









RANCHO SANTIAGO
Community College District

Hazard Mitigation Plan

November 14, 2017

RSCCD Natural Hazard Mitigation Plan
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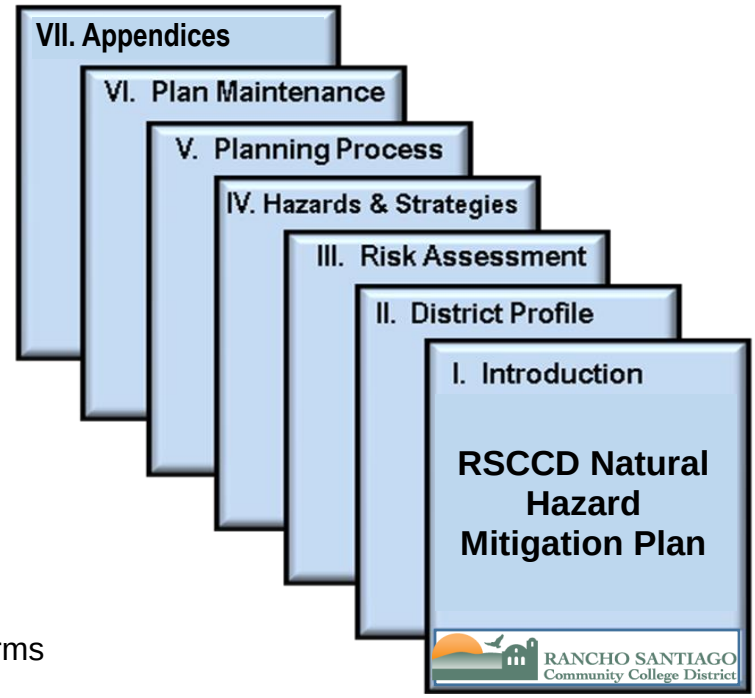
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I. OVERVIEW

It is impossible to predict exactly when natural disasters will occur, or the extent to which they will affect Rancho Santiago Community College District (RSCCD). However, with careful planning and collaboration among district personnel, public agencies, private sector organizations, and community members, it is possible to minimize the losses that can result from these natural disasters. The Hazard Mitigation Plan is the first step in this process.

The ultimate purpose of the plan is to determine practical and cost effective strategies to mitigate our most common and worst case scenario hazards to protect our campuses, district and the community. This will be done in partnership with the federal, state, county and city governments; the two colleges within the district and district office. In the end, the work done on this plan can save lives, prevent injuries, prevent damage to property and the environment and save millions of dollars in public assistance.

A. PARTICIPANTS

The RSCCD Hazard Mitigation Team was formed to jointly develop this plan. Letters outlining the Hazard Mitigation Project and invitations to all named participates were sent prior to the kick off meeting held on April 2, 2015. The Team representatives were selected from the following organizations:

- RSCCD
- City of Santa Ana
- City of Orange
- County of Orange
- State of California Office of Emergency Services (OES)
- Santa Ana Chamber of Commerce
- Orange Chamber of Commerce
- American Red Cross Orange County Chapter
- Coast Community College District

District and college invitees included representatives from the district office, two colleges, and other educational and child care sites owned by the district including:

District Office

- Assistant Vice Chancellor, Fiscal Services
- Director of District Construction
- Risk Manager
- Chief, District Safety & Security
- Executive Director of Child Care Services
- Admissions/Records Specialist III
- Plan Writer

Santa Ana Community College

- Lt. District Safety & Security
- Vice President Administrative Services
- Dean of Instruction Continuing Education
- Facilities Manager
- Assistant Dean, Criminal Justice Academies
- Student Representative, Associated Student Government
- Associated Student Government Representative

Santiago Canyon Community College

- Lt., District Safety & Security
- Vice President Administrative Services
- Vice President Continuing Education
- Facilities Manager
- Assistant Dean Criminal Justice Academies

Additional members consisting of City Emergency Managers, City Planners, Police and Fire Department representatives were invited. These members supplied RSCCD Team with their city General Plans including the Safety Elements, Emergency Operations Plans (EOPs), and Hazard Mitigation Plans from those agencies that had completed one. This group includes the general public and the following:

City of Santa Ana

- City Planner
- Emergency Manager

City of Orange

- Orange Police Sgt. /Homeland Security & Emergency Management
- Orange Fire Department
- City Planner

County of Orange

- Emergency Management Bureau

State of California

- Office of Emergency Services

Community Groups

- American Red Cross

Business Groups

- Santa Ana Chamber of Commerce
- Orange Chamber of Commerce

General Public/General District

- Communication via the RSCCD Website
- RSCCD Emergency Preparedness Team
- RSCCD Students

Engineering/Mapping Services Contractor

- MMI Engineering

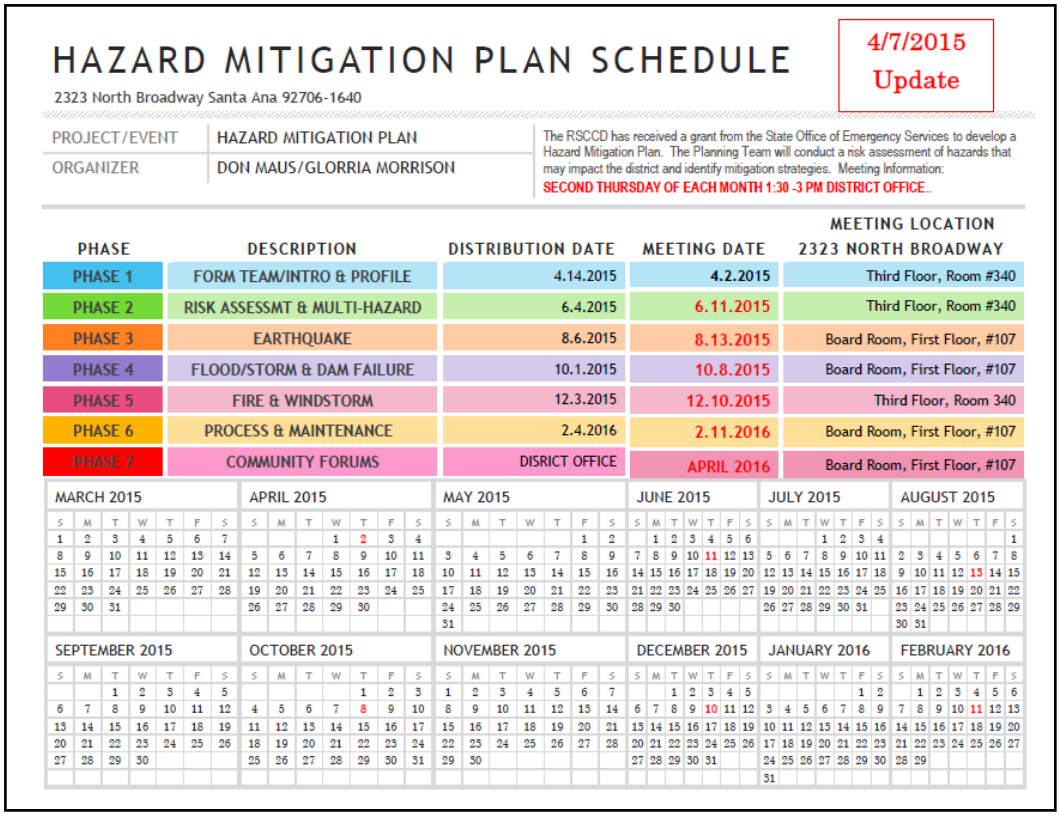
Individuals for the Hazard Mitigation Team (Team) were selected based on their expertise and knowledge of the district, campuses, city, planning, emergency management, public safety and community knowledge in relation to information required in the plan development process.

The Team representatives were extremely helpful in the initial planning process. Orange County had completed their Hazard Mitigation Plan update in 2010. Neither of the two cities with district facilities had approved Hazard Mitigation plans. The City of Orange wrote a planning grant in 2013 and hopes of developing a plan within the next two years. The City of Santa Ana had a draft of a plan but it was never approved by the State, Federal government or the City of Santa Ana.

B. HAZARD MITIGATION PLANNING SCHEDULE

The 18 month long FEMA planning grant will complete the writing of the plan in 14 months leaving time to edit the plan.

The project was broken into 7 Phases. Meetings have been scheduled every other month on the second Thursday of each month at the District Office conference rooms.



HAZARD MITIGATION PLAN SCHEDULE

4/7/2015 Update

2323 North Broadway Santa Ana 92706-1640

PROJECT/EVENT	HAZARD MITIGATION PLAN
ORGANIZER	DON MAUS/GLORRIA MORRISON

The RSCCD has received a grant from the State Office of Emergency Services to develop a Hazard Mitigation Plan. The Planning Team will conduct a risk assessment of hazards that may impact the district and identify mitigation strategies. Meeting Information:
SECOND THURSDAY OF EACH MONTH 1:30 -3 PM DISTRICT OFFICE..

PHASE	DESCRIPTION	DISTRIBUTION DATE	MEETING DATE	MEETING LOCATION 2323 NORTH BROADWAY
PHASE 1	FORM TEAM/INTRO & PROFILE	4.14.2015	4.2.2015	Third Floor, Room #340
PHASE 2	RISK ASSESSMT & MULTI-HAZARD	6.4.2015	6.11.2015	Third Floor, Room #340
PHASE 3	EARTHQUAKE	8.6.2015	8.13.2015	Board Room, First Floor, #107
PHASE 4	FLOOD/STORM & DAM FAILURE	10.1.2015	10.8.2015	Board Room, First Floor, #107
PHASE 5	FIRE & WINDSTORM	12.3.2015	12.10.2015	Third Floor, Room 340
PHASE 6	PROCESS & MAINTENANCE	2.4.2016	2.11.2016	Board Room, First Floor, #107
PHASE 7	COMMUNITY FORUMS	DISRICT OFFICE	APRIL 2016	Board Room, First Floor, #107

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The geographic area incorporated in this plan includes the district's owned facilities which are all located in the Cities of Santa Ana and Orange, all located within Orange County, California.

The district's entire service area is located in central and north Orange County. Orange County is immediately adjacent to and south of Los Angeles County and north of San Diego County. Orange County has a population of over three million residents and is the eighth largest economy in the world.

The area's topographic characteristics and associated threats include the Newport-Inglewood, San Andreas, Whittier and San Joaquin Hills Earthquake Faults; alluvial soils prone to liquefaction; and low-lying flood prone areas mostly as a result of the Santa Ana River. The area is prone to Santa Ana winds and is in the Prado Dam inundation zone.

II. PURPOSE OF THIS PLAN

Throughout history, RSCCD has dealt with various natural hazards affecting the area. Photos, journal entries, and newspapers from the 1800s, 1900s and early 2000s show that the residents of the area dealt with earthquakes, liquefaction, fires, flooding, and severe coastal storms resulting in flooding and high winds.

Although there were fewer people in the area, the natural hazards adversely affected the lives of those who depended on the land, climate and tourism for their income and well-being. As the population continues to increase, the exposure to natural hazards creates an even higher risk than previously experienced. As the population at the campuses and district complex increase, the expectations on RSCCD and other government agencies following a disaster becomes greater.

Orange County is the second most populous county in California and the most populated state in the United States. Orange County has over three million people. Its population is greater than the population of 29 of this country's states. RSCCD enrolls more than 40,000 students. With Orange County's dense population and the large number of individuals on each of the campuses, disaster impacts can be devastating; therefore, every effort must be taken to mitigate the natural hazards identified in this plan.

The district is in the heart of Orange County, home of one of the state's oldest community colleges, Santa Ana College, and also one of its newest, Santiago Canyon College. Centered in a growing and dynamic area, the district serves a population of more than 700,000 residents in the communities of Anaheim Hills, Orange, Santa Ana, Villa Park and portions of Anaheim, Costa Mesa, Irvine, Fountain Valley, Garden Grove and Tustin.

Encompassing 24 percent of Orange County's total area (193 square miles), the district maintains seven sites with hundreds of buildings. In addition to Santa Ana College and Santiago Canyon College, these include the Centennial and Orange Continuing Education Centers, the Digital Media Center, the Orange County Sheriff's Regional Training Academy and the District Operations Center.

Student Headcount (Fall 2013)	
College Credit	25,138
Non-Credit	29,862
Total	**55,000**

In addition to the enrolled students, the child care sites have over 900 children that the district is responsible for their safety.

The area offers the benefits of living in a Mediterranean type of climate. RSCCD service area is characterized by the unique and attractive landscape coupled with world-famous tourist attractions. However, the potential impacts of natural hazards associated with the terrain and large numbers of college students make the environment and population vulnerable to natural disasters. The college's large events like graduations, football games, swap meets and special events increase the population of the campuses and therefore will increase the impact of a disaster.

Orange County experienced destructive flooding, winter storms and in some cases water spouts six times in the 1990s (1991, 1992, 1993, 1995, 1997 and 1998) in 2001 and again in the winter of 2010/11. The county sought and received Presidential Disaster Declarations to obtain federal assistance for recovery efforts in 1992, 1993, 1995, 1998, and again in 2010/11 for winter storms. In 1997/1998 and 2001 only a State Proclamation was received. Wildfires have been more prominent since 2000 in inland Orange County. Orange County operates as one entity during disasters through the Orange County Operational Area as required in the State of California Standardized Emergency Management System. If the RSCCD service area is not impacted, it supplies its facilities as shelters, Local Assistance Centers, Pointes of Dispensing, staging areas and other uses as part of the Orange County Operational Area response. So what disasters impact Orange County will in turn impact the RSCCD personnel, resources and facilities.

RSCCD is an official member of the Orange County Emergency Management Organization (OCEMO) and is a fully recognized partner in mitigation and prevention, preparedness (including coordinating plans, training and exercises), response and recovery operations. To ensure RSCCD is doing all it can to mitigate and prevent disasters at its sites, this Natural Hazard Mitigation Plan is being developed. Within the planning process, RSCCD will research hazards, effectively evaluate the vulnerability of each of the sites and examine and agree on mitigation strategies. The RSCCD plan writer will enlist the district personnel, campuses, faculty, students and public input on hazard mitigation issues while educating them on the district's hazards and vulnerabilities. The planning progression will be documented throughout the process. Public involvement is critical in the planning process.

A. PURPOSE OF DEVELOPING A HAZARD MITIGATION PLAN

As the costs of damage from natural disasters continues to increase, the community realizes the importance of identifying effective ways to reduce vulnerability. A hazard mitigation plan will assist our communities in reducing risk by identifying resources, information, and strategies for risk reduction, while helping to guide and coordinate mitigation activities throughout RSCCD.

The Plan provides a set of strategies intended to do the following: reduce risk from natural hazards, provide education and outreach programs, foster the development of partnerships, and implement preventative activities.

Resources and information within the Mitigation Plan:

- Establish a basis for coordination and collaboration among participating agencies and public entities
- Identify hazards and assess their vulnerability to the district facilities
- Identify and prioritize future mitigation strategies or projects and determine ways to fund and implement them

The hazard mitigation plan works in conjunction with other RSCCD plans, including the district's Emergency Operations Plans, Campus Emergency Plans and district facility planning documents.

Natural hazards impact populations, campuses, property, the environment, and the economy of RSCCD service area which in turn impacts the district staff, faculty and students as well as its ability to continue operations. Earthquakes, flooding, fires, dam failure, and high winds have exposed RSCCD 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 them.

In the district's service area, which is essentially "built-out" (i.e., has 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. This increases the need for additional campuses and classrooms. The campuses are mostly built out and most new development will have to include mid- or high-rise buildings or demolishing old structures and replacing them with new facilities. This again increases the population density at the campuses making prevention and mitigation even more critical.

The inevitability of natural hazards, and the growing population and activity within the study area 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. All of this will be coordinated with the county and cities where the campuses and district offices are located.

B. PLAN CONTENTS

RSCCD Hazard Mitigation Plan includes resources and information to assist the district, the public and private sector organizations, the college community (students, faculty, staff) and other parties interested in future mitigation planning. This plan outlines actions taken to direct the District-wide efforts in risk reduction and loss prevention caused by natural hazard events. The strategies focused on a multitude of natural hazard issues with primary mitigating efforts.

C. PARTICIPATING AGENCIES

California's Standardized Emergency Management System (SEMS) requires counties to form an Operational Area consisting of all public agencies (county, cities, and special districts and school districts). The Operational Area agencies work together to mitigate and prevent, prepare for, respond to and recover from disasters.

RSCCD is an official member of the Orange County Emergency Management Organization (OCEMO) whose membership includes the county, 34 cities within the county, special districts, school districts and other organizations approved by the group (universities, utilities, federal sites within the county, American Red Cross non-profits, etc.). OCEMO members are emergency managers representing their various agencies who are knowledgeable in hazards and threats. OCEMO members assisted in the plan development by contributing relative information, mapping, and copies of their plans for use in research. OCEMO members (county, cities, school districts, and special districts totaling 113 public agencies) were all invited to participate on the planning team at the April 2, 2015 OCEMO meeting.

The Orange County Operational Area places a high priority on disaster prevention and mitigation. The Orange County Hazard Mitigation Plan and State Hazard Mitigation Plan (SHMP) have been key resources utilized in the development of this plan.

The development of this plan was a collaborative effort with cooperation between the District, its local stakeholders, the campuses. The district office networked with the cities, county, State Office of Emergency Services (OES) Hazard Mitigation Division and with the assistance of the Federal Emergency Management Agency (FEMA) hazard mitigation publications. The planning process was an example of cooperation in an educational entity and the process was a model for future Hazard Mitigation endeavors.

Public participation played a key role in the development of the goals and strategies. Interviews were conducted with stakeholders District-wide, and included cities, county, special districts, and the public. Public workshops were held which outline the threats, strategies and planning process and requested input from all stakeholders. The invitees included service area residents and District community at large. RSCCD Hazard Mitigation Team guided the plan development process and utilized the recommendations and suggestions from the public workshops when determining and prioritizing mitigation strategies.

RSCCD would like to acknowledge *RSCCD Hazard Mitigation Planning Team* for their commitment and dedication throughout the planning process. This plan took 14 months to complete and consists of hundreds of work-hours of research and writing to develop. The experience and knowledge of these individuals were critical in the development of the plan. *The following individuals are to be commended:*

TABLE 1: RSCCD HAZARD MITIGATION TEAM

Rancho Santiago Community College District (RSCCD) Hazard Mitigation Planning Team

6/4/2015 DRAFT

Name	Title	Email	Phone	Priorities
District Office 2323 North Broadway Santa Ana 92706-1640				
Adam O'Connor	Assistant Vice Chancellor Fiscal Services	OConnor_Adam@rsccd.edu	(714) 480-7320	Fiscal Support Planning
Darryl Taylor	Director of District Construction	Taylor_Darryl@rsccd.edu	(714) 480-7513	Mitigation Strategies
Don Maus	Risk Manager	Maus_Don@rsccd.edu	(714) 480-7330	Project Manager
Alistair Winter	Chief, District Safety & Security	Winter_Alistair@rsccd.edu	(714) 480-7333	Hazard Assessments
Hank Dang	Associated Student Government	HankDang@gmail.com	(714) 926-0702	Hazard Assessments
Skylar Bertram	Student Representative	ep5577@aol.com	(714) 658-4044	Hazard Assessments
Janneth Linniell	Ex. Director Child Dev. Services	Linniell_Janneth@rsccd.edu	(714) 480-7546	Mitigation Strategies
Glorria Morrison	Plan Writer	Morrison_Glorria@rsccd.edu	(714) 955-2504	Plan Writer
Santa Ana Community College 1530 West 217th Street Santa Ana 92706-3398				
Mike Colver	Lt., District Safety & Security	Colver_michael@sac.edu	(714) 564-6335	Hazard Assessments
Michael Collins	VP Administrative Services	Collins_michael@sac.edu		Fiscal Support Planning
Nilo Lipiz	Dean of Instruction Continuing Ed	Lipiz_Nilo@sac.edu		Mitigation Strategies
Mark Wheeler	Facilities Manager	Wheeler_Mark@sac.edu	(714) 241-5701	Mitigation Strategies
Ron Coopman	Assistant Dean, Criminal Justice Academies	Coopman_Ron@sac.edu	(714) 566-9201	Mitigation Strategies
Santiago Canyon Community College 8045 East Chapman Avenue Orange, CA 92869-4512				
Ken Gouldsmith	Lt., District Safety & Security	Gouldsmith_Ken@sccollege.edu	(714) 628-4989	Hazard Assessments
Arleen Satele	VP Administrative Services	Satele_Arleen@sccollege.edu	(714) 628-4717	Fiscal Support Planning
Jose Vargas	VP Continuing Education	Vargas_Jose@sccollege.edu	(714) 628-5910	Mitigation Strategies
Position Vacant	Facilities Manager			Mitigation Strategies
City of Santa Ana Representatives 20 Civic Center Plaza Santa Ana, CA, 92702 PO Box 1988 Ross Annex				
Randy Black	Orange County Fire Authority	randyblack@ocfa.org	(714) 292-8476	Hazard Assessments
Vince Fregoso	City Planner	vfregoso@santa-ana.org	(714) 667-2706	Mitigation Strategies
Steve Rymer	Emergency Manager	srhyner@santa-ana.org	(714) 647-5315	City Coordination
City of Orange Representatives 300 East Chapman Avenue in Orange, CA 92866				
Jennifer Amat	Sgt. Orange Police Dept./ Emergency Manager	JAmat@orangepd.org	(714) 744-7462 (714) 325-1423	City Coordination
Alan Velasco	Orange Fire Dept.	AVelasco@cityoforange.org	(714) 288-2512	Hazard Assessments
Rick Otto	City Planner	ROtto@cityoforange.org	(714) 647-5804	Mitigation Strategies
County of Orange Representative 2644 Santiago Canyon Rd, Silverado, CA 92676				
Bryan Hovde, Primary Ray Cheung Vicki Osborn	OC Sheriff Department Emergency Mgmt. Bureau	Bryan Hovde bhovde@ocsd.org Ray Cheung rcheung@ocsd.org Vicki Osborn vosborn@ocsd.org	Vicki Osborn (714) 628-7019 (714) 448-1197 c Ray Cheung (714) 628-7058	County Coordination
State of California Representative				
Jim Acosta, Region I, Los Alamitos Wendy Boemecke Sac, Tech Support Andrew Rush, Sac Grant Coordinator	State OES Los Alamitos, CA 9 and Sac.	Jim.Acosta@CALOES.ca.gov Wendy.Boemecke@CalOES.ca.gov andrew.rush@caloes.ca.gov	(562) 795-2939 (916) 845-8275 (916) 845-8269	State Coordination/ Grant Coordination
Other Representatives				
Debbie Graves	American Red Cross Santa Ana, CA 9	Debbie.Graves redcross.org	(714) 481-5348	Public Participation
Paula Garcia-Young	Santa Ana Chamber of Commerce, Chair	info@santaanachamber.com	(714) 953-4455	Business Interests
Charla Lenarth	Orange Chamber of Commerce	charla@orangechamber.com	(714) 536-3581	Business Interests
Linda Morin	Coast Community College District	LMorin@mail.cccd.edu	(714) 475-9059 (714) 438-4753	Lessons Learned in Community College Hazard Mitigation Planning
Hope Seligson	MMI Engineering	HSeligson@MMIEngineering.com	Office (714) 465-1390 Cell (562) 688-6272	Hazard Maps HAZUS Building Damage Estimates

III. PLAN MISSION AND GOALS

A. MISSION

The mission of RSCCD Natural Hazards Mitigation Plan is to promote sound public policy designed to protect students, faculty, staff and visitors. RSCCD will develop a formal process for prioritizing the mitigation projects by determining the district's Critical Facilities, Community Critical Facilities threatened by natural hazards. This can be achieved by identifying hazards and strategies, increasing public awareness, documenting the resources for risk reduction, and providing a review and maintenance process to guide the district towards building a safer, more sustainable community.

B. HAZARD MITIGATION GOALS

The plan goals describe the overall direction that the district and campuses can take to work toward mitigating risks from natural hazards. The goals are stepping-stones between the broad direction of the mission statement and the specific recommendations outlined in the strategies. The Plan goals help to guide direction of future activities aimed at reducing risk and preventing loss from natural hazards. The goals listed here serve as checkpoints as agencies and organizations begin implementing mitigation action items.

PROTECT LIFE, PROPERTY AND THE ENVIRONMENT

Implement activities that assist in protecting lives by making the district, college facilities and their infrastructure more resistant to losses from natural hazards.

Reduce losses and repetitive damages from chronic hazard events while promoting insurance coverage for catastrophic hazards. Improve hazard assessment information to make recommendations for discouraging new development in high hazard areas, building with the hazards in mind, and encouraging preventative measures for existing development in areas vulnerable to natural hazards. When development does occur, ensure all planners are familiar with updated building codes and the National Flood Insurance Program and their recommendations. (Cities participate in the National Flood Insurance Program, not districts.)

STRENGTHEN EMERGENCY SERVICES

Establish policies to ensure mitigation projects are outlined in the plan for critical facilities, services, and infrastructure. Strengthen emergency operations by increasing collaboration and coordination among the campuses, the district and other public agencies. Coordinate and integrate natural hazard mitigation activities, where appropriate, with emergency operations plans and procedures.

PROMOTE 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.

Even with mitigation being a priority, the district should continue the disaster preparedness programs including Building Captains, Command Posts, Campus Emergency Operations Centers (C-EOCs), Emergency Operations Centers (EOCs) and other programs in place. The

district should train these teams on the hazards, vulnerability, and future mitigation plans. Ask for their input on mitigation strategies. And most importantly, be aware of what facilities may be vulnerable in what types of disasters so these facilities are not utilized by the public.

CREATE PARTNERSHIPS FOR IMPLEMENTATION

Strengthen communication and coordinate participation among and within the campuses, public agencies and the public for district facilities to gain a vested interest in implementation. Encourage leadership within public and private sector organizations to prioritize and implement local and regional hazard mitigation activities.

RSCCD will participate in the countywide mitigation efforts. They will partner with the cities where their facilities are located and with countywide and regional efforts. The district works with the Orange County Emergency Management Organization (OCEMO) with mitigation and preparedness issues and through the Orange County Operational Area for response and recovery operations.

PROMOTE NATURAL SYSTEMS

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

C. HAZARD SPECIFIC GOALS AND OBJECTIVES

Hazard-specific information on the natural hazards is addressed in this Plan. Flooding occurs with regularity and was the most common type of disaster for the district's area in the 1990's and during the long drought of the 2000's, wildfires have become the most common disaster. This can be forecasted through historic evidence and scientific methods. Catastrophic hazards do not occur with the frequency of flooding and wildfires, but when they do occur, they have devastating impacts on life, property, and the environment. In Southern California, because of its geology and terrain, earthquakes, floods, wildfires, landslides and high winds have the potential to be catastrophic. Earthquakes with Santa Ana winds and/or fires would be the most catastrophic natural event. The hazards and their long and short term mitigation goals addressed in the Plan include:

EARTHQUAKE

Goals

- Identify at-risk structures and promote seismic retrofitting of any buildings that do not meet current building codes
- Minimize losses to critical facilities from earthquakes and liquefaction by seismically retrofitting unstable structures
- Develop a Non-Structural Hazard Mitigation Program which would include standards that campuses and the district would follow
- Ensure earthquake preparedness education remains a priority
- Pursue funding sources to accomplish these goals and objectives
- Minimize economic loss to the local agency, state and federal governments

Objectives

- Provide education on non-structural hazard mitigation to the campuses
- Identify critical facilities like the campus and district Emergency Operations Centers (EOC), Health Offices, Security Offices, child care facilities and ensure these facilities are structurally sound and all non-structural hazards have been secured

FLOOD/STORM

Goals

- Eliminate to the greatest degree possible, the risk from flood hazards to life, property, public investment, and social order
- Support a flood control system on the campuses and district complex which are able to support the permitted land uses while preserving the public's safety
- Identify and upgrade existing deficient flood control systems on campuses and at the district complex
- Pursue funding sources to reduce the costs of flood control
- Minimize losses to critical facilities from flooding
- Minimize losses to existing and future structures within the 100 year flood zone
- Minimize economic loss to public agencies, the public, and recovery costs to FEMA and Cal OES from floods
- Meet National Flood Insurance Program (NFIP) Requirements

Objectives

- Upgrade campus flood protection systems
- Educate district and campus on emergency flood protection measures
- Work with the cities and county to upgrade flood protection systems that impact the district

DAM FAILURE

Goals

- Identify dam failure prone areas on and surrounding the campuses
- Enhance warning systems to provide quick and effective notifications of an impending dam failure
- Ensure dam failure preparedness education remains a priority
- Pursue funding sources to accomplish these goals and objectives

Objectives

- Review all warning systems to ensure that adequate coverage exists for all campuses and the district complex
- Upgrade warning systems to add/improve coverage

WINDSTORMS/SEVERE WEATHER

Goals

- Determine who the stakeholders are in windstorm damage
- Determine how communications between stakeholders can be established to coordinate windstorm prevention

- Decide how the district and campuses can participate in windstorm damage prevention
- Pursue funding sources to accomplish these goals and objectives

Objectives

- Work together with stakeholders to educate the district and campuses on proper tree pruning to reduce windstorm related power outages
- Establish a list of critical facilities on the campuses to determine if they have backup power to be able to continue operations should a commercial power failure occur

DROUGHT/CLIMATE CHANGE

Goals

- Determine who the leaders and stakeholders are in drought and climate change
- Determine a system for monitoring and managing drought and climate change
- Work together with stakeholders to educate the district and campuses on drought and climate change
- Enhance water conservation
- Study these issues and data to determine the short and long term impact on the district
- Develop short and long term goals for drought and climate change

D. ORGANIZATION OF STRATEGIES

The strategies listed in this plan are activities in which the district, campuses and public can be engaged to reduce risk. Each strategy includes an estimate of the time line for implementation. Some strategies are activities that the district and its campuses may implement with existing resources and authorities within one to two years. Other strategies may require new or additional resources, and may take up to 10 years to completely implement.

The strategies are listed at the end of each of the hazard section of the plan. A strategy matrix is located in the Plan Maintenance Section lists all of the strategies in the plan. Data collection, research, and the public participation process resulted in the development of these strategies. This has all been documented throughout the plan. Each strategy listed in this plan includes the following information:

IDENTIFY A COORDINATING OR LEAD ORGANIZATION FOR EACH STRATEGY

The coordinating organization is the district or a specific campus and a department. The assignment will be to the most appropriate department able to address a natural hazard, or that is willing and able to organize resources, find appropriate funding, or oversee activity implementation, monitoring, and evaluation. Coordinating organizations may include District Facilities, District Maintenance & Operations, a city or the county agencies that are capable of or responsible for implementing activities and programs. Some hazards are managed by county, state and federal government agencies and the district has no control over them. In those cases, the district will work with the agency and make recommendations for improvements. The district and campuses can conduct individual projects or work in conjunction with their city, county, state and federal agencies to mitigate hazards.

ESTIMATE A TIME LINE

Each strategy includes an estimate of the time line for implementation. Some strategies are activities which agencies are capable of implementing with existing resources and authorities within one to two years. Other strategies may require new or additional resources or authorities, and may take up to 10 years to implement.

IDENTIFY RESOURCES FOR IMPLEMENTATION

Each strategy includes identifying ideas and potential resources for implementation, which may include grant programs or human resources. The Plan Maintenance Matrix includes the section within the mitigation plan where this information can be found.

PLAN GOALS ADDRESSED

The plan goals addressed by each strategy are included as a way to monitor and evaluate how well the Mitigation Plan is achieving plan goals once implementation begins. The plan goals are organized into the following five areas:

- Protect Life and Property
- Strengthen Emergency Services
- Promote Public Awareness
- Create Partnerships for Implementation
- Preserve, Rehabilitate and Enhance Natural Systems
- Meet National Flood Insurance Program (NFIP) Requirements (Community College Districts are not governed by the NFIP)

IDENTIFY PARTNER ORGANIZATIONS

Partner organizations are agencies or public/private sector businesses that may be able to assist in the implementation of strategies by providing relevant resources to the coordinating organization. The partner organizations listed in the Resource Directory of RSCCD Natural Hazard Mitigation Plan are potential partners recommended by the Team, but were not necessarily contacted during the development of the plan.

RECOGNIZE REASONABLE CONSTRAINTS

Constraints may apply to some of the strategies. These constraints may be a lack of district staff, expertise, lack of funding, or vested property rights which might expose the district to legal action as a result of adverse impacts on private property.

Since the 2008 stock market crash and subsequent economic down turn, RSCCD has had to deal with less revenue. This plan attempted to take into consideration these tough economic times and reduced revenue. Although the economy is improving, no one really knows for sure the State of California's and United States long term economic future. This makes estimating time frames for projects extremely difficult. The RSCCD staff used their best knowledge available and their years of experience but many variables are out of their control.

FUNDING SOURCES

For each mitigation strategy, the Team listed the most likely funding source or sources.

COST ESTIMATE

For each mitigation action item the facilities personnel did a cost estimate based on their experience and knowledge. For some action items, where cost estimates were not available, gathering cost estimates was one of the implementation phase goals.

BENEFITS: LOSSES AVOIDED

The one criterion that must be part of the evaluation and prioritization process is benefit-cost review. The planning team considered the benefits that would result from a mitigation action versus the cost. Benefits included losses avoided, such as the number and value of structures and infrastructure protected by the action and the population protected from injury and loss of life. Benefits, such as quality of life were also included in the review.

