Park	0	3.15	0	0	0	0	1.75	4.9
Nye	0	2.85	0	0	1	0	1.75	5.6
Oak Park	0	3.15	0	0	0	0	1.75	4.9
Ocean Beach	0	3.45	0	0	0	0	1.75	5.2
Pacific Beach (E)	0	3.15	0	0	0	0	1.75	4.9
Paradise Hills	0	2.85	0	0	0	0	1.75	4.6
Penn	0	2.85	0	0	0	0	1.75	4.6
Perkins	0	3.15	0	0	0	2.5	1.75	7.4
Perry	0	2.85	0	0	0	0	1.75	4.6
Porter	0	3.15	0	0	0	0	1.75	4.9
Rodriguez	0	3.45	3.15	0	0	0	1.75	8.35
Rolando Park	0	2.85	0	0	0	0	1.75	4.6
Rosa Parks	0	3.15	0	0	0	0	1.75	4.9
Ross	0	3.15	0	0	0	0	1.75	4.9
Rowan	0	3.15	0	0	0	0	1.75	4.9
Sandburg	0	2.85	0	0	0	0	1.75	4.6
Sequoia	0	3.15	0	0	0	0	1.75	4.9
Sessions	0	3.45	0	0	0	0	1.75	5.2
Sherman	0	3.15	0	0	0	0	1.75	4.9
Silver Gate	0	3.15	0	0	0	0	1.75	4.9
Spreckels	0	3.45	0	0	0	0	1.75	5.2

		Dam Failure	Earthquake	Liquefaction	Flood	Landslide	Tsunami	Wildfire	Total
	Sunset View	0	2.85	0	0	0	0	1.75	4.6
	Tierrasanta	0	2.85	0	0	1	0	2.5	6.35
	Toler	0	3.45	0	0	1	0	1.75	6.2
	Torrey Pines	0	3.45	0	0	0	0	2.95	6.4
	Valencia Park	0	2.85	0	0	0	0	1.75	4.6
	Vista Grande	0	2.85	0	0	1	0	2.5	6.35
	Walker	0	2.85	0	0	0	0	2.65	5.5
	Washington	0	3.45	0	0	0	0	1.75	5.2
	Webster	0	3.15	0	0	0	0	1.75	4.9
	Wegeforth	0	3.15	0	0	0	0	1.75	4.9
	Whitman	0	3.45	0	0	0	0	1.75	5.2
	Zamorano	0	2.85	0	0	0	0	1.75	4.6
Atypical	ALBA Elementary	0	3.45	0	0	0	0	1.75	5.2
	ALBA Middle	0	3.45	0	0	0	0	1.75	5.2
	ALBA High	0	2.85	0	0	0	0	1.75	4.6
	Del Sol Academy	0	3.15	0	0	0	0	1.75	4.9
	Garfield High	0	3.45	0	0	0	0	1.75	5.2
	Gompers Middle	0	3.15	0	0	0	0	1.75	4.9
	John Muir	0	3.45	0	0	0	0	1.75	5.2
	Longfellow	0	3.45	0	0	0	0	1.75	5.2
	Mt. Everest Academy	0	3.45	0	0	0	0	1.75	5.2
	Language Academy	0	2.85	0	0	0	0	1.75	4.6

	Dam Failure	Earthquake	Liquefaction	Flood	Landslide	Tsunami	Wildfire	Total
New Dawn	0	3.15	0	0	1	0	1.75	5.9
Riley	0	3.15	0	0	1	0	1.75	5.9
San Diego MET	0	3.45	3.15	0	1	0	1.75	9.35
SCPA	0	2.85	0	0	0	0	1.75	4.6
TRACE	2.8	2.85	0	0	0	0	1.75	7.4
Twain Sr. High	0	3.45	0	0	1	0	1.75	6.2
Twain Mesa Satellite	0	2.85	0	0	0	0	2.65	5.5
Albert Einstein Academy	0	3.15	0	0	0	0	1.75	4.9
Albert Einstein Academy Middle	0	3.15	0	0	0	0	1.75	4.9
Audeo	0	2.85	0	0	0	0	1.75	4.6
Chanc. William McGill School of Success	0	3.15	0	0	0	0	1.75	4.9
Children's Conservation Academy	0	3.15	0	0	0	0	1.75	4.9
City Arts Academy	0	3.15	0	0	0	0	1.75	4.9
Cortez Hill Academy	0	3.15	0	0	0	0	1.75	4.9
Darnall	0	2.85	0	0	0	0	1.75	4.6
Explorer Elementary	0	3.45	3.15	0	0	0	1.75	8.35
Fanno Academy	0	3.15	0	0	0	0	1.75	4.9
Gompers Charter Middle	0	3.15	0	0	0	0	1.75	4.9
Harriett Tubman Village	0	2.85	0	0	0	0	1.75	4.6
High Tech High	0	3.45	3.15	0	0	0	1.75	8.35
High Tech High International	0	3.45	3.15	0	0	0	1.75	8.35
High Tech High Media Arts	0	3.45	3.15	0	0	0	1.75	8.35

		Dam Failure	Earthquake	Liquefaction	Flood	Landslide	Tsunami	Wildfire	Total
	High Tech Middle	0	3.45	3.15	0	0	0	1.75	8.35
	High Tech Middle Media	0	3.45	3.15	0	0	0	1.75	8.35
	Holly Drive Leadership Academy	0	3.15	0	0	0	0	1.75	4.9
	Iftin	0	2.85	0	0	0	0	1.75	4.6
	Keiller Leadership Academy	0	2.85	0	0	0	0	2.05	4.9
	King/Chavez Arts Academy	0	3.15	0	0	0	0	1.75	4.9
	King/Chavez Athletics Academy	0	3.15	0	0	0	0	1.75	4.9
	King/Chavez Excellence Academy	0	3.15	0	0	0	0	1.75	4.9
	King/Chavez Prepratory Academy	0	3.15	0	0	0	0	1.75	4.9
	King/Chavez Primary Academy	0	3.15	0	0	0	0	1.75	4.9
	KIPP Adelante Prep. Academy	0	3.45	0	0	0	0	1.75	5.2
	Learning Choice Academy	2.8	2.85	3.15	0	0	0	1.75	10.55
	Memorial Academy of Learning and Technology	0	3.15	0	0	0	0	1.75	4.9
	Momentum Middle School	0	2.85	0	0	0	0	1.75	4.6
	Museum School	0	3.45	0	0	0	0	1.75	5.2
	Nubia Leadership Academy	0	2.85	0	0	1	0	1.75	5.6
	O'Farrell Community School	0	2.85	0	0	1	0	1.75	5.6
	Preuss School UCSD	0	3.45	0	0	0	0	1.75	5.2
	Promise Charter School	0	3.15	0	0	0	0	1.75	4.9
	San Diego Cooperative	0	3.15	0	0	0	0	1.75	4.9

		Dam Failure	Earthquake	Liquefaction	Flood	Landslide	Tsunami	Wildfire	Total
Child Development Center	Bayview	0	3.45	3.15	0	0	0	1.75	8.35
	Brooklyn	0	3.15	0	0	0	0	1.75	4.9
	Carson	0	3.45	0	0	0	0	1.75	5.2
	De Anza	0	2.85	0	0	0	0	1.75	4.6
	Dewey	2.7	3.45	3.15	0	0	2.5	1.75	13.55
	Euclid	0	3.15	0	0	0	0	1.75	4.9
	Field	0	3.45	0	0	0	0	1.75	5.2
	Fletcher	0	3.45	0	0	0	0	1.75	5.2
	Florence	0	3.45	0	0	0	0	1.75	5.2
	Garfield	0	3.15	0	0	0	0	1.75	4.9
	Hawthorne	0	3.15	0	0	0	0	1.75	4.9
	Jefferson	0	3.15	0	0	0	0	1.75	4.9
	Logan	0	3.15	0	0	0	0	1.75	4.9
	Kennedy	0	3.15	0	0	0	0	1.75	4.9
	Los Altos	0	3.45	0	0	0	0	1.75	5.2
	Mead	0	3.15	0	0	0	0	1.75	4.9
	Miller	0	2.85	0	0	0	0	1.75	4.6
	Montezuma	0	2.85	0	0	0	0	1.75	4.6
	Ocean Beach	0	3.45	0	0	0	0	1.75	5.2
	Ross	0	3.15	0	0	0	0	1.75	4.9
	Rowan	0	3.15	0	0	0	0	1.75	4.9
	Salomon	0	3.45	0	0	0	0	1.75	5.2

		Dam Failure	Earthquake	Liquefaction	Flood	Landslide	Tsunami	Wildfire	Total
	Sandburg	0	2.85	0	0	0	0	1.75	4.6
	Walker	0	2.85	0	0	0	0	2.65	5.5
	Wegeforth	0	3.15	0	0	0	0	1.75	4.9
	Whittier	0	3.15	0	0	0	0	1.75	4.9
Special Programs	Alvarado Parkway Institute	0	2.85	0	0	0	0	1.75	4.6
	Aurora	0	2.55	0	0	1	0	1.75	5.3
	Hillcrest School	0	3.45	0	0	0	0	1.75	5.2
	County Mental Health	0	0	0	0	0	0	0	0
	Mesa Vista	0	3.45	0	0	0	0	1.75	5.2
	Midway Transition Program	2.8	3.45	3.15	0	0	0	1.75	11.15
	OCILE-Balboa	0	3.45	0	0	0	0	1.75	5.2
	OCILE-Camp Palomar	0	3.15	0	0	0	0	3.7	6.85
	OCILE-Old Town	0	3.45	3.15	0	0	0	1.75	8.35
	STEPS	0	3.45	0	0	0	0	1.75	5.2
	Venture Day	0	0	0	0	0	0	0	0
	Vista S.D. Residential Treatment Center	0	3.45	0	0	0	0	1.75	5.2
Administrative Office	ALBA Admin Center	0	2.85	0	0	0	0	1.75	4.6
	Del Sol Academy	0	3.15	0	0	0	0	1.75	4.9
	Eugene Brucker Education Center	0	3.45	0	0	0	0	1.75	5.2
	Fleet Maintenance	0	3.15	0	0	0	0	1.75	4.9

		Dam Failure	Earthquake	Liquefaction	Flood	Landslide	Tsunami	Wildfire	Total
	Freemont Training Center	0	3.45	0	0	0	0	1.75	5.2
	Harold J. Ballard Parent Center	0	3.45	3.15	0	0	0	1.75	8.35
	IMC	0	3.45	0	0	0	0	1.75	5.2
	Physical Plant Operations Center	0	3.15	0	0	0	0	1.75	4.9
	Mission Beach Center	0	3.45	3.15	2.45	0	2.5	1.75	13.3
	Pacific Beach Center	0	3.45	0	0	0	0	1.75	5.2
	Revere Center	0	3.15	0	0	1	0	1.75	5.9
	Supply Center	0	3.45	0	0	0	0	1.75	5.2
	Transportation Services	0	3.15	0	0	0	0	1.75	4.9
	Whittier Center	0	3.15	0	0	0	0	1.75	4.9

Key to CPRI Summary

The Calculated Priority Risk Index (recommended by FEMA) was adapted for use by the San Diego Unified School District. Once the regional hazards were identified, maps and data were gathered in order to assess the impact of hazards on each individual administrative and school site in the district. Site Assessment data was gathered using the following data sources:

Table 4-3 of Section Four Risk Assessment indicates an “X” in the column if the probability of a hazard event is between “possible and highly likely” on the Site Assessment (see below).

1. Earthquake – all locations considered “likely” for probability. Magnitude/severity was determined using the HAZUS Rose Canyon 6.9 map dated 2.06. The risk assessment breaks out liquefaction in the notes “L”.
2. Dam Failure information is drawn from SANGIS website. A “D” is shown in the Risk Assessment column for flood is the site is within a dam inundation area.
3. Landside information is drawn from SANGIS website. Geologic information on the maps includes “landslides” and “slide-prone formations”.

Dam Failure (Data Source: SANGIS website)				
Category	Degree of Risk			Assigned Weighting Factor
	Level ID	Description	Index	
Probability	N /A	Not impacted	0	45%
	Unlikely	Adjoining inundation area	1	
	Possible	Any impacted site	2	
	Likely		3	
	Highly Likely		4	
Magnitude / Severity	N/A		0	30%
	Negligible		1	
	Limited		2	
	Critical	Adjoining inundation area	3	
	Catastrophic	Any impacted site	4	
Warning Time	N/A		0	15%
	Less than 6 hrs	Any impacted site	4	
	6 to 12 hrs		3	
	12 to 24 hrs		2	

	More than 24 hrs		1	
Duration	N/A		0	10%
	Less than 6 hrs	Any impacted site	1	
	Less than 24 hrs		2	
	Less than one wk		3	
	More than one wk		4	

Earthquake (Magnitude/Severity Source: HAZUS Map Rose Canyon 6.9 Scenario 2.3.06)				
Category	Degree of Risk			Assigned Weighting Factor
	Level ID	Description	Index	
Probability	N /A		0	45%
	Unlikely		1	
	Possible		2	
	Likely	All sites	3	
	Highly Likely		4	
Magnitude / Severity	N/A		0	30%
	Negligible	Green: VI – Moderate shaking with objects falling Grey: I to V – Light Shaking with slight or no damage	1	
	Limited	Yellow: VII – Strong shaking with nonstructural damage	2	
	Critical	Orange: VIII – Very strong shaking with moderate damage	3	
	Catastrophic	Red: IX – Violent shaking with heavy damage	4	
Warning Time	N/A		0	15%
	Less than 6 hrs	All sites	4	
	6 to 12 hrs		3	

	12 to 24 hrs		2	
	More than 24 hrs		1	
Duration	N/A		0	10%
	Less than 6 hrs		1	
	Less than 24 hrs		2	
	Less than one wk	All sites	3	
	More than one wk		4	

Liquefaction
(Data Source: SANGIS website)

Category	Degree of Risk			Assigned Weighting Factor
	Level ID	Description	Index	
Probability	N /A		0	45%
	Unlikely		1	
	Possible		2	
	Likely	Any impacted site	3	
	Highly Likely		4	
Magnitude / Severity	N/A		0	30%
	Negligible		1	
	Limited		2	
	Critical	Any impacted site	3	
	Catastrophic		4	
Warning Time	N/A		0	15%
	Less than 6 hrs	Any impacted site	4	

	6 to 12 hrs		3	
	12 to 24 hrs		2	
	More than 24 hrs		1	
Duration	N/A		0	10%
	Less than 6 hrs		1	
	Less than 24 hrs		2	
	Less than one wk	Any impacted site	3	
	More than one wk		4	

Flooding

Category	Degree of Risk			Assigned Weighting Factor
	Level ID	Description	Index	
Probability	N /A		0	45%
	Unlikely		1	
	Possible	500-Year Floodplain	2	
	Likely	100-Year Floodplain	3	
	Highly Likely	50-Year Floodplain	4	
Magnitude / Severity	N/A		0	30%
	Negligible		1	
	Limited		2	
	Critical	All probabilities	3	
	Catastrophic		4	
Warning Time	N/A		0	15%
	Less than 6 hrs		4	

	6 to 12 hrs	All sites	3	
	12 to 24 hrs		2	
	More than 24 hrs		1	
Duration	N/A		0	10%
	Less than 6 hrs		1	
	Less than 24 hrs	All sites	2	
	Less than one wk		3	
	More than one wk		4	

Landslide (Rain-Induced)
(Source: SANGIS website “landslide or slide prone formation”)

Category	Degree of Risk			Assigned Weighting Factor
	Level ID	Description	Index	
Probability	N /A		0	45%
	Unlikely	Slide-prone formation	1	
	Possible	Landslide	2	
	Likely		3	
	Highly Likely		4	
Magnitude / Severity	N/A		0	30%
	Negligible	Slide-prone formation	1	
	Limited	Landslide	2	
	Critical		3	
	Catastrophic		4	
Warning Time	N/A		0	15%
	Less than 6 hrs	Landslide	4	
	6 to 12 hrs		3	
	12 to 24 hrs		2	
	More than 24 hrs	Slide-prone formation	1	
Duration	N/A		0	10%
	Less than 6 hrs	Landslide and slide-prone formation	1	
	Less than 24 hrs		2	
	Less than one wk		3	
	More than one wk		4	

Tsunami
(Source: San Diego County Multi-Jurisdictional Hazard Mitigation Plan)

Category	Degree of Risk			Assigned Weighting Factor
	Level ID	Description	Index	
Probability	N /A		0	45%
	Unlikely	Site adjoins Tsunami Run-Up area	1	
	Possible	Site in Tsunami Run-up area (42 ft.)	2	
	Likely		3	
	Highly Likely		4	
Magnitude / Severity	N/A		0	30%
	Negligible		1	
	Limited	Site adjoins Tsunami Run-Up area	2	
	Critical	Site in Tsunami Run-up area (42 ft.)	3	
	Catastrophic		4	
Warning Time	N/A		0	15%
	Less than 6 hrs	both	4	
	6 to 12 hrs		3	
	12 to 24 hrs		2	
	More than 24 hrs		1	
Duration	N/A		0	10%
	Less than 6 hrs	both	1	
	Less than 24 hrs		2	
	Less than one wk		3	
	More than one wk		4	

Wildfire
(Source: San Diego County Multi-Jurisdictional Hazard Mitigation Plan)

Category	Degree of Risk			Assigned Weighting Factor
	Level ID	Description	Index	
Probability	N /A	Grey: Little or no threat	0	45%
	Unlikely	Yellow: Moderate	1	
	Possible	Orange: High	2	
	Likely	Red: Very High	3	
	Highly Likely	Burgundy: Extreme	4	
Magnitude / Severity	N/A		0	30%
	Negligible		1	
	Limited	Yellow	2	
	Critical	Orange, Red, Burgundy	3	
	Catastrophic		4	
Warning Time	N/A		0	15%
	Less than 6 hrs	All sites	4	
	6 to 12 hrs		3	

	12 to 24 hrs		2	
	More than 24 hrs		1	
Duration	N/A		0	10%

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.