PRIORITY

The planning team put together a list of actions that were acceptable and practical for addressing the problems identified in the risk assessment. They then needed a system to prioritize the action items for implementation. Action items were prioritized by numerical ranking; high, medium, or low designation; the evaluation and prioritization process helped the planning team weigh the pros and cons of different action alternatives. RSCCD used the FEMA Local Mitigation Planning Handbook from March 2013, worksheet 6.1 to facilitate this process.

E. PLANNING AREA

RSCCD Natural Hazard Mitigation Plan covers 7 sites located in three cities in central and north Orange County.

The Rancho Santiago Community College District is a multi-college district that includes:

- Rancho Santiago Community College District Office
- Santa Ana Community College
- Santiago Canyon Community College
- Centennial Education Center
- Digital Media Center
- Orange Education Center (Adult Education)
- OC Sheriff Regional Training Academy



The service area includes:

- 40,000 students
- 700,000 residents
- 193 square miles
- Includes nine coastal communities:

Anaheim Hills, Orange, Santa Ana, Villa Park and Portions of Anaheim, Costa Mesa, Irvine, Fountain Valley, Garden Grove and Tustin.

This plan provides a framework for planning for natural hazards. The resources, background information, goals and recommendations lay groundwork for local mitigation plans and partnerships.

F. NATURAL HAZARD LAND USE POLICY IN CALIFORNIA

Planning for natural hazards is an integral element of every city's and county's land use planning program within the State of California. Community College Districts are not responsible for land use planning. All California cities and counties have General Plans and

implement ordinances that comply with statewide planning regulations. Community Colleges do not have General Plans. The closest type of document would be the Facilities Master Plans.

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 and increasing population.

This is particularly true in the case of planning for natural hazards where communities must balance development pressures with detailed information on the nature and extent of hazards. The cities, the RSCCD service area are almost entirely built out and most of the future decisions will be on rebuilding, not new developments. This also is true of RSCCD sites. Land in north central Orange County is extremely expensive and open space is almost nonexistent. Populations continue to grow mostly due to the excellent weather, closeness to the coastline and few extremes in heat or freezing.

Planning for natural hazards required our Hazard Mitigation Planning Team to list assets of RSCCD, review policies which guide the development in hazard areas, research hazards and their impacts, and determine strategies to mitigate the natural hazards. This research includes the compendium of hazards facing the community, the built environment at risk, the public property that may be damaged by hazard events and most of all, the people who attend college in the shadow of these hazards.

Since this plan is for a community college district and not a city or county, a few of the critical documents that will be utilized to write the plan include:

TABLE 2: CITY, COUNTY AND STATE DOCUMENTS UTILIZED

City/County	General Plan	Safety Element	Hazard Mitigation Plan	Website and Other Documents
City of Santa Ana	X	X	No Plan	X
City of Orange	X	X	No Plan	X
City of Tustin	X	X	No Plan	X
County of Orange	X	X	X	X
State of California			X	X

G. SUPPORT FOR THE PLAN

RSCCD will take responsibility for the development and implementation of risk reduction strategies and policies. RSCCD, however, is not alone. Partners and resources exist at the county, regional, state and federal levels. Numerous California state agencies and Federal agencies have a role in natural hazards and natural hazard mitigation. Some of the key agencies include:

- The California Office of Emergency Services (OES) is responsible for disaster mitigation, preparedness, response, recovery, and the administration of federal funds after a major disaster declaration. Cal OES will also assist jurisdictions in preparing

their Natural Hazard Mitigation Plans and their website has outstanding resources to assist in the process including a Hazard Mitigation section.

- Federal Emergency Management Agency is responsible for disaster mitigation and prevention, preparedness and planning, response and recovery on the federal level. FEMA
- The Southern California Earthquake Center (SCEC) gathers information about earthquakes, integrates this information on earthquake phenomena, and communicates this to the general public to increase earthquake awareness, reduce economic losses, and save lives
- 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 and inundation zone delineation) to state-mandated 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
- The California Division of Forestry (CDF) is responsible for all aspects of wildland fire protection on state lands, and administers forest practices regulations on non-federal lands. The Urban Fire section of the Plan relies extensively on data provided by and available from the CDF's website
- The National Flood Insurance Program (NFIP) provides maps, educational information, and flood prevention requirements

The Plan Methodology in this hazard mitigation plan is based on research from a variety of sources including the RSCCD campuses, cities, as well as the County of Orange, State and Federal Agencies, special districts, etc.. The Hazard Mitigation Team assisted in conducting data research and analysis, participated in planning team meetings and public workshops, and developed the final mitigation plan. The research methods and various contributions utilized in preparing the plan are briefly described below.

H. INPUT FROM THE HAZARD MITIGATION PLANNING TEAM

The Hazard Mitigation Planning Team convened seven official times and included a special meeting/community forum with the public to guide the development of the plan. Over and above this were dozens of special meetings to discuss the Facilities Master Plan, bond issues, funding issues, dam inundation maps, past disaster history of the district, meetings with the engineering company, insurance agency, and many other specific meetings. The Team played an integral role in developing the mission, goals, and strategies and all sections of the plan.

I. STAKEHOLDER INTERVIEWS

RSCCD staff conducted dozens of interviews with individuals and specialists from organizations interested in natural hazards planning. The interviews identified common concerns related to natural hazards and identified key activities to reduce risk from natural hazards. Stakeholders interviewed for the plan included representatives from:

- Orange County Emergency Management Organization (OCEMO)
- Orange County Agencies: Emergency Management, Planning Department and Public Works Department

- Cities of Santa Ana, Orange and Tustin
- California Office of Emergency Services (OES)
- United States Geological Survey (USGS)
- University of California, Irvine (UCI)
- Federal Emergency Management Agency (FEMA)
- Army Corps of Engineers

J. STATE AND FEDERAL GUIDELINES FOR MITIGATION PLANS

Following are the federal requirements for approval of a Natural Hazard Mitigation Plan:

- Open public involvement, with public meetings that introduce the process and project requirements
- The public must be afforded opportunities for involvement in identifying and assessing risk, drafting a plan, and public input into the mitigation strategies
- Campus and community cooperation, with opportunity for other local government agencies, the business community, educational institutions, and non-profits to participate in the process
- Incorporation of local documents, including city and county General Plans, Safety Elements, Zoning Ordinances, Building Codes, Hazard Mitigation Plans and other pertinent documents

The following components must be part of the planning process:

- Complete documentation of the planning process
- A detailed risk assessment on hazard exposures in the community
- A comprehensive mitigation strategy, which describes the goals and objectives, including proposed strategies, programs and actions that can be implemented to reduce or minimize long-term vulnerabilities
- A plan maintenance process, which describes the method and schedule of monitoring, evaluating and updating the Plan and integration of the Hazard Mitigation Plan into other planning mechanisms
- Formal adoption by RSCCD Board of Trustees
- Plan review by both California OES and FEMA.

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

RSCCD Plan Writer and staff examined existing mitigation plans from around the country, current FEMA hazard mitigation planning standards, the State of California Natural Hazards Mitigation Plan Guidance and FEMA planning documents.

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

- California State Natural Hazards Mitigation Plan
- County of Orange Hazard Mitigation Plan
- City of Newport Beach Hazard Mitigation Plan
- Huntington Beach Hazard Mitigation Plan

- City of Fullerton Hazard Mitigation Plan
- City of Riverside Hazard Mitigation Plan
- Coast Community College Natural Hazards Mitigation Plan

K. PLAN WRITER EXPERIENCE

RSCCD hired an experienced plan writer to develop this plan. The plan writer was a professional Emergency Manager for 31 years leading the City of Huntington Beach Emergency Management & Homeland Security Office. This Emergency Manager had her own consulting company for six years writing Emergency Operations Plans and Hazard Mitigation Plans. As a City of Huntington Beach employee she developed the Huntington Beach/Fountain Valley Natural Hazards Mitigation Plan in 2003/04. The plan included the cities of Huntington Beach and Fountain Valley as well as the Fountain Valley School District, Huntington Beach City School District, Huntington Beach Unified High School District and Ocean View School District.

The plan writer also worked for Coast Community College District (CCCD) for 18 months developing the Golden West College Emergency Response Planning documents followed by a 2 year contract to develop the CCCD Hazard Mitigation Plan, the *first approved Community College District plan in California*. In 2012 the plan writer updated the City of Mission Viejo Natural Hazard Mitigation Plan. With plan writer's experience in the geography and history of the local area and having worked with local school districts, community college districts, cities, county, state and federal government, this was an excellent match for the RSCCD.

L. ENVIRONMENTAL ISSUES

The adoption of the Hazard Mitigation Plan is categorically exempt pursuant to Class 6, Section 15306 of the California Environmental Quality Act which states that basic data collection and research which do not result in a serious or major disturbance to an environmental resource is exempt from further review. Additionally, the Hazard Mitigation Plan is only a study that identifies, among other things, mitigation strategies that the local jurisdiction has not yet approved, adopted, or funded.

IV. CAPABILITY ASSESSMENT

The RSCCD Hazard Mitigation Team assessed the planning and regulatory, administrative and technical, as well as the educational ability that could be utilized to support mitigation implementation. The Capability Assessment table below provides a summary of the various district departments, city and county capabilities available to support this plan including the technical contract with MMI Engineering.

TABLE 3: RSCCD CAPABILITY ASSESSMENT

District Departments	Policy or Plan	Ability to Support, Expand and Improve on Mitigation
Risk Management	Hazard Mitigation Project Lead	▪ Tracks and maintains hazard mitigation plan ▪ Manages the districts insurance program ▪ Access to placing information on the website and local newspaper articles to ensure public participation ▪ Works with the District public relations personnel to include the public into the Hazard Mitigation process ▪ Local champion for Hazard Mitigation education
District Safety and Security	Emergency Plan	▪ Provides disaster preparedness education to employees ▪ Develops and updates/improves the Districts Emergency Plan ▪ Leads disaster drills for all district sites ▪ Liaison's with all Orange County cities, the county, Cal OES, and FEMA for mitigation, preparedness, response and recovery ▪ Local champion for emergency preparedness
Director of District Construction	New Construction Facilities Master Plan	▪ Manages new buildings and construction ▪ Works with bond issues ▪ Local champion for mitigation in new construction ▪ Lead for Facilities Master Plan, initiates changes and upgrades
Facilities Department	Facilities Planning	▪ Manages all aspects of facilities planning and maintenance ▪ Manages some construction projects ▪ Works with Bond issues; works with the Board to initiate new bonds ▪ Local champion for mitigation in upgrading older facilities
MMI Engineering	Mapping Hazus	▪ Developed maps for this plan ▪ Runs Hazus software including Advanced Engineering Building Module for earthquake risk assessment and the User Defined Facilities Module for flood risk assessment.
Orange County Fire Authority (OCFA) & Orange City Fire Department	Fire Codes Fire Prevention	▪ Fire protection ▪ Rescue, Emergency Medical and Hazardous Materials ▪ Manages Fire ISO Rating and updates codes ▪ Fire safety education ▪ Local champion for fire mitigation and prevention
Santa Ana and Orange PDs	Law Enforcement	Emergency response and preparedness; crime prevention; Orange PD is the lead for emergency management for the City of Orange
Santa Ana, Orange and Tustin City/County Planners	Land use, Bldg., Codes, Flood	Participants in NFIP, CRS, Floodplain Ordinance, Building Codes, Storm Water

District Departments	Policy or Plan	Ability to Support, Expand and Improve on Mitigation
Child Development Services	Dependent Care of Children	Manages all aspects of 4 child care centers, emergency preparedness and mitigation for the sites
American Red Cross	Preparedness, Response and Recovery	▪ Community preparedness education resources ▪ Community mass care/shelter/canteen services ▪ Community partner resources

FISCAL MITIGATION CAPABILITIES

The following table lists the District's fiscal mitigation capabilities that could be utilized to support mitigation implementation.

TABLE 4: RSCCD FISCAL RESOURCES

Financial Resources	Accessible/Eligible to Use (yes/no)
District General Fund	Yes
Facilities Improvements Project funding	Yes
Authority to levy bonds for specific purposes	Yes
Fees for educational and other services	Yes
Incur debt through general obligation bonds	Yes
Incur debt through specific tax bonds	Yes
Incur debt through private activities	Yes
FEMA Pre-Disaster Hazard Mitigation Grant Program	Yes
FEMA Post-Disaster Hazard Mitigation	Yes
Public and Private Partnerships	Yes
Partnerships	Yes

For the list of resources outside the district government including contact information and websites, see the Appendices and the Resource Directory. All of these resources were used to develop this plan and will continue to be used to implement the mitigation strategies.

V. PLAN LAYOUT

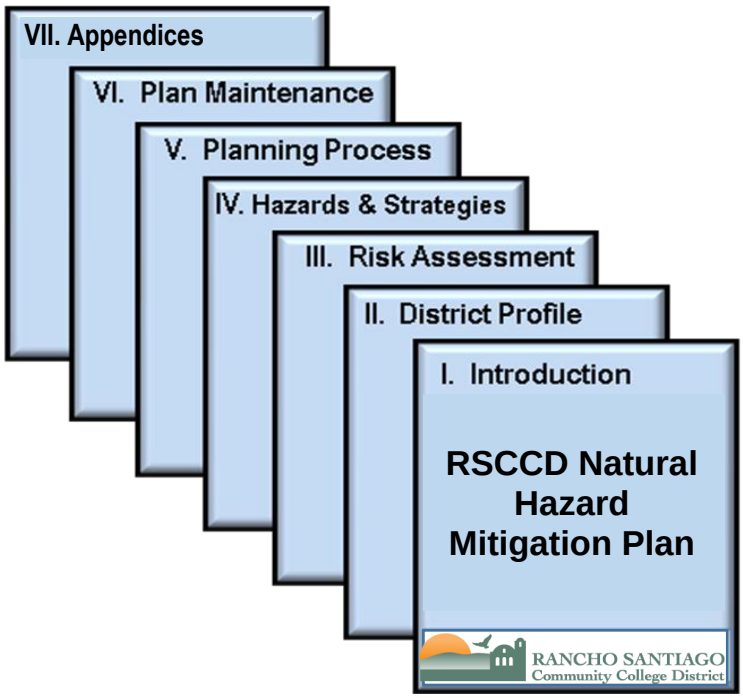
Each section of the mitigation plan provides information and resources to assist people in understanding RSCCD and the hazard-related issues facing the district complex and campuses. Combined, the sections of the plan work together to create a document that guides the mission to reduce risk and prevent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

The structure of the plan enables the review of the entire plan or specific sections of interest. It also allows RSCCD staff 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 RSCCD. 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. Ultimately, the entire plan will be reviewed and updated every five years.

This team chose to develop *Part IV – Hazards, Vulnerabilities and Mitigation Strategies*. In RSCCD plan, hazards are researched, the vulnerability to RSCCD facilities is discussed, and the mitigation strategies are listed and ranked in each section by hazard. Each hazard is set up as its own individual sub-section, i.e. *Earthquake (which includes its mitigation strategies)*. This way if someone wants to learn more about a hazard, for example, *Dam Failure,* they can find out all the risks, vulnerabilities and mitigation strategies in one sub-section.

The Section IV. Hazards and Strategies is made up of:

- IV-A Multi-Hazard Strategies
- IV-B Earthquake
- IV-C Flood/Storm
- IV-D Dam Failure
- IV-E Drought and Climate Change
- IV-F Severe Weather/Windstorms



VI. PLAN SUMMARY

SECTION I: INTRODUCTION AND CAPABILITY ASSESSMENT

The Plan Introduction includes: an overview of the plan and introduction of the RSCCD; organization of the plan; participating agencies and Team members; plan mission, goals and objectives; acknowledgements, and the distribution list.

SECTION II: DISTRICT PROFILE

The District Profile section of the plan includes a profile and statistics of RSCCD including the population demographics. The district's two large community colleges and other sites are outlined in the District Profile along with layout maps of the campuses.

SECTION III: RISK ASSESSMENT

Risk Assessment includes sections how RSCCD identified and profiled hazards, assessed vulnerability, agency asset lists, as well as how the potential losses were estimated. The district's high occupancy facilities were identified along with, dependent care facilities and critical facilities used to manage disasters.

SECTION IV: HAZARDS, VULNERABILITIES AND MITIGATION STRATEGIES

The five natural hazards studied for this plan are: earthquake, flood/storm, dam failure, severe weather/windstorms, and drought/climate change. Included is a comprehensive study of each hazard and how it impacts RSCCD facilities followed by an assessment of vulnerability of the district's facilities and the mitigation strategies for each hazard. This section is made up of five sub-documents, one for each hazard. This makes the plan easier to read and understand.

PART A: Multi-Hazard Strategies
PART B: Earthquake
PART C: Floods/Storms
PART D: Dam Failure
PART E: Drought/Climate Change
PART F: Severe Weather/Windstorms

SECTION V: PLANNING PROCESS AND PUBLIC PARTICIPATION

This section of the plan describes the meetings, discussions, interviews, community forums, Cal OES and FEMA approval process, crosswalk, and board resolutions.

SECTION VI: PLAN MAINTENANCE

A plan for maintaining this document has been developed to ensure it remains a *living* document. It includes monitoring the plan, evaluating, updating and plan follow-up. This section shows how RSCCD will deal with the subject of hazard mitigation in the future with Future Development Trends. It also includes a consolidated table of all mitigation strategies.

SECTION VII: APPENDICES AND REFERENCES

The appendices include: strategy for voting on mitigation strategy priorities, list of exhibits, plan resource directory, list of acronyms and a glossary.

APPENDICES

- PART A: Glossary
- PART B: Acronyms
- PART C: Economic Analysis of Mitigation Strategies
- PART D: California Disasters

REFERENCES

- Reference A: RSCCD 2015 Insurance Property Evaluation Report
- Reference B: RSCCD Earthquake Hazus Study by MMI Engineering
- Reference C: RSCCD Flood Hazus Study by MMI Engineering
- Reference D: Facilities Master Plan

Note: These references may be accessed at the RSCCD Risk Manager Office.

VII. PLAN DISTRIBUTION

The plan will be copied and distributed to the following partners:

- Rancho Santiago Community College District
  - Board of Trustees/Clerk of the Board
  - District Chancellor
  - Vice Chancellor of Business Operations & Fiscal Services
  - Assistant Vice Chancellor, Facilities Planning
  - Risk Manager
  - Chief, District Safety & Security
  - Director of District Construction
- Santa Ana Community College
  - Lt., District Safety & Security
  - Vice President Administrative Services
  - Vice President Continuing Education
  - Facilities Manager
- Santiago Canyon Community College
  - Lt., District Safety & Security
  - Vice President of Administrative Services
  - Vice President of Continuing Education
  - Facilities Manager
- City of Santa Ana Emergency Manager
- City of Orange Emergency Manager
- City of Tustin Emergency Manager
- County of Orange, Orange County Sheriff Department, Emergency Management Bureau
- State of California Office of Emergency Services (OES)
- Federal Emergency Management Agency (FEMA)
- Sustainable RSCCD Committee (SRC)
- Plan Writer

VIII. GRANT AWARD

(Cal OES Use Only)

Cal OES# 059-91021-00 FIPS# 059-91021 VS 00 CFDA# 97.047 Grant# 2014-0005 PDM14-PL0170

CALIFORNIA GOVERNOR'S OFFICE OF EMERGENCY SERVICES
GRANT AWARD FACE SHEET (Cal OES 2-101)

The California Governor's Office of Emergency Services hereafter designated Cal OES, hereby makes a Grant Award of funds to the following:

1. **Grant Recipient:** Rancho Santiago Community College District — 1a. **DUNS#** 076070283
   In the amount and for the purpose and duration set forth in this Grant Award.
2. **Implementing Agency:** Rancho Santiago Community College District — 2a. **DUNS#** 076070283
3. **Implementing Agency Address:** 2323 North Broadway (Street) Santa Ana (City) 92706-1640 (Zip+4)
4. **Location of Project:** Santa Ana (City) area Orange (County) 92706-1640 (Zip+4)
5. **Disaster/Program Title:** FY14 PRE-DISASTER MITAGATION Competitive — 6. **Performance Period:** 10/28/14 to 10/27/16

Grant Year	Fund Source	A. State	B. Federal	C. Total	D. Cash Match	E. In-Kind Match	F. Total Match	G. Total Project Cost
2014	7. PDM		$74,999			$25,000	$25,000	$99,999
Select	8. Select						$0	$0
Select	9. Select						$0	$0
Select	10. Select						$0	$0
Select	11. Select						$0	$0
	12. TOTALS	$0	$74,999	$74,999	$0	$25,000	$25,000	12b. Total Project Cost: $99,999

13. This Grant Award consists of this title page, the application for the grant, which is attached and made a part hereof, and the Assurances/Certifications. I hereby certify I am vested with the authority to enter into this Grant Award Agreement, and have the approval of the City/County Financial Officer, City Manager, County Administrator, Governing Board Chair, or other Approving Body. The Grant Recipient certifies that all funds received pursuant to this agreement will be spent exclusively on the purposes specified in the Grant Award. The Grant Recipient accepts this Grant Award and agrees to administer the grant project in accordance with the Grant Award as well as all applicable state and federal laws, audit requirements, federal program guidelines, and Cal OES policy and program guidance. The Grant Recipient further agrees that the allocation of funds may be contingent on the enactment of the State Budget.

14. **Official Authorized to Sign for Applicant/Grant Recipient:** — 15. **Federal Employer ID Number:** 952696799

Name: Raúl Rodríguez, Ph.D. Title: Chancellor

Telephone: (714) 480-7450 (area code) FAX: (714) 796-3915 (area code) Email: Rodriguez-Raul@rsccd.edu

Payment Mailing Address: 2323 North Broadway City: Santa Ana Zip+4: 92706-1640

Signature: [signature] Date: 2/10/15

[FOR Cal OES USE ONLY]

I hereby certify upon my own personal knowledge that budgeted funds are available for the period and purposes of this expenditure stated above.

Sara Stillwell 3/5/15
Cal OES Fiscal Officer — Date

[signature] 3/6/15
Cal OES Director (or designee) — Date

14LA0172-00

Yr / Chapter: 2014-15 / 25/14 PCA No: 14824
Item: 0690-101-0890 Fed Cat #: 97.047
Program: 40
Title: PreDisaster Mitigation Competitive Grant
Fund: Federal Trust
Match Req: 25% on TPC
Project No: 14 PDMC Amount $74,999.00

RECEIVED MAR 2015 Hazard Mitigation

RECEIVED FEB 2015 Hazard Mitigation

Grant Award Face Sheet – Cal OES 2-101 (Revised 7/23/2013)

IX. RSCCD Board of Trustee Plan Resolutions

The plan was approved by Cal OES and FEMA and then adopted by the Board of Trustees of the Rancho Santiago Community College District. The district adoption is the final step in the planning process.

X. State Office of Emergency Services Plan Review Tool Comments

XI. FEMA Plan Review Tool and Comments

Section II - District Profile

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II. District Profile

I. Overview

The Rancho Santiago Community College District (RSCCD) is a multi-college district that includes seven owned sites:

1. Rancho Santiago Community College District Office
2. Santa Ana Community College
3. Santiago Canyon Community College
4. Centennial Education Center
5. Orange Education Center
6. Orange County Sheriff's Regional Training Academy
7. Digital Media Center

In the heart of Orange County lies Rancho Santiago Community College District, home of one of the state's oldest community colleges, Santa Ana College, and also one of its newest, Santiago Canyon College. Centered in a growing and dynamic area, the district serves a population of more than 768,000 residents in the communities of:

- Anaheim Hills
- Orange
- Santa Ana
- Villa Park
- Portions of Anaheim
- Costa Mesa
- Irvine
- Fountain Valley
- Garden Grove
- Tustin

Student Headcount (Fall 2013)

College Credit	25,138
Non-Credit	25,138
Total	**55,000**

In addition to the enrolled students, the child care sites have over 900 children that the district is responsible for their safety.

It should be noted that the RSCCD has 146 buildings in the district. These 146 buildings will be considered by the Hazard Mitigation Team for mitigation measures.

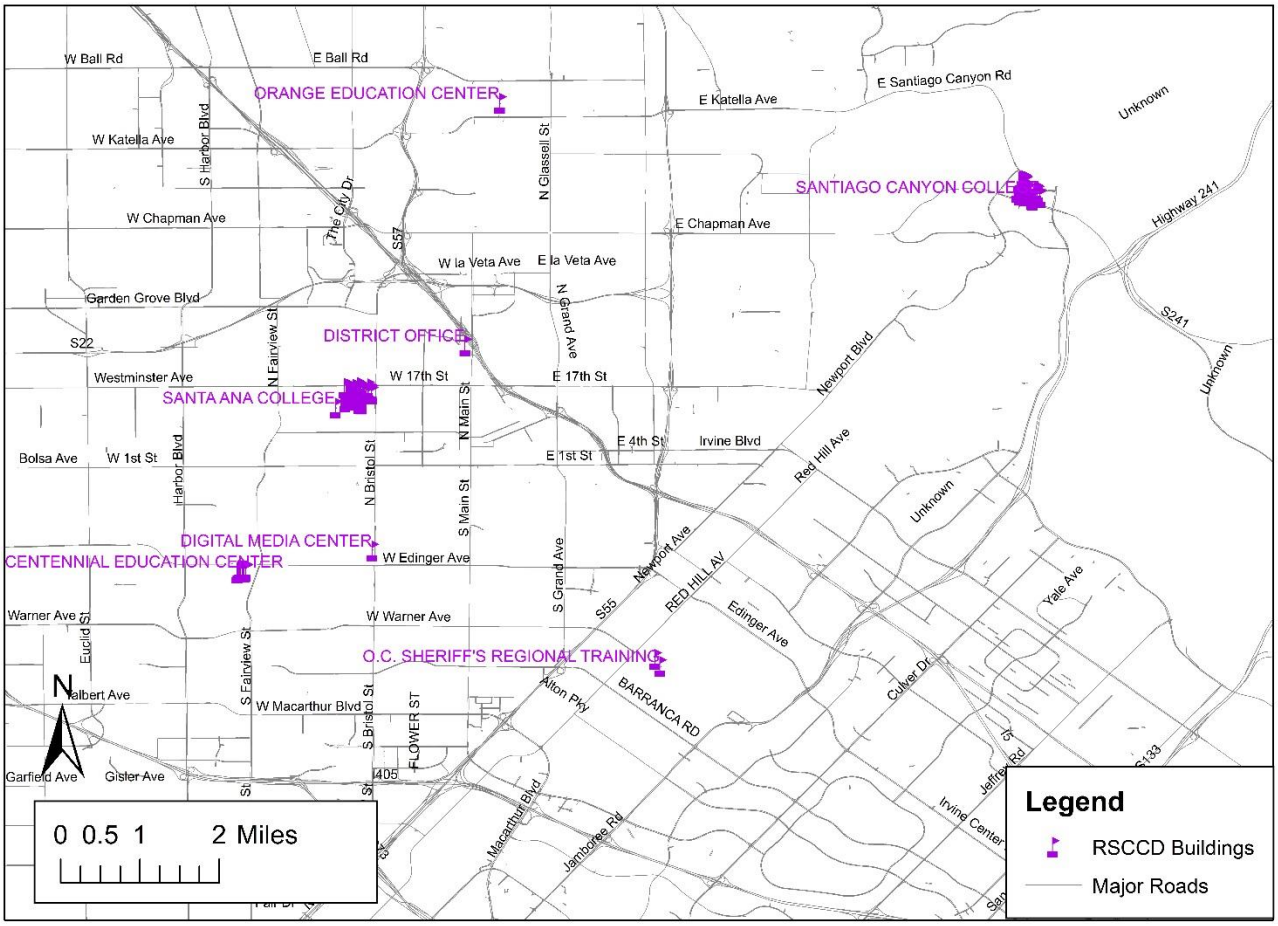
A. DISTRICT FACTS

- RSCCD is one of the largest of California's 72 community college districts based on the number of credit and noncredit students.
- The college district serves a population of more than 768,000 residents and encompasses 24 percent of Orange County's total area
- Santa Ana College is on 63 acres and Santiago Canyon College on 82 acres are one of the oldest and one of the newest campuses respectively among the state's 112 two-year public colleges.
- The district offers educational programs in seven locations accounting for 1,251,353 square feet (not including any leased instructional space.)
- With new facilities master plans approved for both colleges in October 2011, work continues to move forward on Measure E and state-funded construction and renovation projects. At Santiago Canyon College, work was completed on a Humanities Building, a gymnasium, and an aquatics complex. At Santa Ana College work was completed on a new soccer field and a project that improved campus access and signage; work is underway on campus perimeter site improvements projects and a renovation of Cook Gymnasium.
- Measure Q, approved by voters in November 2012, provides 198 million in general obligation bonds to finance renovation, repair and construction at Santa Ana College.
- According to Community College Week, Santa Ana College ranks 20th among the top 100 associate degree producers for "total minority" students in the nation. In addition, among the top 100 associate degree producers nationwide Santa Ana College ranks 12th for Hispanic students and 26th for Asian American students. The rankings are based on degrees conferred during the 2011-12 academic year. (Source: U.S. Dept. of Education)
- Continuing education courses are a substantial part of the college district's commitment to the community. In fall 2013, 14,931 students enrolled in these college preparation and career enhancing courses.
- In the 2012-13 academic year, 2,944 students transferred from these community colleges to the University of California and California State University systems and other baccalaureate-granting institutions.
- During 2012-13, Santa Ana College and Santiago Canyon College students completed associates degrees on average in 8 and 7 semesters respectively. During the same year, the district awarded 2,879 AA/AS degrees and 3,061 vocational certificates.
- The district employs 3,731 full-and part-time employees, creating a payroll of $103.58 million in 2012
- The district's adopted budget for 2013-14 is $209,559,264
- Credit Enrollment Student Characteristics (Fall 2013)
- ***Students Ethnicity***
  - Latino 58%
  - Caucasian 21%
  - Asian 10%
  - African-American 2%
  - Filipino 2%
  - Native American 1%
  - Other 1%
  - Non-declared 5%

Gender of Student

Women 50%
Men 50%

B. DISTRICT SERVICE AREA MAP



Rancho Santiago Community College District (RSCCD) Facilities

C. VISION STATEMENT

The colleges and centers of the Rancho Santiago Community College District (RSCCD) are learning communities. The RSCCD Board of Trustees is committed to ensuring access, equity, and success for students by providing comprehensive educational opportunities throughout our communities. RSCCD will be a global leader in many fields, delivering cost-effective, innovative and sustainable programs and services that are responsive to the diverse needs and interests of all students. RSCCD will be exceptionally sensitive and responsive to the economic and educational needs of our students and communities. The environment of the RSCCD will be collegial and supportive for students, staff, and the communities we serve.

RSCCD will promote and extensively participate in partnerships with other educational providers, including business, industry, and community groups, to further the goal of enhancing our communities' cultural, educational, and economic well-being.

RSCCD is a leader in the state in student learning. Students who complete programs will be prepared for success in business, industry, careers, and all future educational endeavors. We will prepare students to embrace and engage the diversity of our global community and to assume leadership roles in their work and public lives.

D. MISSION

The mission of the Rancho Santiago Community College District is to provide quality educational programs and services that address the needs of our diverse students and communities.

E. GOALS

1. RSCCD will assess the educational needs of the communities served by RSCCD and will adjust instructional programs, offerings, and support services and will allocate resources as needed to optimize the alignment of students' needs with services and fiscal resources.
2. RSCCD will assess the educational needs of the communities served by RSCCD and then pursue partnerships with educational institutions, public agencies, non-profit organizations, and business/industry/labor to collaboratively meet those needs.
3. RSCCD will annually improve the rates of course completion and completion of requirements for transfer, degrees, certificates, and diplomas.
4. RSCCD will support innovations and initiatives that result in quantifiable improvement in student access, preparedness, and success.
5. RSCCD will use a cycle of integrated planning that will demonstrate the effective use of resources.

II. HISTORY/GEOGRAPHY OF ORANGE COUNTY AND THE DISTRICT

A. ORANGE COUNTY HISTORY AND GEOGRAPHY

All RSCCD facilities are located within Orange County, in the State of California. Orange County is the second most populous County in the state with a population of over three million. Its population is greater than the population of 29 of this country's states. The economy is 31st in the world. The County encompasses 798 square miles, 205 square miles (25.7%) of unincorporated area, and 34 incorporated cities. There are 42 miles of coastline, three harbors, numerous internationally known tourist attractions, technical/manufacturing locations, shopping malls, John Wayne Airport, Disneyland, various venues hosting national and international sporting events, and several large convention centers. Orange County hosts 37.9 million visitors annually. The Mediterranean-type climate, characterized by a unique and attractive landscape, is most desirable to residents and visitors alike.



Unfortunately, even paradise has its hazards. In the late 1980's and 1990's Orange County was hit with a series of floods, riots, and earthquakes. Winter storms caused countywide flooding on numerous occasions especially in years where the El Nino weather condition was present. In 1992 the Laguna Beach Firestorm destroyed hundreds of homes; in 1994 Orange County was impacted by the Northridge Earthquake; and in the 2000's severe wildfires occurred along with continued flooding, an incident at Prado Dam and a severe drought.

Orange County began at some undetermined point in the distant past when Shoshone Indians came to dwell along the coast and in the lower canyons of the mountains. Theirs was a simple form of existence, living off of the abundance of the land.

In 1769, Gaspar de Portola, a military man and Spanish aristocrat, was appointed governor of Lower California. He commanded an expedition traveling northward into the literally unmapped

and half mythical territory of Alta California. His assignment was to seek out the legendary Bay of Monterey. He was also to secure the Spanish claim to his vast frontier against any invasion from Russian trappers or British colonizers. Portola called upon Father Junipero Serra, president of the Mexico City Missionary College, to assist in this monumental undertaking.

It was late in July in 1769 when this first party of European explorers reached the boundaries of present-day Orange County. Members of the expedition named the region "The Valley of Saint Anne" (Santa Ana). It was to this valley that Father Serra returned six years later, where he proceeded with the work of establishing the Church and converting the local people.

While the East Coast of North America was engaged in revolution and spectacular change, the West Coast too was undergoing a quiet and almost undetected transformation. Father Serra dedicated the Mission of San Juan Capistrano, Orange County's first permanent settlement, on November 1, 1776. The Mission became a self-sustaining unit based upon an agricultural economy. Its chapel and adjoining structure were the first signs of civilization erected upon the fertile, virgin soil of the Santa Ana Region.

In 1801, Jose Antonio Yorba, a volunteer in the Portola expedition, also returned to Santa Ana. He established the county's first rancho (Santiago de Santa Ana) in what are today the cities of Villa Park, Orange, Tustin, Costa Mesa and Santa Ana.

Following Mexico's liberation from Spanish rule in 1821, the extensive land holdings of the Capistrano Mission were subdivided and awarded to a number of distinguished war heroes. By this time Yorba's Rancho Santiago de Santa Ana had grown to resemble a feudal manor, and the romantic rancho era of Orange County had been ushered in.

Cattle were introduced into the area in 1834. A prosperous hide and tallow industry developed. Southern California became a virtual suburb of New England as sailing ships loaded with cargo traveled back and forth between coasts. In 1835, author-seaman Richard Henry Dana arrived at what is today known as Dana Point. He later immortalized Spanish Orange County in his book "Two Years Before the Mast" by describing it as "the only romantic spot on the Coast." The Spanish California tradition of a carefree lifestyle, fiestas with music and dancing, bear and bull fights, rodeos, and gracious hospitality, survived until the 1860.

A severe drought brought an end to the cattle industry. Adventurous pioneers, such as James Irvine, capitalized on the economic downfall of the ranchos. Irvine, an Irish immigrant, established a 110,000-acre sheep ranch that is today one of the most valuable pieces of real estate in America.

In 1887, silver was discovered in the Santa Ana Mountains. Hundreds of fortune seekers flocked to the "diggings." Land speculators and farmers came by rail from the East to settle in such boomtowns as Buena Park, Fullerton and El Toro.

Orange County was formally organized as a political entity separate from the County of Los Angeles in 1889. The wilderness had finally given way to irrigated farmlands and prosperous communities. A year-round harvest of Valencia oranges, lemons, avocados, and walnuts made agriculture the single most important industry in the fledgling county. And with orange groves beginning to proliferate throughout the area, the new county was named for the fruit: "Orange County."

The twentieth century brought with it many industrious individuals such as Walter Knott, a farmer

turned entrepreneur, who founded the Knott legacy in Buena Park.

During the years that followed, Orange County witnessed the discovery of oil in Huntington Beach, the birth of the aerospace industry on the Irvine Ranch, and filming of several Hollywood classics in the Newport Beach area.

In 1955, Walt Disney opened his Magic Kingdom in Anaheim. Noted as the pioneer of animated films, Disney revolutionized the entertainment world again with his "theme park" recreation concept.

By 1960, the neighboring metropolis of Los Angeles was "bursting at the seams." As the population spilled over the county line and across the rural Santa Ana Valley, it left in its wake an urban landscape of homes, shopping malls, and industrial parks.

Today Orange County is the home of a vast number of major industries and service organizations. As an integral part of the second largest market in America, this highly diversified region has become a Mecca for talented individuals in virtually every field imaginable. Indeed the colorful pageant of human history continues to unfold here; for perhaps in no other place on earth is there an environment more conducive to innovative thinking, creativity and growth than this balmy, sun bathed valley stretching between the mountains and the sea in Orange County.

The County of Orange has an area of 798 square miles located in the southwestern portion of the State and is bordered by Los Angeles to the north, San Diego to the south, Riverside and San Bernardino to the east and the Pacific Ocean to the west. Thirty-four incorporated cities and dozens of special districts in the county are responsible for hazard mitigation planning within their jurisdictions.

Orange County enjoys a diverse economy. The largest labor markets comprised 32% in service and 42% in trade and manufacturing. Small businesses flourish in this entrepreneurial climate. Only 19% of its residents work in companies employing more than 500 people. Firms employing 50 to 500 have grown at the fastest rate. Large companies with employment of over 1,000 declined over the same period.

Throughout our history, Orange County residents have endured various natural hazards. Photos, journal entries, and newspaper articles dating back to the 1800's document earthquakes, earth movement, flooding, tornados, wildfires, and windstorms in the area.

Although fewer people lived in the area, natural hazards adversely affected the lives of those that were dependent on the land and climate for food and survival. As the population of Orange County continues to increase, exposure to natural hazards creates an even higher risk.

The potential impact of natural hazards associated with the terrain makes the environment and the population (over 3 million) vulnerable to natural disaster situations. The County is subject to floods/storms, wildland/urban fires, earthquakes, dam failures, high winds, vector issues, landslide/mudslides, tornados, and tsunamis. It is impossible to predict exactly when a disaster will occur or the exact affect a disaster will have on the County. But careful planning and collaboration among public agencies, private sector organizations, and residents within the community minimizes loss resulting from natural disasters.

In a six-year period (1992-1998), Orange County experienced six declared flood disasters and two declared fire disasters. Orange County received over $30 million in reimbursement funds from Federal (FEMA) and State (NDAA) Public Assistance Programs for the eight disasters.

Damages to several County-owned roads during the Flood Disasters in 1995 and 1998 qualified the County for an additional reimbursement of $945,106 from the Federal Highway Administration.

A state declared disaster in December 1997 and a federally declared disaster in February 1998 were the result of back-to-back El Nino driven floods. The County will long remember this El Nino season not only for the rainfall produced in a 24-hour period, but also for the high rainfall intensity along the coastal areas of southern Orange County. Laguna Beach, particularly hard hit by this storm, received over 7.6 inches of rain in a 24-hour period. Rainfall intensity during certain hours of the storm reached 100-year rainfall frequencies. The storm produced numerous mudslides, road closures, and channel erosion, with storm debris deposited throughout the County. The severity of this storm prompted the Board of Supervisors to declare a local emergency and the State to declare a "State of Emergency."

Following the initial storm in December 1997, additional storms contributed to a tremendous amount of rainfall throughout the County. Two record-breaking rainfall storms occurred on February 2 and 23 in the Irvine, Santa Ana and Laguna Beach areas causing additional mudslides, undermining homes, and inundating creeks with mud. In Laguna Beach, there was one death and an instance of a baby rescued by a by-stander from one of the mud flows. The canyon areas of Santiago, Modjeska and Silverado, as well as Trabuco and Serrano Creeks experienced hillside erosion and mudslides, resulting in numerous road closures. The heavy rainfall produced erosion in the County's flood control channels, clogged drainage facilities, and damaged County parks and harbors. On December 7, Huntington Beach had three senior-citizen mobile homes flooded causing major evacuations and requiring sheltering operations. The three disasters in one storm season resulted in approximately $3.9 million in reimbursement funds to the County for storm clean-up, emergency protection and repairs to Countywide facilities. This figure does not include funds from the other Orange County cities or Individual Assistance Program, designed for residential, business, and agricultural damages.



Winter storms that hit the County from December 2004 through February 2005 resulted in two state emergency proclamations as well as two federal declarations.

The Santiago Fire was a federally declared disaster in October 2007 with over $7 million in individual damage claims and $21 million for response costs. The fire also re-ignited fears of catastrophic debris flows and mudslides in the burned canyon areas. Indeed, several mudslides were reported during winter storms that followed. Fortunately, no serious injuries or deaths were reported due to slides.

Winter storms have also been a threat to the East Garden Grove-Wintersburg Channel, a county levee system which fell into such disrepair that an emergency resolution by the Board of Supervisors was required to facilitate an $8 million emergency mitigation project to save lives and property.

The Freeway Complex Fire was another federally declared disaster in November 2008. 171 homes were lost in the cities of Yorba Linda, Brea, and Anaheim with nearly $140 million in individual damages while the response cost almost $20 million.

This plan will utilize the California, Orange County and District geography and disaster history to fully determine its natural hazards and mitigation strategies. The RSCCD Hazard Mitigation Committee and their Plan Writer will work together with input from the public, students, staff and faculty to identify and mitigate the hazards, therefore reducing deaths, injuries, property and environmental damage from disasters.

B. DISTRICT HISTORY

Rancho Santiago Community College District is one of the oldest community college districts in the state.

Santa Ana College

In 1915, Santa Ana Junior College opened its doors to 25 students as a department of Santa Ana High School. It was the second junior college founded in Orange County.

An earthquake in 1933 damaged the Santa Ana High School building, prompting the campus move to North Main Street where it remained until 1947. A bond issue passed in 1945, paved the way for development of a 48-acre campus at the corner of 17th and Bristol Streets.

A new multi-college district

In 1971, Santa Ana College officially separated from Santa Ana Unified School District to form the Rancho Santiago Community College District. In 1997, the college district's Board of Trustees voted to become a multi-college district.

The multi-college district included, at the time, Santa Ana College, Santiago Canyon College, the Business and Industry Services Center, the Criminal Justice Training Center, Garden Grove Center, Marketplace Education Center, Continuing Education—Centennial and Orange Centers, and the Regional Fire Training Center.

Santiago Canyon College

In response to population growth in east Orange County, the district purchased 30 acres from the Irvine Company in 1978 where Santiago Canyon College now stands. The first permanent classroom building was opened in 1985, offering comprehensive programs as well as a range of services such as admissions and registration, financial aid, academic advising and job placement.

Table 1: RSCCD Past Disasters

Date	Location	Type of Damage	Details (from insurance records)	Costs
1/1/2006	Santa Ana College	Weather/wind damage	Metal roof sheeting that covered the pole vault equipment had blown off completely. They had been bolted down to the metal housing unit but due to the high winds, the bolts could not keep the metal sheets in place.	Unknown
10/20/2007	Santa Ana College	Wind damage	Replace the baseball field fence and awning damaged during a wind storm	$81,210
11/25/2008	Santiago Canyon	Rain caused flood and mud	Rain caused flooding and mud of SCC buildings	$51,777

The RSCCD service area is in north and central Orange County, south of Los Angeles County. The Newport-Inglewood Fault runs through the Orange County coastal area evidenced by the 1933 Long Beach 6.4 magnitude earthquake resulting in 120 deaths and horrendous building damage. This earthquake damaged numerous buildings in Santa Ana where 5 of the seven sites are located.



(Photo: 1933 Long Beach Earthquake - Jefferson Junior High School in Long Beach.) Much of the area is subject to liquefaction. As in most of Southern California, the San Andreas Fault could impact the district. Both of these faults along with the San Joaquin Hills Fault have the potential to cause severe disruption to classes and day to day activities. Other faults that are in the area that will be studied include: El Modena, Whittier, Elsinore, Puente Hills and Peralta Hills Faults.

Much of the district is in the 100 Year Flood Zone. The Santa Ana River runs through the area which has a history of great floods. The federal, state, county, cities and Orange County Flood District have worked together over the past 25 years to mitigate the effects of the Santa Ana River which greatly benefited the district properties. The area went from the ***"worst flood threat west of the Mississippi River"*** to having a sophisticated flood control system recently completed that includes the Seven Oakes Dam, Prado Dam and the Santa Ana River. However, a lesser threat of flooding still remains especially in low lying areas. Much of the area is threatened by the Prado Dam which if damaged, could inundate low lying areas with 4 - 9 feet of flooding. The impact area includes over one million people. The area is hit with high winds, usually the *Santa Ana Winds* annually which could cause moderate damage. The district can be impacted by wildfires and urban fires. The Santiago Canyon College could be impacted by wildfire which would cause a campus evacuation and shutdown.

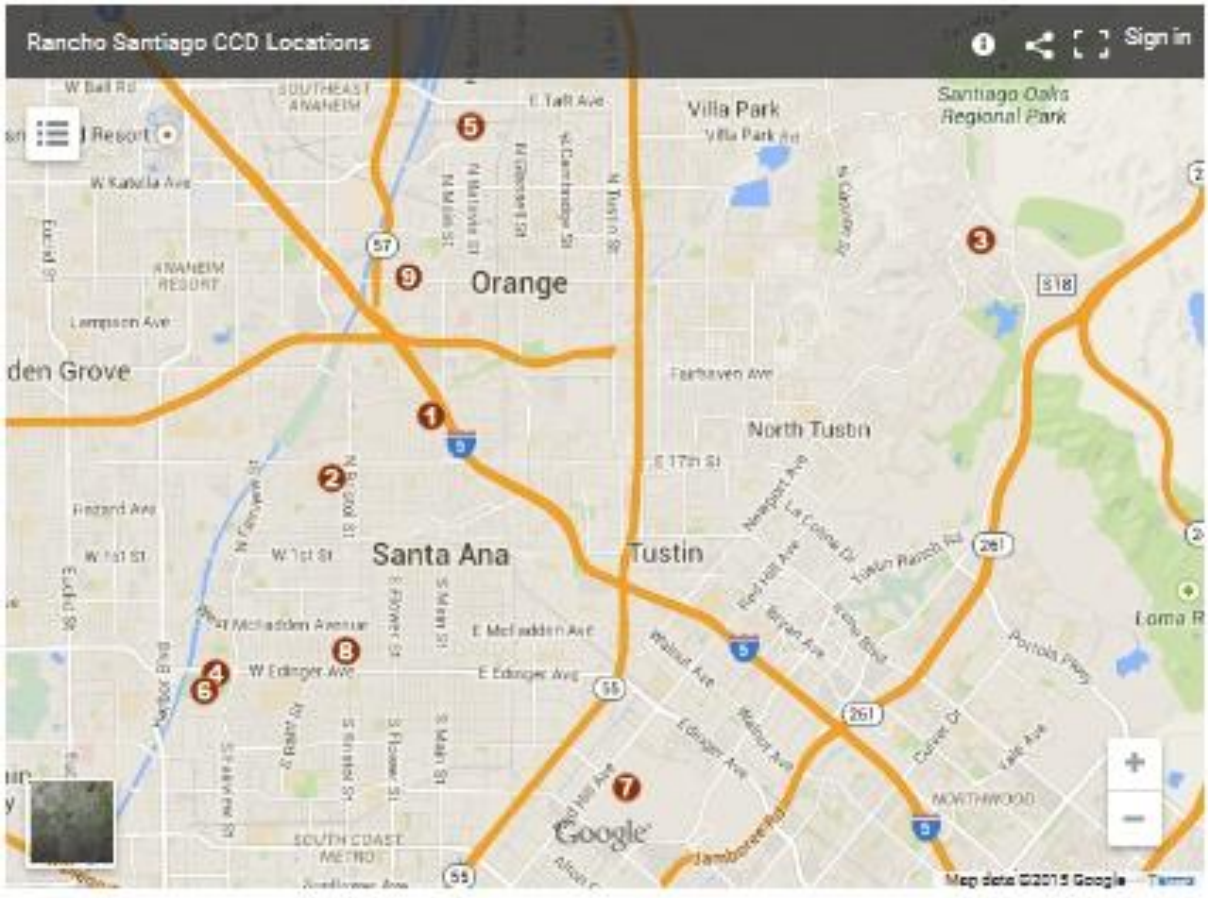
Threatened Homes in Wildland-Urban Interface Area



Source: CAL FIRE

Because of the district geography and history of disasters, it is important that district administrators place a priority on mitigating hazards and preparing for emergencies to protect its students, faculty and staff.

III. DISTRICT SITE LOCATIONS MAP



View Rancho Santiago CCD Locations in a larger map

Item	District Location	Address
1	District Operations Center	2323 North Broadway, Santa Ana 92706
2	Santa Ana College (SAC)	1530 West 17th Street, Santa Ana 92706
3	Santiago Canyon College (SCC)	8045 East Chapman Avenue, Orange 92869
4	Centennial Education Center (CEC)	2900 West Edinger Avenue, Santa Ana 92704
5	Orange Education Center (OEC)	1465 North Batavia Street, Orange 92867 1937 West Chapman Ave, Orange 92867
7	Orange County Sheriff's Regional Training Academy (OCSRTA)	115991 Armstrong Avenue, Tustin 92782
8	Digital Media Center (DMC)	1300 South Bristol Street, Santa Ana 92704

Note: Site 6 is the Regional Fire Training Center; land not owned by RSCCD; lease terminated May 2015; selling portables

District Colleges and Centers

Rancho Santiago Community College District is home to two colleges and two continuing education centers throughout the Central Orange County area. In addition, the college district presents convenient community education courses in many other locations in cooperation with its education and community partners.

Santa Ana College founded in 1915, is a comprehensive community college preparing students for the workplace as well as to transfer to four-year higher learning institutions. Students may earn an associate degree certificate. For those willing to commit to high academic achievement, honors courses are offered. The college also assists students in gaining basic skills and technology proficiency so they can pursue other goals. It is located at the corner of West 17th Street and Bristol in Santa Ana on about 58 acres. Santiago Canyon College offers a comprehensive curriculum that includes university transfer as well as associate degree programs. Honors courses are offered to those with high academic achievement goals. In addition, the college provides community services, technical certificate programs, non-credit courses and basic skills instruction. The college is located in Orange at the corner of Chapman Avenue and Newport Drive.

Centennial Education Center presents a wide variety of continuing education courses such as adult basic education, citizenship, English as a Second Language, high school completion subjects, parent education, and vocational training. It is located on West Edinger in Santa Ana.

Orange Education Center emphasizes non-credit courses to prepare individuals for occupations and independent living. These include adult basic education, business skills, citizenship, English as a Second Language and many other offerings designed to help individuals become employable.

Digital Media Center (DMC) is the first facility of its kind in Orange County combining education and business in the digital media industry. The DMC was created to stimulate economic growth in Orange County by attracting emerging businesses to the area and providing educational programs in digital media arts, TV/video communication, digital music and business seminars. The 28,000 square-foot DMC also features a business incubator program dedicated to the emerging digital media industry in the Orange County area. It is located on South Bristol in Santa Ana.

Orange County Sheriff's Regional Training Academy, a 53,000-square-foot training facility enables Santa Ana College and the Orange County Sheriff's Department to serve more than 800 Academy cadets annually while expanding the weekend and evening education and training opportunities for existing law enforcement officers in Orange County and around the state. The facility includes: classrooms, lecture halls, training yards, an auditorium/gymnasium, a physical fitness obstacle course and offices.

The district has a total of 8 sites. One of the sites, the Santa Ana College Regional Fire Training Center facilities are not owned by the RSCCD so only 7 sites will be studied as part of this plan.

Table 2: Sites OWNED BY RSCCD

Identifier	Address	Photo	Property Owned/ Leased
A	**District Operations Center** 2323 North Broadway Santa Ana 9206-1640		Owned
B	**Santa Ana Community College (SAC)** 2900 West Edinger Santa Ana 92704-3902		Owned
C	**Santiago Canyon Community College (SCC)** 8045 East Chapman Avenue Orange 92869-4512		Owned
D	**SAC Centennial Education Center** 2900 West Edinger Santa Ana 92704-3902		Own portables only, not the land Leased Site

E	**SCC Orange Education Center** 1465 North Batavia Street Orange 92867-3504		Owned
F	**SAC Regional Fire Training Center** At SAC 2900 West Edinger Santa Ana 92704-3902	Facilities not owned by RSCCD. This site will not be included as part of the plan.	Land not owned Lease terminated 5/2015 Selling portables
G	**SAC Orange County Sheriff's Regional Training Academy** 1991 Armstrong Avenue Tustin 92782		Owned
H	**SAC Digital Media Center** 1300 South Bristol Street Santa Ana 92705-3424		Owned

III. Risk Assessment
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I. What is a Risk Assessment?

Risk assessment is the five step process of estimating or calculating the potential losses in terms of life, injuries, property damage and economic damage resulting from a natural hazard incident. To conduct this analysis, it is necessary to identify and understand the hazards that can impact the district and individual campuses; assess the vulnerability of the people, buildings and infrastructure; and estimate the potential losses. Each of these tasks, as it pertains to RSCCD is described below.

II. 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 requirement is intended to provide information that will help communities identify and prioritize mitigation activities that will reduce losses from the identified hazards.

To simplify the Risk Assessment Process, we have broken it down into five simple steps. Below is a summary of the five steps.

Table 1: Federal Criteria for Risk Assessment

Section 322 Plan Requirement	How is this addressed in this plan?
Step 1: Identifying Hazards	Each section includes an inventory of the best available data sources that identify hazard areas. To the extent GIS and Hazus data are available, MMI Engineering developed maps identifying the location of the hazards impacting the district. They used Hazus for earthquake and flood. It is not available for any other hazards studied. The hazard maps are overlaid with RSCCD sites.
Step 2: Profiling Hazard Events	Each hazard section includes research and documentation on the geography, history of past hazard events, and the causes and characteristics of the hazard impact on RSCCD facilities.

Section 322 Plan Requirement	How is this addressed in this plan?
Step 3: **Assessing Vulnerability Identifying Assets**	Where data is available, the vulnerability assessment each hazard addressed provides information and an inventory on RSCCD facilities. RSCCD completed a contract with MMI Engineering for Vulnerability Assessment and mapping hazards for the Hazard Mitigation Plan. RSCCD provided their District's Insurance Property Evaluation Report to MMI Engineering to be used with the Hazus Advanced Engineering Building Module (AEBM) program. This will result in damage estimates of potential deaths, injuries and financial losses by building.
Step 4: **Risk Assessment** **(Assessing Vulnerability: Estimating Potential Losses)**	The Risk Assessment Section of this plan identifies key Critical Facilities, Dependent Care Facilities, High Occupancy Facilities and Community Critical Facilities. Vulnerability assessments have been completed for each hazard addressed in the plan and quantitative estimates were made for each hazard where data was available.
Step 5: **Assessing Vulnerability on Development Trends**	The Plan provides a description of development trends on the district's sites, future sites and buildings and their vulnerabilities, including geography and environment, as well as population and demographics.

III. Local Mitigation Plans

The local mitigation plan 201.6 is the representation of the jurisdiction's commitment to reduce risks from natural hazards, serving as a guide for decision makers as they commit resources to reducing the effects of natural hazards. Local plans will also serve as the basis for the State to provide technical assistance and to prioritize project funding.

IV. RSCCD 5-Step Risk Assessment Process

A. STEP 1: HAZARD IDENTIFICATION

This is the description of the geographic extent, potential intensity and the probability of occurrence of a given hazard. Maps were used to display hazard identification data; this document includes numerous maps that show the geographic extent of the natural hazards. Maps specific to north and central Orange County and RSCCD sites are included throughout this plan. The district and its campuses can be impacted by earthquakes and secondary hazards triggered by earthquakes; floods/storms most often resulting from the Santa Ana River runoff; dam failure from the Prado Dam; high winds including the

Santa Ana Winds; and one site has the potential for wildland interface fire. This plan discusses only natural hazards.

DEFINITIONS

Chronic Hazard
Substance or event, dangerous and damaging over a long period due to continuous or repeated exposures.

Catastrophic Hazard
Catastrophic hazards do not occur with the frequency of chronic hazards, but can have devastating impact on life, property, and the environment

RSCCD Hazard Mitigation Team collected data and compiled research for chronic hazards. Chronic hazards occur with some regularity and can be loosely predicted through historic evidence and scientific methods. Chronic hazards addressed in the plan include minor and moderate earthquakes, flood/storms, wildfires and high winds.

The district has the capability of having emergencies where the probability is low but the consequences are high. An example of this is a dam failure from Prado Dam. If following heavy rains that filled the dam and the dam construction failed (whether naturally or human-caused), over one million residents of Orange County would be impacted, have to be evacuated, and the damage could be catastrophic depending on the level of the dam and if residents had sufficient time to evacuate to higher ground. The threat of earthquake combined with fire or earthquake combined with Santa Ana Winds and fire are low probability but our highest consequence. These types of incidents happen rarely but because of the major consequences, mitigation efforts should be determined.

Catastrophic hazards do not occur with the frequency of chronic hazards, but can have devastating impact on life, property, and the environment. In Southern California, because of the geology and terrain, earthquake, flooding and wildfire have the same potential to be catastrophic as a chronic hazard.

Research was conducted referencing policies and procedures, located RSCCD information in historical documents, statistics, insurance reports, and interviewed long-time RSCCD employees. The resources and information cited in the mitigation plan provides a strong local perspective and helps identify strategies making RSCCD more disaster resistant. The Hazard Mitigation Team also identified current mitigation activities, resources and programs, and potential action items through research materials and Team meetings.

Each of the hazard-specific sections includes information on the history, hazard causes and characteristics, hazard assessment as well as goals and action items.

For the purpose of mitigation planning, RSCCD has determined five natural hazards that form the basis for the Hazard Mitigation Plan. Human-caused hazards are not included in this plan, however, it is recommended that in the second update of this plan, at the 10-year update that human-caused hazards

be added. Most planning team members felt that they needed 10 years to complete the list of mitigation strategies listed in this plan and wouldn't be ready for human-caused hazards until then.

To research all hazards that could possibly impact the district, the Team reviewed the State of California and the Orange County Hazard Mitigation Plans. The Team utilized dozens of public and private websites and documents. A review of the district's disaster history was conducted using insurance files. Considerable time was spent reviewing Orange County's Hazus data and plan.

Hazus is a regional multi-hazard loss estimation model that was developed by FEMA and the National Institute of Building Sciences. The primary purpose of Hazus is to provide methodology and software application to develop multi-hazard losses at a regional scale. These loss estimates would be used primarily by local, state and regional officials to plan and simulate efforts to reduce risks and to prepare for emergency response and recovery. It cannot be emphasized enough that the Hazus loss estimates are exactly that, estimates. The study discussed throughout this plan was the Orange County Hazus Study dated April 23, 2009.

FEMA (2009), Orange County Essential Facilities Risk Assessment (OCEFRA) Project Report, Prepared by Map-IX Mainland/Dewberry & Davis, ABS Consulting and MMI Engineering for the Federal Emergency Management Agency, Mitigation Division, Region IX. Available for download from the FEMA library at: http://www.fema.gov/media-library-data/20130726-1719-25045-0604/ocefra_report_final tagged.pdf

A list of RSCCD owned sites was compiled and reviewed by the Team. All sites are located within the cities of Santa Ana, Orange and Tustin. None of these cities had completed Local Hazard Mitigation Plans. The California Multi-Hazard Mitigation Plan and Orange County Hazard Mitigation Plan were reviewed. Maps from the plans, websites, publications and the Orange County Hazus studies were consulted.

History is one of the best indicators of future disasters. A study of past insurance claims in RSCCD include the following incidents:

01/01/2006	Santa Ana College	Weather/wind damage	Cost: Unknown
10/20/2007	Santa Ana College	Wind damage	Cost: $81,210
11/25/2008	Santiago Canyon College	Rain caused flood and mud	Cost: $51,777

On April 2, 2015, RSCCD held its Hazard Mitigation Kick-Off meeting. At the meeting the following list of hazards were considered. The Team reviewed each hazard and discussed whether they could impact RSCCD facilities. After an in-depth discussion, the Team came to a consensus on which hazards would be the basis for RSCCD Hazard Mitigation Plan.

Table 2: List of Hazards Surveyed

Hazard	Natural or Human-Caused	Preliminary Disposition	To Be Researched for This Plan
Agricultural Pests	Natural	Not Applicable. RSCCD does not have any agriculture industry and would not warrant consideration of agricultural pest strategies.	No
Avalanche	Natural	Not Applicable. Avalanches are not possible given the location and geographical features of RSCCD.	No
Coastal Erosion	Natural	Not Applicable. There are no coastal sites in the district.	No
Coastal Storm	Natural	Yes - The Team agreed to add the concern for coastal storm with the flood hazard profile.	Yes - Combine with Flood/Storm
Dam Failure	Natural	Yes - The Team agreed the Prado Dam hazard warranted mitigation strategies. It was acknowledged that there was one incident of seepage, but the dam has been raised and holds more water. (Good news/bad news)	Yes
Earthquake	Natural	Yes – The Team agreed that in addition to the earthquake hazard, mitigation strategies for fires that occur as a result of earthquakes are needed. Earthquakes are especially dangerous to RSCCD area and facilities due to the possibility of liquefaction.	Yes
Epidemic/ Pandemic	Human-Caused	The Team agreed this concern is addressed adequately through the Orange County's public health efforts.	No
Extreme Heat	Natural	Not Applicable. Extreme heat is not a concern given the location and geographical features of OC.	No
Flood	Natural	The Team agreed to research flood in combination with storms and consider this hazard for mitigation strategies	Yes - Combine with Flood/Storm

Hazard	Natural or Human-Caused	Preliminary Disposition	To Be Researched for This Plan
Hurricane	Natural	Not Applicable. Hurricanes are not a concern given the location and geographical features of RSCCD.	No
Land Subsidence	Natural	Not Applicable. The Team agreed that land subsidence is not a concern given the location and geographical features of RSCCD area.	No
Landslide and Mudslide	Natural	Not Applicable. The Team agreed that landslides and mudflow are not a concern given the location and geographical features of RSCCD area.	No
Santa Ana Winds	Natural	Yes – The Team was informed of the incidents that have occurred in Orange County and want this hazard studied.	Yes – Combine with Windstorm
Severe Winter Storms	Natural	Yes. Severe Winter Storms are a concern given the location and geographical features of RSCCD.	Yes - Combine with Flood/Storm
Terrorism	Human-Caused	Not a natural hazard. Add human-caused disasters in the first update of the plan scheduled for 2021.	No
Tornado	Natural	The Team acknowledged past incidents of high winds but they rarely reached tornado wind speeds (per the National Weather Service). The Team agreed to combine tornados with Windstorms.	Yes – Combine with Windstorm
Tsunami	Natural	Not Applicable. The district has no coastal sites.	No
Urban Fire	Natural or Human-Caused	Yes – The Team wanted this hazard researched and mitigation strategies developed.	Yes – Combine all Fire types
Volcano	Natural	Not Applicable. Volcano eruptions are not a concern given the location and geographical features of RSCCD.	No

Hazard	Natural or Human-Caused	Preliminary Disposition	To Be Researched for This Plan
Waterspouts	Natural	Not applicable – The Team agreed this is a coastal problem.	No
Wildland/Urban Interface Fires	Natural	Yes – The Team wanted this hazard researched and mitigation strategies developed if any of the sites were threatened. This will be combined with Urban Fire.	Yes – Combine all Fire
Windstorm	Natural	Yes – Windstorm will consist of Santa Ana Winds & tornado.	Yes

The Project Manager and the Plan Writer facilitated an in depth discussion on this topic. The Team was certain that flood/storm and earthquake should be included. The discussions came about when the entire Team agreed that tornado-like events hit Orange County but they rarely reached the actual definition of a tornado. High winds including Santa Ana Winds caused the exact same type of threat and damage. The only difference was the warning systems. However, in Orange County both hazard warnings were received in the exact same manner. The National Weather Service often reminded Orange County Emergency Managers that the tornado-like events did not reach the National Weather Service definition of a tornado. However, tornado type events were possible so we wanted them included in the study. The Team agreed to combine these wind-related hazards (Santa Ana Winds and Tornado) into “Severe Weather/Windstorms”.

After considerable research and dialogue with Team members, they came to a consensus that the following natural hazards should be reviewed by MMI Engineering as a potential hazards to be studied.

Table 3: Initial List of Hazards For Review

1	Earthquake
2	Floods/Storms
3	Dam Failure
4	Fire (Urban and Urban/Wildland Interface Fire)
5	Windstorms/Severe Weather

RSCCD hired MMI Engineering to conduct a Hazard Identification study to confirm which hazards should be studied. The following is the result of this study. It was learned that "All of the RSCCD's buildings are located outside mapped areas of Fire Hazard Severity zones. The committee had thought that Santiago Canyon Community College in Orange would be in the Fire Severity Zone but is only borders the zone so this information was taken back to the Team at the June 11, 2015 meeting to discuss whether fire would be one of the hazards studied. With the drastic and long-term drought in California, the Team considered the plan should study drought instead of fire.