Figure 4-1:

Ranking Your Hazards

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

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

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

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

Hazard	***Score***
Earthquake	
Flooding	
Wildfire	
Windstorm	
Earth Movement (Landslide/Debris Flow)	
Tsunami	
Drought	
Other Hazard ___________________________	
Other Hazard ___________________________	
Other Hazard ___________________________	
Other Hazard ___________________________	
Other Hazard ___________________________	
Other Hazard ___________________________	

Section 5:
Earthquake Hazards

Why Are Earthquakes a Threat to the San Diego Unified School District?

Historic documents record that a very strong earthquake struck San Diego on May 27, 1862, damaging buildings in Old Town and opening up cracks in the earth near the San Diego River mouth. This destructive earthquake was centered on either the Rose Canyon or Coronado Bank faults and descriptions of damage suggest that it had a magnitude of about 6.0 (M6). The strongest recently recorded earthquake in San Diego County was a M5.3 earthquake that occurred on July 13, 1986 on the Coronado Bank Fault, 25 miles west of Solana Beach. In recent years there have been several moderate earthquakes recorded within the Rose Canyon Fault Zone as it passes beneath the City of San Diego. Three temblors shook the city on 17 June 1985 (M3.9, 4.0, 3.9) and a stronger quake occurred on 28 October 1986 (M4.7).

Although San Diego Unified School District has facilities located in the Old Town area, they were not there at the time of the 1862 earthquake event. The District has never been severely impacted by any earthquake.

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

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

However, the earthquake occurred early in the morning on a holiday. This circumstance considerably reduced the potential effects. Many collapsed buildings were unoccupied, and most businesses were not yet open. The direct and indirect economic losses ran into the 10's of billions of dollars.

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

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

Although the most famous of the faults, the San Andreas, is capable of producing an earthquake with a magnitude of 8+ on the Richter Scale, some of the "lesser" faults have the potential to inflict greater damage on the urban core of Southern California. 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 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 5-1: 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 – Old Town	1971 San Fernando

1892	San Jacinto or Elsinore Fault	1973	Point Mugu
1893	Pico Canyon	1986	Coastal San Diego
1894	Lytle Creek Region	1986	North Palm Springs
1894	E. of San Diego	1987	Whittier Narrows
1899	Lytle Creek Region	1992	Landers
1899	San Jacinto and Hemet	1992	Big Bear
1907	San Bernardino Region	1994	Northridge
1910	Glen Ivy Hot Springs	1999	Hector Mine

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

To better understand the earthquake hazard, the scientific community has looked at historical records and accelerated research on those faults that are the sources of the earthquakes occurring in the Southern California region. Historical earthquake records can generally be divided into records of the pre-instrumental period and the instrumental period. In the absence of instrumentation, the detection of earthquakes is based on observations and felt reports, and are dependent upon population density and distribution. Since California was sparsely populated in the 1800s, the detection of pre-instrumental earthquakes is relatively difficult. However, two very large earthquakes, the Fort Tejon in 1857 (M7.9) and the Owens Valley in 1872 (M7.6) are evidence of the tremendously damaging potential of earthquakes in Southern California. In more recent times two M7.3 earthquakes struck Southern California, in Kern County (1952) and Landers (1992). The damage from these four large earthquakes was limited because the occurred in areas which were sparsely populated at the time they happened. The seismic risk is much more severe today than in the past because the population at risk is in the millions, rather than a few hundred or a few thousand persons.

History of Earthquake Events in Southern California

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

Measuring and Describing Earthquakes

An earthquake is a sudden motion or trembling that is caused by a release of strain accumulated within or along the edge of the Earth's tectonic plates. The effects of an earthquake can be felt far beyond the site of its occurrence. They usually occur without warning and, after just a few seconds, can cause massive damage and extensive casualties. Common effects of earthquakes are ground motion and shaking, surface fault ruptures, and ground failure. Ground motion is the vibration or shaking of the ground during an earthquake. When a fault ruptures, seismic waves radiate, causing the ground to vibrate. The severity of the vibration increases with the amount of energy released and decreases with distance from the causative fault or epicenter. Soft soils can further amplify ground motions. The severity of these effects is dependent on the amount of energy released from the fault or epicenter. One way to express an earthquake's severity is to compare its acceleration to the normal acceleration due to gravity. The acceleration due to gravity is often called "g". A 100% g earthquake is very severe. More damage tends to occur from earthquakes when ground acceleration is rapid. Peak ground acceleration (PGA) is a measure of the strength of ground movement. PGA measures the rate in change of motion relative to the established rate of acceleration due to gravity (980 cm/sec/sec). PGA is used to project the risk of damage from future earthquakes by showing earthquake ground motions that have a specified probability (10%, 5%, or 2%) of being exceeded in 50 years. These ground motion values are used for reference in construction design for earthquake resistance. The ground motion values can also be used to assess relative hazard between sites, when making economic and safety decisions. Another tool used to describe earthquake intensity is the Richter scale. The Richter scale was devised as a means of rating earthquake strength and is an indirect measure of seismic energy released. The scale is logarithmic with each one-point increase corresponding to a 10-fold increase in the amplitude of the seismic shock waves generated by the earthquake. In terms of actual energy released, however, each one-point increase on the Richter scale corresponds to about a 32-fold increase in energy released. Therefore, a magnitude 7 (M7) earthquake is 100 times (10 X 10) more powerful than a M5 earthquake and releases 1,024 times (32 X 32) the energy. An earthquake generates different types of seismic shock waves that travel outward from the focus or point of rupture on a fault. Seismic waves that travel through the earth's crust are called body waves and are divided into primary (P) and secondary (S) waves. Because P waves move faster (1.7 times) than S waves they arrive at the seismograph first. By measuring the time delay between arrival of the P and S waves and knowing the distance to the epicenter, seismologists can compute the Richter scale magnitude for the earthquake.

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

Table 5-2 Modified Mercalli Intensity Scale

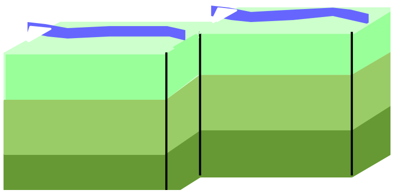
MMI Value	Description of Shaking Severity	Summary Damage Description Used on 1995 Maps	Full Description
I			Not Felt
II			Felt by persons at rest, on upper floors, or favorably placed.
III			Felt indoors. Hanging objects swing. Vibration like passing of light trucks. Duration estimated. May not be recognized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

			fall of chimneys, factory stacks, monuments, towers, and elevated tanks. Frame houses moved on foundations if not bolted down; loose panel walls thrown out. Cracks in wet ground and on steep slopes.
IX	Very Violent	Extreme Damage	Most masonry and frame structures destroyed with their foundations. Some well-built wooden structures and bridges destroyed. Serious damage to dams, dikes, embankments. Large landslides. Water thrown on banks of canals, rivers, lakes, etc. Sand and mud shifted horizontally on beaches and flat land.
X			Rails bent greatly. Underground pipelines completely out of services.
XII			Damage nearly total. Large rock masses displaced. Lines of sight and level distorted. Objects thrown into air.

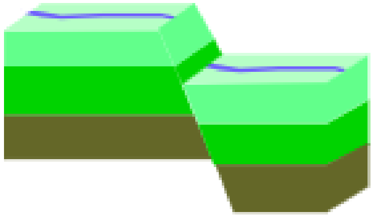
Figure 5-1: Causes and Characteristics of Earthquakes in Southern California

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

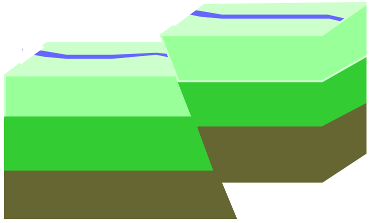
Strike-slip Faults
Strike-slip faults are vertical or almost vertical rifts where the earth's plates move mostly horizontally. From the observer's perspective, if the opposite block looking across the fault moves to the right, the slip style is called a right lateral fault; if the block moves left, the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



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



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



Dr. Kerry Sieh of Cal Tech has investigated the San Andreas Fault at Pallett Creek. “The record at Pallett Creek shows that rupture has recurred about every 130 years, on average, over the past 1500 years. But actual intervals have varied greatly, from less than 50 years to more than 300. The physical cause of such irregular recurrence remains unknown.” Damage from a great quake on the San Andreas would be widespread throughout Southern California.

Earthquake Related Hazards

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

Ground Shaking

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

Earthquake-Induced Landslides

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

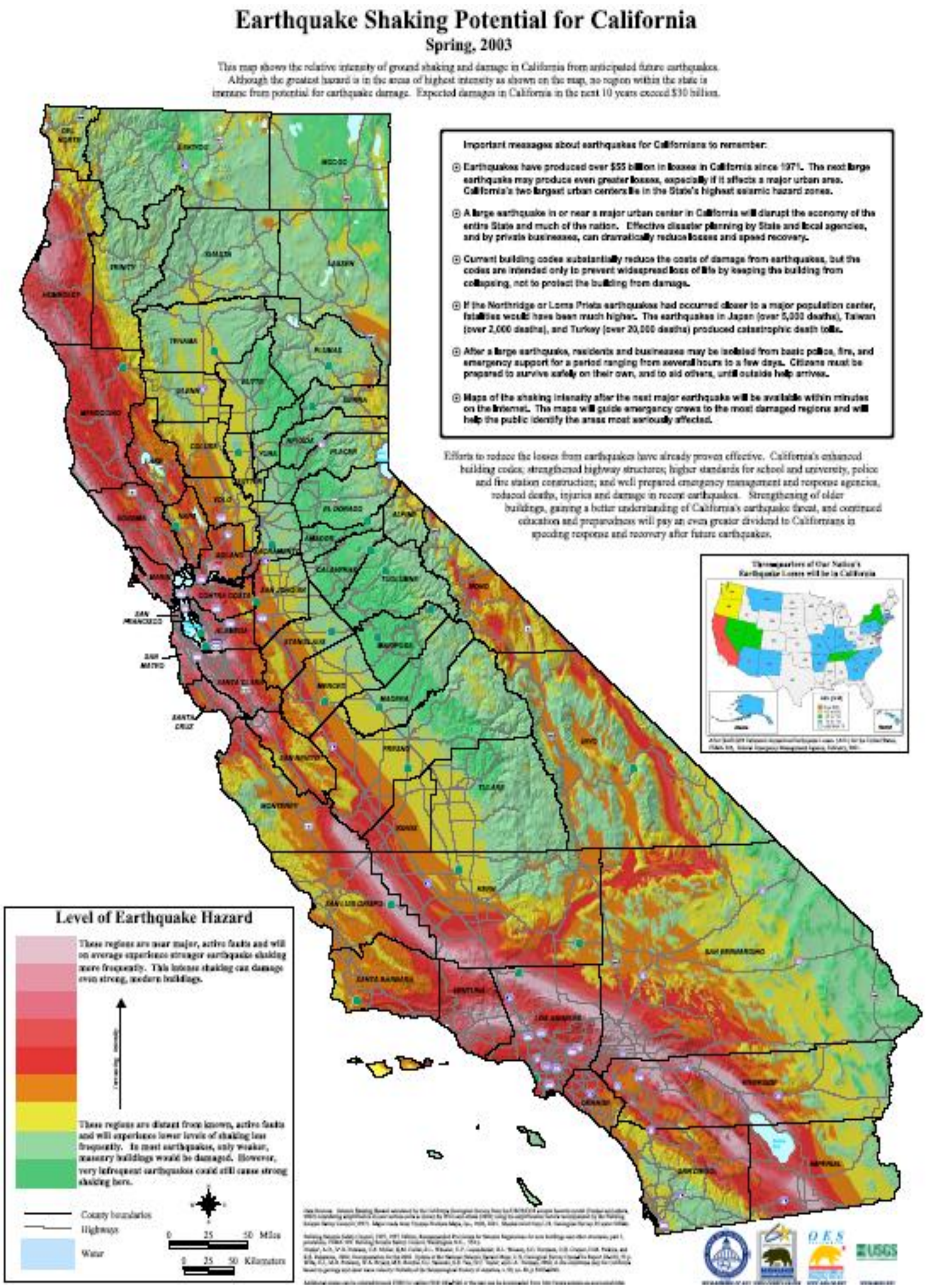
Liquefaction

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

Amplification

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

Map 5-1: Earthquake Shaking Potential for California
Source: State of California Geological Service



Earthquake Hazard Assessment

Hazard Identification

Map 5-2 Southern California Earthquake Faults plots the various major faults in Southern California. The Southern California Earthquake Data Center predicts that somewhere in Southern California will likely experience a Magnitude 7.0 or greater earthquake about seven times each century. About half of these will probably be on the San Andreas "system" (the San Andreas, San Jacinto, Imperial, and Elsinore Faults) and half will be on other faults. The equivalent probability in the next 30 years is 85%.