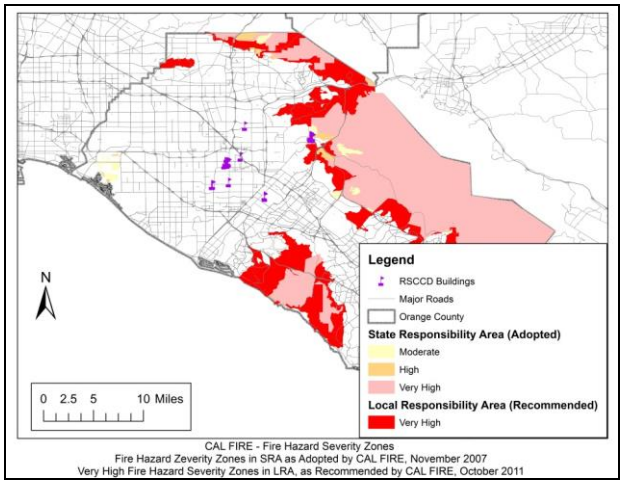
V. Fire Hazard Severity Zones

Fire hazard severity zones (FHSZs) throughout California have been mapped by the California Department of Forestry and Fire protection (CalFire), delineating areas of moderate, high and very high fire hazard severity within federal and state responsibility areas, and very high fire hazard severity within local responsibility areas. Per CalFire, uses for the FHSZ maps may include:

- Building construction standards on building permit
- Natural hazard disclosure at time of sale
- Defensible space clearance around buildings
- Property development standards such as road widths, water supply, address signs
- Considered in City and County general plans

Orange County's FHSZ maps include the FHSZ map for State Responsibility Areas (*Adopted* 11/2007) and for Local Responsibility Areas (Draft 9/2007 and *Recommended* 11/2011). As shown in **Figure 1**, the RSCCD facilities are located outside all *Recommended* and *Adopted* fire hazard severity zones and Santiago Canyon College is located the closest to any of the mapped zones; a close-up view of Santiago Canyon College is provided in **Figure 1/right.**

Figure 1: CalFire Fire Hazard Severity Zones for O.C. and Santiago Canyon College



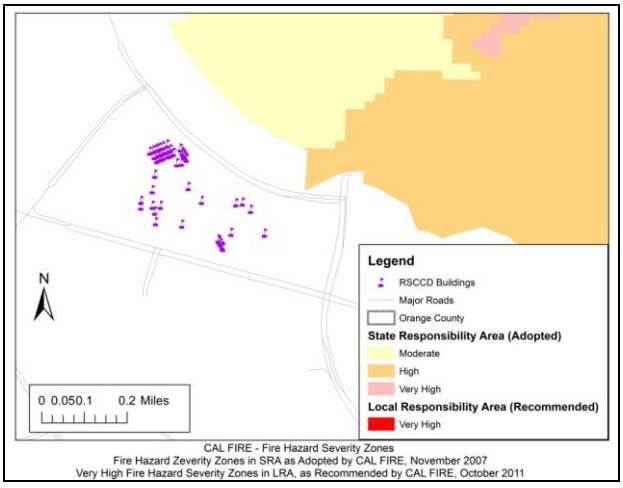


Table 4: RSCCD Hazard Identification Summary by MMI Engineering

Rancho Santiago Community College District Hazard Mitigation Plan - Hazard Identification Summary 4/24/2015

		SITE	Centennial Education Center	Digital Media Center	District Office	Orange County Sheriff's Regional Training	Orange Education Center	Santa Ana College	Santiago Canyon College
		Total # of Buildings	16	1	1	2	1	75	51
Fire Hazards	Fire Hazard Severity Zones - Local Responsibility Area	Very High	All of the Rancho Santiago Community College District's buildings are located *outside* mapped areas of Fire Hazard Severity						
	Fire Hazard Severity Zones - State Responsibility Area	Very High							
		High							
		Moderate							
Flood Hazards	Special Flood Hazard Areas Subject to Inundation by the 1% Annual Chance (100-year) Flood	Zone A - no base flood elevations determined	0	0	0	0	0	0	0
		Zone AE - base flood elevations determined	0	0	0	0	0	0	0
		Zone AH - Flood depths of 1 - 3 feet (usually areas of ponding); base flood elevations determined	0	0	0	0	0	0	0
		Zone AO - Flood depths of 1 - 3 feet (ususally sheet flow on sloping terrain); average depths determined.	0	0	0	0	0	0	0
	Other flood areas	Zone X (Shaded) - areas of 0.2% annual chance (500 yr) flood; areas of 1% annual chance flood with average depths of less that 1 foot or with drainage areas less than 1 square mile.	0	1	0	0	0	0	0
		Zone X Protected by Levee - areas protected by levees from the 1% annual chance flood	0	0	1	0	1	75	0
	Other Areas	Zone D - areas in which flood hazards are undetermined, but possible	16	0	0	0	0	0	0
		Zone X (Unshaded) - areas determined to be outside the 0.2% annual chance (500-year) floodplain	0	0	0	2	0	0	51

Rancho Santiago Community College District Hazard Mitigation Plan - Hazard Identification Summary 4/24/2015

		SITE	Centennial Education Center	Digital Media Center	District Office	Orange County Sheriff's Regional Training	Orange Education Center	Santa Ana College	Santiago Canyon College
		Total # of Buildings	16	1	1	2	1	75	51
Earthquake Hazards	Seismic Hazard Zones: Zones of Required Investigation as mapped by the California Geological Survey	*Liquefaction:* Areas where historic occurrence of liquefaction, or local geological, geotechnical and groundwater conditions indicate a potential for permanent ground displacements such that mitigation as defined in Public Resources Code Section 2693(c) would be required.	16	1	1	2	0	75	0
		Earthquake-Induced Landslides : Areas where previous occurrence of landslide movement, or local topographic, geological, geotechnical and subsurface water conditions indicate a potential for permanent ground displacements such that mitigation as defined in Public Resources Code Section 2693(c) would be required.	0	0	0	0	0	0	0 (mapped zone within 0.25 miles of site)
	Alquist-Priolo Earthquake Fault Zone	Inside mapped fault zone	All of the Rancho Santiago Community College District's buildings are located *outside* mapped Fault Zones						
	Location relative to Quaternary and Younger Faults as mapped by the California Geological Survey	Fault Name of Closest Fault	Bolsa-Fairview Fault (Newport-Inglewood - Rose Canyon Fault Zone)		El Modeno Fault	Bolsa-Fairview Fault (Newport-Inglewood - Rose Canyon Fault Zone)	El Modeno Fault		
		Approximate distance to Fault (miles)	3.8	4.6	4.6	5.3	1.6	5.5	1.3

Table 5 (next page) is a summary of the MMI Engineering Hazard Identification Summary. It identifies the hazard and each RSCCD site that could be impacted by each hazard. It was distributed at the second meeting to help finalize which hazards would be studied. It includes recommendations from the Project Manager and Plan Writer to the Team on which hazards should be studied.

Table 5: Summary of MMI Engineering Study

	Hazard	MMI Engineering Results	RSCCD Hazard Mitigation Committee Recommendation
1	Earthquake	Located within Mapped Fault Zones: All RSCCD buildings are located outside mapped fault zones. Liquefaction Investigation Zone: -Centennial Education Center -Digital Media Center -District Office -OC Sheriff's Regional Training Academy -Santa Ana College Earthquake-Induced Landslides Investigation Zone: -Santiago Canyon College (Not in the zone; .25 miles from zone)	Yes, study Earthquake because of earthquake and liquefaction threat to sites
2	Floods/ Storms	Zone X: (shaded) /0.2% annual chance of flood or 500 year flood zone -Digital Media Center Zone X: Within 500 Year flood zone but protected from 100 year flood (1% annual chance of flood) by Levee -District Office -Orange Education Center -Santa Ana College Zone D: flood hazards are undetermined, but possible -Centennial Education Center Zone X (unshaded) areas outside the 0.2% annual chance of flood/500 year flood -OC Sheriff's Regional Training Center -Santiago Canyon College (SCC)	Yes, 5 sites are exposed to potential flood hazards
3	Dam Failure	In Inundation Zone: -Santa Ana College -Centennial Education Center -Digital Media CentE0072 Borders Inundation Zone: -Orange Education Center -OC Sheriff Regional Training Academy -District Office	Yes, study Dam Failure because several sites are in the inundation zones and other sites border the inundation zones. Study which dams other than Prado Dam may impact the RSCCD.
4	Fire	Fire Hazard Severity Zone: All of the RSCCD buildings are located outside the mapped areas for Fire Hazard Severity Zone	The Team discussed the Fire Threat at Meetings 1, 2 and 3. The final decision was not

		-Santiago Canyon College borders the Fire Hazard Severity Zone	include fire but instead, include drought. .
5	Windstorms / Severe Weather	No data available	Yes, study Windstorms due to Orange County's Santa Ana Wind history of events.
6	Drought	The team decided to study drought, an ongoing problem in CA.	Study Drought because CA is in a "Drought State of Emergency"

The Hazard "Fire"
At the June 11, 2015 (second meeting), the Fire Hazard Severity Zone maps were presented. There was an intense discussion on the fire hazard. The MMI Engineering Hazard Identification Study was presented. It stated that "All buildings in the RSCCD are located outside the Fire Hazard Severity Zone." But it was also noted that one site, the Santiago Canyon Community College borders the Fire Hazard Severity Zone. The Hazard Mitigation Team voted on whether to study the hazard "fire." After reviewing the MMI Engineering study and the maps, the Team voted, NO, not to study the hazard "fire." It was suggested that in the 5-year review that fire should again be considered.

The Hazard "Drought"
It was brought to the attention of the Team that with the long term drought that California is experiencing, we may want to study the hazard, "drought." The Team held a discussion on "drought." Drought is being discussed every day in California newspapers, television news, etc. Families and businesses are being asked to cut their water usage. The district too is being asked to cut their water usage and having to work through how to best accomplish this. The Team voted, YES, study drought for this plan. They are worried that the drought will continue on for one or more years and that additional steps will be mandated to mitigate the drought. Drought is such a timely issue the Team voted to study drought as part of this Hazard Mitigation Plan.

Climate Change
In January the State OES provided assistance in developing a section on Climate Change. Climate Change was closely associated with Drought so it was combined into Drought and Climate Change. This plan will have to be enhanced in the 2021 update since not much actual data or maps done specifically for each jurisdiction were available.

B. STEP 2: PROFILING HAZARD EVENTS

Each hazard section includes research and documentation on the geography, history of past hazard events, and the causes and characteristics of the hazard impact on RSCCD facilities.

To profile the hazards both California and Orange County's Hazard Mitigation Plans were used. A history of California and Orange County disasters were reviewed. Major disasters have Presidential Declarations and are Federally Declared Disasters; moderate disasters have only State Declarations and a State of Emergency. When a local disaster does not require major resources it remains a local disaster. This plan reviewed both Federally Declared Disasters and States of Emergency.

C. STEP 3: VULNERABILITY ASSESSMENT/INVENTORYING ASSETS

The District provided its Insurance Property Evaluation Report to contractor MMI Engineering who was hired to provide mapping overlays of district facilities with the hazards (earthquake and flood). MMI Engineering will use the Orange County Hazus study of 2009 to show how RSCCD facilities vulnerability to the hazards.

The resulting report from MMI Engineering used RSCCD insurance data to complete the Hazard Identification and Earthquake Risk Assessment. The report is entitled:

> Rancho Santiago Community College District (RSCCD) Hazard Mitigation Plan
> Hazard Identification and Earthquake Risk Assessment
> MMI Engineering Project No. MMHB073, Memo MMHB073-TM-001, Rev. 0

HAZUS PROJECT OVERVIEW

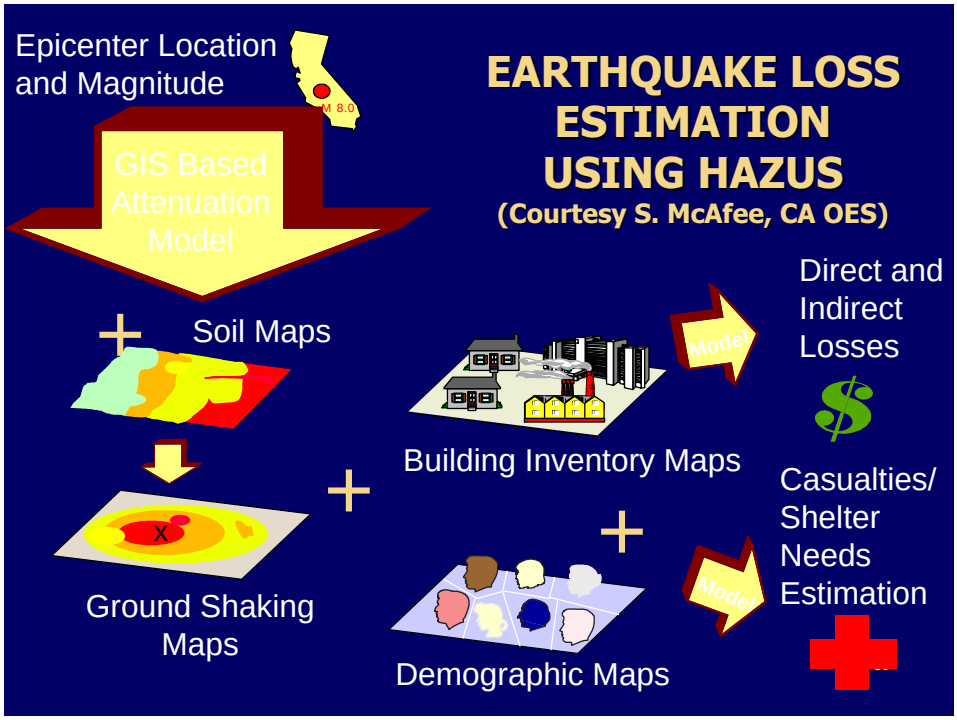
In 2007, Orange County had an estimated population of 2,997,033 people, or about 8% of the total population of California (U.S. Census Bureau, 2007 estimate). The Hazus study is based on that data. The 2010 Orange County population increased to 3,010,232. The County includes 34 incorporated cities, as well as various unincorporated areas. Within Orange County, several emergency services providers manage a significant portion of service delivery; the Orange County Fire Authority (OCFA) provides fire-fighting and other services to 22 cities and the unincorporated areas, while the Orange County Sheriff's Department (OCSD) provides law enforcement services to 12 cities and the unincorporated areas. Remaining cities handle law enforcement and fire-fighting with their own city personnel. The three cities impacted have the following public safety services:

Table 6: RSCCD Facilities Public Safety Providers

City	Fire Service Provider	Law Enforcement Service Provider
Santa Ana	Orange County Fire Authority (OCFA)	Santa Ana Police Department
Orange	Orange City Fire Department	Orange City Police Department
Tustin	Orange County Fire Authority (OCFA)	Tustin Police Department

Because of this, the Team was expanded to include an OCFA member as of June 2, 2015.

Seismic hazards are a significant issue for California in general, and for Orange County, in particular. In 2000, the California Division of Mines and Geology (now the California Geological Survey) used Hazus to develop statewide annualized earthquake loss estimates (CDMG, 2000). In 2001, FEMA similarly used Hazus to estimate national annualized earthquake losses (FEMA, 2001). This study was later updated using Hazus (FEMA, 2008). Both FEMA studies indicated that California suffered the bulk of the country's average annual losses (74% in 2001, and 66% in 2008), with Orange County suffering about 6.5% of the California loss and about 5% of the total national annualized earthquake loss in 2001. (Similar estimates for Orange County cannot be extracted from the 2008 results, because Orange County is grouped with Los Angeles County in the Los Angeles – Long Beach – Santa Ana metropolitan statistical area).



California is also subject to frequent and often destructive flooding. As noted in the State of California's Multi-Hazard Mitigation Plan (2004): "While ShakeMap earthquakes tend to cause more extensive and costly damage, floods are noted for their persistence and effect on numerous communities during a single event. Of the 72 federally declared disasters in the state occurring between 1950 and 2000, 50 percent have been flood related. Between 1992 and 2002, every county in California was declared a federal disaster area at least once due to a flooding event. The counties of Los Angeles, Orange, and San Bernardino were declared federal flood disaster areas five times.

Thus, understanding the potential impacts of earthquakes and floods on the district's facilities and the populace is an essential element of good hazard mitigation planning.

Hazus, developed for the Federal Emergency Management Agency (FEMA) by the National Institute of Building Sciences (NIBS), is a standardized, nationally applicable natural hazard loss estimation methodology implemented through PC-based geographic information system (GIS) software. First released as an earthquake loss estimation tool in 1997, the latest release of Hazus (currently released as Maintenance Release 3, or MR3) includes flood and hurricane wind modeling capability. Hazus MR3 also includes a new Comprehensive Data Management System (CDMS) for incorporating more accurate local data into the Hazus databases which will be used in the study. Its flood model also includes a streamlined process for incorporating DFIRM data, which will be exercised as part of this pilot study.

Default data provided with the Hazus software allows a user to run a simplified or "Level 1" analysis without collecting additional data. In many cases, however, the quality of default national data delivered with the software is less than optimal; it may originate from agencies other than FEMA, or was collected for applications other than loss estimation. Accordingly, the accuracy of Hazus results can be greatly improved with the input of various "user supplied" data on either the hazard or the affected assets or both. Such an enhanced analysis is usually referred to as a "Level 2" analysis.

For the purposes of this RSCCD Hazard Mitigation Plan it utilized the Hazus information run by MMI Engineering using Hazus Advanced Engineering Building Module (AEBM).

Hazus produces estimates of damage to regional building stocks, lifelines and essential facilities, economic loss, and social impacts. Local, state and federal government officials use Hazus for mitigation, emergency response, and recovery planning. Default data built into Hazus MR3 includes regional building inventory databases representing building stock conditions in the year 2006, "proxied" from 2000 census data (e.g., square footage of residential structures is estimated from census data on housing unit counts) and commercially-available data on employment and businesses. These data are aggregated data, i.e., the database tabulates attributes such as the total building square footage and dollar exposure by census block (flood) or tract (earthquake), rather than on a building-by-building basis. For the Orange County pilot study, available parcel data was used to update this aggregate inventory data for selected residential occupancy types.

In contrast to the general building stock, Hazus estimates damage and functionality of essential facilities as well as transportation and utility lifelines, on a building or facility specific basis. In addition to developing enhanced regional building inventory data, the Orange County pilot study also generated significantly improved data sets for essential facilities, required for emergency response, community resilience and rapid recovery. Within Hazus, "Essential Facilities" include hospitals, fire stations, police stations, emergency operations centers (EOCs), and schools, including both grade schools and colleges and universities.

The Hazus Earthquake Module estimates damage state probabilities (i.e., the probability that a facility will be in each of five damage states; None, Slight, Moderate, Extensive, or Complete) and functionality (i.e., estimates of facility functionality, in percent, at Day 1, 3, 7, 10, 14, 30 and 90). Economic losses are not explicitly generated for essential facilities, but mean damage estimates were computed outside the Hazus program for this pilot study. In the Hazus Flood Module, essential facilities functionality and mean damage (in terms of percent of replacement cost) are computed directly.

As noted above, the OC Hazus was used to generate general building stock and essential facility loss estimates for six different natural hazard scenarios. Two of the scenarios were large scenario earthquakes selected by the Orange County Community Executive Team that was established as part of the project in preparation for the Orange County Hazard Mitigation Plan. The earthquakes chosen for analysis were a (1) M6.9 Newport-Inglewood Scenario Earthquake and a (2) M6.6 San Joaquin Hills Scenario Earthquake. Three scenarios involved major riverine flooding: (3) a 1% annual chance flood event (100-year flood), (4) a 1% annual chance flood event (100-year flood) with the assumed failure of the entire levee system, (5) and a 0.2% annual chance flood event (500-year flood).

Results from the five scenario analyses will help government officers and administrators better understand where and how significant natural hazard risks exist throughout the county. This risk information should prove quite useful for developing effective disaster mitigation plans and designing emergency response exercises. The results can also be used in developing justifications for hazard mitigation grant funding requests to FEMA. And with a more updated county database and the Hazus tool, county and city officials will be able to model other natural disasters, obtaining much more accurate estimates of the potential effects for disaster mitigation planning.

This is a combination of hazard identification with an inventory of the existing (or planned) RSCCD property developments, populations and financial impact that may be exposed to the five identified hazards.

RSCCD provided their most recent Insurance Building Asset Values, types of buildings, square footage, construction type, number of floors, etc. to MMI Engineering to prepare damage cost estimates.

Hazus is available only for earthquake and flood. There will be damage cost estimates for earthquake and flood scenarios that are considered the most probable for Orange County, California

Table 7: RSCCD Building Data Considered in the Risk Assessment

Site	Number of Buildings	Peak Daytime Occupancy (Number of People)	Building Area (Square Feet)	2015 Building Replacement Value ($1,000)	2015 Content Replacement Value ($1,000)
Centennial Education Center	15	1,809	49,263	8,008	1,352
Digital Media Center	1	283	28,184	6,877	3,049
District Office	1	399	61,002	14,744	1,895
Orange County Sheriff's Regional Training	2	305	52,455	13,547	2,121
Orange Education Center	1	1,600	84,404	17,609	0
Santa Ana College	76	14,925	599,107	136,298	30,010
Santiago Canyon College	50	9,513	406,026	103,223	25,323
TOTAL	146	28,834	1,280,441	300,306	63,750

Table 8: Buildings not Included in the District's Space Inventory Report

Buildings Using Judgment-based Occupancy Estimates	Site & Building Number (2015 Insurance Appraisal Report)
SAC - Vending Building	Site 2 Building 17
SAC - Campus Vehicles Building	Site 2 Building 20
SAC - Office/Restroom Building	Site 2 Building 22
SAC - Weight Pavilion	Site 2 Building 24
SAC - Maintenance Storage Building	Site 2 Building 25
SAC - Mechanical Pool Building	Site 2 Building 26
SAC - PE Office Building	Site 2 Building 27
SAC - Office/Storage Building	Site 2 Building 28
SAC - Middle School (Business/Computer) Bldg	Site 2 Building 31
SAC - Pool Equipment Building	Site 2 Building 32
SCC – Childcare Building C	Site 6 Building 04
SCC - TV Studio Building	Site 6 Building 08
SCC - Boiler Building	Site 6 Building 09
SCC - Concession Stand	Site 6 Building 11
SCC - Grounds Building	Site 6 Building 12
SCC - Maintenance and Operation Building	Site 6 Building 15
OCSRT - Maintenance Office Building	Site 8 Building 02

D. STEP 4: RISK ASSESSMENT

The purpose of this task is to estimate the potential losses in a geographic area by assessing the damage likely to be sustained. This level of analysis involves estimating risk. The components in this plan of risk analysis are ***Geographic Area***, ***History***, ***Probability of Occurrence*** and ***Potential Impact*** to RSCCD

The District provided the Hazard Mitigation Team with their FUSION property insurance data. This data was combined with the 2009 Orange County Hazus study to determine potential dollar losses. Hazus data was only available on the hazards of earthquake and flood/storms.

CRITICAL FACILITY DESCRIPTIONS

High-Risk Facilities
High Risk Facilities, if severely damaged, may result in a disaster far beyond the facilities themselves. Examples include power plants, dams and flood control structures, freeway interchanges, bridges, and industrial plants that use or store explosives, toxic materials or petroleum products.

High-Occupancy Facilities
High Occupancy Facilities have the potential of resulting in a large number of casualties or crowd-control problems. This category includes high-rise buildings, large assembly facilities, and large multifamily residential complexes RSCCD has seven facilities with a population of over 100 (faculty, students, and staff combined). These will be considered High Occupancy for the purpose of this plan.

Dependent-Care Facilities
Dependent-Care Facilities such as preschools and schools, rehabilitation centers, prisons, group care homes, and nursing homes, house populations with special evacuation considerations. All 15 sites are either schools or facilities that support the educational process.

Economic Facilities
Economic Facilities are those facilities that should remain operational to avoid severe economic impacts. These facilities include banks, archiving and vital record-keeping facilities, airports, and large industrial or commercial centers.

Critical Facilities
Critical Facilities are those parts of a community's infrastructure that must remain operational after a disaster. Community Colleges do not have hospitals, fire stations and police stations as cities do. They have district emergency operation centers (EOCs), Campus EOCs, Health Centers and information technology and communication centers.

These are facilities critical to emergency response and recovery activities such as life safety, property protection, environmental protection and damage assessment and reporting procedures.

Community Critical Facilities
The following facilities owned and/or operated by RSCCD have been identified by the Team as Community Critical Facilities. These facilities have been identified in Orange County Operational Area, County, Cities and/or District Emergency Plans as facilities necessary for community response and recovery. All RSCCD parking lots may be utilized as staging areas for police, fire and other emergency responders in times of disasters. In addition, the following sites have been identified as:

- Shelters – as stated in the District/American Red Cross Orange County Chapter Agreement
- Local Assistance Centers (LAC) – Orange County Operational Area and City Emergency Operation Plans
- Points of Dispensing (POD) for medications and supplies – Orange County Operational Area Plan and Orange County Health Care Agency Emergency Operations Plans
- Staging Areas – Orange County Operational Area and City Emergency Operations Plans

RSCCD Pre-Identified Critical Facilities

These lists will help RSCCD prioritize its hazard mitigation strategies.

Table 9: HIGH OCCUPANCY SITES LISTED IN POPULATION ORDER

Identifier	Site Name	Total Student Population	Priority
2	Santa Ana College (SAC)	16,300	1
3	Santiago Canyon College (SCC)	8,200	2
4	Centennial Education Center (CEC)	2,000	3
5	Orange Education Center (OEC)	900	4
7	Orange County Sheriff's Regional Training Academy (OC SRTA)	200	5
8	Digital Media Center	283	6
1	District Operations Center	150	7

Table 10: DEPENDENT CARE/CHILD CARE FACILITIES LISTED IN POPULATION ORDER

Identifier	Site Name	Child Population	Adult Staff Population	Priority
2	Santa Ana College (SAC) 1530 West 17th Street Santa Ana	190	60	**1**
4	Centennial Education Center (CEC) 2900 West Edinger Santa Ana	75	20	**3**
3	Santiago Canyon College (SCC) 8045 East Chapman Avenue Orange	95	30	**2**
5	Orange Education Center (OEC) 1465 North Batavia Street Orange	Temporarily Closed	Closed	**4**
Local church; not owned by RSCCD	Santa Ana College Child Development Center East Campus 1510 North Parton Street Santa Ana	75	20	**Not owned by RSCCD**

Once the Orange Education Center Child Care site is reopened, the priority will have to be re-evaluated.

Once all child care facilities are reopened and operation there are expected to be over 900 children under the care of the district.

RSCCD CRITICAL FACILITIES

Critical Facilities are district and campus sites needed during emergencies. They include:

- Emergency Operations Centers (EOC) where sites will manage the response to the emergency
- IT and Communications centers because they are critical for communicating damage assessments and resource requests to the Orange County Operational Area (County EOC) during emergency incidents. These facilities are necessary to respond and recover from a disaster.
- Health Centers where first aid can be provided and first aid supplies are maintained
- Child Care Centers/Dependent Care sites

Table 11: CRITICAL FACILITIES NEEDED FOR DISASTER REPONSE

Facility #	Facility Name	Address	Building/ Room #	Description
1	RSCCD District	2323 North Bristol Santa Ana	▪ District EOC: Floor #1 Large Incident: Room 107 District Boardroom Small Incident: Chancellor's Conference Room ▪ IT: Floor #2	Used to manage emergencies for ***all*** RSCCD facilities District Information Technology
2	Santa Ana College	1530 West 17th Street Santa Ana	▪ Campus EOC: -Large Incident: A-214 Caesar Chavez Bldg. -Small Incident: X-101/ Campus Safety Office ▪ Student Health Center/ U-120 or #16 IT: A-117/Caesar Chavez Bldg.	Used to manage emergencies at Santa Ana College ▪ Used to Manage medical incidents
3	Santiago Canyon College	8045 East Chapman Orange	▪ Campus EOC: Building A/01 ▪ Health Care Center: Building T/03 ▪ IT: Building 18, room 107	▪ Used to manage emergencies at Santiago Canyon College ▪ Used to manage medical incidents
4	Centennial Education Center	2900 West Edinger Avenue Santa Ana	▪ Campus EOC: Building A ▪ Large Incident: outside, back of Building E ▪ No Health Care Center	▪ Used to manage emergencies at Centennial Education Center
5	Orange Education Center	1465 North Batavia Street Orange	▪ Campus EOC: Parking Lot ▪ No Health Care Center	▪ Used to manage emergencies at Orange Education Center
7	Orange County Sheriff's Regional Training Academy	15991 Armstrong Avenue Tustin, CA 92782	▪ Campus EOC: Main Conference Rm ▪ No Health Care Center	Used to manage emergencies at the OC Sheriff's Regional Training Academy
8	Digital Media Center	1300 South Bristol Street Santa Ana	▪ Campus EOC: Second Floor Administration	Used to manage emergencies at the Digital Media Center

COMMUNITY CRITICAL FACILITIES NEEDED FOR THE COMMUNITY DURING A DISASTER

Community Critical Facilities are also utilized during emergencies by the community. They are outlined in Orange County Operational Area, County, and City emergency plans. These sites include:

- Public shelters
- Local Assistance Centers (LAC)
- Points of Dispensing (POD)
- Staging Areas

Table 12: COMMUNITY CRITICAL FACILITIES NEEDED FOR DISASTER RESPONSE

Identifier	Site Name	Shelters	LAC	POD	Staging Areas
1	RSCCD District				Yes
2	Santa Ana College	Yes Gym*	Possibly	Yes	Yes
3	Santiago Canyon College	Yes Gym*	Possibly	Yes	Yes
4	Centennial Education Center				Yes
5	Orange Education Center				Yes
7	Orange County Sheriff's Regional Training Academy				Yes
8	Digital Media Center				Yes

*RSCCD is not a primary shelter site. The district's facilities will only be used as public shelters, after available high schools in the area have been utilized.

E. STEP 5: ASSESSING VULNERABILITY ON FUTURE DEVELOPMENTS

This task provides a general description of land uses and development trends for RSCCD properties so that mitigation options can be considered in land use planning and future land use decisions. This Plan provides an overview of the district facilities (see Section II for complete site list). Section II also includes the geography, history, demographics of students. Analyzing these components can help in identifying potential problem areas and can serve as a guide for incorporating the mitigation strategies contained in this plan into other RSCCD documents including future facility planning.

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 District, City, County or State agencies and private sources.

Regardless of the data available for hazard assessments, there are numerous strategies RSCCD can take to reduce risk. Mitigation strategies can further reduce disruption to essential facilities, reduce the risk to human life, and alleviate damage to public property and infrastructure.

The Director of District Construction reviewed the Facilities Master Plan and reviewed the Hazus earthquake and flood facility studies. He utilized the data from the these three studies and the two passed bond measures to come up with “RSCCD Development Trends” which is located in the Plan Maintenance section. This was one of the final sections of the plan to be completed.

VI. HAZARD MITIGATION BENEFIT-COST REVIEW

FEMA requires local governments to analyze the benefits and costs of a range of mitigation actions that can reduce the effects of each hazard within their community. Benefit-cost analysis is used in hazard 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. The analysis is based on calculating the frequency and severity of a hazard, avoided future damages and risk.

A hazard mitigation plan must demonstrate that a process was employed that emphasized a review of benefits and costs when prioritizing the mitigation actions. The benefit-cost review must be comprehensive to the extent that it can evaluate the monetary as well as the non-monetary benefits and costs associated with each action. The benefit-cost review should at least consider the following questions:

1. How many people will benefit from the action?
2. How large an area is impacted?
3. How are the facilities that benefit from the action (which is more beneficial to protect, the fire station or the administrative building)?
4. Environmentally, does it make sense to do this project for the overall community?

For this plan, the Hazard Mitigation Planning Team used this data to help determine the appropriateness of each mitigation actions and idea. The Benefits: Losses Avoided - The one criterion that must be part of the evaluation and prioritization process. Priority - The planning team put together a list of actions that were acceptable and practical for addressing the problems identified in the risk assessment. They then needed a system to prioritize the action items for implementation. Action items were prioritized by numerical ranking; high, medium, or low designation. The evaluation and prioritization process helped the planning team weigh the pros and cons of different action alternatives. RSCCD used the FEMA Local Mitigation Planning Handbook from March 2013, worksheet 6.1 to facilitate this process.

VII. RANKING THE MITIGATION STRATEGIES

Ranking of Hazards by Damage Estimates
Once all research was presented to RSCCD Hazard Mitigation Team, the group agreed to rank the hazards. Hazus was used to study several hazards but was unavailable for others, so damage cost estimates could not be completed for all hazards. Since we do not have the same data for each hazard, the only system we could use to rank the hazards was for the Team to come to a consensus on which hazards posed the greatest potential impact to life, injury, and costs to RSCCD.

STAPLE/E PROCESS

The FEMA recommended STAPLE/E system was utilized by the Hazard Mitigation Team to determine the priority mitigation strategies. The FEMA worksheet 6.1 was used by the Team to rate each action item. STAPLE/E reviews the following criteria:

Social - Does the measure treat people fairly? (Different groups, different generations)

Technical - Will it work? (Does it solve the problem? Is it feasible?)

Administrative - Do you have the capacity to implement and manage project?

Political - Who are the stakeholders? Did they get to participate? Is there public support? Is political leadership willing to support?

Legal - Does your organization have the authority to implement? Is it legal? Are there liability implications? Is there property ownership issues such as co-owned properties?

Economic - Is it cost-beneficial? Is there funding? Does it contribute to the local economy or economic development?

Environmental - Does it comply with environmental regulations?

Rankings for STAPLE/E:

Low	1-3 points (all low priority items were not included in the plan)
Medium	4-5 points
Medium/High	6 points
High	7-9 points

The following data was used to help rank the district's mitigation strategies along with the team's extensive knowledge of facilities and experience.

- Table 4
- Table 5
- Table 6
- Table 7
- Table 8
- Table 9

The next few pages show layouts of the four most populated sites where the most of the Critical Facilities and Community Critical Facilities are located.

Figure 2: RSCCD – DISTRICT OFFICE

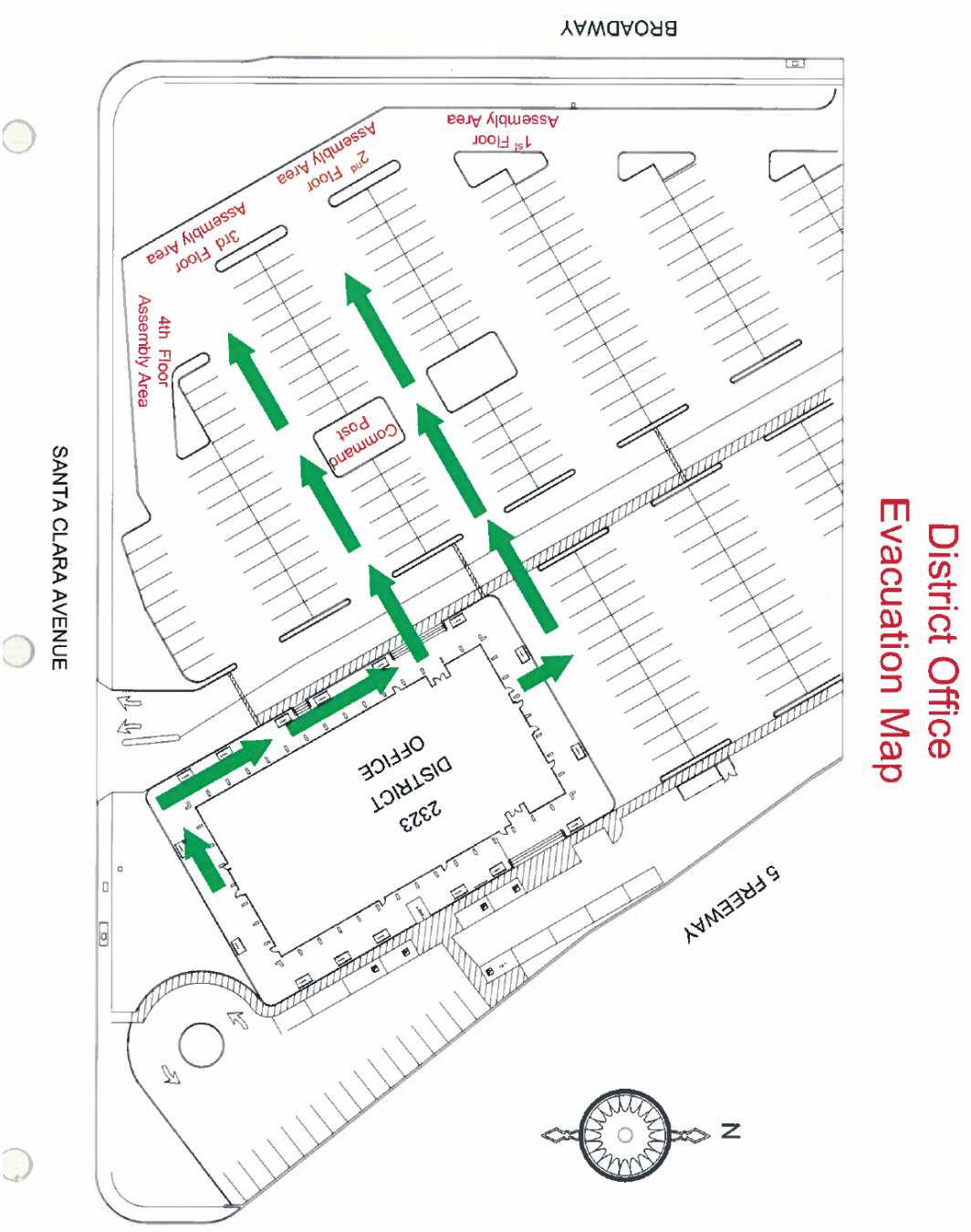
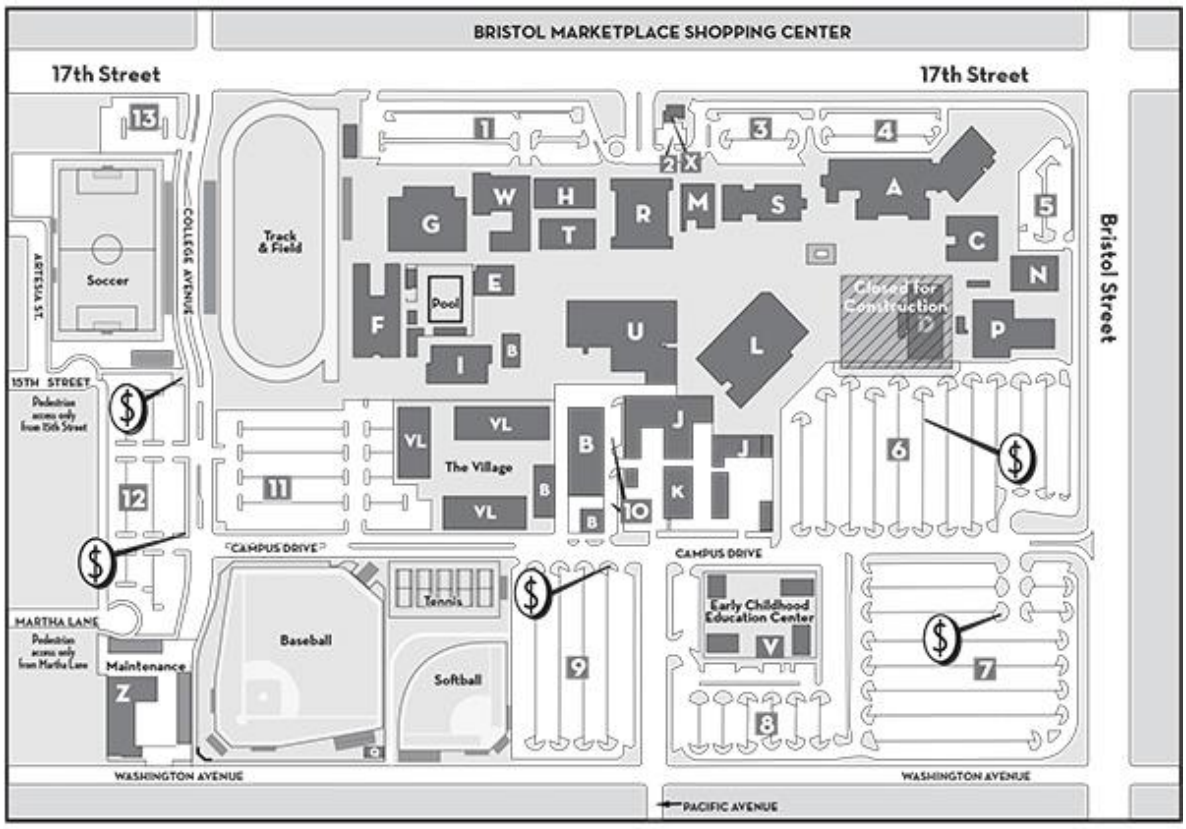


Figure 3: SANTA ANA COLLEGE



SAC FACILITIES

- **A** Cesar Chavez Building / Business / Computer Lab
- **B** Middle College High School
- **C** Fine Arts / Art Gallery
- **D** Dunllap Hall / Amphitheatre
- **E** Fitness Center
- **F** Locker Rooms
- **G** Cook Gym
- **H** Hammond Hall
- **I** Classroom Building
- **J** Auto Shop / Quick Center
- **K** Welding / Auto Diesel
- **L** Neally Library
- **M** Planetarium
- **N** Music Building
- **P** Phillips Hall Theatre
- **R** Russell Hall
- **S** Administration Building / Admissions / Counseling
- **T** Technical Arts
- **U** Johnson Center / Student Business Office Bookstore / Cafeteria / International Students Program
- **V** Early Childhood Education Center
- **VL** The Village
- **W** Exercise Science
- **X** Security / Safety
- **Z** Maintenance

PARKING

- **1** Staff Parking
- **2 - 3** Visitor Parking
- **4 - 5** Staff Parking
- **6 - 13** Student Parking (except as posted)
- **$** Permit Dispenser ($2 for 8 hours)

Figure 4: SANTIAGO CANYON COLLEGE

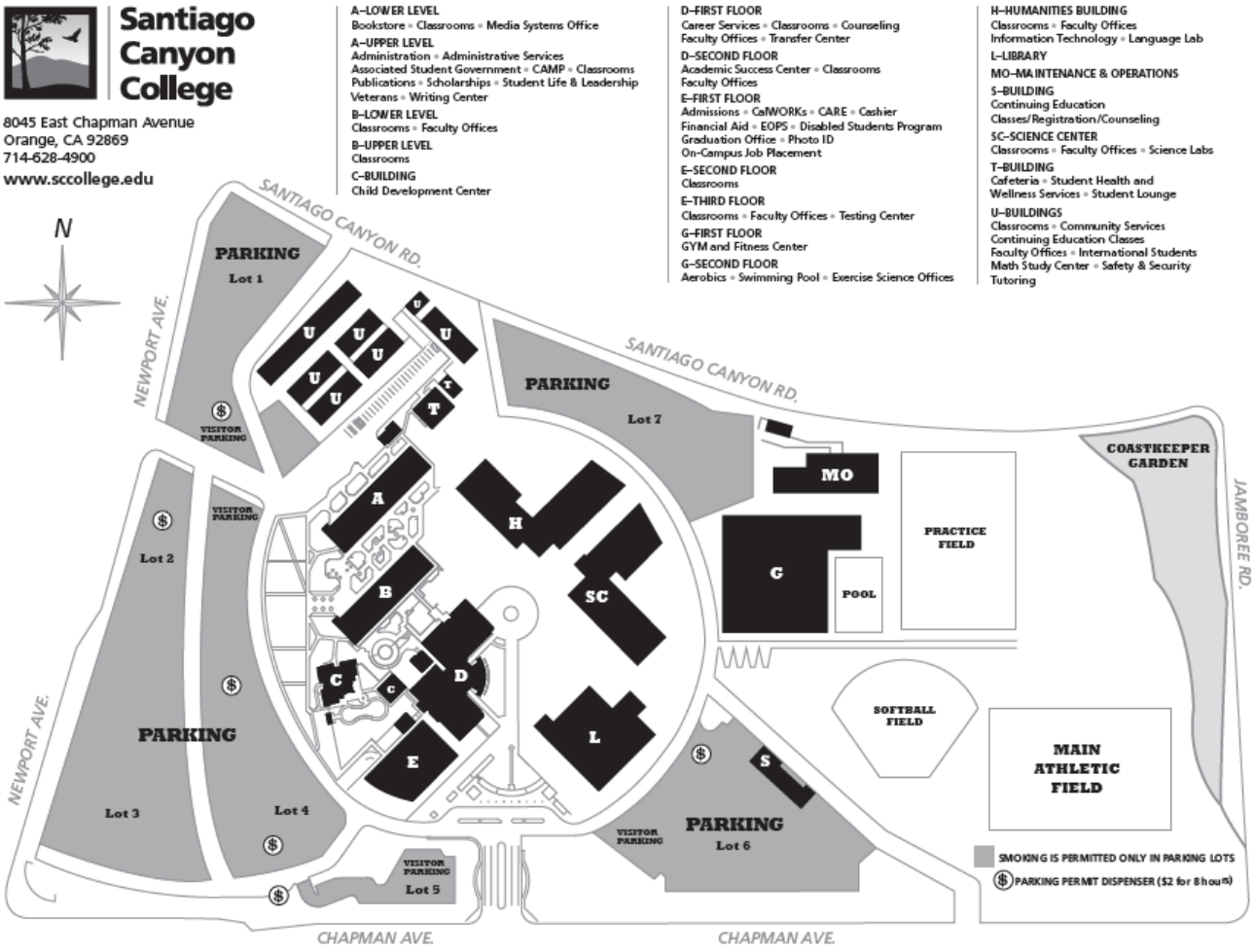
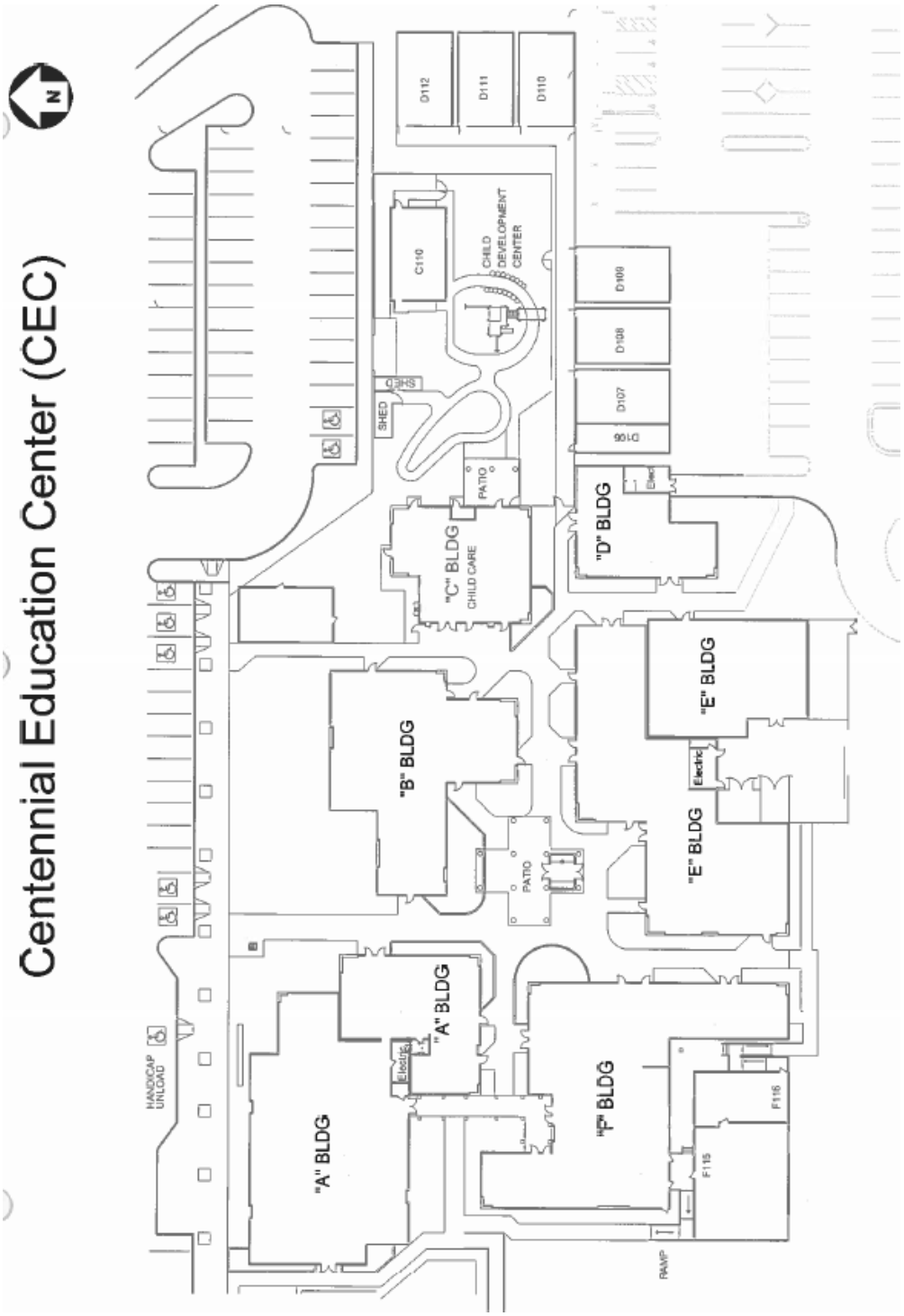


Figure 5: Centennial Education Center Layout



VIII. REPETITIVE LOSSES

After considerable research, assessing both RSCCD records and discussions with employees from facilities and finance, it was learned that RSCCD has never filed a State OES or FEMA claim on any of their properties up to this date. It is the Team's conclusion that there are no repetitive loss properties owned or operated by RSCCD.

RSCCD has filed three known insurance claims for floods and winds since 2000.

IX. SUMMARY

Natural hazard mitigation strategies can reduce the impacts of disasters on college campuses especially those considered critical facilities. Natural hazard mitigation for campuses includes developing relationships with City and County emergency management offices before disaster strikes and establishing mitigation strategies together. Collaboration among the cities, counties and school districts to create mitigation plans and actions can reduce the impacts of natural hazards.

This plan is an example of how a college district worked closely with the cities, the county and State of California to collaborate on mitigation strategies.

The following section IV. Hazards and Strategies details each of the five hazards addressed in this Hazard Mitigation Plan and their impact on RSCCD. Each hazard analysis will be followed by Mitigation Action Items for the hazard.

IV – A Multi-Hazard Strategies for all hazards
IV – B Earthquake
IV – C Floods/Storms
IV – D Dam Failure
IV – E Drought/Climate Change
IV – F Windstorms/Severe Weather

SECTION IV-A MULTI-HAZARD STRATEGIES

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SECTION IV-A
Multi-Hazard Goals and Action Items

This section provides information on the process used to develop goals and action items that pertain to the five natural hazards addressed in the Mitigation Plan. It also describes the framework that focuses the plan on developing successful mitigation strategies. The framework is made up of three parts: the Mission, the Goals, and the Action Items or strategies. The last section of the plan includes the multi-hazard Action Items. Some action items can be used for more than one hazard and they are called Multi-Hazard Action Items.

I. MISSION

The mission of RSCCD Hazards Mitigation Plan is to promote sound public policy designed to protect citizens, facilities, infrastructure, the district's 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 toward building a safer, more sustainable community.

A. Goals

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

The District will set both short term and long term goals to mitigate natural hazards.

Hazard Mitigation Plans must be updated every five years in order to maintain the district's eligibility for FEMA grants. At each 5-year plan update, the District plans to move to a higher level of understanding of the hazards, its vulnerability, and its assets that are at risk.

One of this first plan's primary goals is *to educate* the RSCCD Hazard Mitigation Team on: (1) what Hazard Mitigation is, 2) why it's important and (3) how to integrate it into facility planning, and (4) identifying funding opportunities to fund projects.

As technology becomes more available and less costly, each plan will move to a higher level of technical analysis. As GIS becomes more and more sophisticated, the plans mapping capability will improve. The district will document all actions taken during the 5-year interval between plans and newer plans will include updated information. This Hazard Mitigation Plan is like a blueprint for the district to mitigate and prevent the impact of major disasters on district facilities and therefore preventing deaths and injuries to its employees, students and guests. As time passes, the plan will be updated, refined and improved.

B. Mitigation Strategies or Action Items

The Mitigation Strategies or Action Items are a listing of activities in which District agencies and citizens can be engaged to reduce risk. Each action item includes an estimate of the time line for implementation. Short-term action items are activities that 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.

II. MITIGATION PLAN GOALS

The planning goals helped to guide the direction of future activities aimed at reducing risk and preventing loss from natural hazards. The goals listed here serve as checkpoints as RSCCD continues to implement mitigation action items.

A. Protect Life and Property

Implement short term and long term activities that assist in protecting lives and reducing property damage by making the district's facilities and especially critical facilities more resistant to natural hazards.

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

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

B. Public Awareness & Education

Improve education and outreach programs to increase public awareness of the risks associated with natural hazards and how to mitigate these hazards.

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

Once educational programs are developed, they should be used on an ongoing basis.

It is important to note that the committee wanted the information contained in the hazard sections to not only support hazard mitigation but be done in a way that was educational to both employees and the public. The hazard sections contain more information than is required but this has been done for committee, employee and student educational purposes. This education is invaluable to the employees who will respond to emergencies and to the students who will use the information to help them prepare themselves for emergencies.

C. Natural Systems

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

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

D. Partnerships and Implementation

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

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

Form financial partnerships that benefit all parties.

E. 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.

Ensure technology is in place to meet emergency communications during a disaster to facilitate: (a) mandatory damage reporting requirements; (b) life-saving resource requests and (c) coordination for recovery operations to get the district back up and operating.

III. PLAN ACTION ITEMS

The Mitigation Plan identifies action items or mitigation strategies developed through data collection and research, and the public participation process. Hazard Mitigation Plan activities may be considered for funding through Federal and State grant programs, and when other funds are made available through the District. Many short-term action items can be funded through the general fund budget but larger projects and long-term action items may need additional state and federal government dollars to complete the projects. Action items address multi-hazard and hazard specific issues. To help ensure activity implementation, each action item includes information on the time line and coordinating organizations. Upon implementation, the coordinating organizations may look to partner organizations for resources and technical assistance.

A description of the partner organizations is provided in Appendix A, the resource directory of this Plan. Many technical websites and documents were consulted and interviews were conducted within the District, the community, and the general public.

A. Coordinating Organization

The coordinating organization is the organization that is willing and able to organize resources, find appropriate funding, or oversee activity implementation, monitoring, and evaluation. Coordinating organizations usually include district personnel responsible for implementing activities and programs.

B. Ideas for Implementation

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

C. Time Line

Action items include both short and long-term activities. Each action item includes an estimate of the time line for implementation. Short-term action items are activities that District agencies may implement with existing resources and authorities within one to two years. Short-term action items often are funded through the general fund. Long-term action items may require new or additional resources or authorities, and may take between one and five years (or more) to implement.

D. Constraints

Constraints may apply to some of the action items. These constraints may be a lack of District staff, lack of expertise, lack of funds, or vested property rights. The recent and long recession slowed the progress of many local Hazard Mitigation Plans. Many of the projects were not funded due to the recession. Now that the recession has ended, the District must take advantage of the improving economy.

E. Funding Sources

The Hazard Mitigation Committee determined how best each mitigation action item would be funded. If it can be done during day-to-day business or as a yearly special project, it will be funded by General Fund budget. If not, then the District employees decided if the item could be funded under a State program, a FEMA Hazard Mitigation Grant, categorical funding or other source of funding.

F. Cost Estimate

The District included a basic cost estimate to each of its action items. This was done mostly by the District Facilities Managers and Construction Director who used their experience and judgment.

G. Benefits - Losses Avoided

The planning team considered the benefits of each action item that would result from a mitigation action versus the cost. The District did not do a benefit-cost analysis, simply a planning level assessment of whether the costs are reasonable compared to the probable benefits. The committee found this process extremely valuable.

H. Priority

The final prioritization included the committee ranking each action item by priority (low, medium, high) using the FEMA Worksheet 6.1, Mitigation Action Evaluation Worksheet. (**STAPLE/E system).** The system review includes:

IV. Multi-Hazard Action Items

Multi-hazard action items are activities that pertain to two or more of the five hazards in the Mitigation Plan: earthquake, flood/storm, fire, dam failure, and windstorm/severe weather. Action items were selected by the Hazards Mitigation Tea, as they were deemed the most feasible after consideration of a range of factors such as costs, benefits, expected degree of public support, local capabilities, and potential environmental impacts.

A. Multi-Hazard Activities

Hazard	MULTI-HAZARD ACTIVITY #1
Action item	**Identify and pursue funding opportunities to develop and implement mitigation activities. Complete a cost benefit analysis on all "high" priority projects.**
Coordinating Organization	Assistant Vice Chancellor of Administrative Services
Ideas for Implementation	Make a list of the projects that need funding and a list of the funding opportunities available. Match up which project would be funded best by which funding source. Review annually. Work with grant consultants to research grant opportunities for projects Track annual and special openings of FEMA/State OES Pre-Disaster Mitigation Project Grants. Be prepared to apply for project grants during open grant sessions (usually with a 10-14 day period.) Research State of California and other federal agency funding opportunities and other school funding sources; be prepared to apply when opportunities present themselves Conduct a FEMA approved cost benefit analysis on high priority projects.
Time Line	Ongoing
Constraints	Available Personnel and Time
Funding Sources	General Fund
Cost Estimate	Staff Time
Benefits: Losses Avoided	Funding is critical to implementing all life safety and property protection mitigation strategies.
Priority	High
Plan Goals Addressed	
	Promote Public Awareness
X	Create Partnerships and Implementation
	Protect Life and Property
	Protect Natural Systems
	Strengthen Emergency Services

Hazard	MULTI-HAZARD ACTIVITY #2
Action item	**Create additional funding mechanisms for Hazard Mitigation projects**
Coordinating Organization	Assistant Vice Chancellor of Administrative Services
Ideas for Implementation	Establish a special fund or line item in the annual budget for hazard mitigation measures Establish a local reserve fund for hazard mitigation measures
Time Line	Ongoing
Constraints	Available Personnel and Time
Funding Sources	General Fund
Cost Estimate	Staff Time
Benefits: Losses Avoided	Funding is critical to implementing all life safety and property protection mitigation strategies.
Priority	High
Plan Goals Addressed	
	Promote Public Awareness
X	Create Partnerships and Implementation
	Protect Life and Property
	Protect Natural Systems
	Strengthen Emergency Services

Hazard	MULTI-HAZARD ACTIVITY #3
Action item	**Develop and conduct NEW educational programs to educate employees, students and the public on the hazards and risk-reduction plans outlined in the District's Hazard Mitigation Plan.**
Coordinating Organization	Risk Manager and Chief, District Safety & Security
Ideas for Implementation	Use opportunities such as Benefit Fairs, Professional Development Fairs, Earthquake Preparedness Month, and other events to educate the employees, students and the public on the District's Hazard Mitigation Plan and projects. Train building captains and floor wardens on the hazards using the Hazard Mitigation Plan. This information will assist them in knowing what to prepare for, what supplies may be needed to respond, and what buildings may be more dangerous than others. Make RSCCD Natural Hazards Mitigation Plan available to the public by publishing the Plan electronically on the District's website and in the RSCCD college libraries Invite employees, students and the public to participate in the plan reviews Use local radio, newspapers and cable stations as a conduit for advertising public forums on the Hazard Mitigation Plan Utilize the maps and information contained in this Plan in outreach materials for mitigation, preparedness, response and recovery Ensure key employees are trained in the District's and Campus emergency response plans including the hazards and district vulnerabilities found in this Plan. Ensure they understand which buildings to use and which to not use during a disaster.
Time Line	Ongoing
Constraints	Pending Funding and Available Personnel
Funding Sources	General Fund
Cost Estimate	Staff time
Benefits: **Losses Avoided**	This is low cost item; joining existing events requires little cost and time; participation in these events can easily be done annually;
Priority	Medium
Plan Goals Addressed	
X	Promote Public Awareness
	Create Partnerships and Implementation
	Protect Life and Property
	Protect Natural Systems
	Strengthen Emergency Services

Hazard	MULTI-HAZARD ACTIVITY #4
Action item	**Strengthen emergency preparedness and response by linking emergency services with hazard mitigation programs**
Coordinating Organization	Chief, District Safety & Security
Ideas for Implementation	Work the Cities of Santa Ana and Orange as well as the Orange County Operational Area to help provide facilities for community use during a disaster. Take steps to ensure these facilities are usable during a disaster. Review and ensure communication systems are capable of operating following a disaster so the District can meet its legal requirement of reporting damage, requesting needed resources, providing facilities, and sharing its resources during a response to a disaster. Ensure sufficient electrical power exists in each site EOC and the Information Technology Department to manage a disaster response. Develop a list of critical facilities that need generators but do not have them. Budget for, purchase, install and test generators regularly.
Time Line	Ongoing
Constraints	Pending Funding and Available Personnel
Funding Sources	General Fund
Cost Estimate	Staff time
Benefits: Losses Avoided	Life safety; reduction in property losses; efficiency during disasters; low cost to the District; Sustained mitigation outreach program
Priority	Medium
Plan Goals Addressed	
	Promote Public Awareness
	Create Partnerships and Implementation
	Protect Life and Property
	Protect Natural Systems
X	Strengthen Emergency Services

Hazard	MULTI-HAZARD ACTIVITY #5
Action item	**Develop and Conduct Life Saving and Disaster Management Training for RSCCD staff**
Coordinating Organization	Chief, District Safety & Security
Ideas for Implementation	a. Start a RSCCD Community Emergency Response Team (CERT) program for staff, faculty and students b. Once the plan is updated, train employees on the plan c. Train on NIMS, SEMS and ICS training d. Create and conduct EOC training for identified staff at all 7 sites e. Create and Conduct Command Post Training f. Utilize the Community Forum Power Point to educate employees on Hazard Mitigation, site risks, and what facilities to avoid (do not use as a shelter or other purpose) during an emergency until mitigation projects are complete. .
Time Line	Ongoing
Constraints	Need to hire an Emergency Services Coordinator to prepare plans; develop and conduct training; design and conduct exercises; and to build and sustain the hazard mitigation and disaster preparedness outreach programs
Funding Sources	General Fund
Cost Estimate	Staff time
Benefits: Losses Avoided	Life safety; reduction in property losses; efficiency and effectiveness during disasters; sustain the hazard mitigation and disaster preparedness outreach programs
Priority	High
Plan Goals Addressed	
X	Promote Public Awareness
	Create Partnerships and Implementation
	Protect Life and Property
	Protect Natural Systems
X	Strengthen Emergency Services

Hazard	MULTI-HAZARD ACTIVITY #6
Action item	**Conduct annual meeting reviews of the Hazard Mitigation Plan and document all progress, continually advancing the plans strategies.**
Coordinating Organization	Risk Manager
Ideas for Implementation	Annually hold a meeting of the Hazard Mitigation Planning Team meeting and review each strategy for progress. - This can be done pre-budget or when Hazard Mitigation grant money becomes available or both. Document all progress At every opportunity, advance the mitigation strategies within the plan.
Time Line	5-years annually
Constraints	Time (If time does not permit, at minimal send out the Mitigation Action Items Tracking Form (in the Plan Maintenance Section) annually and ask each district team member listed on the form as Coordinating Organization to update the form.) Consolidate their responses.
Funding Sources	Staff Time
Cost Estimate	10 Hours
Benefits: Losses Avoided	This annual review and advancement of the strategies will help keep the Hazard Mitigation goals as a district priority. Conducting the annual review prior to budget planning will remind everyone of the priority projects that need to be funded. Again, conducting the review when FEMA makes hazard mitigation grants available is another opportunity to receive available funding.
Priority	
Plan Goals Addressed	
X	Promote Public Awareness
X	Create Partnerships and Implementation
X	Protect Life and Property
	Protect Natural Systems
X	Strengthen Emergency Services

Hazard	MULTI HAZARD ACTIVITY #7
Action Item	**Update the District and Site emergency plans.** **a. Include critical information and maps from the Hazard Mitigation Plan** **b. Add the list of buildings that may need structurally retrofitted and note not to use any of these facilities during a disaster incident**
Coordinating Organization	Risk Manager and Chief District Safety & Security
Ideas for Implementation	▪ Provide this data to Site Emergency Coordinators who need to understand which facilities should be avoided in a flood
Time Line	5 years
Constraints	Pending Funding and Available Personnel
Funding Sources	General Fund
Cost Estimate	Staff Time
Benefits: Losses Avoided	Life-saving. Low cost item
Priority	Medium/High
Plan Goals Addressed	
X	Promote Public/College Community Awareness
X	Create Partnerships and Implementation
	Protect Life and Property
	Protect Natural Systems
X	Strengthen Emergency Services

Hazard	MULTI-HAZARD ACTIVITY #8
Action Item	**Develop a "District Warning Plan" to improve monitoring and dissemination of all hazardous conditions. Develop a list of RSCCD key personnel who should receive the early warnings. Include: policy makers, managers, planners, as well as facility and maintenance personnel to help prepare personnel and sites for emergencies. (i.e., flood warnings, dam failure, Santa Ana wind warnings, etc.)**
Coordinating Organization	Chief District Safety & Security and his designees
Ideas for Implementation	1. Get connected with the Orange County Operational Area Control One to receive warnings via email. . 2. Monitor these warnings and disseminate warnings to key elected, management, facilities, and maintenance personnel to help prepare personnel and facilities for emergencies. 3. Develop an agreement with IT on how to get this information on the District's website in an expedited manner and update as the situation changes. 4. Develop a dissemination list of who should be notified and how these communications will take place along alternative communications systems.
Time Line	Ongoing
Constraints	Pending Funding and Available Personnel
Funding Sources	General Fund
Cost Estimate	Staff Time; Fund a District Emergency Services Coordinator
Benefits: Losses Avoided	Will save lives, prevent property damage and environmental damage and mitigate litigation following a disaster.
Priority	High
Plan Goals Addressed	
X	Promote Public/College Community Awareness
X	Create Partnerships and Implementation
	Protect Life and Property
	Protect Natural Systems
X	Strengthen Emergency Services

Hazard	MULTI HAZARD ACTIVITY #9
Action Item	**Conduct annual reviews of the Hazard Mitigation Plan and document all progress, continually advancing the plan's strategies.**
Coordinating Organization	Risk Manager
Ideas for Implementation	Schedule a meeting annually or send out this table to all district personnel on the Hazard Mitigation Team.
Time Line	5 years
Constraints	Time Limits
Funding Sources	General Fund
Cost Estimate	Staff Time
Benefits: Losses Avoided	Low cost item; minimal time
Priority	High
Plan Goals Addressed	
X	Promote Public/College Community Awareness
X	Create Partnerships and Implementation
	Protect Life and Property
	Protect Natural Systems
X	Strengthen Emergency Services

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Part IV-B Earthquake

A. Overview

Earthquakes are considered a major threat to Orange County, California due to the proximity of several fault zones, including: the San Joaquin Hills, Newport-Inglewood/Rose Canyon, Whittier, San Andreas and the little known El Modeno Fault. In March 2015. Southern California Earthquake Center reported that a Magnitude 7+ has a 75% chance of occurrence in the next 30 years. A significant earthquake along one of the major faults could cause substantial casualties, extensive damage to buildings, roads and bridges, fires, and other threats to life and property. The effects could be aggravated by aftershocks and by secondary effects such as fire, landslides and dam failure. A major earthquake could be catastrophic in its effect on the population, and could exceed the response capability of the district, the local communities and even the State of California.