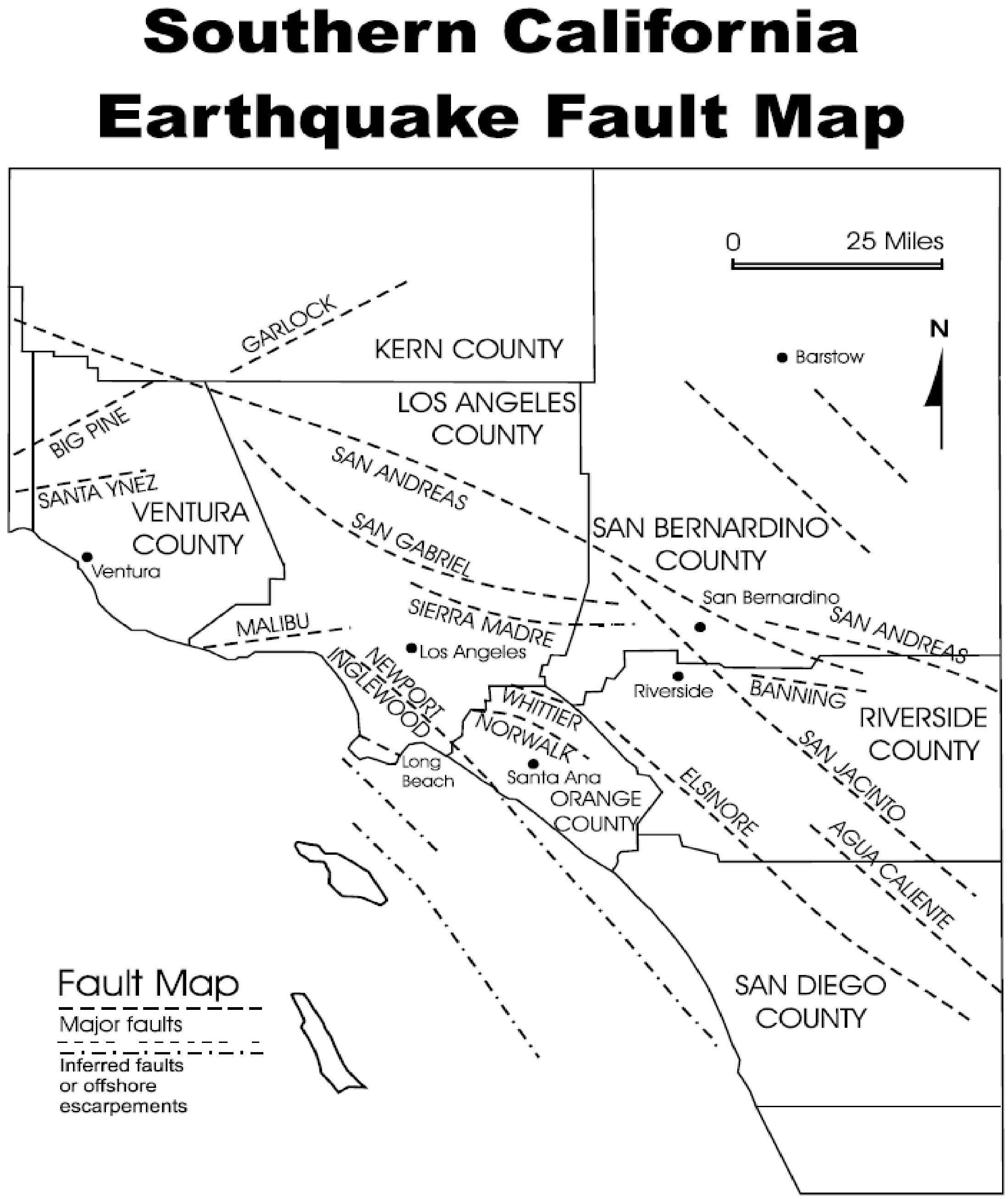
In California, many agencies are focused on seismic safety issues: the State's Seismic Safety Commission, the Applied Technology Council, Governor's Office of Emergency Services, United States Geological Survey, Cal Tech, the California Geological Survey as well as a number of universities and private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

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

Map 5-3 Faults and Liquefaction Areas shows the faults and liquefaction-prone areas in San Diego County. **Map 5-4 Seismic Shaking Intensities for Rose Canyon Fault** shows the projected shaking intensities for a "planning scenario" M6.9 event on the Rose Canyon Fault.

Map 5-5 displays the location and extent of the profiled earthquake hazard areas for San Diego County. This is based on a USGS earthquake model that shows probabilistic peak ground acceleration for every location in San Diego County. Since 1984, earthquake activity in San Diego County has increased twofold over the preceding 50 years (Demere, SDNHM website 2003). All buildings that have been built in recent decades must adhere to building codes that require them to be able to withstand earthquake magnitudes that create a PGA of 0.4 or greater. Ongoing field and laboratory studies suggest the following maximum likely magnitudes for local faults: San Jacinto (M6.4 to 7.3), Elsinore (M6.5 to 7.3), Rose Canyon (M6.2 to 7.0), La Nacion (M6.2 to 6.6), Coronado Bank (M6.0 to 7.7), San Clemente (M6.6 to 7.7) (Demere, SDNHM website 2003).

Map 5-2: Southern California Earthquake Fault Map



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

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

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

Vulnerability Assessment

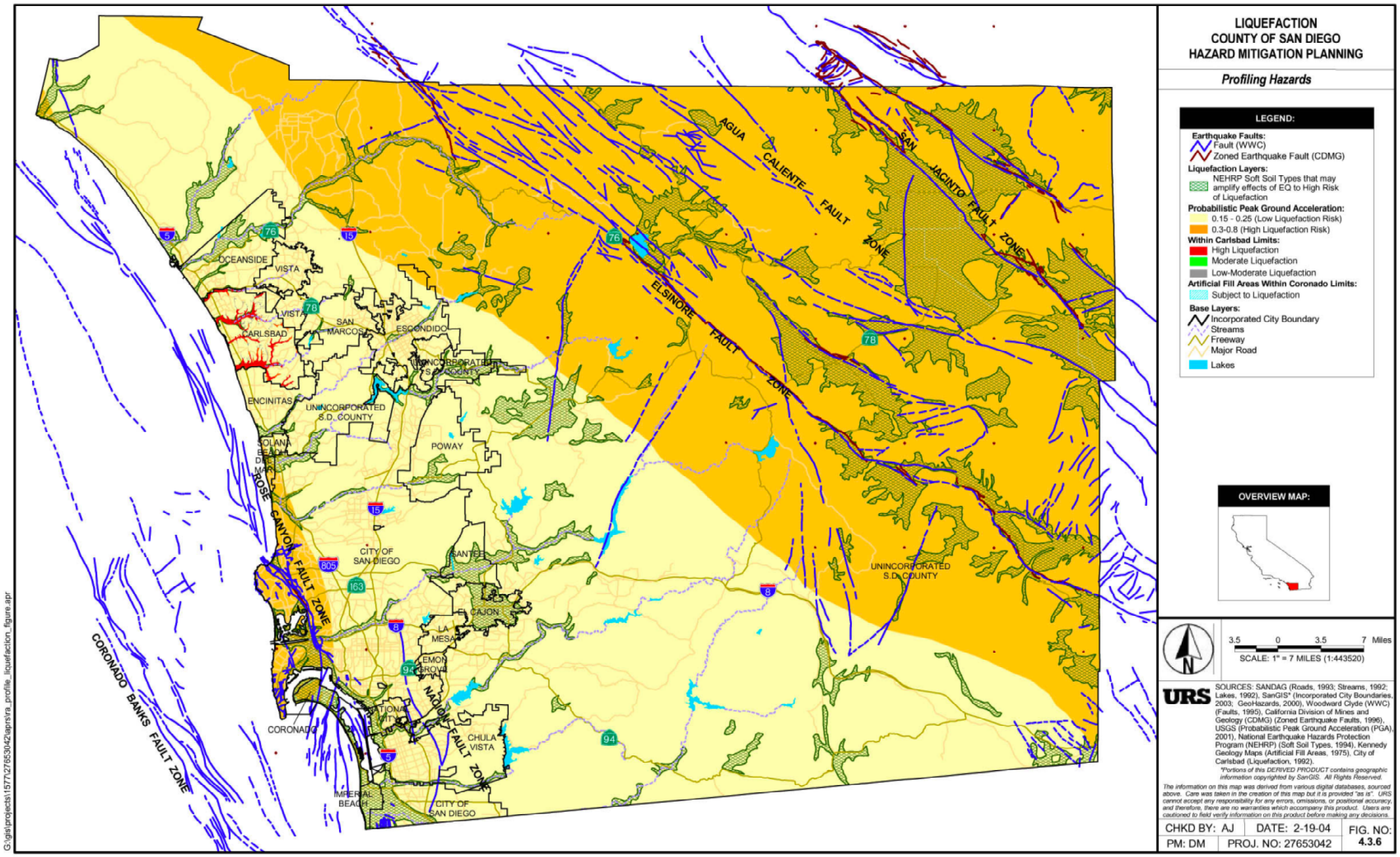
The effects of earthquakes span a large area, and large earthquakes occurring in many parts of the Southern California region would probably be felt throughout the region. However, the degree to which the earthquakes are felt, and the damages associated with them may vary. At risk from earthquake damage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

The California Geological Survey has identified areas most vulnerable to liquefaction. Liquefaction occurs when ground shaking causes wet granular soils to change from a solid state to a liquid state. This results in the loss of soil strength and the soil's ability to support weight. Buildings and their occupants are at risk when the ground can no longer support these buildings and structures. Map 5-3 identifies areas in the vicinity that are subject to liquefaction and landslides associated with earthquake activities.

The San Diego Unified School District has facilities in liquefaction zones as shown on **Map 5-3: Faults and Liquefaction Areas**. The majority of the liquefaction prone areas are located in the coastal and riverine locations in the district.

Several major active faults exist in San Diego County, including the Rose Canyon, La Nacion, Elsinore, San Jacinto, Coronado Bank and San Clemente Fault Zones. The Rose Canyon Fault Zone is part of the Newport-Inglewood fault zone, which originates to the north in Los Angeles, and the Vallecitos and San Miguel Fault Systems to the south in Baja California. The Rose Canyon Fault extends inland from La Jolla Cove, south through Rose Canyon, along the east side of Mission Bay, and out into San Diego Bay. The Rose Canyon Fault is considered to be the greatest potential threat to San Diego as a region, due to its proximity to areas of high population. The La Nacion Fault Zone is located near National City and Chula Vista. The Elsinore Fault Zone is a branch of the San Andreas Fault System. It originates near downtown Los Angeles, and enters San Diego County through the communities of Rainbow and Pala; it then travels in a southeasterly direction through Lake Henshaw, Santa Ysabel, Julian; then down into Anza-Borrego Desert State Park at Agua Caliente Springs, ending at Ocotillo, approximately 40 miles east of downtown. The San Jacinto Fault is also a branch of the San Andreas Fault System. This fault branches off from the major fault as it passes through the San Bernardino Mountains. Traveling southeasterly, the fault passes through Clark Valley, Borrego Springs, Ocotillo Wells, and then east toward El Centro in Imperial County. This fault is the most active large fault within County of San Diego. The Coronado Bank fault is located about 10 miles offshore. The San Clemente Fault lies about 40 miles off La Jolla and is the largest offshore fault at 110 miles or more in length (Unified San Diego County Emergency Services Organization Operational Area Emergency Plan, 2000).

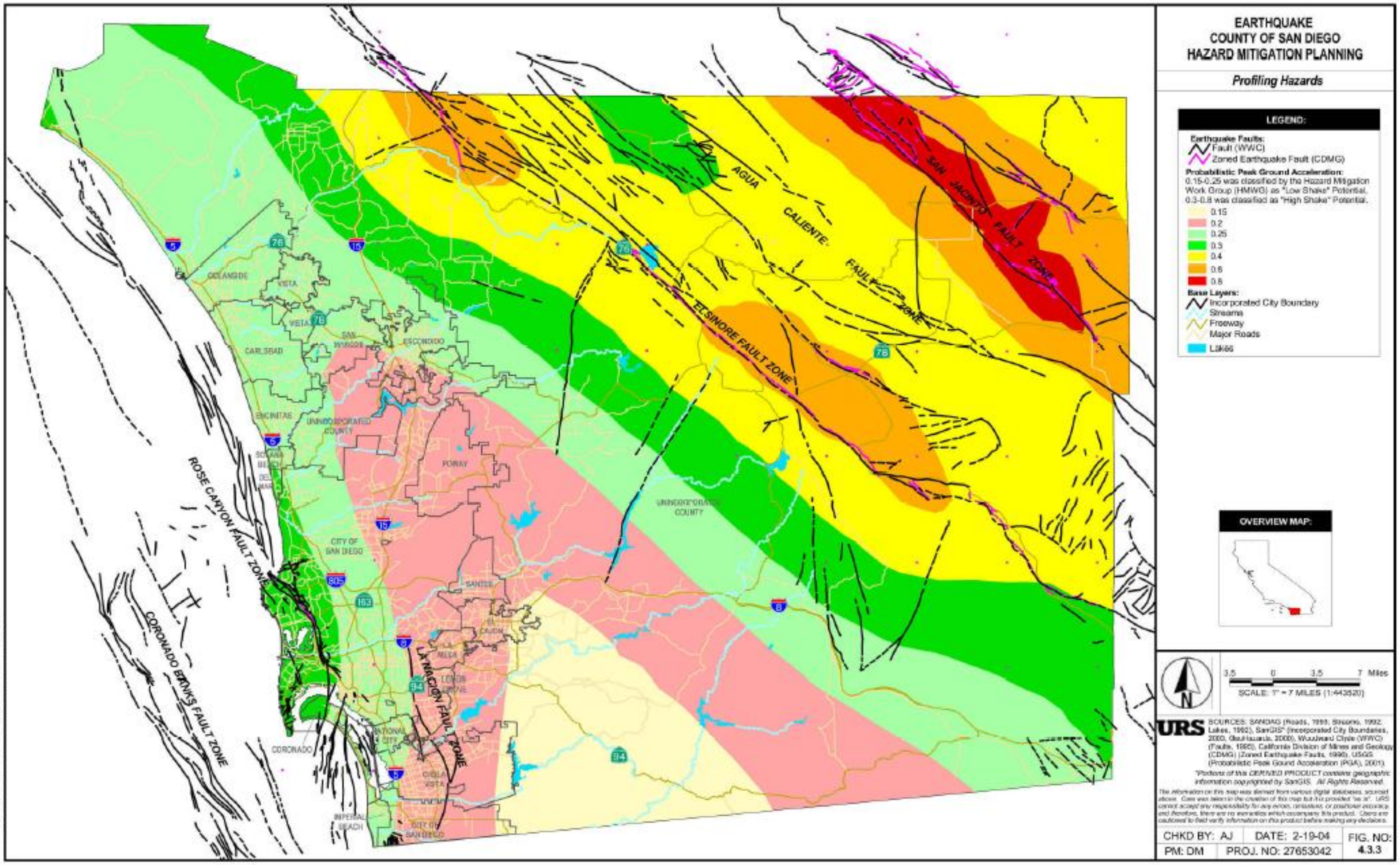
Map 5-3: Faults and Liquefaction Areas in the San Diego Unified School District
(Source: San Diego County Multi-Jurisdictional Hazard Mitigation Plan)
(Key: Blue line indicates faults, green checkered indicates soft soils prone to liquefaction, red indicates high liquefaction, green indicates moderate liquefaction, and grey indicates low liquefaction)



Map 5-4: Seismic Shaking Intensities for the Rose Canyon Fault
(Source: http://www.consrv.ca.gov/cgs/rghm/loss/index.htm)

PERCEIVED SHAKING	Not felt	Weak	Light	Moderate	Strong	Very strong	Severe	Violent	Extreme
POTENTIAL DAMAGE	none	none	none	Very light	Light	Moderate	Moderate/Heavy	Heavy	Very Heavy
PEAK ACC.(%g)	<.17	.17-1.4	1.4-3.9	3.9-9.2	9.2-18	18-34	34-65	65-124	>124
PEAK VEL.(cm/s)	<0.1	0.1-1.1	1.1-3.4	3.4-8.1	8.1-16	16-31	31-60	60-116	>116
INSTRUMENTAL INTENSITY	I	II-III	IV	V	VI	VII	VIII	IX	X+

Map 5-5: Earthquake Faults and Probabilistic Peak Ground Accelerations (Source: San Diego County Multi-Jurisdictional Hazard Mitigation Plan)



Risk Analysis

Risk analysis is the third phase of a hazard assessment. Risk analysis involves estimating the damage and costs likely to be experienced in a geographic area over a period of time. Factors included in assessing earthquake risk include population and property distribution in the hazard area, the frequency of earthquake events, landslide susceptibility, buildings, infrastructure, and disaster preparedness of the region. This type of analysis can generate estimates of the damages to the region due to an earthquake event in a specific location. FEMA's software program, HAZUS, uses mathematical formulas and information about building stock, local geology and the location and size of potential earthquakes, economic data, and other information to estimate losses from a potential earthquake. The HAZUS software is available from FEMA at no cost.

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

Damages for a large earthquake almost anywhere in Southern California are likely to run into the billions of dollars. Although building codes are some of the most stringent in the world, ten's of thousands of older existing buildings were built under much less rigid codes. California has laws affecting 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 San Diego Unified School District has no 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.

District Earthquake Issues

What is Susceptible to Earthquakes?

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

Dams
There are a total of 56 dams in San Diego County, owned by various agencies. These dams hold billions of gallons of water in reservoirs. Releases of water from the major reservoirs are designed to protect Southern California from flood waters and to store domestic water. Seismic activity can compromise the dam structures, and the resultant flooding could cause catastrophic flooding. Following the 1971 Sylmar Earthquake the Lower Van Norman Dam showed signs of structural compromise, and tens of thousands of persons had to be evacuated until the dam could be drained. The dam has never been refilled.

Two major dam failures have been recorded in San Diego County. The Hatfield Flood of 1916 caused the failure of the Sweetwater and Lower Otay Dams, resulting in 22 deaths. Most of those deaths were attributed to the failure of Lower Otay Dam (Source: County of San Diego Hazard Mitigation Plan, 2004).

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 San Diego Unified School District, many buildings were built before 1993 when building codes were not as strict. School structures are built in compliance with State of California building standards, not those controlled by the local jurisdictions.

Retrofitting of school facilities was mandated back in the late 1990's. To date, the District has retrofitted 70% of proposed structures. Given the retrofitting program, the number of buildings at risk has been decreased significantly. Even though the school facilities may be better off that does not change the fact that students and staff live in unreinforced masonry buildings vulnerable to damage from earthquakes. The California Seismic Safety Commission makes annual reports on the progress of the retrofitting of unreinforced masonry buildings.

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

Damage to Lifelines
Lifelines are the connections between communities and outside services. They include water and gas lines, transportation systems, electricity, and communication networks. Ground shaking and amplification can cause pipes to break open, power lines to fall, roads and railways to crack or move, and radio and telephone communication to cease. Disruption to transportation makes it especially difficult to bring in supplies or services.

Lifelines need to be usable after earthquake to allow for rescue, recovery, and rebuilding efforts and to relay important information to the public.

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

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

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

Individual Preparedness
Because the potential for earthquake occurrences and earthquake related property damage is relatively high in the San Diego Unified School District, increasing individual preparedness (students and staff) is a significant need. Strapping down heavy furniture, water heaters, and expensive personal property, as well as being earthquake insured, and anchoring buildings to foundations are just a few steps individuals can take to prepare for an earthquake.

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

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

Debris

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

Section 6:
Flooding Hazards

Why are Floods a Threat to the San Diego Unified School District?

Most recently, San Diego Unified School District was impacted by the March 11th, 2006 flash flood, however data was not available on the extent or values of those damages. (Source: http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwevent~ShowEvent~610800)

Flooding poses a threat to life and safety, and can cause severe damage to public and private property. There are various locations throughout the district that are threatened by flooding due to the various streams and creeks that run through the district.

The San Diego Unified School District facilities have not had any significant flood events since the area was first settled in the 18th century, however the region has a strong history for coastal, riverine, urban, and dam failure flooding.

History of Flooding in the San Diego Unified School District

The San Diego Unified School District is susceptible to flooding from the San Diego River, other rivers and streams, coastal storm surges, and localized urban flooding.

There are a number of rivers in the San Diego region, but the rivers with the most significant riverine flooding threat coming from the San Diego River.

Historic Flooding in San Diego County

From 1770 until 1952, 29 floods were recorded in San Diego County. Between 1950 and 1997, flooding prompted 10 Proclaimed States of Emergency in the County of San Diego. Several very large floods have caused significant damage in the County of San Diego in the past. The Hatfield Flood of 1916 destroyed the Sweetwater and Lower Otay Dams, and caused 22 deaths and $4.5 million in damages. The flood of 1927 caused $117,000 in damages, and washed out the Old Town railroad bridge (Bainbridge, 1997). The floods of 1937 and 1938 caused approximately $600,000 in damages. (County of San Diego Sanitation and Flood Control, 1996). In the 1980 floods, the San Diego River at Mission Valley peaked at 27,000 cubic feet per second (cfs) and caused $120 million in damage (Bainbridge, 1997).

Average annual precipitation in San Diego County ranges from 10 inches on the coast to approximately 45 inches on the highest point of the Peninsular Mountain Range that transects the county, and 3 inches in the desert east of the mountains. Several factors determine the severity of floods, including rainfall intensity and duration. A large amount of rainfall over a short time span can result in flash flood conditions. A sudden thunderstorm or heavy rain, dam failure, or sudden spills can cause flash flooding. The National Weather Service's definition of a flash flood is a flood occurring in a watershed where the time of travel of the peak of flow from one end of the watershed to the other is less than six hours. There are no watersheds in San Diego County that have a longer response time than six hours. Flash floods in this county range from the stereotypical wall of water to a gradually rising stream. The central and eastern portions of San Diego County are most susceptible to flash floods where mountain canyons, dry creek beds, and high deserts are the prevailing terrain.

Table 6-1: Historical Records of Large Floods in San Diego County

Date	Loss Estimation	Source of Estimate	Comments
862	Not available	County of San Diego Sanitation and Flood Control	6 weeks of rain
1891	Not available	County of San Diego Sanitation and Flood Control	33 inches in 60 hours
1916	$4.5 million	County of San Diego Sanitation and Flood Control	Destroyed 2 dams, 22 deaths
1927	$117,000	County of San Diego Sanitation and Flood Control	Washed out railroad bridge Old Town
1937 & 1938	$600,000	County of San Diego Sanitation and Flood Control	N/A
1965	Not available	San Diego Union	6 killed
1969	Not available	San Diego Union	All of State declared disaster area
1979	$2,766,268	County OES	Cities of La Mesa, Lemon Grove, National City, San Marcos, San Diego and unincorporated areas
1980	$120 million	County of San Diego Sanitation and Flood Control; Earth Times	San Diego river topped out in Mission Valley
Oct-87	$640,500	State OES	N/A
1995	$Tens of Millions	County OES	San Diego County Declared Disaster Area

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

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

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

Winter Rainfall
Over the last 125 years, the average annual rainfall in the region is 10 inches. But the term “average” means very little because there is a fluctuation rate in the coastal rains as high as thirty percent in forty-five out of every one hundred years, which is coupled with a highly seasonal rainfall pattern with only fifteen percent falling during the hottest six months of the year.

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

Table 6-2: Tropical Cyclones of Southern California

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”

Month-Year	Date(s)	Area(s) Affected	Rainfall
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”
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			

Geography and Geology

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

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

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

Another potential source of flooding is "asphalt creep." The street space between the curbs of a street is a part of the flood control system. Water leaves property and accumulates in the streets, where it is directed towards the underground portion of the flood control system. The carrying capacity of the street is determined by the width of the street and the height of the curbs along the street. Often, when streets are being resurfaced, a one to two inch layer of asphalt is laid down over the existing asphalt. This added layer of asphalt subtracts from the rated capacity of the street to carry water. Thus the original engineered capacity of the entire storm drain system is marginally reduced over time. Subsequent re-paving of the street will further reduce the engineered capacity even more.

Flood Terminology

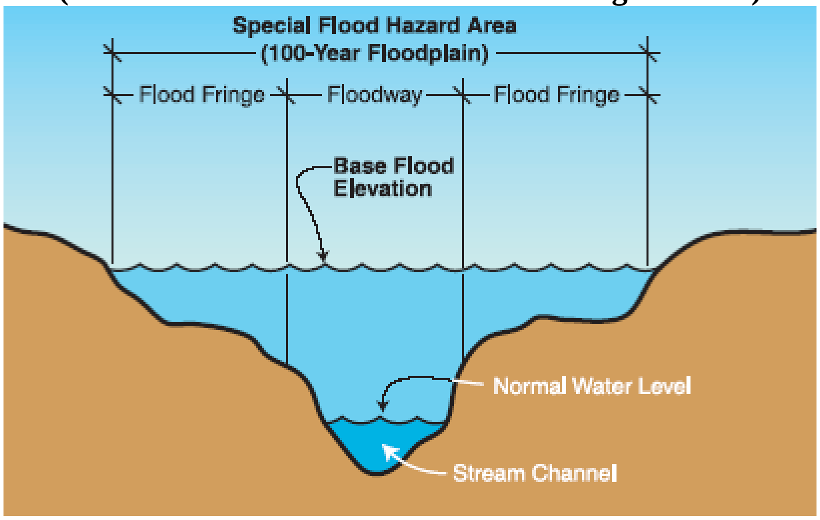
Floodplain

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

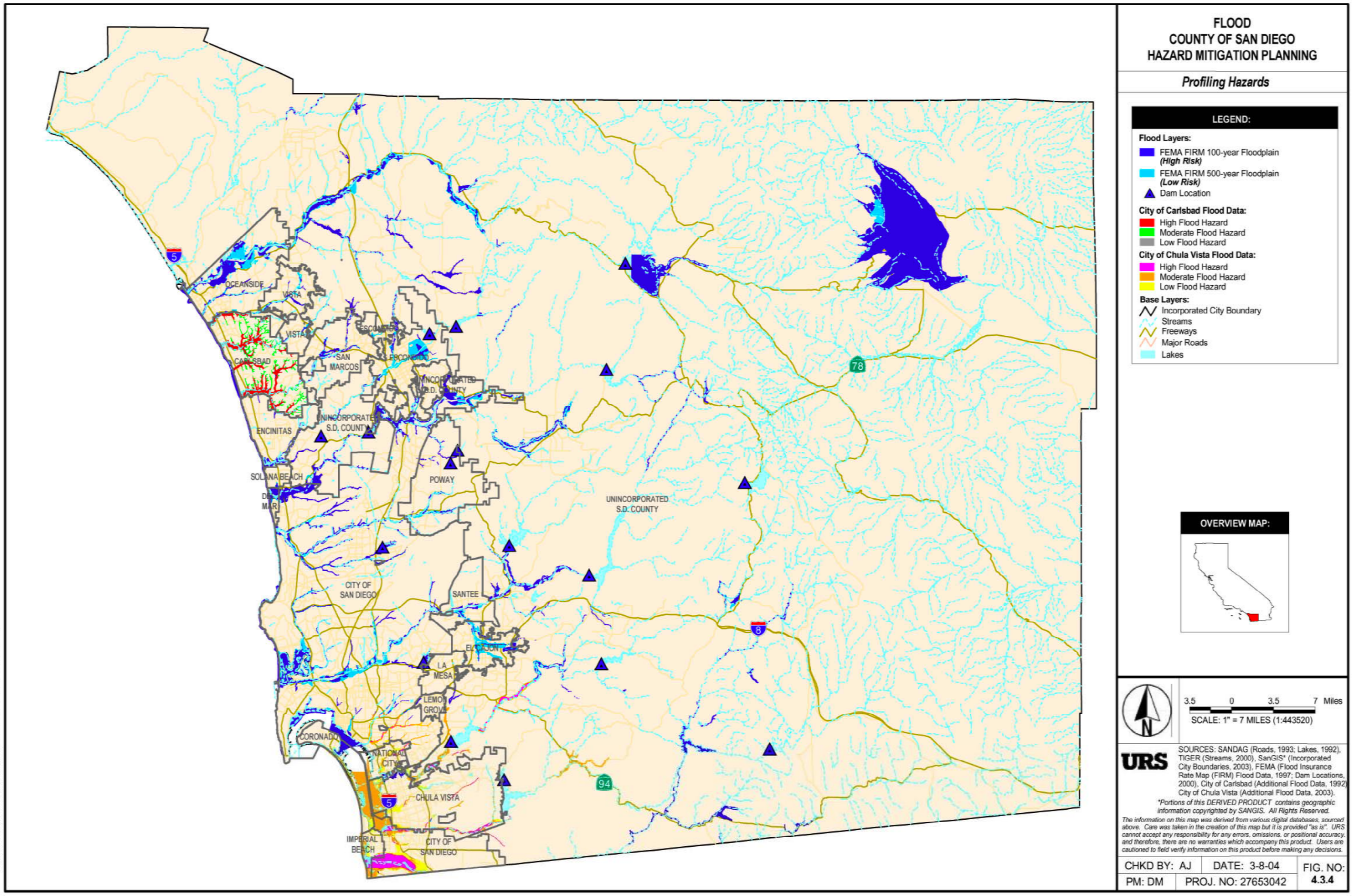
100-Year Flood

The 100-year flooding event is the flood having a 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. Schematic 6-1 Floodplain shows the relationship of the floodplain and the floodway. Map 6-1 illustrates the 100-year floodplain in San Diego County. There are no schools or district administrative facilities located in the 100-year floodplain. There are only a few accessory buildings located within the 500-year floodplain.

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



Map 6-1: Floodplains in San Diego County
Source: San Diego County Multi-Jurisdictional Hazard Mitigation Plan



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

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

Flood Fringe
The flood fringe refers to the outer portions of the floodplain, beginning at the edge of the floodway and continuing outward.

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

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

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. Map 5-1 shows the various river basins (or flood zones) in San Diego County.

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.

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

The San Diego Unified School District has a high concentration of impermeable surfaces that either collect water, or concentrate the flow of water in unnatural channels. During periods of urban flooding, streets can become swift moving rivers and basements can fill with water. Storm drains often back up with vegetative debris causing additional, localized flooding.

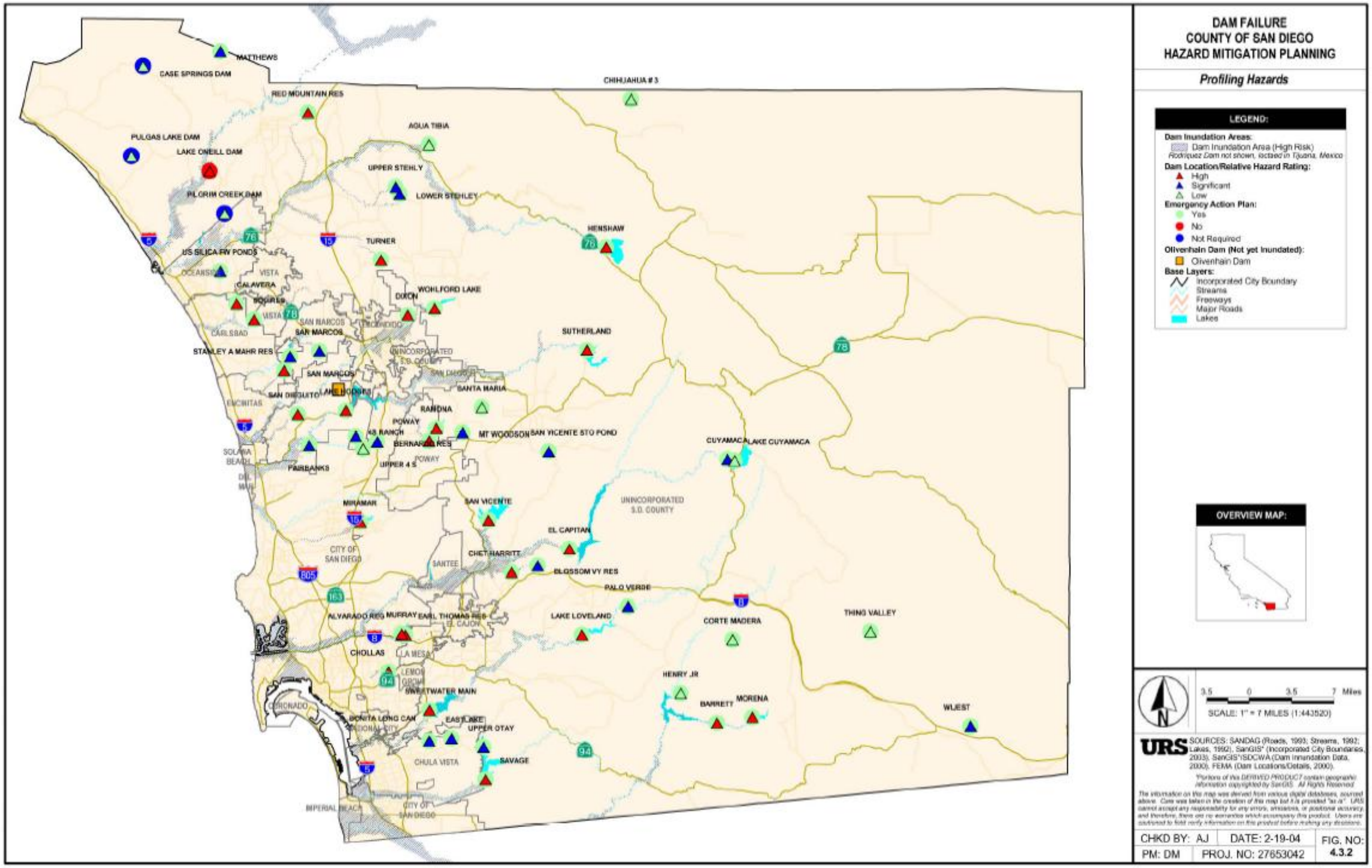
Dam Failure Flooding
Loss of life and damage to structures, roads, and utilities may result from a dam failure. Economic losses can also result from a lowered tax base and lack of utility profits. These effects would certainly accompany the failure of one of the major dams in the San Diego Unified School District. There are a total of 23 dams or reservoirs in the San Diego Unified School District holding millions (or billions) 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.