Japan's 2011 earthquake demonstrates how damaging earthquakes can be to a population in a built environment. It also graphically demonstrates the catastrophic secondary hazards caused by earthquakes such as tsunamis, landslides, fires and nuclear power plant melt-downs. This is why FEMA, the State of California, Orange County and the Rancho Santiago Community College District (RSCCD) have worked together to make earthquake mitigation a priority.

B. California Earthquake Vulnerability

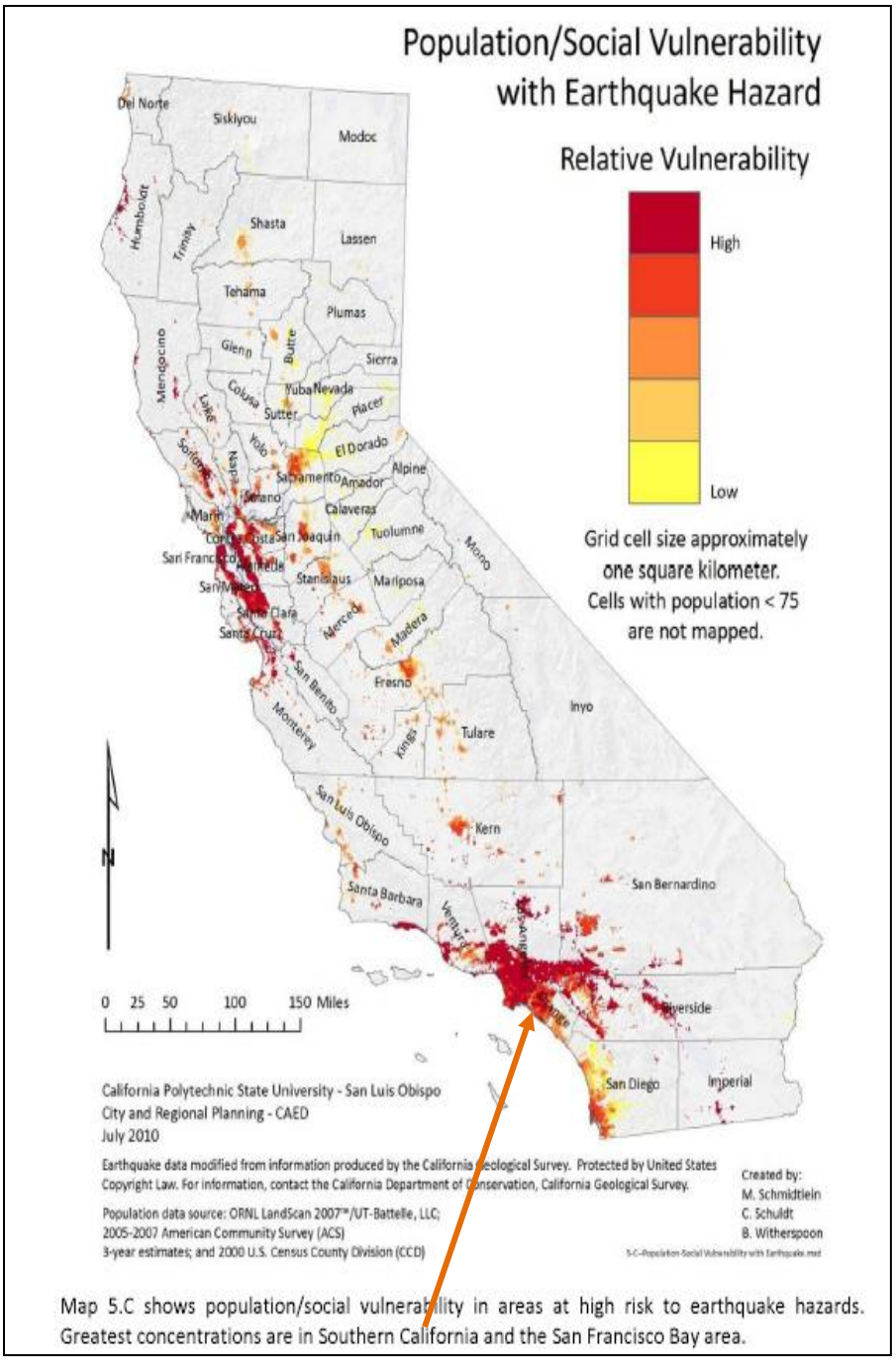
The following risk assessment map identifies which areas within California's 58 counties are particularly vulnerable to earthquakes, whether due to high population density or because of higher numbers of socially vulnerable residents. In addition to completion of the population/ social vulnerability mapping, this GIS risk assessment addresses where people live in relation to earthquakes. Areas of the state with low population density have relatively low risk compared to areas with high population density or areas with medium density and high percentages of vulnerable population.

As of the 2010 U.S. Census, the Los Angeles Metropolitan Statistical Area had a population of nearly **13 million residents**. Meanwhile, the larger metropolitan region's 2014 population estimate is **about 18.5 million** people (includes Orange County).

When a major earthquake strikes anywhere in the Los Angeles metropolitan region, the impact on the millions of individuals, families, small businesses and businesses with hazardous chemicals, transportation systems, utilities, infrastructure, public agencies, schools, hospitals, and the economy can be catastrophic, causing perhaps the worst natural disaster in the United States history.

This map uses combined “social vulnerability” factors, such as age, income, disability, education, ethnicity, gender and other variables which may reduce individual disaster resiliency.

FIGURE 1: CALIFORNIA POPULATION/SOCIAL VULNERABILITY EARTHQUAKE HAZARD



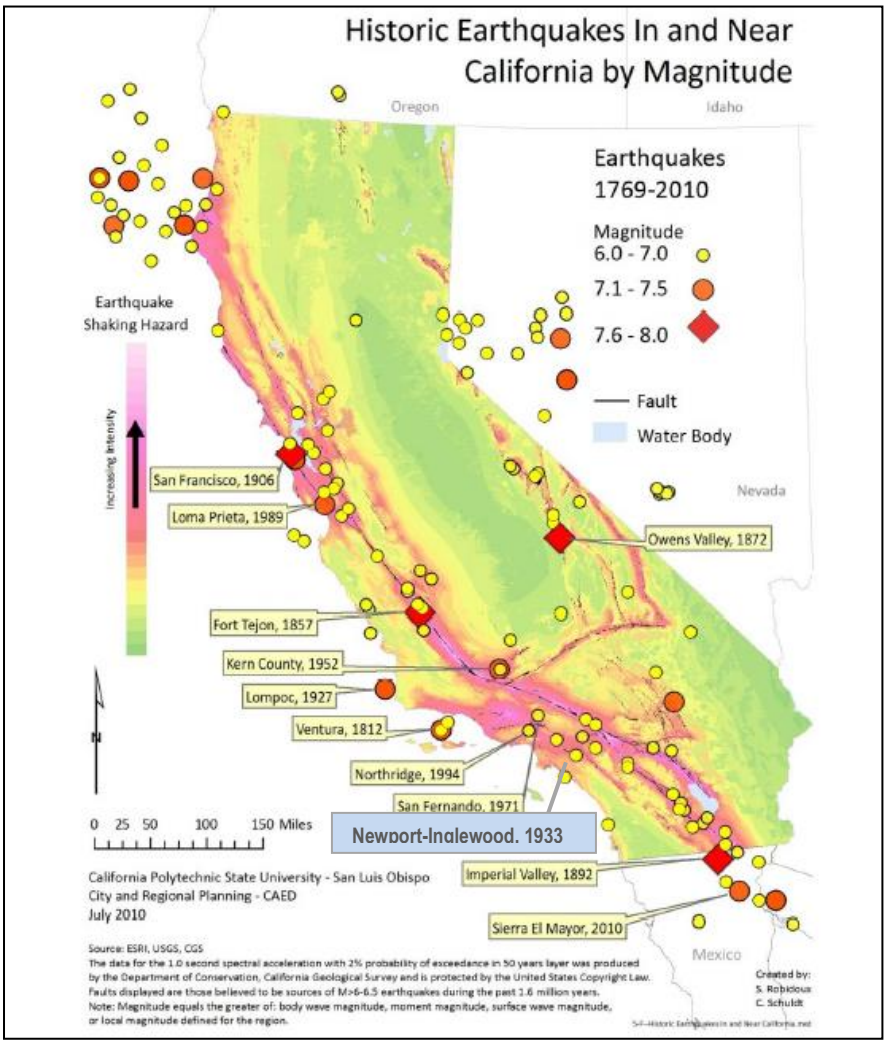
STATE OF CALIFORNIA MULTI-HAZARD MITIGATION PLAN

The RSCCD is located in an area that is between the highest and high rankings.

PREVIOUS EARTHQUAKE OCCURRENCES

The following map shows the ***Historic Earthquakes in and Near California by Magnitude***. Note the Newport-Inglewood fault in 1933 (name added to the map in blue). This 6.4 magnitude earthquake's epicenter was in Orange County (Huntington Beach/Huntington Harbour) area. This quake devastated the closest built-out area, which at the time was Long Beach, where 120 deaths occurred and hundreds of buildings collapsed, mostly buildings made of unreinforced masonry. There was damage to many schools.

FIGURE 2: CALIFORNIA AREAS DAMAGED BY EARTHQUAKE FROM 1800 – 2007



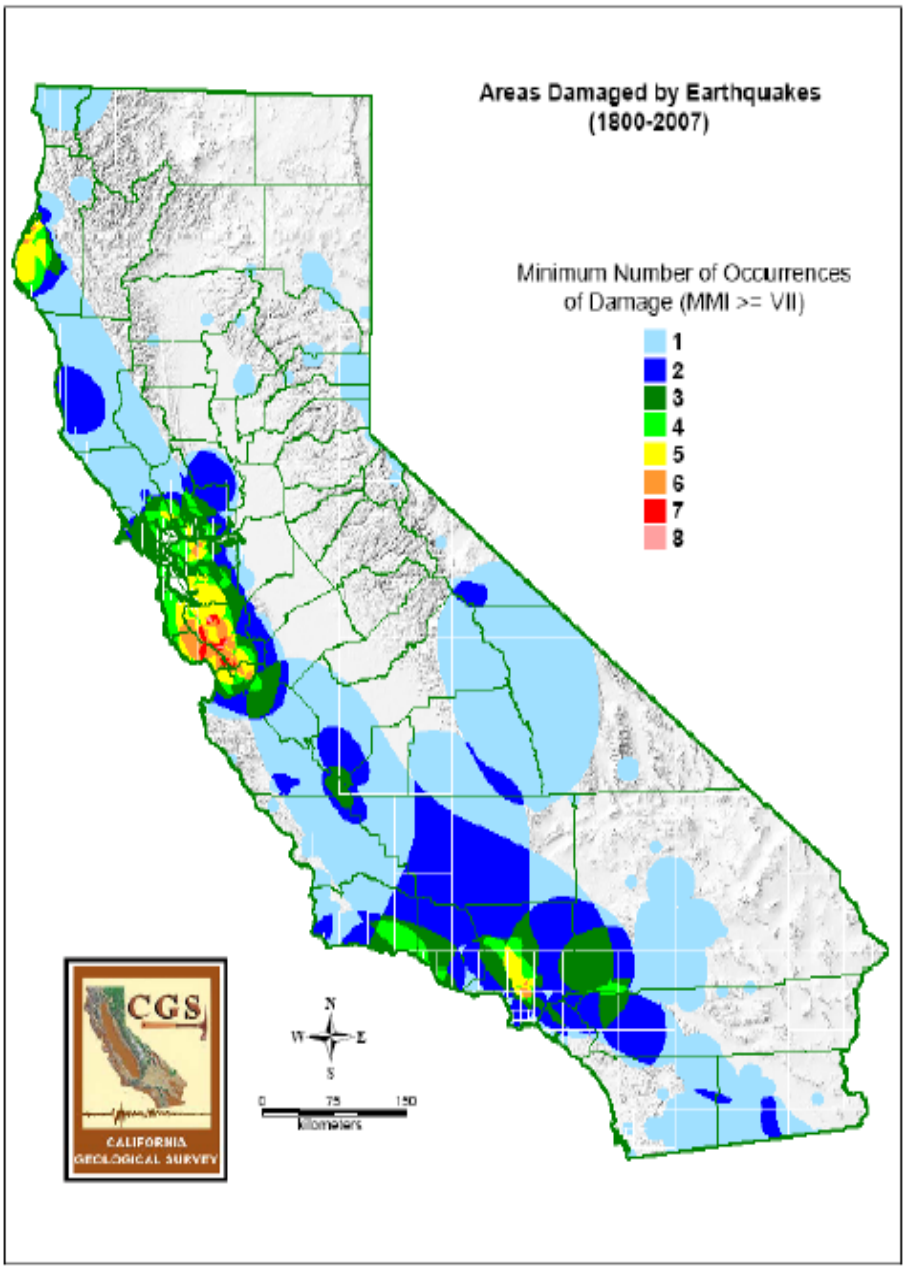
STATE OF CALIFORNIA MULTI-HAZARD MITIGATION PLAN

As reported in the RSCCD Century of Excellence, the 100th anniversary newspaper: The Santa Ana Community College once occupied a tiny building within Santa Ana High School and has evolved from its modest 25-strong student body to educate at least 30,000 students a semester.

"In 1933, an incident out of anyone's control would force Santa Ana College to move out from under the auspices of the high school when the magnitude 6.3 Long Beach earthquake and a series of aftershocks rumbled through the southland. Santa Ana College's building was amongst the worst hit. Classes were suspended for two weeks. Eventually, the east building was condemned and then demolished."

Below is the map depicting the areas damaged by earthquakes from 1800 to 2007.

FIGURE 3: AREAS DAMAGED BY EARTHQUAKES (1800-2007)



Orange County has proclaimed Local Emergencies and been part of two State and Federally Declared Earthquake Disasters since 1950. These were for the:

1987 Whittier Earthquake
- 6.0 magnitude
- 9 deaths
- 200+ injuries
- $522 million total damage
- Shaking but no RSCCD damage

1994 Northridge Earthquake
- 6.7 magnitude
- 57 deaths
- 11,846 injuries
- $46 billion total damage
- Shaking but no RSCCD damage

RSCCD has no insurance records of damage from either the 1987 Whittier or 1994 Northridge earthquakes. Newspapers were reviewed, county and State OES records show no claims for either of these earthquakes.

Below in Table 1 is a list of California earthquakes from 1971 to 2003. It includes the earthquake magnitude, direct dollar losses in millions, deaths and injuries as the result of these earthquakes.

STATE OF CALIFORNIA MULTI-HAZARD MITIGATION PLAN

TABLE 1: EARTHQUAKE LOSSES FOR CALIFORNIA 1971 TO 2003

Earthquake	Date	Magnitude	Direct Losses[a]	Deaths[d]	Injuries[d]
San Fernando	February 9, 1971	6.6	$2,200[b]	58	2000
Imperial Valley	October 15, 1979	6.5	$70[b]	0	91
Coalinga	May 2, 1983	6.4	$18[b]	1	47
Whittier Narrows	October 1, 1987	6.0	$522[c]	9	200+
Loma Prieta	October 17 1989	6.9	$10,000[d]	63	3757
Cape Mendocino	April 25, 1992	7.0	$80[c]	0	356
Landers/Big Bear	June 28, 1992	7.3	$120[c]	1	402
Northridge	January 17, 1994	6.7	$46,000[b]	57	11,846
Hector Mine	October 16, 1999	7.1		0	11
San Simeon	December 22, 2003	6.5	$263[e]	2	46

[a] *Estimate in millions of dollars*
[b] *FEMA, 1997; U.S Office of Technology Assessment*
[c] *National Research Council, 1994*
[d] *Cal EMA*

STATE OF CALIFORNIA MULTI-HAZARD MITIGATION PLAN

CALIFORNIA AND EARTHQUAKE MITIGATION EXPENDITURES

The State of California has made earthquake hazard mitigation a priority. The following table summarizes the dollar amount spent on selected earthquake mitigation projects in Californa from 1990 – 2010. *Unfortunately*, there has been little state dollars dedicated to community colleges. To date, $9 million has been spent on Community College Seismic Evaluation Surveys by the state. Most of the progress of Community Colleges has been due to locally passed bond measures.

TABLE 2: CALIFORNIA ESTIMATED EXPENDITURES ON EARTHQUAKE MITIGATION

Program or Project	Expenditures (in Millions)
Caltrans Bridge Retrofit, Replacement and Toll Bridge Program	$11,120
Bridge Retrofit by Local Governments	$1,196
Caltrans Earthquake Research	$90
Proposition 122 State Building Retrofits	$223.5
Local Government Essential Services Building Retrofits	$45.4
Technology Development	$3
AB 300 Public School Survey	$.5
Alquist Act Hospital Evaluation and Retrofit Program	$11
Cal EMA/DSA Nonstructural Pamphlet for Schools	$.05
Cal EMA Hazard Mitigation Program (HMGP)	$70
Division of the State Architect K-12 School Seismic Hazard and Retrofit/Design*	$1,550
Community College Seismic Evaluation Survey	$.9
UC Berkeley SAFER Program	$250
CSU Seismic Retrofit Program	$300
UC Seismic Retrofit Program	$2,600
Department of Insurance Retrofit Grants Program	$6.4
Pacific Earthquake Engineering Research Center	$20
PUC/CEC Earthquake Research	$5.5
TriNet/CISN	$13.8
DWR Levee Study in the Delta	$2.3
State Lands Commission Marine Oil Terminal Project	$.1
CAL EMA New State Operations Center	$26.5
Seismic Instrument Operation (DWR)	$6
Water Project Review (DWR)	$7
Division of Safety of Dams (DWR)	$5
OPR	$225
PUC	$.6
CSSC	$10
Seismic Hazard Mapping Program	$32
UC Seismographic Station and Research Center	$23
BART Retrofit Program	$28
CEA Mitigation Program	$5
Strong Motion Instrument Program	$45
Hospital Seismic Hazard mitigation 1989-2002 (all California hospitals)	$7,120
City of Los Angeles ATC 50 Residential Grading Plan	$1
San Francisco Bond Measure for URM Retrofits	$350
URM Building Seismic Retrofits	$1,730
San Francisco Community Action Plan for Seismic Safety	$7
Los Angeles Historic Property Contracts Retrofit Program	2.5
East Side Reservoir Project (Lost Angeles)	$2,000
Local Match for FEMA Post-Northridge Earthquake Seismic Hazard Mitigation	$249.7
Total	$18,970.6

NOTE: Includes possible errors due to rounding.
** 1990-2002 only*

STATE OF CALIFORNIA MULTI-HAZARD MITIGATION PLAN

RSCCD was included in the California Seismic Survey Report, April 1998. Six RSCCD buildings were on the list as recommended seismic upgrades. Five of those building have been either demolished or retrofitted. The sixth is scheduled for demolition in 2016.

EARTHQUAKE COMMUNITY IMPACTS

Following major earthquakes, extensive search and rescue operations may be required to assist trapped or injured persons. Emergency medical care, food and temporary shelter would be required for injured or displaced persons. Fires may rage out of control. In the event of a truly catastrophic earthquake, identification and burial of the dead would pose difficult problems. Mass evacuation may be essential to save lives, particularly in areas below dams and around nuclear power plants. Many families could be separated, particularly if the earthquake should occur during working/school hours, and a personal inquiry or locator system would be essential. Emergency operations could be seriously hampered by the loss of communications and damage to transportation routes within, to and out of the disaster area and by the disruption of public utilities and public safety services.

Extensive state and federal assistance could be required and could continue for an extended period. Efforts would be required to remove debris and clear roadways; demolish unsafe structures; assist in reestablishing public services and utilities; and provide continuing care and welfare for the affected population including temporary housing for displaced persons.

In general, the population is less at risk during non-work hours (if at home) as wood-frame structures are relatively less vulnerable to major structural damage than are typical commercial and industrial buildings. Transportation problems are intensified if an earthquake occurs during work hours, as significant numbers of Orange County residents commute to work in/out of Los Angeles County. Thousands also commute to and from Riverside County. An earthquake occurring during work hours would clearly create major transportation problems for those displaced workers.

Hazardous materials could present a major problem in the event of an earthquake. Orange County, one of the largest industrial and manufacturing areas in the state, has several thousand firms that handle hazardous materials, and are estimated to produce more than 100 million gallons of hazardous waste per year. The County's highways serve as hazardous materials transportation corridors, and Interstate 5 is the third busiest highway corridor in the country.

Much of the industrial base of Southern California, and Orange County in particular, consists of high-technology and bio-technology companies essential to the Nation's commerce, economy, and defense effort. A catastrophic earthquake could not only have a severe impact on the local industrial base; but also a major impact on the security of our nation. For example, Census and Department of Defense data indicate that over 50 percent of the U.S. Missile and Space Vehicle business, about 75 percent of the domestic micro-chip industry, 40 percent of the U.S. semiconductor business, and more than 20% of the U.S. optical instrument business is located in California. Much of that capacity, including prime contractors, subcontractors or supply vendors, is located in Orange County. Approximately 5,000 defense contractors are located within 50 miles of the San Andreas Fault -- including virtually all of Orange and Los Angeles Counties. In some cases, local defense contractors are the only source for some of the most critical defense systems used by our military departments.

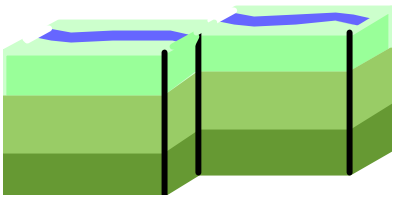
In addition to the loss of production capabilities, the economic impact on the County from a major earthquake would be considerable in terms of loss of employment and loss of tax base. Also, a

major earthquake could cause serious damage and/or outage to computer facilities. The loss of such facilities could curtail or seriously disrupt the operations of banks, insurance companies, and other elements of the financial community. In turn, this could affect the ability of local government, business and the population to make payments and purchases.

CAUSES AND CHARACTERISTICS OF EARTHQUAKES

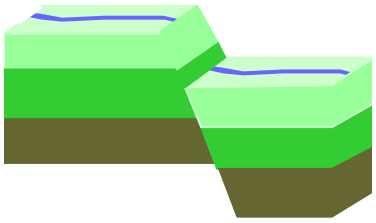
EARTHQUAKE FAULTS

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



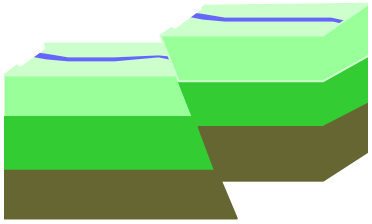
STRIKE-SLIP

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



DIP-SLIP

Dip-slip faults are slanted fractures where the blocks mostly shift vertically. If the earth above an inclined fault moves down, the fault is called a normal fault, but when the rock above the fault moves up, the fault is called a reverse fault. Thrust faults have a reverse fault with a dip of 45 ° or less.



STRUCTURAL CODES IMPROVEMENTS

The 1933 Long Beach earthquake resulted in the Field Act, mandating improved building codes for school construction. The 1971 Sylmar earthquake brought another set of increased structural standards for hospitals. Similar re-evaluations occurred after the 1989 Loma Prieta and 1994 Northridge earthquakes on steel framed high rise construction. These code changes have resulted in stronger and more earthquake resistant structures.

TABLE 3: MODIFIED MERCALLI INTENSITY (MMI) SCALE (RICHTER, 1958)

The **Mercalli** intensity **scale** is a seismic **scale** used for measuring the intensity of an earthquake. It measures the effects of an earthquake.

Value	Description
I	Not felt. Marginal and long period effects of large earthquakes.
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. Glasses clink. Crockery clashes. In the upper range of IV, wooden walls and frame creak.
V	Felt outdoors; direction estimated. Sleepers wakened. Liquids disturbed, some spilled. Small unstable objects displaced or upset. Doors swing, close, open. Shutters, pictures move. Pendulum clocks stop, start, change rate.
VI	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. Small bells ring (church, school). Trees, bushes shaken (visibly, or heard to rustle)
VII	Difficult to stand. Noticed by drivers of motor cars. Hanging objects quiver. Furniture broken. Damage to masonry D, including cracks. Weak chimneys broken at roof line. Fall of plaster, loose bricks, stones, tiles, cornices (also unbraced parapets and architectural ornaments). Some cracks in masonry C. Waves on ponds; water turbid with mud. Small slides and caving in along sand or gravel banks. Large bells ring. Concrete irrigation ditches damaged.
VIII	Steering of motor cars 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, elevated tanks. Frame houses moved on foundations if not bolted down; loose panel walls thrown out. Decayed piling broken off. Branches broken from trees. Changes in flow or temperature of springs and wells. Cracks in wet ground and on steep slopes.
IX	General panic. Masonry D destroyed; masonry C heavily damaged, sometimes with complete collapse; masonry B seriously damaged. (General damage to foundations.) Frame structures, if not bolted, shifted off foundations. Frames racked. Serious damage to reservoirs. Underground pipes broken. Conspicuous cracks in ground. In alluvial areas sand and mud ejected, earthquake fountains, sand craters.
X	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. Rails bent slightly.
XI	Rails bent greatly. Underground pipelines completely out of service.
XII	Damage nearly total. Large rock masses displaced. Lines of sight and level distorted. Objects thrown into the air.

Masonry A: Good workmanship, mortar, and design; reinforced, especially laterally, and bound together by using steel, concrete, etc.; designed to resist lateral forces.

Masonry B: Good workmanship and mortar; reinforced, but not designed in detail to resist lateral forces.

Masonry C: Ordinary workmanship and mortar; no extreme weaknesses like failing to tie in at corners, but neither reinforced nor designed against horizontal forces.

Masonry D: Weak materials, such as adobe; poor mortar; low standards of workmanship; weak horizontally.

C. ORANGE COUNTY EARTHQUAKE THREAT

Large faults as shown below (Figure 4) could affect Orange County include the:

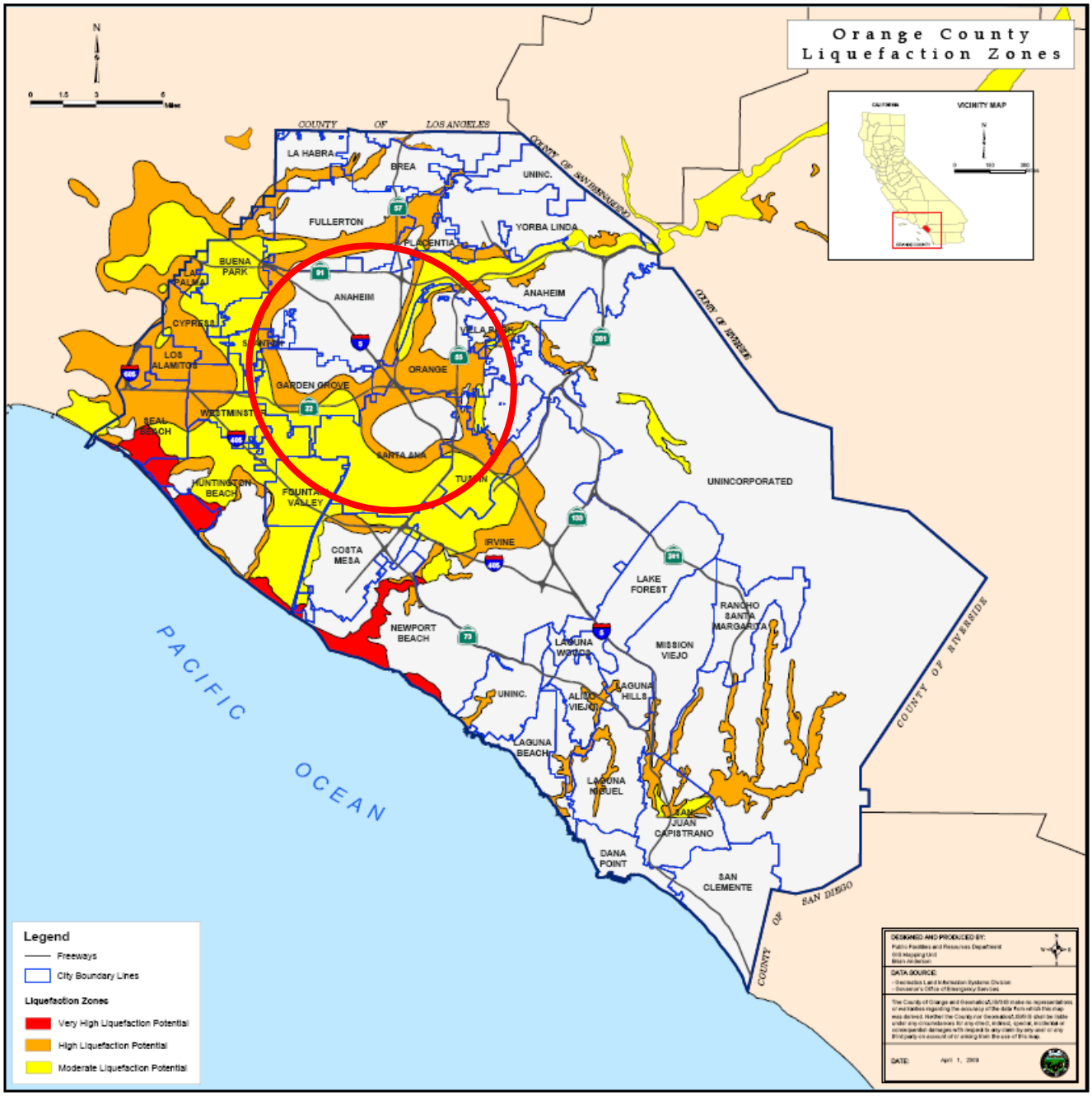
- San Andreas Fault
- Newport-Inglewood Fault
- Palos Verdes (off-shore)
- Whittier Fault
- Elsinore Fault
- San Jacinto Fault
- San Joaquin Hills Fault
- Puente Hills Fault

FIGURE 4: ORANGE COUNTY FAULT ZONES



ORANGE COUNTY HAZARD MITIGATION PLAN 2010

FIGURE 5: ORANGE COUNTY LIQUEFACTION ZONES



COUNTY OF ORANGE AND OCFA HAZARD MITIGATION PLAN

EARTHQUAKE FAULTS THAT THREATEN ORANGE COUNTY

The most recent significant earthquake event affecting Southern California was the 1994 Northridge Earthquake. At 4:31 A.M. on Monday, January 17, 1994 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.

Fifty-seven people were killed and more than 1,200 people seriously injured. For days afterward, thousands of homes and businesses were without electricity, tens of thousands had no natural 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. Over sixty-six thousand 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 the earthquake triggered liquefaction and dozens of fires also caused additional severe damage. This extremely strong ground motion felt 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 tens 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 according to the Southern California Earthquake Center.

But the 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/Rose Canyon, 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 Whittier Narrows earthquake in October 1987.

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

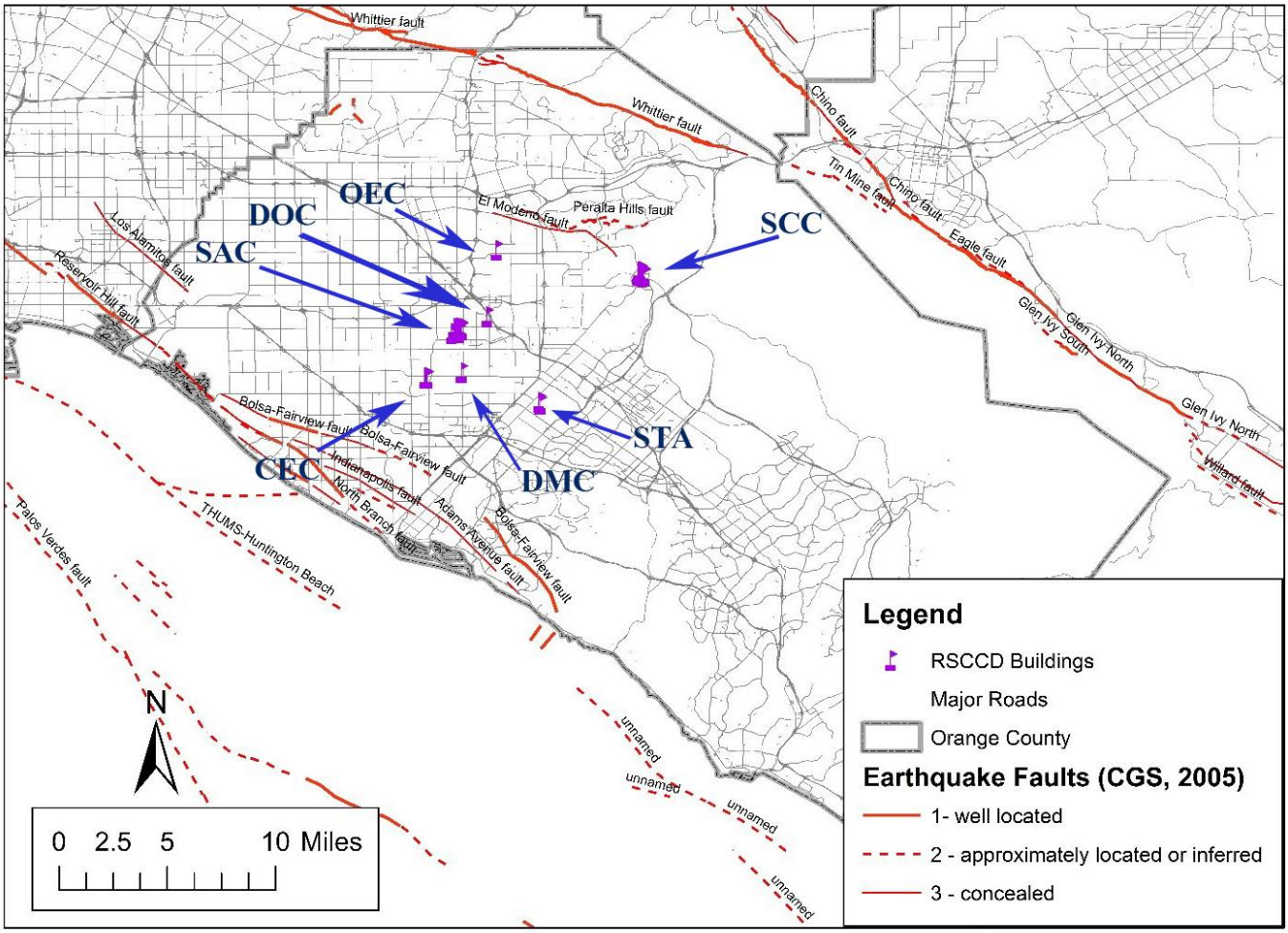
For decades, partnerships have flourished between the USGS, Caltech, the California Geological Survey and universities to share research and educational efforts with Californians. Tremendous earthquake mapping and mitigation efforts have been made in California in the past two decades, and public awareness has risen remarkably during this time. Major federal, state, and local government agencies and private organizations support earthquake risk reduction. These partners 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.