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 6-3.

Table 6-3: Dam Failures in Southern California

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			

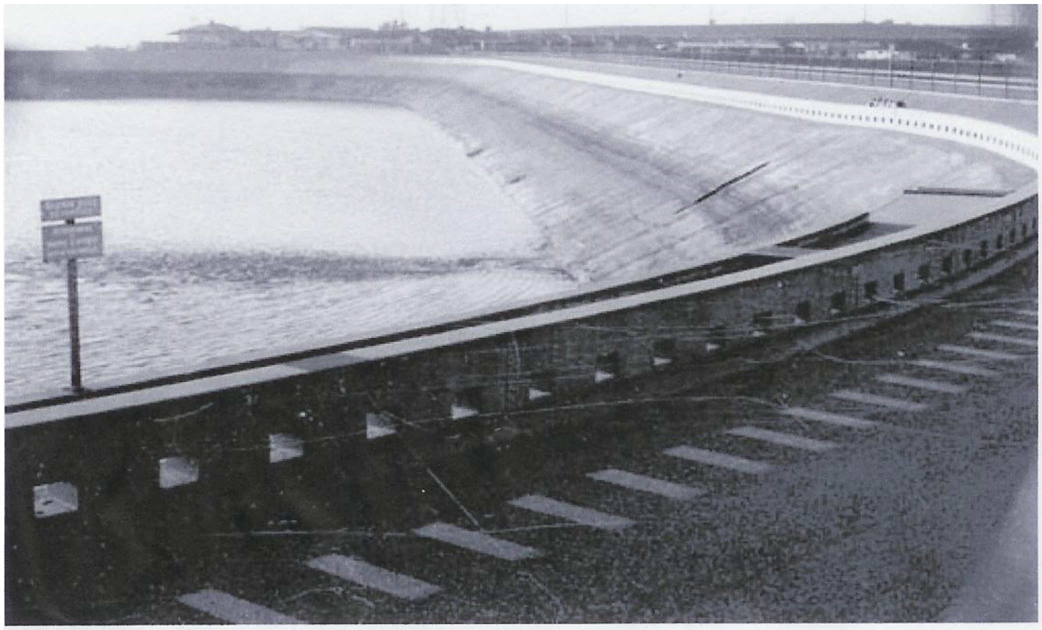
Map 6-2
Dam Failure San Diego County



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."
>
> The 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, Jefferson Boulevard, and La Cienega Boulevard.

Photo 6-1: Baldwin Hills Dam



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."

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."

Coastal Flooding

Low lying coastal communities of Southern California have one other source of flooding, coastal flooding. This occurs most often during storms which bring higher than normal tides. Storms, the time of year and the tidal cycle can sometimes work to bring much higher than normal tides which cause flooding in low lying coastal areas. This hazard however is limited to those areas.

What is the Effect of Development on Floods?

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

How are Flood-Prone Areas Identified?

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

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

Water surface elevations are combined with topographic data to develop FIRMs. FIRMs illustrate areas that would be inundated during a 100-year flood, floodway areas, and elevations marking the 100-year-flood level. In some cases they also include base flood elevations (BFEs) and areas located within the 500-year floodplain. Flood Insurance Studies and FIRMs produced for the NFIP provide assessments of the probability of flooding at a given location. FEMA conducted many Flood Insurance Studies in the late 1970s and early 1980s. These studies and maps represent flood risk at the point in time when FEMA completed the studies. However, it is important to note that not all 100-year or 500-year floodplains have been mapped by FEMA. It is estimated that the flood maps cover 30% of the total occupancy in the San Diego Unified School District.

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. Man-made and natural changes to the environment have changed the dynamics of storm water run-off since then.

Flood Mapping Methods and Techniques

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

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

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.

Hazard Assessment

Hazard Identification

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

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 which mapped the floodplain in (DATE?), this is when the San Diego Unified School District initially entered into the NFIP. The district has updated portions of the USACE and FEMA maps through smaller drainage studies in the district since that time.

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.

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 San Diego Unified School District 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.

District Flood Issues

What is Susceptible to Damage during a Flood Event?

The largest impact on communities from flood events is the loss of life and property. During certain years, property losses resulting from flood damage are extensive.

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. Students and staff of the District could be significantly impacted by damages to their private residences.

Business/Industry

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

Public Infrastructure

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

Roads

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

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 San Diego Unified School District are state, county, city, or privately owned. A state-designated inspector must inspect all state, county, and city bridges every two years; but private bridges are not inspected, and can be very dangerous.

Storm Water Systems

Local drainage problems are common throughout the San Diego Unified School District. The San Diego Unified School District maintenance and operations staff is aware of local drainage threats. The problems are often present where storm water runoff enters culverts or goes underground into storm sewers. Inadequate maintenance can also contribute to the flood hazard in urban areas.

Water/Wastewater Treatment Facilities

The San Diego Unified School District receives its water services from the following providers: San Diego county wastewater management section, and San Diego County Water Authority.

Water Quality

Environmental quality problems include bacteria, toxins, and pollution.

Section 7:
Wildfire

Why are Wildfires a Threat to Southern California?

A wildfire is an uncontrolled fire spreading through vegetative fuels and exposing or possibly consuming structures. They often begin unnoticed and spread quickly. Naturally occurring and non-native species of grasses, brush, and trees fuel wildfires. A wildland fire is a wildfire in an area in which development is essentially nonexistent, except for roads, railroads, power lines and similar facilities. An Urban-Wildland/Urban Interface fire is a wildfire in a geographical area where structures and other human development meet or intermingle with wildland or vegetative fuels. Significant development in San Diego County is located along canyon ridges at the wildland/urban interface. Areas that have experienced prolonged droughts or are excessively dry are at risk of wildfires.

People start more than 80 percent of wildfires, usually as debris burns, arson, or carelessness. Lightening strikes are the next leading cause of wildfires. Wildfire behavior is based on three primary factors: fuel, topography, and weather. The type, and amount of fuel, as well as its burning qualities and level of moisture affect wildfire potential and behavior. The continuity of fuels, expressed in both horizontal and vertical components is also a determinant of wildfire potential and behavior. Topography is important because it affects the movement of air (and thus the fire) over the ground surface. The slope and shape of terrain can change the speed at which the fire travels, and the ability of firefighters to reach and extinguish the fire. Weather affects the probability of wildfire and has a significant effect on its behavior. Temperature, humidity and wind (both short and long term) affect the severity and duration of wildfires. San Diego County's topography, consisting of a semi-arid coastal plain and rolling highlands, when fueled by shrub overgrowth, occasional Santa Ana winds and high temperatures, creates an ever-present threat of wildland fire. Extreme weather conditions such as high temperature, low humidity, and/or winds of extraordinary force may cause an ordinary fire to expand into one of massive proportions.

San Diego Unified School District was most recently impacted by the 2003 Cedar Fire (see **Map 7-1** for outline of 2003 Cedar Fire impact area). Certain schools were evacuated and all schools were closed to facilitate the work of emergency crews and due to outdoor breathing conditions. Data was not available on the extent or values of direct or indirect expenses relating to the 2003 fires.

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. According to CDF statistics, in the October 2003 Firestorms, over 4,800 homes were destroyed and 22 lives were lost.

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 7-1: 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

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."

Table 7-2: Destructive Fires in California 1961-2003

Destructive Fires in California History					
Fire Name	**Date**	**County**	**Acres**	**Structures**	**Deaths**
City of Berkeley	September 1923	Alameda	130	584	0
Bel Air	November 1961	Los Angeles	6,090	484	0
Laguna	September 1970	San Diego	175,425	382	5
Sycamore	July 1977	Santa Barbara	805	234	0
Kannan	October 1978	Los Angeles	25,385	224	0
Panorama	November 1980	San Bernardino	23,600	325	4
Paint	June 1990	Santa Barbara	4,900	641	1
Tunnel	October 1991	Alameda	1,600	2,900	25
Fountain	August 1992	Shasta	63,960	636	0
Laguna	October 1993	Orange	14,437	441	0
Topanga	November 1993	Los Angeles	18,000	323	3
Harmony	October 1996	San Diego	8,600	122	0
Canyon	September 1999	Shasta	2,580	230	0
Jones	October 1999	Shasta	26,200	954	1
Cedar	October 2003	San Diego	273,246	2,820	14
Paradise	October 2003	San Diego	56,700	415	2
Old	October 2003	San Bernardino	91,281	1,003	6
Simi	October 2003	Ventura	108,204	300	0
Grand Prix	October 2003	San Bernardino	59,448	196	0

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. Taxpayers spent more than $1.6 billion 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 7-3 illustrates fire suppression costs for state, private and federal lands.

Table 7-3: 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

Wildfire Characteristics

There are three categories of interface fire: 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 shrub land wildfires, nor has it proven effective in halting them." said Dr. Jon Keeley, a USGS fire researcher who studies both southern California shrub lands 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."

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."

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.

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."

> "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."

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.

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.

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. 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.

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.

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.

Wildfire Hazard Assessment

Wildfire Hazard Identification

San Diego County's topography, consisting of a semi-arid coastal plain and rolling highlands, when fueled by shrub overgrowth and occasional Santa Ana winds and high temperatures, creates an ever-present threat of wildland fire. Extreme weather conditions such as high temperature, low humidity, and/or winds of extraordinary force may cause an ordinary fire to expand into one of massive proportions.

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 7-4 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 7-4: 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

Category	Indicator	Rating
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:

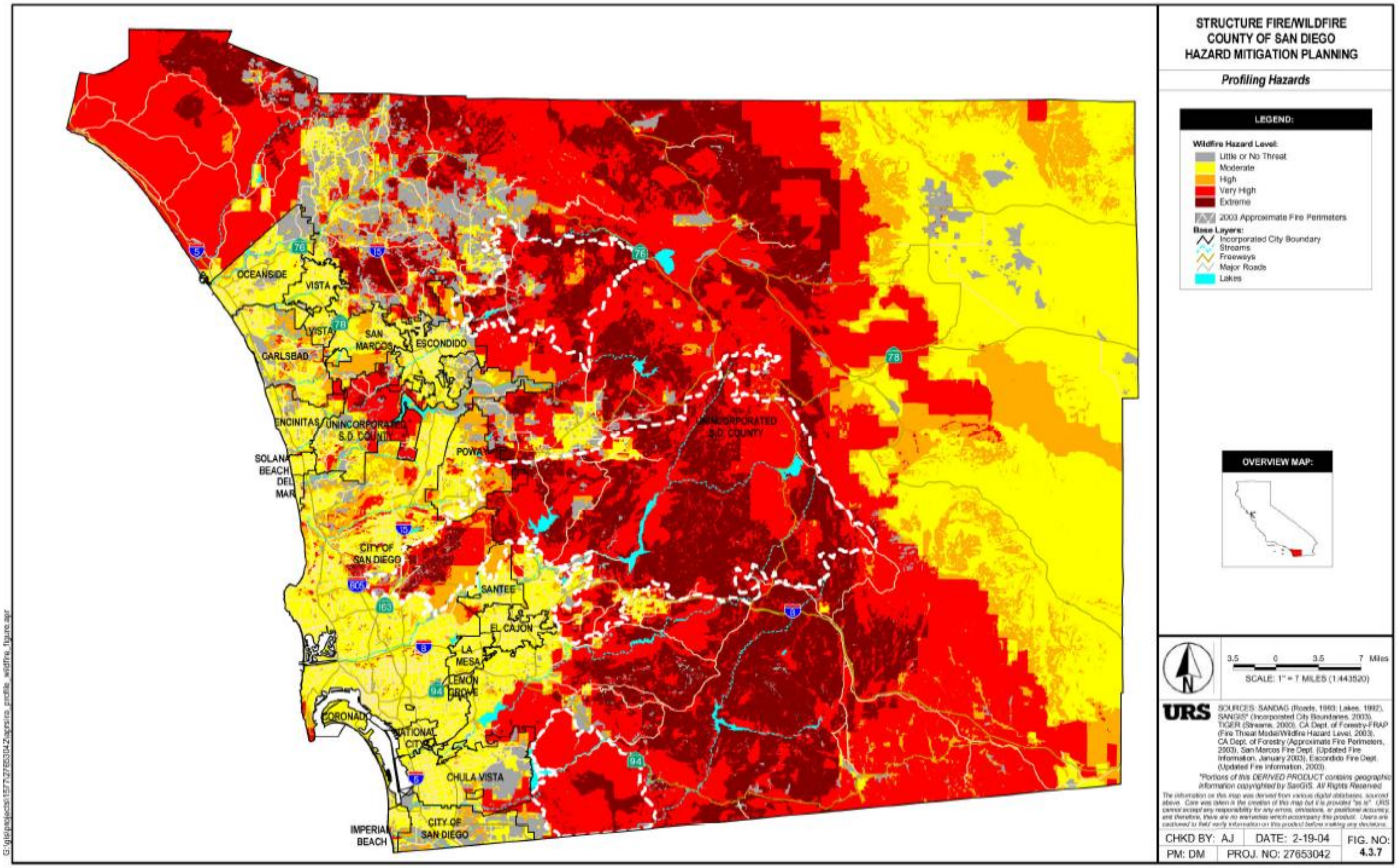
Topographic location, characteristics and fuels
Site/building construction and design
Site/region fuel profile (landscaping)
Defensible space
Accessibility
Fire protection response
Water availability

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. Map 7-1 Wildfire/Urban Interface incorporates GIS and data from the State of California's Fire and Resource Management Plan (FRAP).

Wildland fires in San Diego County prompted 7 States of Emergency between 1950 and 2003. San Diego County's worst wildfire occurred in October 2003. Several fires burned at the same time throughout the County, burning over 392,000 acres in the urban areas and the backcountry. The fires destroyed 2,668 residential and commercial structures, with costs exceeding $450 million. (Map 7-1 portrays the areas burned during the 2003 fires with a white-dashed line.)

Schools located near the Wildland/Urban Interface must incorporate adequate evacuation planning into their Site Emergency Plans. Fire drills and fire evacuation routes should be pre-planned and practiced with transportation vehicles and shelter locations pre-planned.

Map 7-1 Wildfire/Urban Interface Threat
(Source: County of San Diego Multi-Jurisdictional Hazard Mitigation Plan)



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, district 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.

District Wildfire Issues

What is Susceptible to Wildfire?
As seen in Map 7-1 Wildfire/Urban Interface Threat, the majority of the northeastern quadrant of the District is vulnerable to fire. This area contains several elementary, middle/junior, and high schools.

Palomar Outdoor School (Camp Palomar) is a long running program for sixth grade students from San Diego Unified School District. Sixth graders reside at the Camp for one week. On any given week, two or more schools are staying at the Camp. The average camp population for a week ranges from 230-260 students, along with visiting teachers and staff. In a year, the program includes more than 10,000 sixth graders. The Camp is staffed with a teaching staff of 8 credentials and 16 classified instructors, two nurses which provide 24 hour a day nursing and counseling, a kitchen crew of 6, and a maintenance staff of 4.

Camp Palomar is located in the Palomar Mountain forest in the northeastern corner of San Diego County. Road access is very limited, while the threat from wildfire is high. The Camp Director is very aware of this threat and maintains an up-to-date evacuation plan and coordinates with local emergency response personnel.

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 were destroyed or damaged for one or more of the following reasons:

Combustible roofing material
Wood construction
Structures with no defensible space
Fire Department had poor access to structures
Subdivisions located in areas with heavy natural fuel types
Structures located on steep slopes covered with flammable vegetation
Limited water supply and/or water pressure
Winds over 30 miles per hour

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.

Water Supply

Fire fighters in remote and rural areas are faced by limited water supply and lack of hydrant taps. Rural areas are characteristically outfitted with small diameter pipe water systems, inadequate for providing sustained fire fighting flows.

Interface Fire Education Programs and Enforcement

Fire protection in urban/wildland interface areas may rely heavily more 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 are resist maintaining the minimum brush clearances may be cited for failure to clear brush.

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.

Section 8: Landslides

Why are Landslides a Threat?

Landslides occur when masses of rock, earth, or debris move down a slope, including rock falls, deep failure of slopes, and shallow debris flows. The most common cause of a landslide is an increase in the down slope gravitational stress applied to slope materials (oversteepening). This may be produced either by natural processes or by man's activities. Undercutting of a valley wall by stream erosion or of a sea cliff by wave erosion are ways in which slopes may be naturally oversteeped. Other ways include excessive rainfall or irrigation on a cliff or slope. Another type of soil failure is slope wash, the erosion of slopes by surface-water runoff. The intensity of slope wash is dependent on the discharge and velocity of surface runoff and on the resistance of surface materials to erosion. Surface runoff and velocity is greatly increased in urban and suburban areas due to the presence of roads, parking lots, and buildings, which have zero filtration capacities and provide generally smooth surfaces that do not slow down runoff.

Landslides are a serious geologic hazard in almost every state in America. Nationally, landslides cause 25 to 50 deaths each year. The best estimate of direct and indirect costs of landslide damage in the United States range between $1 and $2 billion annually. 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.

Historic Southern California Landslides

1928 St. Francis Dam

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 (2000).

1956 Portuguese Bend

Cost, $14.6 million (2000) 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.

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

1961 Mulholland Cut
Cost, $41.5 million (2000) On Interstate 405, 11 miles north of Santa Monica, Los Angeles County.

1963 Baldwin Hills Dam
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) of dollars in property.

1969 Glendora
Cost, $26.9 million (2000) Los Angeles County, 175 houses damaged, mainly by debris flows.

1969 Seventh Ave., Los Angeles County
Cost, $14.6 million (2000) California Highway 60.

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

1971 Upper and Lower Van Norman Dams, San Fernando
Earthquake-induced landslides Cost, $302.4 million (2000). 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.

1971 Juvenile Hall, San Fernando
Landslides caused by the February 9, 1971, San Fernando, California, earthquake Cost, $266.6 million (2000). 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.

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

1978 Bluebird Canyon Orange County

California October 2, cost, $52.7 million (2000) 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.

1979 Big Rock, California, Los Angeles County

Cost, approximately $1.08 billion (2000) California Highway 1 rockslide.

1980 Southern California slides

$1.1 billion in damage (2000) 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.

1983 San Clemente, California, Orange County

Cost, $65 million (2000), California Highway 1. Litigation at that time involved approximately $43.7 million (2000).

1983 Big Rock Mesa

Cost, $706 million (2000) in legal claims condemnation of 13 houses, and 300 more threatened rockslide caused by rainfall

1978-1979, 1980 San Diego County

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 County.

1994 Northridge Earthquake landslides

As a result of the magnitude 6.7 Northridge 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.

March 1995 Los Angeles and Ventura Counties

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.

January 2005 Ventura County

On January 10, 2005, a landslide once again struck the community of La Conchita, killing 10 people and destroying or seriously damaging 36 houses.

Landslide Characteristics

What is a landslide?

"A landslide is defined as, the movement of a mass of rock, debris, or earth movement 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."

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.

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.

"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."

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 mile per hour, and can often move much faster. This high rate of speed makes debris flows extremely dangerous to people and property in its path.

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 exacerbates many 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 buildable 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. 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. Flows often occur during heavy rainfall, can occur on gentle slopes, and can move rapidly for large distances.

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.

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.

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.

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
- 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

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

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.

Drainage and Groundwater Alterations

Water flowing through or above ground is often the trigger for landslides. Any activity that increases the amount of water flowing into landslide-prone slopes can increase landslide hazards. Broken or leaking water or sewer lines can be especially problematic, as can water retention facilities that direct water onto slopes. However, even lawn irrigation in landslide prone locations can result in damaging landslides. 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.

Road and 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.

Changes in Vegetation

Removing vegetation from very steep slopes can increase landslide hazards. Areas that experience 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.

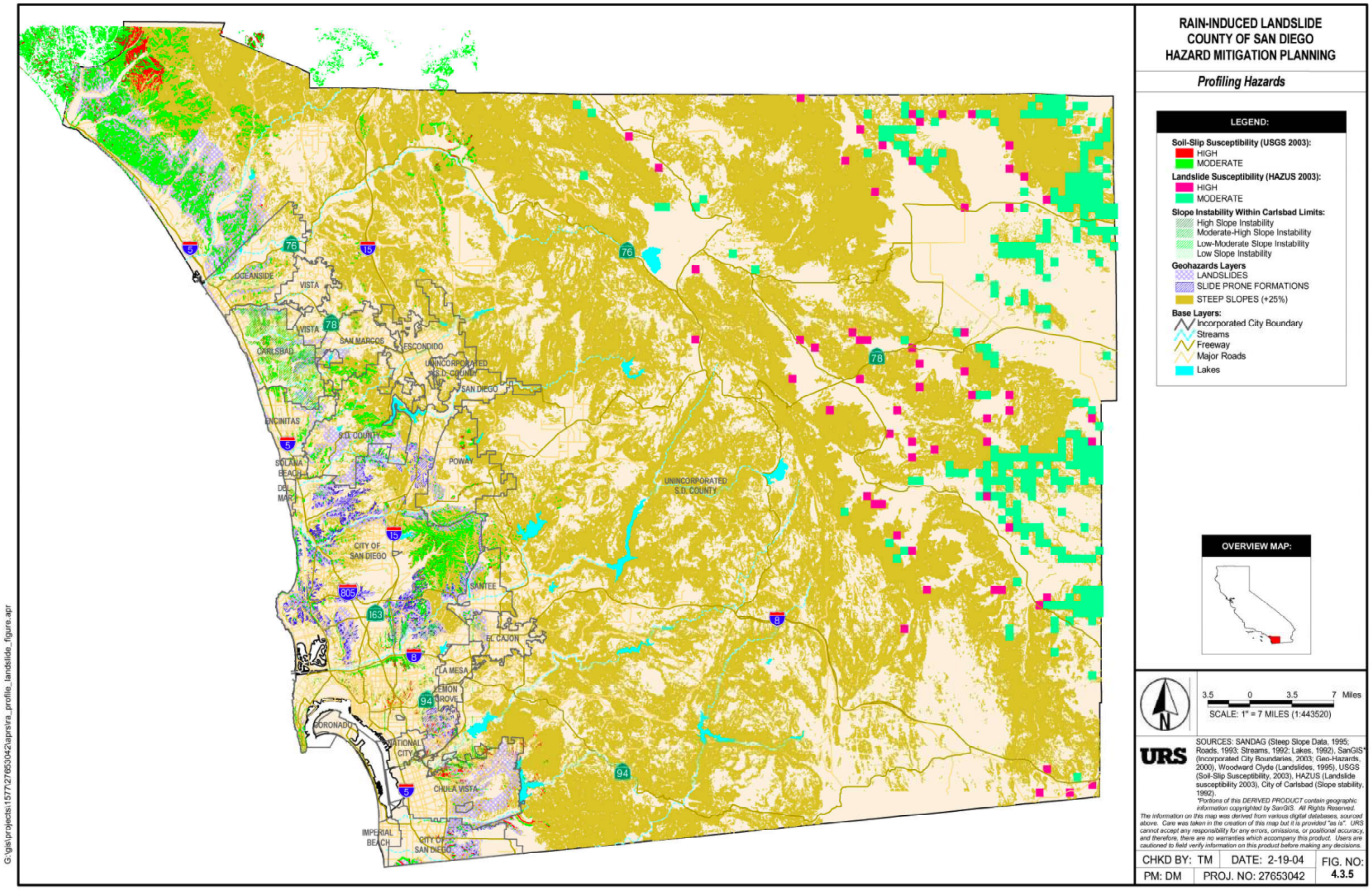
Landslide Hazard Assessment

Hazard Identification

Landslides and landslide prone sedimentary formations are present throughout the coastal plain of western San Diego County. **Map 9-1 Rain-Induced Landslide Areas** shows the distribution of probable rain-induced landslides in San Diego County, some of which may have been subsequently verified and stabilized through grading activity. Landslides are considered "potentially active", meaning they could be reactivated in the future, either by excessive rainfall, introduction of artificial water in the slope (landscaping irrigation/broken water or sewage lines), or improper site design or grading practices. Grading activities must consider these geologic constraints as a condition of project approval.

Areas where significant landslides have occurred are: the Otay Mesa area, Oceanside, Mt. Soledad in La Jolla, Sorrento Valley, in the vicinity of Rancho Bernardo and Rancho Penasquitos, along the sides of Mission Gorge (San Carlos and Tierrasanta), western Santee, the Fletcher Hills area of western El Cajon, western Camp Pendleton, and the east side of Point Loma. Some of the more significant historical coastal bluff landslides have occurred along north La Jolla (Black's Beach), Torrey Pines, Del Mar, and Encinitas. Landslides tend to be more widespread in these areas where the underlying sedimentary formations contain weak claystone beds that are more susceptible to sliding.

Map 9-1: San Diego Unified School District Rain-Induced Landslide Areas (Source: County of San Diego Multi-Jurisdictional Hazard Mitigation Plan)



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. Data that includes specific landslide-prone and debris flow locations in the district can be used to assess the population and total value of property at risk from future landslide occurrences.

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 landslide events impacting the District, there are many qualitative factors that point to potential vulnerability. Landslides can impact major transportation arteries, blocking students and staff from essential services.

Past landslide events have caused major property damage or significantly impacted the district, and continuing to map district 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 district 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.

District Landslide Issues

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

Another potential impact affecting the District is an earth movement that creeps or slides into a structure or vital open area. This type of problem has occurred recently at schools in the Point Loma area near the coastal bluff.

Roads and Bridges
Losses incurred from landslide hazards in the San Diego Unified School District are often associated with roads. The City of San Diego and County of San Diego are responsible for maintenance of public roads. They are tasked with responding to slides that inhibit the flow of traffic or are damaging a road or a bridge. The road departments do their best to communicate with residents and businesses impacted by landslides.

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. The City and County alleviate problem areas by grading slides, and by installing new drainage systems on the slopes to divert water from the landslides. This type of response activity is often the most cost-effective in the short-term, but is only temporary. Unfortunately, many property owners are unaware of slides and the dangers associated with them.

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. 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.

Landslide Mitigation Activities

Landslide mitigation activities include current mitigation programs and activities that are being implemented by local or city organizations.

District Issues Summary

Landslides have posed a problem to certain San Diego Unified School District locations, impacting structures, infrastructure, and open areas (i.e. playing fields).

Section 9:
Tsunami

Why Are Tsunamis a Threat to Southern California?

History has shown that the probability of a tsunami in the planning area is an extremely low threat. However, if a tsunami should occur, the consequences would be great.

California's Tsunamis

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

What are Tsunamis?

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

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

Tsunamis typically are classified as either local or distant. Tsunamis from local sources usually result from earthquakes occurring off nearby coats. Tsunamis from distant sources are the most common type observed along the California Coast. Tsunamis generated by earthquakes in South America and the Aleutian-Alaskan region have posed a greater hazard to the West Coast of the United States than locally generated tsunamis. There is a history of Pacific-wide tsunamis occurring every 10 to 20 years.

What causes Tsunami?

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

Plate Tectonics

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

http://www.prh.noaa.gov/itic/library/about_tsu/faqs.html - 1**Earthquakes and Tsunamis**
An earthquake can be caused by volcanic activity, but most are generated by movements along fault zones associated with the plate boundaries. Most strong earthquakes, representing 80% of the total energy released worldwide by earthquakes, occur in subduction zones where an oceanic plate slides under a continental plate or another younger oceanic plate.

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

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

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

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

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

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

Tsunami Characteristics

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

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

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

Types of Tsunamis

Pacific-Wide and Regional Tsunamis

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

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

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

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

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

In less than a day, tsunamis can travel from one side of the Pacific to the other. However, people living near areas where large earthquakes occur may find that the tsunami waves will reach their shores within minutes of the earthquake. For these reasons, the tsunami threat to many areas such as Alaska, the Philippines, Japan and the 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).

History of Regional Tsunamis

Local

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

Local History of Tsunamis

Tsunamis have been 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 Los Angeles County, Orange County, and San Diego County coastal areas. In Orange County the tsunami wave reached heights of 20 feet or more above sea level. In 1964, following the Alaska Earthquake (Magnitude 8.2), tidal surges of approximately 4 feet to 5 feet hit the Huntington Harbor area causing moderate damage.

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	
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.

Tsunami Hazard Assessment

Hazard Identification

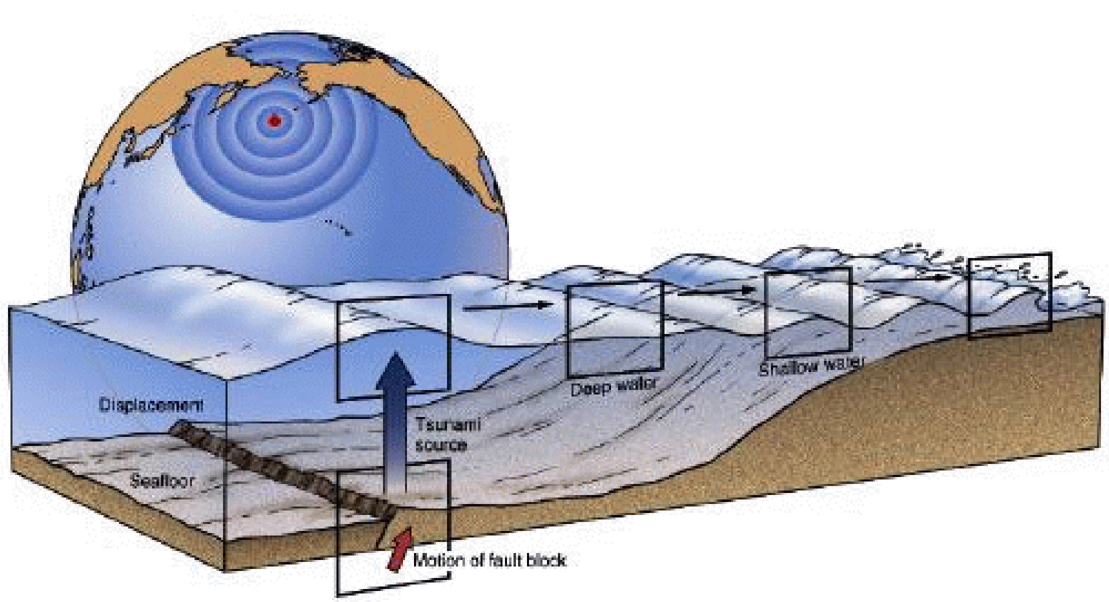
The tsunami threat to the San Diego Unified School District is considered low, although recent studies indicate a possibility that an off-shore landslide could generate a tsunami that could threaten the coastal and bay-front school sites. Although the risk is considered low, the impacts would be high to many of the Districts properties.

Damage Factors of Tsunamis:

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

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

Figure 9-1: Tsunami Formation



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

Tsunami Watches and Warnings

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

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

Notification
The National Warning System (NAWAS) is an integral part of the Alaska Tsunami Warning Center. Reports of major earthquakes occurring anywhere in the Pacific Basin that may generate seismic sea waves are transmitted to the Honolulu Observatory for evaluation. An Alaska Tsunami Warning Center is also in place for public notification of earthquakes in the Pacific Basin near Alaska, Canada, and Northern California. The Observatory Staff determines action to be taken and relays warnings over the NAWAS circuits to inform and warn West Coast states. The State NAWAS circuit is used to relay the information to the 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.

San Diego County will use the Emergency Alert System (EAS) to warn the public of an anticipated tsunami.

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

Vulnerability and Risk

With an analysis of tsunami events depicted in the "Local History" section, it can be deduced that a tsunami would significantly impact life, property, infrastructure and transportation.