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 is dependent upon population density and distribution. Since California was sparsely populated in the 1800s, the detection of pre-instrumental earthquakes is relatively difficult. However, two very large earthquakes, the Fort Tejon in 1857 (7.9M) and the Owens Valley in 1872 (7.6M) are evidence of the tremendously damaging potential of earthquakes in Southern California. In more recent times two M7.3 earthquakes struck Southern California, in Kern County (1952) and Landers (1992). The damage from these four large earthquakes was limited because they occurred in areas which were sparsely populated at the time they happened. The seismic risk is much more severe today than in the past because the population at risk is in the millions, rather than a few hundred or a few thousand persons.

D. EARTHQUAKE FAULT ACTIVITY MAP - IMPACT ON RSCCD FACILITIES

MMI Engineering conducted a study of the earthquake impact on RSCCD in May 2015 for this plan. They used the Orange County HAZUS and District's facilities information and building populations. The following map of Earthquake Fault Activity Map - Impact on RSCCD shows the clusters of RSCCD buildings in purple overlaid with the Fault Activity Map of California.

FIGURE 6: RSCCD SITES AND EARTHQUAKE FAULT ACTIVITY MAP



California Geological Survey, Digital Database of Quaternary and Younger Faults from the Fault Activity Map of California, Version 2.0., Reproduced with permission.

MMI ENGINEERING

E. FAULTS THAT IMPACT RSCCD

After extensive research from dozens of websites, documents, California and Orange County Hazard Mitigation Plans, and HAZUS studies, the following faults were considered the greatest threat to the RSCCD service area. The research was summarized for the RSCCD Hazard Mitigation Committee and they concurred that these five faults should be studied for this plan.

TABLE 4: LIST OF EARTHQUAKE FAULTS THAT IMPACT RSCCD

Ranking	Fault Name	Magnitude
1	San Joaquin Hills	6.6
2	Newport- Inglewood	6.9
3	Whittier	6.8
4	San Andreas	7.4
5	El Modeno	6.0
6	Puente Hills	7.1

Other faults that may impact the RSCCD service area but to a lesser extent include: Elsinore Fault and San Jacinto Fault. These faults are expected to have a lesser impact on the district.

Earthquake ShakeMap "Scenarios"

A ShakeMap is a representation of ground shaking produced by an earthquake. The information it presents is different from the earthquake magnitude and epicenter that are released after an earthquake because ShakeMap focuses on the ground shaking produced by the earthquake, rather than the parameters describing the earthquake source. So, while an earthquake has one magnitude and one epicenter, it produces a range of ground shaking levels at sites throughout the region depending on distance from the earthquake, the rock and soil conditions at sites, and variations in the propagation of seismic waves from the earthquake due to complexities in the structure of the Earth's crust. USGS labels ShakeMaps developed for hypothetical events with the word "Scenario" to distinguish them from ShakeMaps for actual earthquakes.

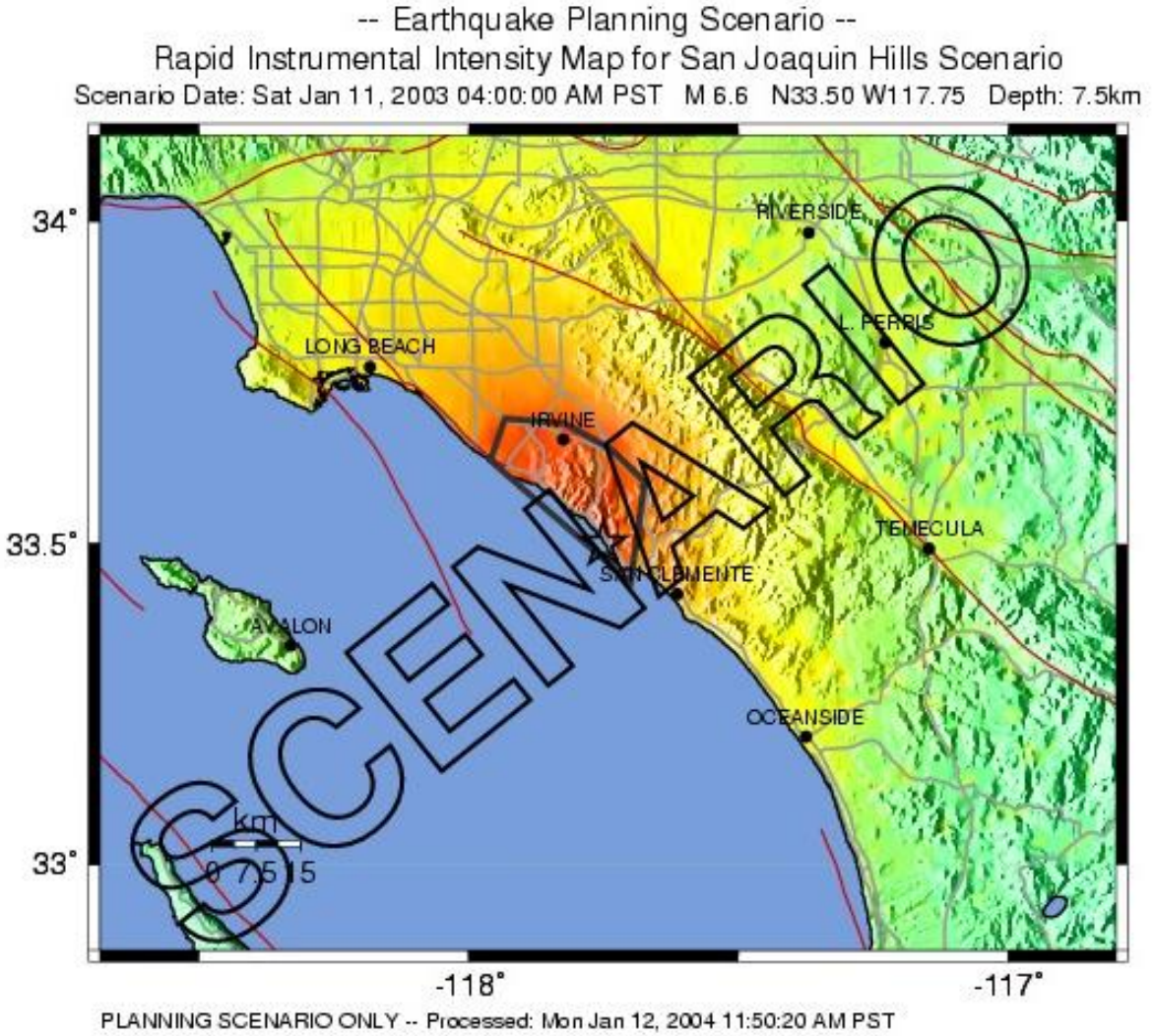
USGS researched and assumed a particular fault or fault segment will rupture over a certain length relying on consensus-based information about the potential behavior of the fault. For historic events, the actual rupture dimensions may be constrained based on existing observations or models. Second, they estimates the ground motions at all locations in a chosen region surrounding the causative fault.

<u>These earthquake scenarios are not earthquake predictions.</u> That is, no one knows in advance when or how large a future earthquake will be. However, if we make assumptions about the size and location of a hypothetical future earthquake, we can make a reasonable prediction of the effects of the assumed earthquake, particularly the way in which the ground will shake. This knowledge of the potential shaking effects is the main benefit of the earthquake scenario for planning and preparedness purposes

SAN JOAQUIN HILLS FAULT

The San Joaquin Hills fault was only discovered in the 1990's by Lisa Grant of UCI. It is a southwest-dipping blind thrust fault originating near the southern end of the Newport-Inglewood Fault close to south Huntington Beach and runs south to Dana Point. Rupture of the entire area of this blind thrust fault could generate an earthquake as large as M7.3. In addition, a minimum average recurrence interval of between about 1650 and 3100 years has been estimated for moderate-sized earthquakes on this fault (Lisa Grant, 1999).

FIGURE 7: M6.6 SAN JOAQUIN HILLS SCENARIO



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+

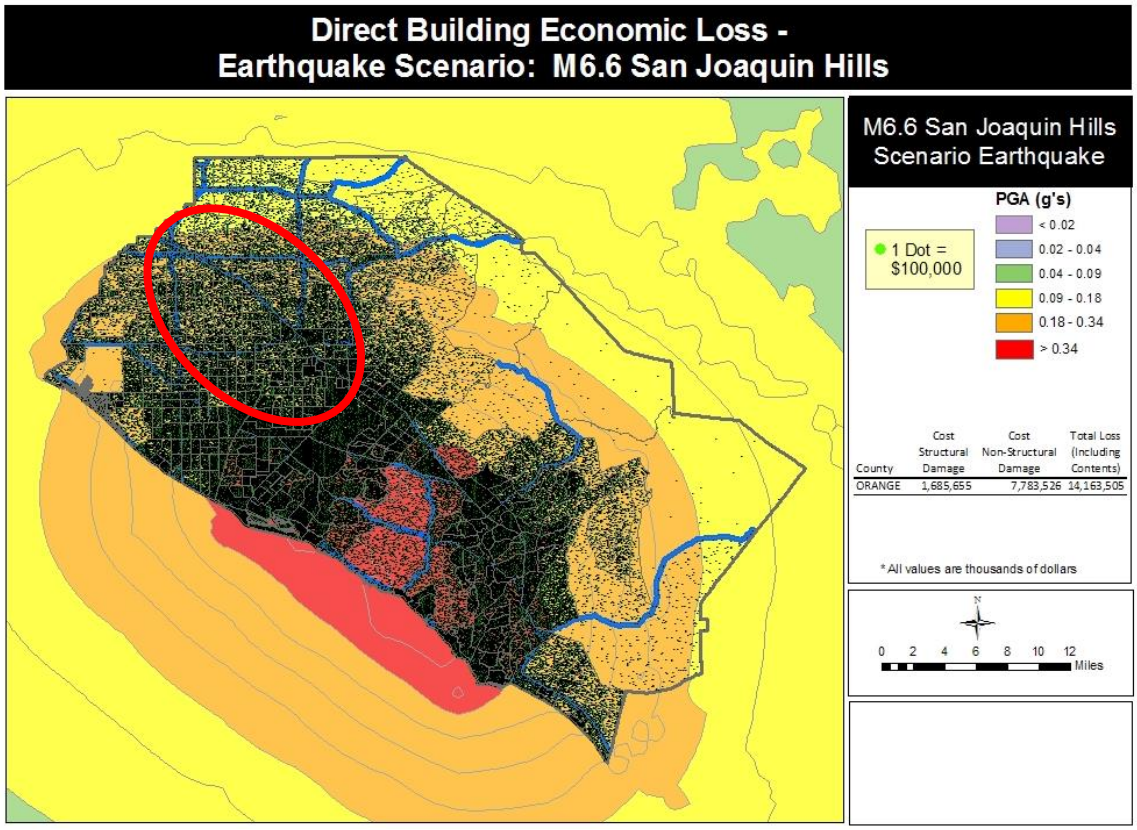
TABLE 5: SUMMARY OF HAZUS M6.6 SAN JOAQUIN HILLS FOR ORANGE COUNTY

Impact Category	HAZUS-Estimated Impact
Economic Loss due to Building Damage Total Building-related Direct Economic Loss	$9.5 B $14.2 B
# Buildings in Complete Damage State	663
Debris Generated (million tons)	3.33
Displaced Households People Needing Short-term Shelter	4,800 Households 3,200 People
Fatalities (2 am, 2 pm, 5 pm) Total Injuries (2 am, 2 pm, 5 pm)	17, 87, 95 2238, 4006, 3491
% of Households without Water	35%
# Highway Bridges w/ at least Moderate Damage (potentially closed)	8
Fire Following Earthquake* Ignitions, area burned, $ loss	78,056 square miles, $240M

ORANGE COUNTY ESSENTIAL FACILITIES RISK ASSESSMENT REPORT PREPARED FOR FEMA

In a M6.6 earthquake on the San Joaquin Hills Fault, Orange County dollar losses related to shaking-induced building damage are estimated to reach $9.5 billion, while total direct economic losses are expected to exceed $14 billion. The geographic distribution of total direct economic loss is mapped below.

FIGURE 8: DIRECT ECONOMIC LOSS IN OC M6.6 SAN JOAQUIN HILLS



ORANGE COUNTY ESSENTIAL FACILITIES RISK ASSESSMENT REPORT PREPARED FOR FEMA

Of the approximately 738,000 buildings modeled within the general building stock for Orange County, less than 1% (663) would be expected to suffer "Complete" damage in the San Joaquin Hills scenario earthquake. These buildings would be considered "red-tagged" or unsafe for continued occupancy. A small percentage of these buildings (15% or less) have the potential for collapse, suggesting the need for Urban Search & Rescue (USAR). More than 10,000 buildings (1.4%) are expected to suffer "Extensive" damage in this scenario earthquake, and would be considered "yellow-tagged", with restrictions on continued use. While the remainder of buildings would be considered "green-tagged" (safe for occupancy, although some damage may have occurred), approximately 13% (94,926) would be expected to suffer "Moderate" damage, and an additional 43% (318,293) would suffer "Slight" damage. More than 3.3 million tons of debris may result from these damaged buildings – 63% is expected to be heavy debris (concrete and steel), requiring heavy equipment to break down and remove, while 37% is expected to be light debris (wood, brick and other debris).

Damage to single family and multi-family dwellings is expected to result in the displacement of approximately 4,800 households. As much as 35% of the County's households may also be without water. While many of the displaced may find shelter with friends and family, or in available hotels, more than 3,200 people are expected to seek public shelter. Depending on the time of

day when the earthquake occurs, the number of people killed as a result of shaking-induced building and transportation system damage may range from 17 (at 2 am, when most of the population are located in relatively safe residential structures) to as many as 95 (at 5 pm, when many people are either in commercial or industrial buildings, or commuting). Total injuries, including the range of injuries from minor injuries treated with basic medical care to mortal injuries (deaths), ranges from approximately 2200 at 2 am to 4000 at 2 pm. Transportation of the injured for treatment could be impacted by transportation system damage, with as many as 8 bridges in the western part of the County suffering at least "Moderate" damage.

Additional economic damage may result from post-earthquake fire. The current HAZUS study model estimates as many as 78 fire ignitions, most of which will be contained. However, a total of approximately ½ square mile is expected to burn, resulting in losses of approximately $240 million. It should be noted that the HAZUS model is currently undergoing significant improvements; future analyses will likely yield different FFE results, so these results should be used with caution.

ESSENTIAL FACILITY IMPACTS

The table below provides an overview of essential facility performance in the San Joaquin Hills Scenario earthquake. The table lists the number of essential facility sites and buildings (these numbers will differ for multi-building campuses, such as schools and hospitals). The table also provides the total building replacement value, and the number of buildings for which value data was available. As can be seen in the table, replacement cost data for hospitals was generally not available, unlike most other essential facility types. Expected building performance in this earthquake event is on the order of 6% damage or less for EOCs, fire stations, police stations, and schools, but as much as 19% damage for large hospitals. Total economic loss for essential facilities has been estimated to exceed $426 million, with 74% of the total loss occurring in schools. It should be noted that although cost data is only available for 19 hospital buildings (out of 157), these 19 buildings suffer more than $112 million in loss, indicating that the actual total economic loss for hospitals would be significant, but can't be estimated at this time because of the lack of replacement value data.

TABLE 6: OC ESSENTIAL FACILITY LOSS ESTIMATES M6.6 SAN JOAQUIN HILLS

Essential Facility	Category	No. of Facilities/ Sites	No. of Buildings	No. of Beds	Replace-ment Cost ($1,000)	# Buildings w/ replace-ment cost data	Function-ality Day 1 (%)	Mean Damage	Economic Loss ($1,000)
Hospital	Small	2	3	78	$0	0	60	13%	$0
	Medium	10	33	1,018	$50,000	7	42	9%	$5,845
	Large	20	121	5,221	$677,998	12	25	19%	$106,291
Schools	K-12 (default data)	560	569		$335,710	569	47	4%	$12,470
	K-12 (providing data)	346	4,952		$2,983,628	4,840	40	6%	$281,544
	Comm College Districts (providing data)	22	212		$461,676	207	55	5%	$20,228
EOCs		38	38		$368,079	38	57	6%	$18
Police Stations		67	67		$770,105	67	48	6%	$49
Fire Stations		139	139		$316,580	135	55	5%	$14
TOTALS		**1,204**	**6,134**	**6,317**	**$5,963,776**	**5,875**			**$426,459**

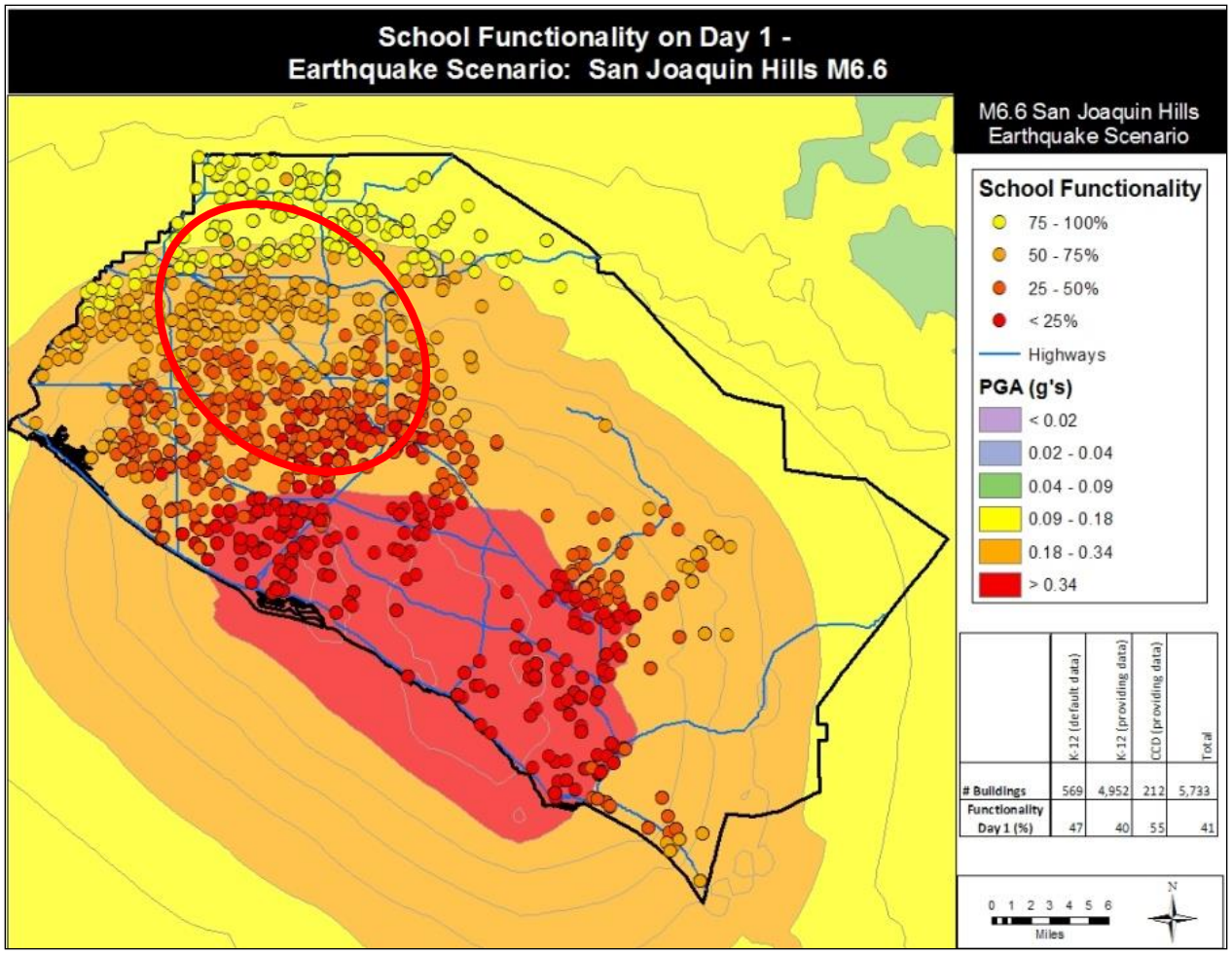
ORANGE COUNTY ESSENTIAL FACILITIES RISK ASSESSMENT REPORT PREPARED FOR FEMA

TABLE 7: ESTIMATED IMPACTS OC SCHOOL DISTRICTS M6.6 SAN JOAQUIN HILLS

Category	District Name	Number of Facilities/ Sites*	No. of Buildings	Replacement Cost ($1,000)	# Buildings w/ replacement cost data	Functionality Day 1 (%)	Mean Damage	Economic Loss ($1,000)
K-12 (default data)		560	569	$335,710	569	47	3.7%	$12,470
K-12 (providing data)	Brea Olinda USD	11	118	$83,802	117	86	0.9%	$1,194
	Capistrano USD	60	1,035	$387,399	1,029	26	6.8%	$26,236
	Fullerton Joint UHSD	12	156	$219,752	156	74	2.6%	$4,869
	Fullerton SD	22	267	$121,646	267	79	1.2%	$1,368
	Huntington Bch City SD	15	176	$115,876	176	24	9.6%	$22,345
	Huntington Bch Union High School District	9	163	$237,697	163	37	5.9%	$17,716
	Laguna Beach USD	7	54	$60,212	54	10	17.1%	$15,604
	Newport-Mesa USD	36	518	$402,503	518	13	12.8%	$88,316
	Ocean View SD	24	238	$149,274	238	43	5.4%	$12,479
	Orange Co DOE	33	180	$54,255	75	45	4.6%	$6,323
	Placentia-Yorba Linda USD	30	641	$292,554	641	80	1.1%	$2,708
	Santa Ana USD	57	1,046	$623,817	1,046	28	6.5%	$66,990
	Tustin USD	30	360	$234,841	360	33	6.0%	$15,397
Comm. CD (providing data)	North Orange Co CCD	7	90	$304,134	90	78	1.3%	$4,564
	Rancho Santiago CCD	15	122	$157,542	117	38	7.0%	$15,664
TOTALS		**928**	**5,733**	**$3,781,014**	**5,616**	**41**	**6%**	**$314,242**

* includes District offices and other facilities (e.g., maintenance, transportation, etc.)
ORANGE COUNTY ESSENTIAL FACILITIES RISK ASSESSMENT REPORT PREPARED FOR FEMA
RSCCD estimate was based on an older version of insurance data

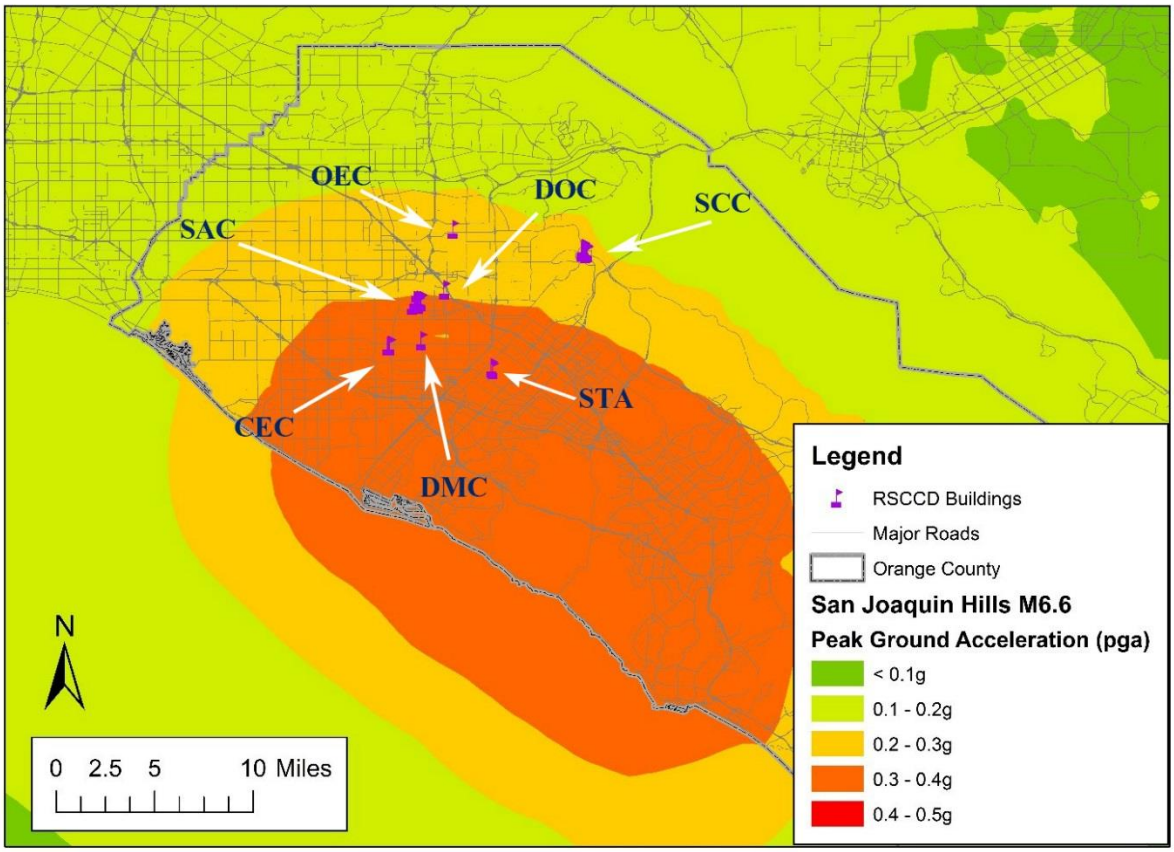
FIGURE 9: OC SCHOOL FUNCTIONALITY M6.6 SAN JOAQUIN HILLS



ORANGE COUNTY ESSENTIAL FACILITIES RISK ASSESSMENT REPORT PREPARED FOR FEMA

The San Joaquin Hills Fault, a large blind thrust fault, could generate an earthquake as large as M7.1 in the vicinity of Orange County. This large earthquake would create strong ground motion and damage across a significant portion of the County, but is a rare event with a recurrence interval on the order of 2,500 years (UCI, 1999).

FIGURE 10: RSCCD IMPACT FROM A M6.6 EARTHQUAKE ON THE SAN JOAQUIN HILLS



USGS ShakeMap for the M6.6 Scenario Earthquake on the San Joaquin Hills Fault: Peak Ground Acceleration
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TABLE 8: RSCCD SITE IMPACT FROM A M6.6 SAN JOAQUIN HILLS FAULT

Site		District Location	Peak Ground Acceleration	Modified Mercalli Intensity	Perceived Shaking	Potential Damage
1	**DOC**	District Operations Center	0.2 – 0.3 g	VII	Very Strong	Moderate
2	**SAC**	**Santa Ana College**	**0.3 – 0.4 g**	**VIII**	**Severe**	**Moderate/Heavy**
3	**SCC**	Santiago Canyon College	0.2 – 0.3 g	VII	Very Strong	Moderate
4	**CED**	**Centennial Education Center**	**0.3 – 0.4 g**	**VIII**	**Severe**	**Moderate/Heavy**
5	**OEC**	Orange Education Center	0.2 - 0.3 g	VII	Very Strong	Moderate
7	**SRTA**	**Orange County Sheriff's Regional Training Academy**	**0.3 – 0.4 g**	**VIII**	**Severe**	**Moderate/Heavy**
8	**DMC**	**Digital Media Center**	**0.3 – 0.4 g**	**VIII**	**Severe**	**Moderate/Heavy**

NEWPORT-INGLEWOOD FAULT ZONE

This fault extends from the Santa Monica Mountains southeastward through the western part of Orange County, through Huntington Beach and to the offshore area near Newport Beach. It was the source of the destructive 1933 Long Beach earthquake (magnitude 6.4), which caused 120 deaths and considerable property damage. During the past 60 years, numerous other shocks ranging from magnitude 3.0 to 5+ have been recorded. Southern California Earthquake Center reports probable earthquake Magnitudes for the Newport-Inglewood fault to be in the range of 6.0 to 7.4.

The epicenter of the 1933 Long Beach earthquake was in Huntington Beach. Orange County had minimal population and few structures in 1933. Because of this, most of the deaths, injuries and damage was in the more built environment, the Long Beach area. There were 4 deaths in Orange County and several schools were seriously damaged in Santa Ana, Garden Grove and Huntington Beach.

Newport-Inglewood Fault Facts

Nearest Communities: Orange County cities potentially affected by the fault are Seal Beach, Huntington Beach, Newport Beach, and Costa Mesa and surrounding areas
Most Recent Major Rupture: March 10, 1933, M6.4 (but no surface rupture)
Interval Between Major Ruptures: unknown
Probable Magnitudes: M6.0 - 7.4

This represents a worst-case earthquake that could affect the urban areas of the Orange County coast. In California, each earthquake is followed by revisions and improvements in the Building Codes.

Due to the number of schools that were damaged in the 1933 Long Beach earthquake, it resulted in the Field Act being passed by the California legislature, mandating improved building codes for school construction. These code changes have resulted in stronger and more earthquake resistant public school 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.

The Newport-Inglewood Fault Zone is a right-lateral fault, running from Newport Beach and Costa Mesa at its southern end, to Culver City and Inglewood at its northern end. The most recent significant earthquake on the Newport-Inglewood Fault was the 1933 M6.4 Long Beach

earthquake, in which 120 people were killed, and causing $50 million in damage (SCEC). An event of this size has a recurrence interval on the order of 1000 years. Many schools were destroyed (top right photo is Compton Middle School). Because of this, parents lobbied legislators to enact the world's first building codes. Had this earthquake occurred during school hours, we could have lost an entire generation of school children. It struck at 5:54 PM.