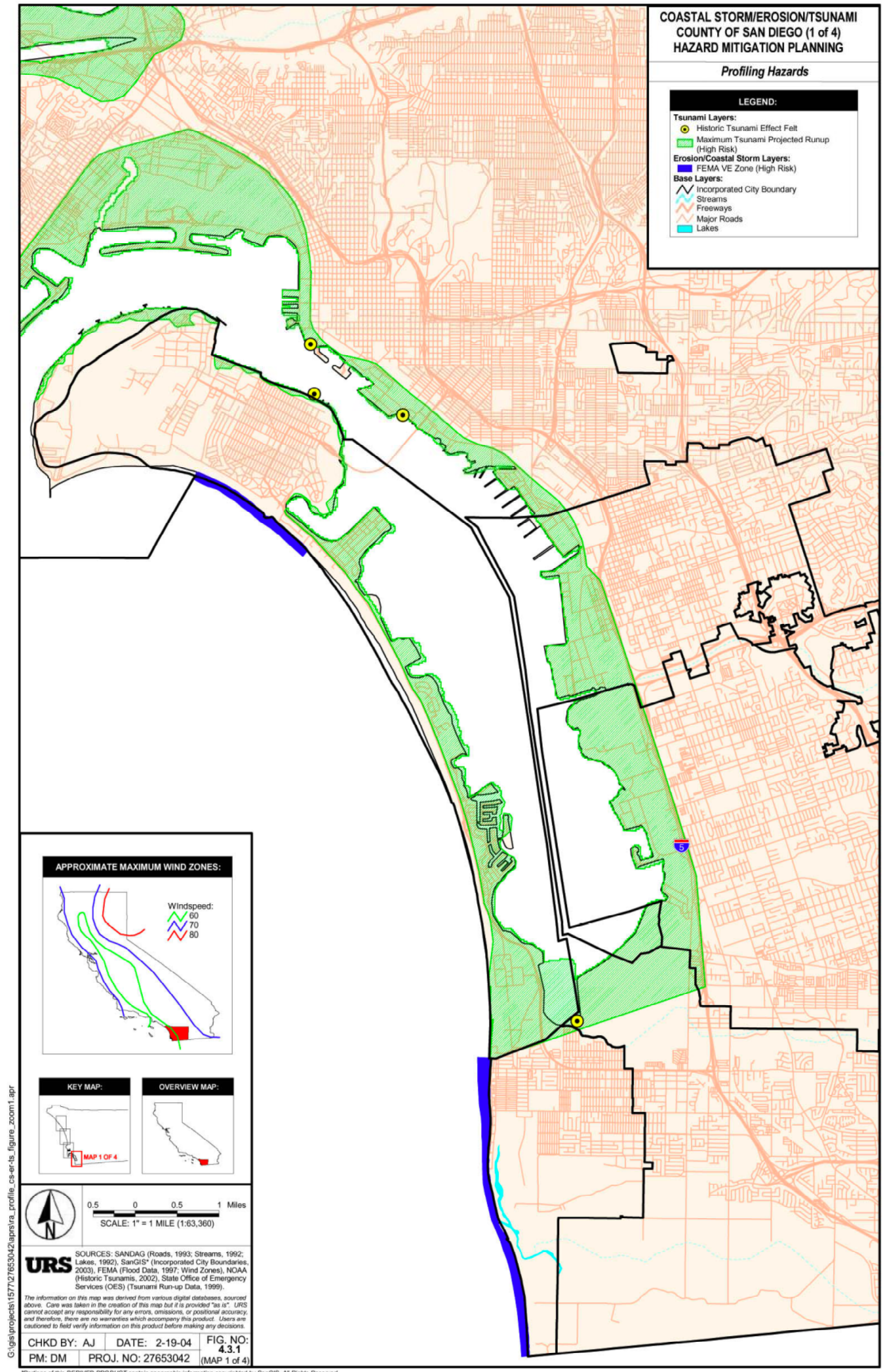
Community Tsunami Issues

What is Susceptible to Tsunami?

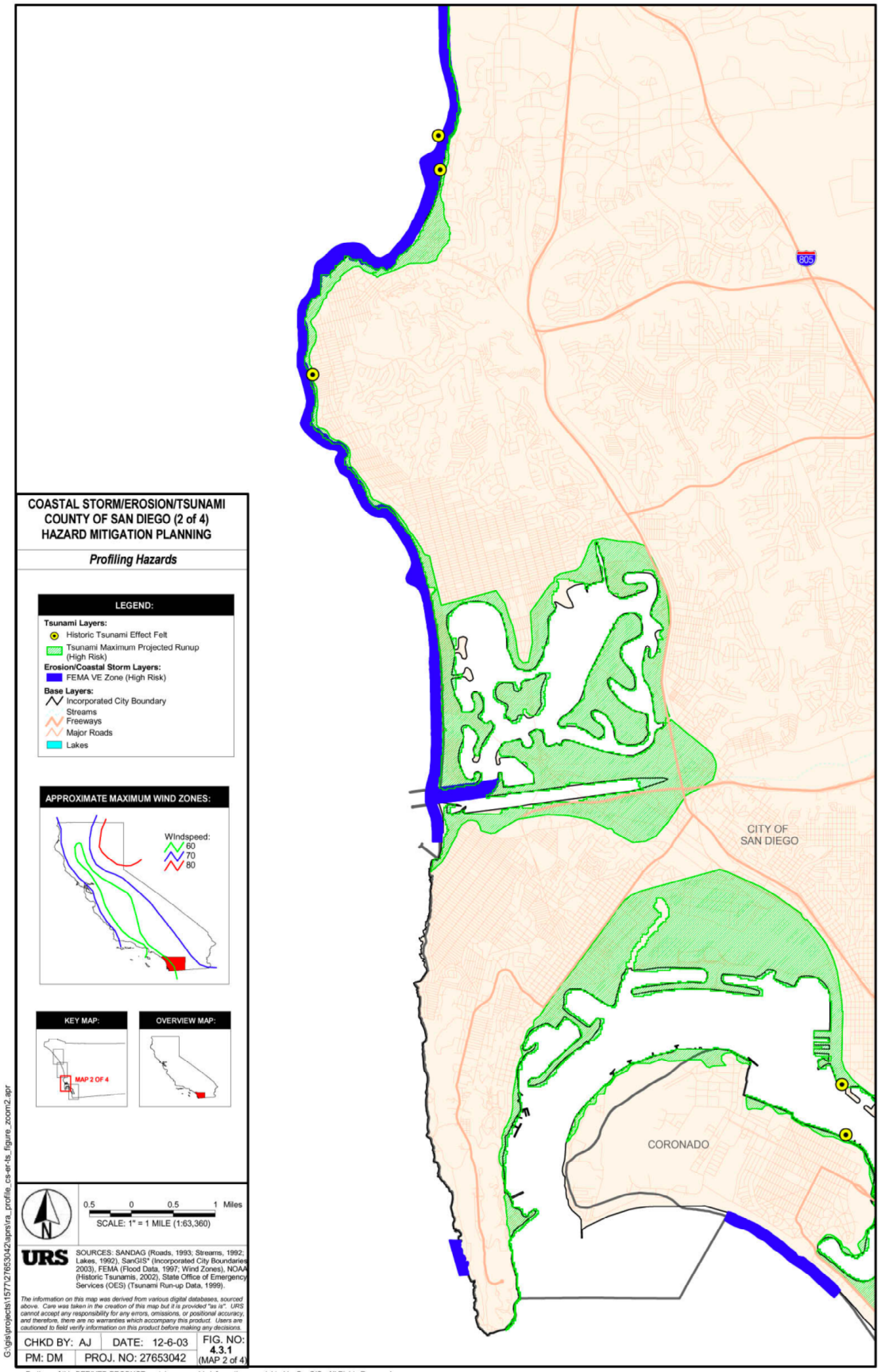
As shown on Maps 9-1 and 9-2, the greatest vulnerability to tsunami is to properties near Mission Bay and San Diego. Limited areas are also identified along the coastal bluffs, however no District properties are located in those areas.

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

Map 9-1: Tsunami Run-Up Map (San Diego Bay)



Map 9-2: Tsunami Run-Up Map (Point Loma/La Jolla)



Life and Property
Based on the local history events and projected "run-up" modeling of tsunamis, it is estimated that less than 10% of the District would be directly impacted. Approximately three schools or administrative facilities are located in or very near the projected run-up inundation areas. In addition to direct impacts, the District would be significantly impacted by regional damages to infrastructure.

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

Development
Property along the coast could also be devastated. The region's coastal area is home to millions of dollars worth of residential and commercial structures. In addition, the area is scattered with infrastructure that serves the entire coastal region. A large tsunami could potentially destroy or damage hundreds of properties and spread debris for miles. A tsunami could have a catastrophic impact on the coastal area. In addition, the run-up maps show an inundation area near Mission Bay and San Diego Bay that would add significantly to the destruction.

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.

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 district 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 Planing Information Network			
Level: State	Hazard: Multi	www.calpin.ca.gov	
		Ph:	Fx:
Notes: The Governor's Office of Planning and Research (OPR) publishes basic information on local planning agencies, known as the California Planners' Book of Lists. This local planning information is available on-line with new search capabilities and up-to-the- minute updates.			

EPA, Region 9			
Level: Regional	Hazard: Multi	http://www.epa.gov/region09	
75 Hawthorne Street			
San Francisco, CA 94105		Ph: 415-947-8000	Fx: 415-947-3553
Notes: The mission of the U.S. Environmental Protection Agency is to protect human health and to safeguard the natural environment through the themes of air and global climate change, water, land, communities and ecosystems, and compliance and environmental stewardship.			

Federal Emergency Management Agency, Region IX			
Level: Federal	Hazard: Multi	www.fema.gov	
1111 Broadway		Suite 1200	
Oakland, CA 94607		Ph: 510-627-7100	Fx: 510-627-7112
Notes: The Federal Emergency Management Agency is tasked with responding to, planning for, recovering from and mitigating against disasters.			

Federal Emergency Management Agency, Mitigation Division			
Level: Federal	Hazard: Multi	www.fema.gov/fima/planhowto.shtm	
500 C Street, S.W.			
Washington, D.C. 20472		Ph: 202-566-1600	Fx:
Notes: The Mitigation Division manages the National Flood Insurance Program and oversees FEMA's mitigation programs. It has of a number of programs and activities of which provide citizens Protection, with flood insurance; Prevention, with mitigation measures and Partnerships, with communities throughout the country.			

Floodplain Management Association			
Level: Federal	Hazard: Flood	www.floodplain.org	
P.O. Box 50891			
Sparks, NV 89435-0891		Ph: 775-626-6389	Fx: 775-626-6389
Notes: The Floodplain Management Association is a nonprofit educational association. It was established in 1990 to promote the reduction of flood losses and to encourage the protection and enhancement of natural floodplain values. Members include representatives of federal, state and local government agencies as well as private firms.			

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's mitigation programs. It has of a number of programs and activities of which provide citizens Protection, with flood insurance; Prevention, with mitigation measures and Partnerships, with communities throughout the country.			
National Oceanic /Atmospheric Administration			
Level: Federal	Hazard: Multi	www.noaa.gov	
14th Street & Constitution Ave NW		Rm 6013	
Washington, DC 20230		Ph: 202-482-6090	Fx: 202-482-3154
Notes: NOAA's historical role has been to predict environmental changes, protect life and property, provide decision makers with reliable scientific information, and foster global environmental stewardship.			

National Weather Service, Office of Hydrologic Development			
Level: Federal	Hazard: Flood	http://www.nws.noaa.gov/	
1325 East West Highway		SSMC2	
Silver Spring, MD 20910		Ph: 301-713-1658	Fx: 301-713-0963
Notes: The Office of Hydrologic Development (OHD) enhances National Weather Service products by: infusing new hydrologic science, developing hydrologic techniques for operational use, managing hydrologic development by NWS field office, providing advanced hydrologic products to meet needs identified by NWS customers			

National Weather Service			
Level: Federal	Hazard: Multi	http://www.nws.noaa.gov/	
520 North Elevar Street			
Oxnard, CA 93030		Ph: 805-988- 6615	Fx:
Notes: The National Weather Service is responsible for providing weather service to the nation. It is charged with the responsibility of observing and reporting the weather and with issuing forecasts and warnings of weather and floods in the interest of national safety and economy. Briefly, the priorities for service to the nation are: 1. protection of life, 2. protection of property, and 3. promotion of the nation's welfare and economy.			

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.			

Sanitation Districts of Los Angeles County			
Level: County	Hazard: Flood	http://www.lacsd.ora/	
1955 Workman Mill Road			
Whittier, CA 90607		Ph:562-699-7411 x2301	Fx:
Notes: The Sanitation Districts provide wastewater and solid waste management for over half the population of Los Angeles County and turn waste products into resources such as reclaimed water, energy, and recyclable materials.			

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's website.			

United States Geological Survey			
Level: Federal	Hazard: Multi	http://www.usgs.gov/	
345 Middlefield Road			
Menlo Park, CA 94025		Ph: 650-853-8300	Fx:
Notes: The USGS provides reliable scientific information to describe and understand the Earth; minimize loss of life and property from natural disasters; manage water, biological, energy, and mineral resources; and enhance and protect our quality of life.			

US Army Corps of Engineers			
Level: Federal	Hazard: Multi	http://www.usace.army.mil	
P.O. Box 532711			
Los Angeles CA 90053- 2325		Ph: 213-452- 3921	Fx:
Notes: The United States Army Corps of Engineers work in engineering and environmental matters. A workforce of biologists, engineers, geologists, hydrologists, natural resource managers and other professionals provide engineering services to the nation including planning, designing, building and operating water resources and other civil works projects.			

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.			

Appendix B:
Public Participation

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

The San Diego Unified School District Natural Hazards Mitigation Plan integrated a cross-section of public input throughout the planning process. To accomplish this goal, the Planning Team developed a public participation process through five components: (1) developing a Planning Team comprised of knowledgeable individuals representative of the District; (2) soliciting the assistance of local media representatives and community newsletters to announce the progress of the planning activities and to announce the availability of the Draft Natural Hazards Mitigation Plan; (3) creating opportunities for faculty, staff, and parents as well as public agencies to review the Draft Natural Hazards Mitigation Plan; (4) conducting a public meeting at the Board of Education where the public had an opportunity to express their views concerning the Draft Natural Hazards Mitigation Plan.

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

Hazard Mitigation Planning Team

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

Meetings

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

Meeting #1: Pre-Training September 22, 2006
Emergency Planning Consultants (EPC) delivered pre-training to the Planning Team. The pre-training consisted of the history of the Disaster Mitigation Act of 2000, the purpose and role of hazard mitigation, and the planning process. The Pre-Training lasted

approximately 1 hour.

Meeting #2: Kick-Off Meeting September 22, 2006
EPC facilitated a workshop where participants had an opportunity to learn about various natural hazards, assess and rank the local threats, examine hazard maps, and complete the FEMA Worksheets contained in FEMA 386-2 Understanding Your Risks. Part of the discussion included a presentation by EPC of historical disaster events across the country. Those slides served as a backdrop for discussing potential mitigation activities.

There was an extensive discussion on various methods of engaging the public in the mitigation process. The Planning Team prepared a draft media release and discussed a public opinion survey provided by EPC. The Kick-Off Meeting lasted approximately 3 hours.

Meeting #3 Pre-Training: Mitigation October 9, 2006
EPC delivered pre-training to the Planning Team. The pre-training consisted of the concepts and issues related to developing mitigation actions. The pre-training lasted approximately 2 hours.

Meeting #4 Mitigation Actions October 9, 2006
EPC delivered the Draft Hazard Analysis and the individual jurisdiction representatives discussed missing information, data, and maps. EPC distributed copies of the Mitigation Actions Planning Tools to assist the Team in developing Goals and Action Items appropriate to their natural hazards. The Planning Tools provided a process for collecting the mitigation actions presently in practice in the District, as well as identifying future mitigation actions.

A brainstorming process was then conducted to develop the goals for the Plan. The Planning Team discussed sample goal language then broke into individual jurisdictions to finalize goal language. Following a discussion on the alternatives available for ranking mitigation actions, the Team agreed to cluster the rankings of the Mitigation Actions by hazard as follows: #1 Multi-Hazard, #2 Earthquakes (including Liquefaction), #3 Flooding, #4 Wildfire, #5 Landslides, and #6 Tsunami. Prioritization of the individual action items was accomplished using the STAPLEE model (see Meeting #5).

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

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

Meeting #5 STAPLEE November 1, 2006

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

Public Meetings

San Diego Unified School District conducted one public meeting concerning the Draft Natural Hazards Mitigation Plan. The Board of Education heard the item on ______________________ (date). The Board was __________________________ (supportive) of the overall goal established by the Hazard Mitigation Planning Team to become Disaster Resistant. The results of the survey were discussed and the Board commended the Planning Team representatives for its dedication and efforts to satisfy the DMA 2000 requirements.

Invitation Process

The Planning Team identified possible public notice sources. A press release was drafted with the assistance of the District's Communication Office and distributed to weekly print media. In addition, the Executive Summary of the Plan was posted on the District website. The local community access cable television channel carried the meeting announcement.

Results

The Planning Team began the presentation to the Board of Education by providing an overview of the project objectives. The Planning Team Chair (Facilities Maintenance Manager) and Consultant presented the staff report on the Plan, including an overview of the Hazard Analysis, Mitigation Goals, and Mitigation Actions. The staff presentation concluded with a summary of the input received during the public review of the document. The meeting participants were encouraged to present their views and make suggestions on possible mitigation actions. The Chair then fielded questions from the Board of Education. The meeting lasted approximately 1 hour and was aired on local cable access for approximately one month.

The Board of Education was ______________(unanimous) in its adoption of the San Diego Unified School District Natural Hazards Mitigation Plan.

Hazard Mitigation Planning Team
Sign-In Sheets
September 22, 2006

Hazard Mitigation Planning Team Meeting
September 22, 2006

Name	Organization/Department
[illegible]	[illegible]
Arthur Triplette	M+O
Rueben L[illegible]	School Police
Ed Perez	SDUSD/M+O
Kevin Chain	" "
Bernard Calangian	" "

Sign-In Sheet
October 9, 2006

SDUSD Hazard Mitigation Planning Team
SIGN-IN SHEET

NAME	DEPARTMENT
[illegible]	[illegible]
Karen Korzyto	Risk Management
Arthur Triplette	M+C
Ed Perez	M&O
[illegible]	M&C

Appendix B – Attachment 2
List of Plan Reviewers

Hazard Mitigation Planning Team
San Diego Unified School District
Arthur Triplette, Facilities Maintenance Department (Team Leader)
Kevin Ohlin, Facilities Maintenance Department
Ed Perez, Facilities Maintenance Department
Bernard Calangian, Facilities Maintenance Department
Lt. Rueben Littlejohn, School Police Services
Sue Weir, Office of the Superintendent
Kassia Kossyta, Risk Management Department

Appendix B – Attachment 3
Board Resolution

Appendix C:
Benefit/Cost Analysis

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

This appendix outlines several approaches for conducting economic analysis of 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: The Interagency Hazards Mitigation Team, State Hazard Mitigation Plan, and 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, required to conform to a mandated standard may consider the following options:

1. Request cost sharing from public agencies;
2. Dispose of the building or land either by sale or demolition;

3. Change the designated use of the building or land and change the hazard mitigation compliance requirement; or
4. Evaluate the most feasible alternatives and initiate the most cost effective hazard mitigation alternative.

Estimating the costs and benefits of a hazard mitigation strategy can be a complex process. Employing the services of a specialist can assist in this process.

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

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

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

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

- Net present value. Net present value is the value of the expected future returns of an investment minus the value of expected future cost expressed in today's dollars. If the net present value is greater than the project costs, the project may be determined feasible for implementation. Selecting the discount rate, and identifying the present and future costs and benefits of the project calculates the net present value of projects.

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

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

How are Benefits of Mitigation Calculated?

Economic Returns of 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

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

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

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

Horner, Gerald, Benefit/Cost Methodologies for Use in Evaluating the Cost Effectiveness of Proposed Hazard Mitigation Measures, Robert Olson Associates, Prepared for Oregon State Police, Office of Emergency Management, July 1999.

Interagency Hazards Mitigation Team, State Hazard Mitigation Plan, (Oregon State Police – Office of Emergency Management, 2000).

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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

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
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)
LAN	Local Area Network
LEMMA	Law Enforcement Master Mutual Aid
LEPC	Local Emergency Planning Committee
MARAC	Mutual Aid Regional Advisory Council
MHFP	Multi-Hazard Functional Plan
MHID	Multi-Hazard Identification
MOU	Memorandum of Understanding
NBC	Nuclear, Biological, Chemical
NEMA	National Emergency Management Agency
NEMIS	National Emergency Management Information System
NFIP	National Flood Insurance Program
NOAA	National Oceanic and Atmospheric Association
NPP	Nuclear Power Plant
NSF	National Science Foundation
NWS	National Weather Service
OA	Operational Area
OASIS	Operational Area Satellite Information System
OCC	Operations Coordination Center
OCD	Office of Civil Defense
OEP	Office of Emergency Planning
OES	California Governor's Office of Emergency Services
OSHPD	Office of Statewide Health Planning and Development
OSPR	Oil Spill Prevention and Response
PA	Public Assistance
PC	Personal Computer
PDA	Preliminary Damage Assessment
PIO	Public Information Office
POST	Police Officer Standards and Training
PPA/CA	Performance Partnership Agreement/Cooperative Agreement (FEMA)
PSA	Public Service Announcement
PTAB	Planning and Technological Assistance Branch
PTR	Project Time Report
RA	Regional Administrator (OES)
RADEF	Radiological Defense (program)
RAMP	Regional Assessment of Mitigation Priorities
RAPID	Railroad Accident Prevention & Immediate Deployment
RDO	Radiological Defense Officer
RDMHC	Regional Disaster Medical Health Coordinator
REOC	Regional Emergency Operations Center

REPI	Reserve Emergency Public Information
RES	Regional Emergency Staff
RIMS	Response Information Management System
RMP	Risk Management Plan
RPU	Radiological Preparedness Unit (OES)
RRT	Regional Response Team
SAM	State Administrative Manual
SARA	Superfund Amendments & 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 being lost to shoreline retreat over a given period of time. The projected inland extent of the area is measured by multiplying the average annual long-term recession rate by the number of years desired.
Essential Facility	Elements important to ensure a full recovery of a community or state following a hazard event. These would include: government functions, major employers, banks, schools, and certain commercial establishments, such as grocery stores, hardware stores, and gas stations.
Extent	The size of an area affected by a hazard or hazard event.
Extratropical Cyclone	Cyclonic storm events like Nor'easters and severe winter low-pressure systems. Both West and East coasts can experience these non-tropical storms that produce gale-force winds and precipitation in the form of heavy rain or snow. These cyclonic storms, commonly called Nor'easters on the East Coast because of the direction of the storm winds, can last for several days and can be very large – 1,000-mile wide storms are not uncommon.
Fault	A fracture in the continuity of a rock formation caused by a shifting or dislodging of the earth's crust, in which adjacent surfaces are differentially displaced parallel to the plane of fracture.

Federal Emergency Management Agency (FEMA)	Independent agency created in 1978 to provide a single point of accountability for all Federal activities related to disaster mitigation and emergency preparedness, response and recovery.
Fire Potential Index (FPI)	Developed by USGS and USFS to assess and map fire hazard potential over broad areas. Based on such geographic information, national policy makers and on-the-ground fire managers established priorities for prevention activities in the defined area to reduce the risk of managed and wildfire ignition and spread. Prediction of fire hazard shortens the time between fire ignition and initial attack by enabling fire managers to pre-allocate and stage suppression forces to high fire risk areas.
Flash Flood	A flood event occurring with little or no warning where water levels rise at an extremely fast rate.
Flood	A general and temporary condition of partial or complete inundation of normally dry land areas from (1) the overflow of inland or tidal waters, (2) the unusual and rapid accumulation or runoff of surface waters from any source, or (3) mudflows or the sudden collapse of shoreline land.
Flood Depth	Height of the flood water surface above the ground surface.
Flood Elevation	Elevation of the water surface above an established datum, e.g. National Geodetic Vertical Datum of 1929, North American Vertical Datum of 1988, or Mean Sea Level.
Flood Hazard Area	The area shown to be inundated by a flood of a given magnitude on a map.
Flood Insurance Rate Map (FIRM)	Map of a community, prepared by the Federal Emergency Management Agency that shows both the special flood hazard areas and the risk premium zones applicable to the community.
Flood Insurance Study (FIS)	A study that provides an examination, evaluation, and determination of flood hazards and, if appropriate, corresponding water surface elevations in a community or communities.
Floodplain	Any land area, including watercourse, susceptible to partial or complete inundation by water from any source.
Frequency	A measure of how often events of a particular magnitude are expected to occur. Frequency describes how often a hazard of a specific magnitude, duration, and/or extent typically occurs, on average. Statistically, a hazard with a 100-year recurrence interval is expected to occur once every 100 years on average, and would have a 1 percent chance – its probability – of happening in any given year. The reliability of this information varies depending on the kind of hazard being considered.

Fujita Scale of Tornado Intensity	Rates tornadoes with numeric values from F0 to F5 based on tornado wind speed and damage sustained. An F0 indicates minimal damage such as broken tree limbs or signs, while and F5 indicated severe damage sustained.
Functional Downtime	The average time (in days) during which a function (business or service) is unable to provide its services due to a hazard event.
Geographic Area Impacted	The physical area in which the effects of the hazard are experienced.
Geographic Information Systems (GIS)	A computer software application that relates physical features on the earth to a database to be used for mapping and analysis.
Ground Motion	The vibration or shaking of the ground during an earthquake. When a fault ruptures, seismic waves radiate, causing the ground to vibrate. The severity of the vibration increases with the amount of energy released and decreases with distance from the causative fault or epicenter, but soft soils can further amplify ground motions
Hazard	A source of potential danger or adverse condition. Hazards in this how to series will include naturally occurring events such as floods, earthquakes, tornadoes, tsunami, coastal storms, landslides, and wildfires that strike populated areas. A natural event is a hazard when it has the potential to harm people or property.
Hazard Event	A specific occurrence of a particular type of hazard.
Hazard Identification	The process of identifying hazards that threaten an area.
Hazard Mitigation	Sustained actions taken to reduce or eliminate long-term risk from hazards and their effects.
Hazard Profile	A description of the physical characteristics of hazards and a determination of various descriptors including magnitude, duration, frequency, probability, and extent. In most cases, a community can most easily use these descriptors when they are recorded and displayed as maps.
HAZUS (Hazards U.S.)	A GIS-based nationally standardized earthquake loss estimation tool developed by FEMA.

Hurricane	An intense tropical cyclone, formed in the atmosphere over warm ocean areas, in which wind speeds reach 74-miles-per-hour or more and blow in a large spiral around a relatively calm center or "eye." Hurricanes develop over the north Atlantic Ocean, northeast Pacific Ocean, or the south Pacific Ocean east of 160°E longitude. Hurricane circulation is counter-clockwise in the Northern Hemisphere and clockwise in the Southern Hemisphere.
Hydrology	The science of dealing with the waters of the earth. A flood discharge is developed by a hydrologic study.
Infrastructure	Refers to the public services of a community that have a direct impact on the quality of life. Infrastructure includes communication technology such as phone lines or Internet access, vital services such as public water supplies and sewer treatment facilities, and includes an area's transportation system such as airports, heliports; highways, bridges, tunnels, roadbeds, overpasses, railways, bridges, rail yards, depots; and waterways, canals, locks, seaports, ferries, harbors, dry docks, piers and regional dams.
Intensity	A measure of the effects of a hazard event at a particular place.
Landslide	Downward movement of a slope and materials under the force of gravity.
Lateral Spreads	Develop on gentle slopes and entail the sidelong movement of large masses of soil as an underlying layer liquefies in a seismic event. The phenomenon that occurs when ground shaking causes loose soils to lose strength and act like viscous fluid. Liquefaction causes two types of ground failure: lateral spread and loss of bearing strength.
Liquefaction	Results when the soil supporting structures liquefies. This can cause structures to tip and topple.
Lowest Floor	Under the NFIP, the lowest floor of the lowest enclosed area (including basement) of a structure.
Magnitude	A measure of the strength of a hazard event. The magnitude (also referred to as severity) of a given hazard event is usually determined using technical measures specific to the hazard.
Mitigation Plan	A systematic evaluation of the nature and extent of vulnerability to the effects of 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.
Probability	A statistical measure of the likelihood that a hazard event will occur.
Recurrence Interval	The time between hazard events of similar size in a given location. It is based on the probability that the given event will be equaled or exceeded in any given year.
Repetitive Loss Property	A property that is currently insured for which two or more National Flood Insurance Program losses (occurring more than ten days apart) of at least $1000 each have been paid within any 10-year period since 1978.
Replacement Value	The cost of rebuilding a structure. This is usually expressed in terms of cost per square foot, and reflects the present-day cost of labor and materials to construct a building of a particular size, type and quality.
Richter Scale	A numerical scale of earthquake magnitude devised by seismologist C.F. Richter in 1935.
Risk	The estimated impact that a hazard would have on people, services, facilities, and structures in a community; the likelihood of a hazard event resulting in an adverse condition that causes injury or damage. Risk is often expressed in relative terms such as a high, moderate or low likelihood of sustaining damage above a particular threshold due to a specific type of hazard event. It also can be expressed in terms of potential monetary losses associated with the intensity of the hazard.
Riverine	Of or produced by a river.
Scale	A proportion used in determining a dimensional relationship; the ratio of the distance between two points on a map and the actual distance between the two points on the earth's surface.

Scarp	A steep slope.
Scour	Removal of soil or fill material by the flow of flood waters. The term is frequently used to describe storm-induced, localized conical erosion around pilings and other foundation supports where the obstruction of flow increases turbulence.
Seismicity	Describes the likelihood of an area being subject to earthquakes.
Special Flood Hazard Area (SFHA)	An area within a floodplain having a 1 percent or greater chance of flood occurrence in any given year (100-year floodplain); represented on Flood Insurance Rate Maps by darkly shaded areas with zone designations that include the letter A or V.
Stafford Act	The Robert T. Stafford Disaster Relief and Emergency Assistance Act, PL 100-107 was signed into law November 23, 1988 and amended the Disaster Relief Act of 1974, PL 93-288. The Stafford Act is the statutory authority for most Federal disaster response activities, especially as they pertain to FEMA and its programs.
State Hazard Mitigation Officer (SHMO)	The representative of state government who is the primary point of contact with FEMA, other state and Federal agencies, and local units of government in the planning and implementation of pre- and post-disaster mitigation activities.
Storm Surge	Rise in the water surface above normal water level on the open coast due to the action of wind stress and atmospheric pressure on the water surface.
Structure	Something constructed. (See also Building)
Substantial Damage	Damage of any origin sustained by a structure in a Special Flood Hazard Area whereby the cost of restoring the structure to its before-damaged condition would equal or exceeds 50 percent of the market value of the structure before the damage.
Super Typhoon	A typhoon with maximum sustained winds of 150 mph or more.
Surface Faulting	The differential movement of two sides of a fracture – in other words, the location where the ground breaks apart. The length, width, and displacement of the ground characterize surface faults.
Tectonic Plate	Torsionally rigid, thin segments of the earth's lithosphere that may be assumed to move horizontally and adjoin other plates. It is the friction between plate boundaries that cause seismic activity.
Topographic	Characterizes maps that show natural features and indicate the physical shape of the land using contour lines. These maps may also include manmade features.

Tornado	A violently rotating column of air extending from a thunderstorm to the ground.
Tropical Cyclone	A generic term for a cyclonic, low-pressure system over tropical or subtropical waters.
Tropical Depression	A tropical cyclone with maximum sustained winds of less than 39 mph.
Tropical Storm	A tropical cyclone with maximum sustained winds greater than 39 mph and less than 74 mph.
Tsunami	Great sea wave produced by submarine earth movement or volcanic eruption.
Typhoon	A special category of tropical cyclone peculiar to the western North Pacific Basin, frequently affecting areas in the vicinity of Guam and the North Mariana Islands. Typhoons whose maximum sustained winds attain or exceed 150 mph are called super typhoons.
Vulnerability	Describes how exposed or susceptible to damage an asset is. Vulnerability depends on an asset's construction, contents, and the economic value of its functions. Like indirect damages, the vulnerability of one element of the community is often related to the vulnerability of another. For example, many businesses depend on uninterrupted electrical power – if an electric substation is flooded, it will affect not only the substation itself, but a number of businesses as well. Often, indirect effects can be much more widespread and damaging than direct ones.
Vulnerability Assessment	The extent of injury and damage that may result from a hazard event of a given intensity in a given area. The vulnerability assessment should address impacts of hazard events on the existing and future built environment.
Water Displacement	When a large mass of earth on the ocean bottom sinks or uplifts, the column of water directly above it is displaced, forming the tsunami wave. The rate of displacement, motion of the ocean floor at the epicenter, the amount of displacement of the rupture zone, and the depth of water above the rupture zone all contribute to the intensity of the tsunami.
Wave Run-up	The height that the wave extends up to on steep shorelines, measured above a reference level (the normal height of the sea, corrected to the state of the tide at the time of wave arrival).
Wildfire	An uncontrolled fire spreading through vegetative fuels, exposing and possibly consuming structures.
Zone	A geographical area shown on a Flood Insurance Rate Map (FIRM) that reflects the severity or type of flooding in the area.