FIGURE 11: 1933 LONG BEACH EARTHQUAKE PHOTOS



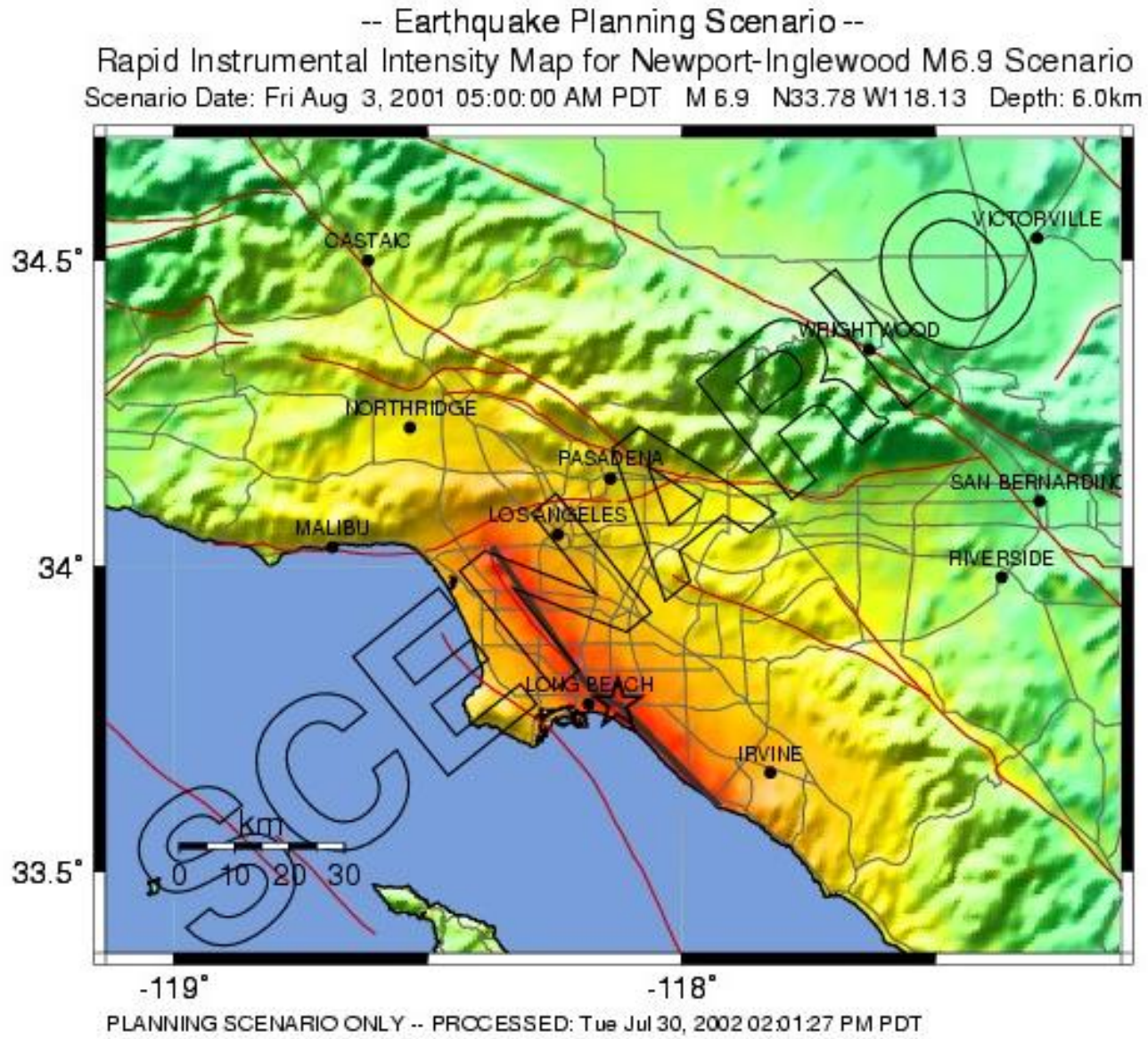
Excerpt from www.anaheimcolony.com/ -

> *On March 10, 1933 at 5:54 in the evening, a severe earthquake shook Southern California. Four deaths occurred in Orange County. In Santa Ana, a man and his wife raced out of the Rossmore Hotel and were crushed under an avalanche of bricks and mortar. Another man, while walking in front of the Richelieu Hotel, was struck by a piece of falling cornice and instantly killed. In Garden Grove, a 13-year old girl was planning a freshman party with her friends when the earthquake hit. She was sitting on the steps of a local high school and was crushed by a falling wall. Two of her friends were injured.*
>
> *In Newport Beach, 800 chimneys were broken off at the roofline and several hundred buildings were destroyed. In Huntington Beach, steel oil derricks were "squashed" several inches out of the ground. In Santa Ana, Anaheim and Garden Grove, business centers were badly damaged and debris covered downtown streets. A heavy fog enveloped the Southland, making rescue work difficult. The 1933 Long Beach earthquake affected 75,000 square miles, and resulted in the formation of more stringent building codes for California structures.*

As reported in the RSCCD Century of Excellence, the 100th anniversary newspaper: The Santa Ana Community College once occupied a tiny building within Santa Ana High School and has evolved from its modest 25-strong student body to educate at least 30,000 students a semester.

"In 1933, an incident out of anyone's control would force Santa Ana College to move out from under the auspices of the high school when the magnitude 6.3 Long Beach earthquake and a series of aftershocks rumbled through the southland. Santa Ana College's building was amongst the worst hit. Classes were suspended for two weeks. Eventually, the east building was condemned and then demolished."

FIGURE 12: SHAKEMAP M6.9 NEWPORT-INGLEWOOD SCENARIO (USGS, 2001)



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+

NEWPORT-INGLEWOOD EARTHQUAKE SCENARIO – REGIONAL IMPACTS

The M6.9 Newport-Inglewood scenario earthquake will impact the western and northwestern communities and infrastructure of Orange County. A summary of regional impacts is provided in the table below. These impacts described below are tabulated in more detail in the HAZUS "Global Summary Report" for this scenario earthquake. This report can be found in the Appendices of the Orange County Hazard Mitigation Plan.

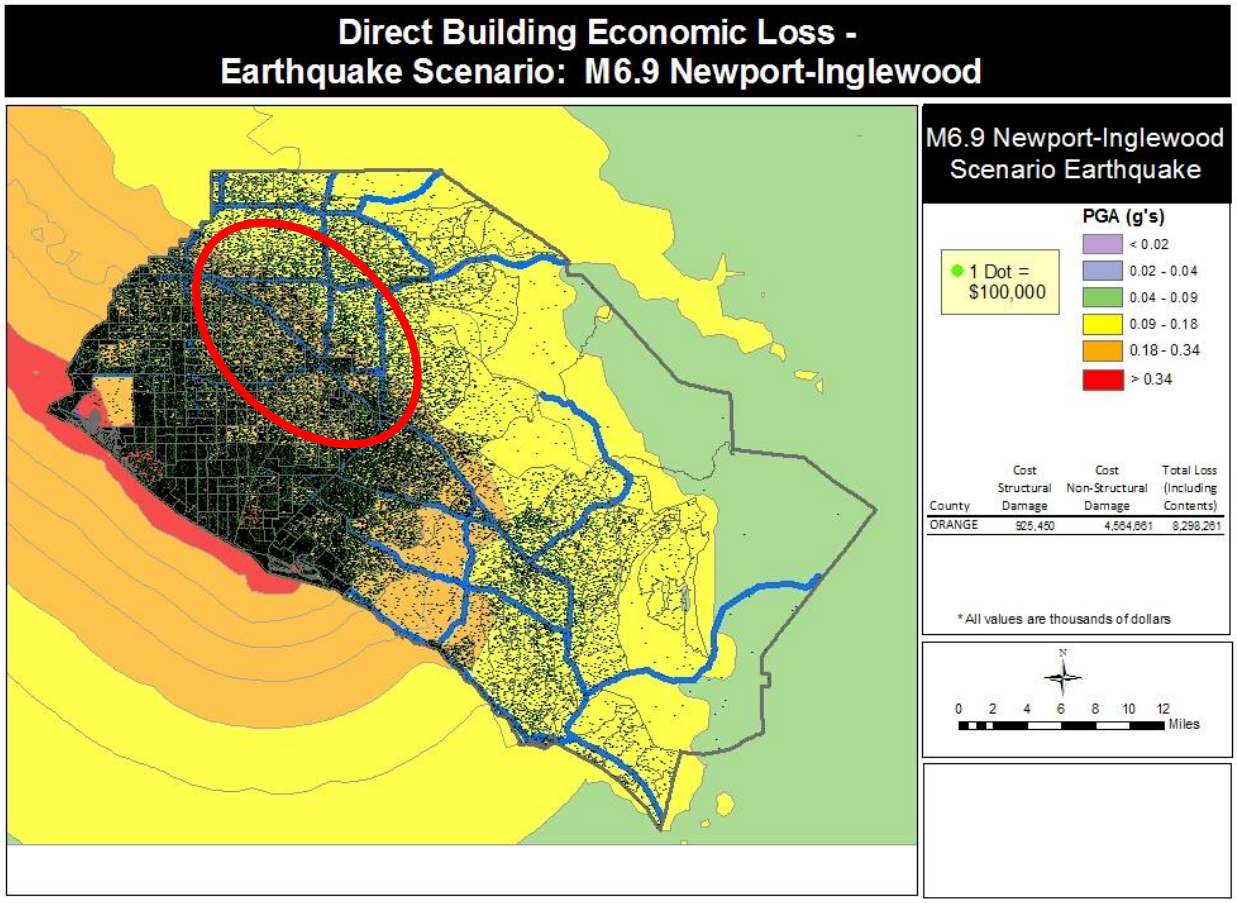
TABLE 9: HAZUS REGIONAL IMPACTS M6.9 NEWPORT-INGLEWOOD

Impact Category	HAZUS-Estimated Impact
Economic Loss due to Building Damage Total Building-related Direct Economic Loss	$5.5 B $8.3 B
# Buildings in Complete Damage State	655
Debris Generated (million tons)	1.94
Displaced Households People Needing Short-term Shelter	3,300 Households 2,050 People
Fatalities (2 am, 2 pm, 5 pm) Total Injuries (2 am, 2 pm, 5 pm)	13, 44, 49 1408, 2209, 1950
% of Households without Water	20%
# Highway Bridges w/ at least Moderate Damage (potentially closed)	18
Fire Following Earthquake* Ignitions, area burned, $ loss	128,054 square miles, $311M

ORANGE COUNTY ESSENTIAL FACILITIES RISK ASSESSMENT REPORT PREPARED FOR FEMA

In a M6.9 earthquake on the Newport-Inglewood Fault, dollar losses related to shaking-induced building damage are estimated to reach $5.5 billion, while total direct economic losses are expected to reach $8.3 billion. Within HAZUS, total direct economic losses include building and content losses, as well as inventory loss and income losses (which includes relocation costs, income losses, wage losses and rental income losses). The geographic distribution of total direct economic loss is mapped below.

FIGURE 13: TOTAL DIRECT ECONOMIC LOSS OC M6.9 NEWPORT-INGLEWOOD



ORANGE COUNTY ESSENTIAL FACILITIES RISK ASSESSMENT REPORT PREPARED FOR FEMA

Of the approximately 738,000 buildings modeled within the general building stock for Orange County, less than 1% (655) are expected to suffer "Complete" damage in the Newport-Inglewood scenario earthquake. These building would be considered "red-tagged" or unsafe for continued occupancy. A small percentage of these buildings (15% or less) have the potential for collapse, suggesting the need for Urban Search & Rescue (USAR). Approximately 7,500 buildings (1%) are expected to suffer "Extensive" damage, and would be considered "yellow-tagged", with restrictions on continued use. While the remainder of buildings would be considered "green-tagged" (safe for occupancy, although some damage may have occurred), as many as 7% (53,320) would be expected to suffer "Moderate" damage, and an additional 29% (215,733) would suffer "Slight" damage. As much as 1.94 million tons of debris may result from these damaged buildings – 62% is expected to be heavy debris (concrete and steel), requiring heavy equipment to break down and remove, while 38% is expected to be light debris (wood, brick and other debris).

Damage to single family and multi-family dwellings is expected to result in the displacement of more than 3,300 households. As much as 20% of the County's households may also be without water. While many of the displaced may find shelter with friends and family, or in available hotels,

as many as 2,000 people are expected to seek public shelter. Depending on the time of day when the earthquake occurs, the number of people killed as a result of shaking-induced building and transportation system damage may range from 13 (at 2 am, when most of the population are located in relatively safe residential structures) to as many as 49 (at 5 pm, when many people are either in commercial or industrial buildings, or commuting). Total injuries, including the range of injuries from minor injuries treated with basic medical care to mortal injuries (deaths), ranges from approximately 1,400 at 2 am to 2,200 at 2 pm. Transportation of the injured for treatment could be impacted by transportation system damage, with as many as 18 bridges in the northwest part of the County suffering at least “Moderate” damage.

Additional economic damage may result from post-earthquake fire. The current HAZUS FFE model estimates as many as 128 fire ignitions, most of which will be contained. However, a total of approximately ½ square mile is expected to burn, resulting in losses of approximately $311 million.

NEWPORT-INGLEWOOD – ESSENTIAL FACILITY IMPACTS

The table below provides an overview of essential facility performance in the Newport-Inglewood Scenario earthquake. The table lists the number of essential facility sites and buildings (these numbers will differ for multi-building campuses, such as schools and hospitals). The table also provided the total building replacement value, and the number of buildings for which value data was available. As can be seen in the table, replacement cost data for hospitals was generally not available, unlike most other essential facility types. Expected building performance in this earthquake event ranges from as little as 2 - 3% damage overall for schools, to as much as 15% for large hospitals. Total economic loss for essential facilities has been estimated to exceed $280 million, the bulk of which ($218 million) will occur in schools. It should be noted that although cost data is only available for 19 hospital buildings (out of 157), these 19 buildings suffer more than $45 million in loss. (The full economic impact on hospitals can't be estimated at this time because of the lack of comprehensive replacement value data.)

TABLE 10: ESSENTIAL OC FACILITY LOSSES M6.9 NEWPORT-INGLEWOOD

Essential Facility	Category	No. of Facilities / Sites	No. of Buildings	No. of Beds	Replacement Cost ($1,000)	# Buildings w/ replace-ment cost data	Function-ality Day 1 (%)	Mean Damage	Economic Loss ($1,000)
	Small	2	3	78	$0	0	60	10%	$0
	Medium	10	33	1,018	$50,000	7	47	9%	$2,462
Hospital	Large	20	121	5,221	$677,998	12	43	15%	$43,229
	K-12 (default data)	560	569		$335,710	569	64	2%	$7,553
	K-12 (providing data)	346	4,952		$2,983,628	4,840	65	3%	$218,017
Schools	Com Col Districts (providing data)	22	212		$461,676	207	71	2%	$15,742
EOCs		38	38		$368,079	38	69	4%	$12
Police Stations		67	67		$770,105	67	59	5%	$39
Fire Stations		139	139		$316,580	135	69	4%	$11
TOTALS		**1,204**	**6,134**	**6,317**	**$5,963,776**	**5,875**			**$287,065**

ORANGE COUNTY ESSENTIAL FACILITIES RISK ASSESSMENT REPORT PREPARED FOR FEMA

SCHOOLS

The default schools database in HAZUS MR3 for Orange County includes 809 school sites, including both public schools and some private schools and pre-schools. Community colleges and Universities are not included in the default school database. It should be noted that HAZUS represents each school campus as a single record in the default database, regardless of the number of buildings on site. (This essentially assumes uniform performance of all structures at a

given school site, when in reality, buildings of different construction types are expected to perform differently.) RSCCD participated in the study.

Detailed school building insurance appraisal data was received from the Alliance of Schools for Cooperative Insurance Programs (ASCIP) for fifteen (15) member districts in Orange County, including two community college districts. These school districts include 50% of the public grade schools in Orange County and 51% of the County's public school enrollment. Data includes site-specific information on 6,371 insured structures (including a number of non-building structures that were omitted from the final database), accounting for almost 25 million square feet, and a replacement value of over $3.6 billion dollars.

Detailed construction data was provided for 5,164 individual school buildings, allowing a more detailed HAZUS risk assessment (e.g., building level rather than site level) for these facilities. The data received is sufficiently detailed to allow the Project Team to categorize each school building for which data was received according to the required HAZUS parameters (e.g., structure type, design level, configuration, etc.) and develop an enhanced (Level 2+) input database for HAZUS. The 569 schools in the remaining K-12 school districts have been analyzed using default HAZUS data.

TABLE 11: SCHOOL DISTRICTS FOR WHICH ASCIP PROVIDED SITE-SPECIFIC DATA

District Type	District Name
K-12 School Districts	Brea Olinda Unified School District
	Capistrano Unified School District
	Fullerton Joint Union High School District
	Fullerton School District
	Huntington Beach City School District
	Huntington Beach Union High School District
	Laguna Beach Unified School District
	Newport-Mesa Unified School District
	Ocean View School District
	Orange County Dept. Of Education
	Placentia-Yorba Linda Unified School District
	Santa Ana Unified School District
	Tustin Unified School District
Community College Districts	North Orange County Community College District
	Rancho Santiago Community College District

ORANGE COUNTY ESSENTIAL FACILITIES RISK ASSESSMENT REPORT PREPARED FOR FEMA

TABLE 12: ESTIMATED IMPACTS OC SCHOOL DISTRICTS M6.9 NEWPORT-INGLEWOOD

Category	District Name	Number of Facilities/ Sites*	No. of Buildings	Replacement Cost ($1,000)	# Buildings w/ replacement cost data	Functionality Day 1 (%)	Mean Damage	Economic Loss ($1,000)
K-12 (default data)		560	569	$335,710	569	64	2.2%	$7,553
K-12 (providing data)	Brea Olinda USD	11	118	$83,802	117	90	0.7%	$933
	Capistrano USD	60	1,035	$387,399	1,029	90	0.5%	$1,598
	Fullerton Joint UHSD	12	156	$219,752	156	73	2.9%	$5,180
	Fullerton SD	22	267	$121,646	267	79	1.2%	$1,534
	Huntington Bch SD	15	176	$115,876	176	15	12.6%	$32,573
	Huntington Bch UHSD	9	163	$237,697	163	19	10.6%	$36,350
	Laguna Beach USD	7	54	$60,212	54	67	2.9%	$2,908
	Newport-Mesa USD	36	518	$402,503	518	23	9.9%	$75,649
	Ocean View SD	24	238	$149,274	238	20	10.6%	$26,499
	Orange Co Dept. of Ed	33	180	$54,255	75	69	2.1%	$2,479
	Placentia-Yorba Linda USD	30	641	$292,554	641	89	0.6%	$1,676
	Santa Ana USD	57	1,046	$623,817	1,046	60	2.7%	$27,540
	Tustin USD	30	360	$234,841	360	76	1.4%	$3,096
Com College Districts (providing data)	North Orange Co CCD	7	90	$304,134	90	72	2.0%	$10,405
	Rancho Santiago CCD	15	122	$157,542	117	70	2.6%	$5,336
TOTALS		**928**	**5,733**	**$3,781,014**	**5,616**	**65**	**3.3%**	**$241,311**

* includes District offices and other facilities (e.g., maintenance, transportation, etc.)

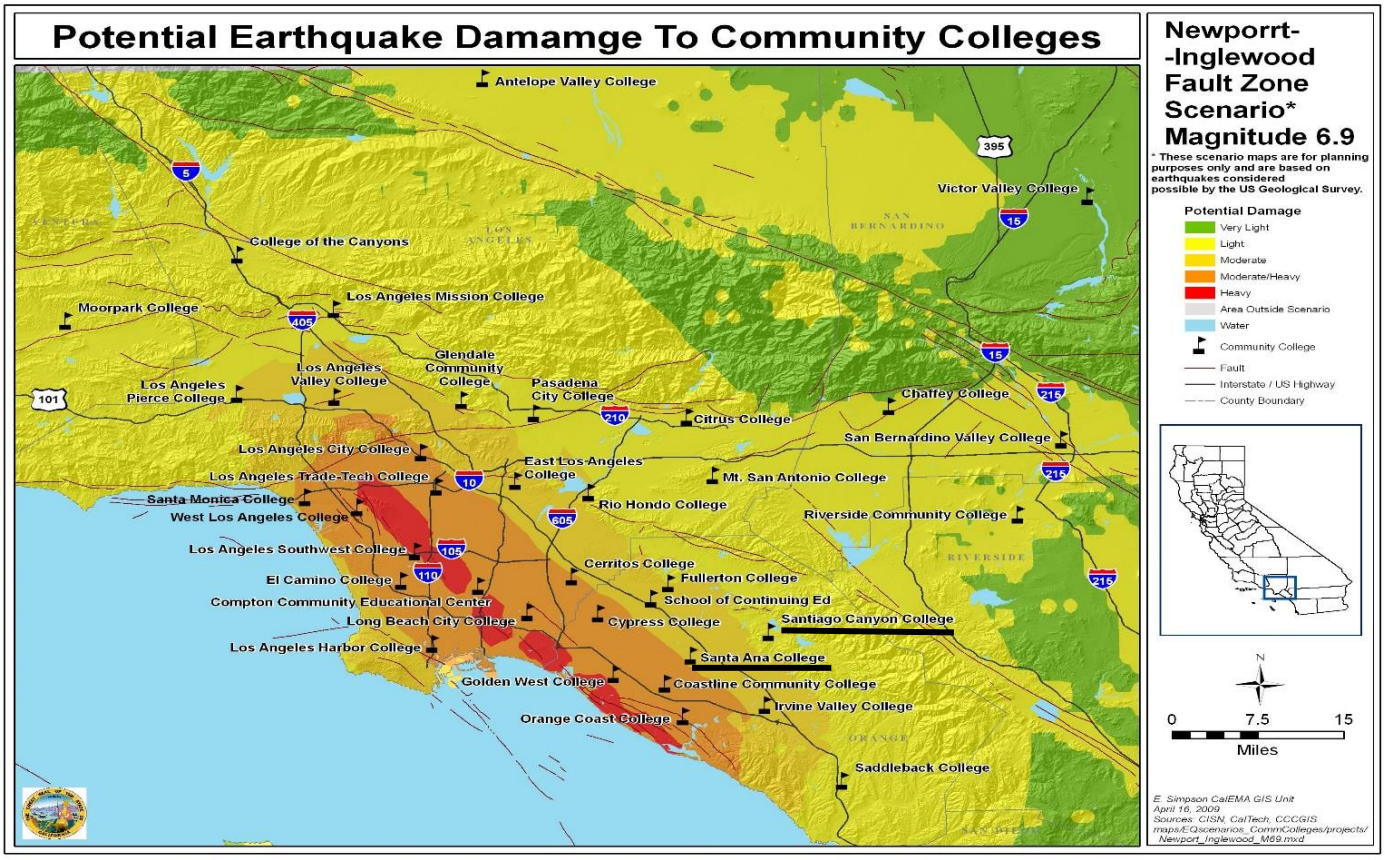
RSCCD estimate was based on an older version of insurance data

ORANGE COUNTY ESSENTIAL FACILITIES RISK ASSESSMENT REPORT PREPARED FOR FEMA

The following map shows the general impact of the Newport-Inglewood Fault Zone on the southern California community colleges.

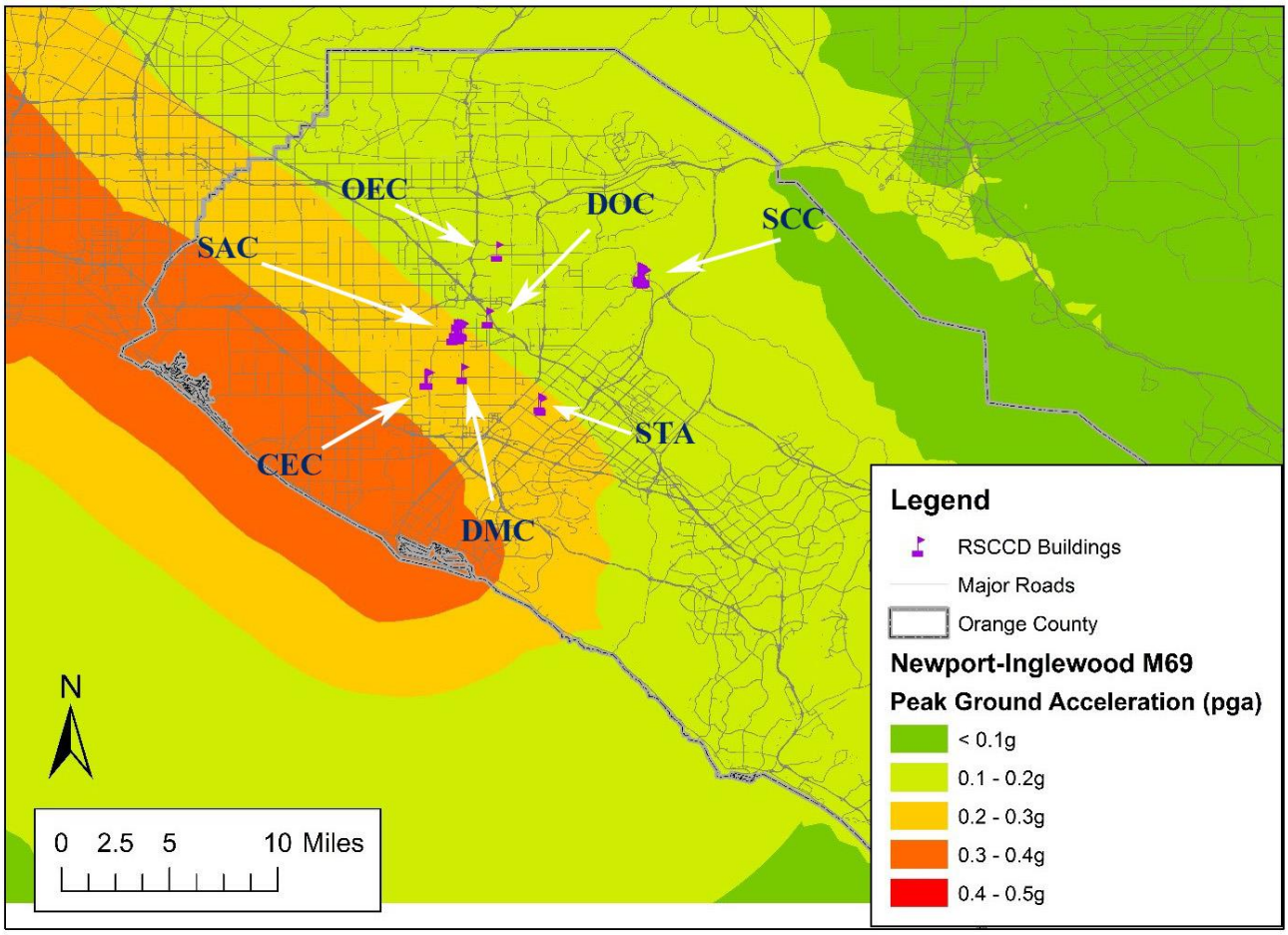
Santa Ana Community borders the “Moderate/Heavy and the Moderate” potential damage while the Santiago Canyon College is located in the “Light” potential damage.

FIGURE 14: POTENTIAL DAMAGE-OC COLLEGES M6.9 NEWPORT-INGLEWOOD



STATE OF CALIFORNIA OES

FIGURE 15: RSCCD IMPACT FROM THE M6.9 NEWPORT-INGLEWOOD



USGS ShakeMap for the M6.9 Scenario Earthquake on the Newport-Inglewood Fault: Peak Ground Acceleration
MMI ENGINEERING

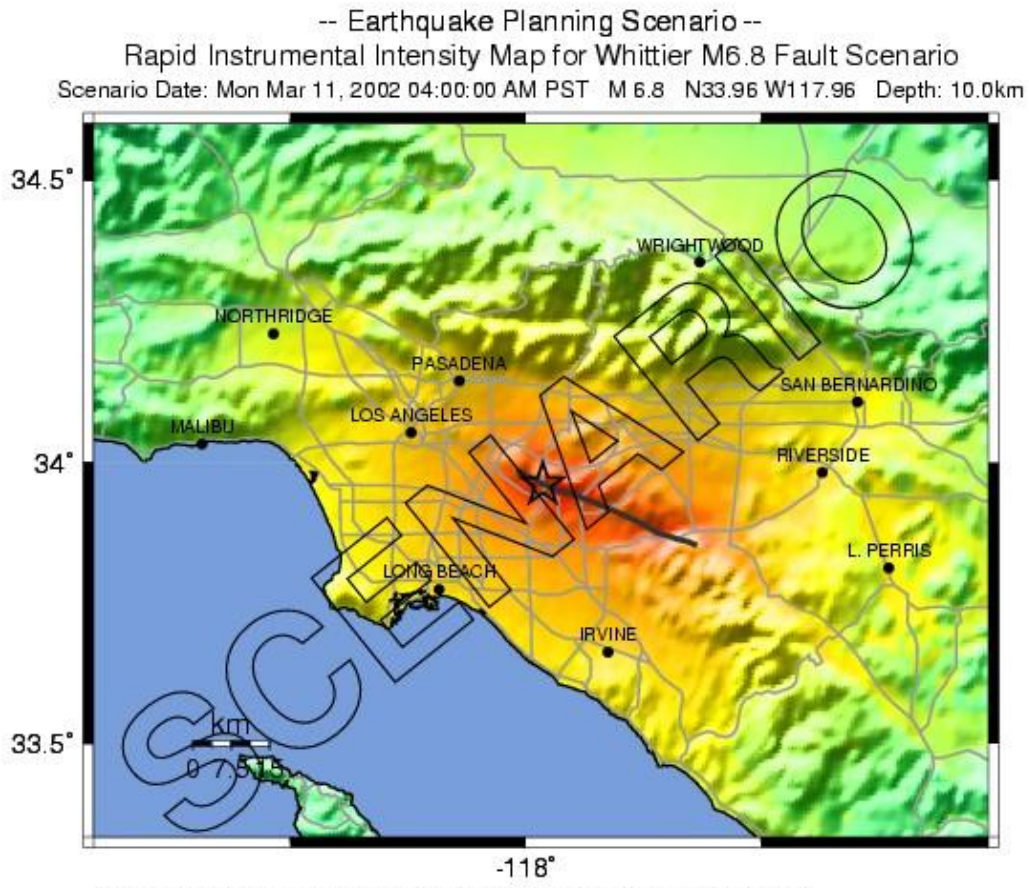
TABLE 13: RSCCD SITE IMPACT FROM A M6.9 NEWPORT-INGLEWOOD FAULT

Site	Abbr	District Location	Peak Ground Acceleration	Modified Mercalli Intensity	Perceived Shaking	Potential Damage
1	DOC	District Operations Center	0.1 – 0.2g	VI	Strong	Light
2	SAC	Santa Ana College	0.2 – 0.3 g	VII	Very Strong	Moderate
3	SCC	Santiago Canyon College	0.1 – 0.2g	VI	Strong	Light
4	CEC	Centennial Education Center	0.2 – 0.3 g	VII	Very Strong	Moderate
5	OEC	Orange Education Center	0.1 – 0.2g	VI	Strong	Light
7	STA	Sheriff's Training Academy	0.2 – 0.3 g	VII	Very Strong	Moderate
8	DMC	Digital Media Center	0.2 – 0.3 g	VII	Very Strong	Moderate

WHITTIER FAULT

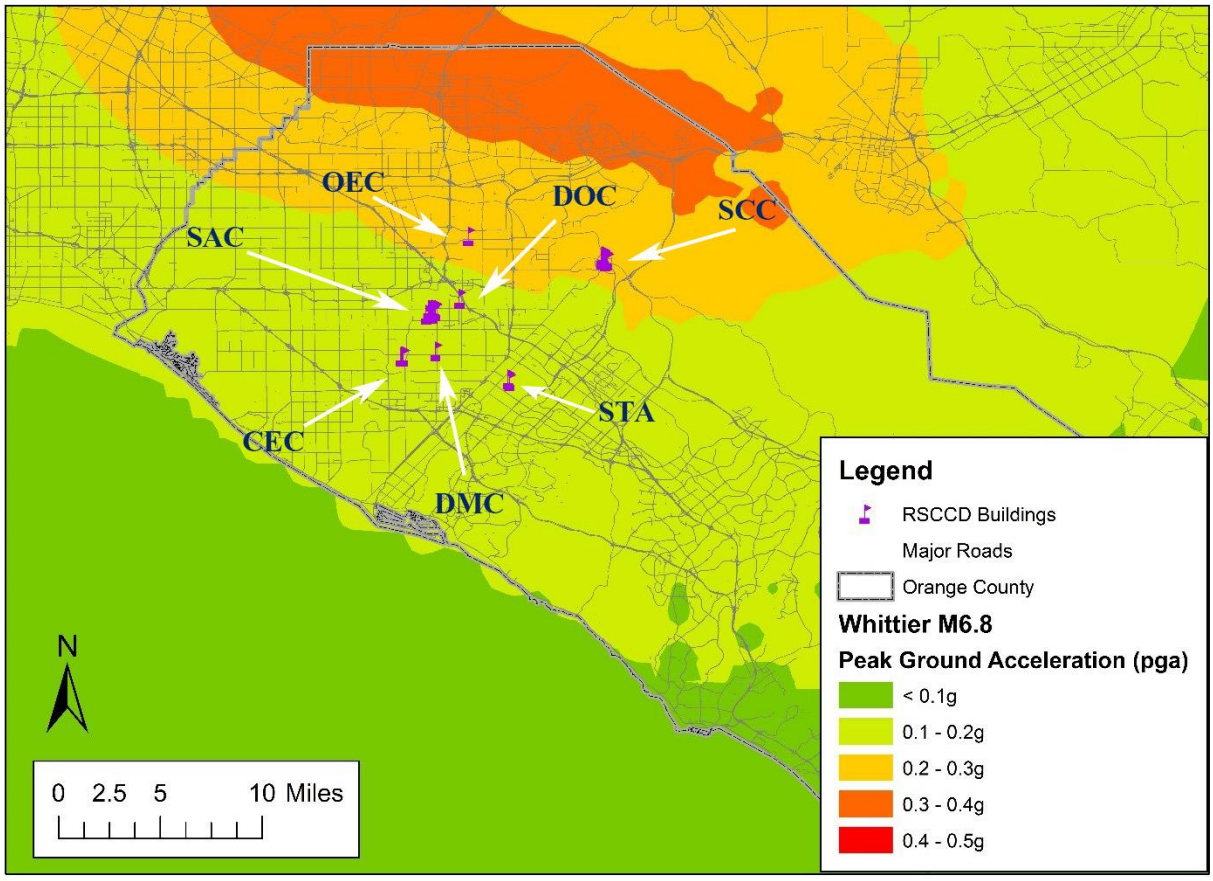
Type of Fault: Right-lateral strike-slip with some reverse slip
Length of Fault: About 40 km
Nearest Community: Yorba Linda, Hacienda Heights, Whittier
Most Recent Surface: Rupture: Holocene
Slip Rate: Between 2.5 and 3.0 mm/year
Interval between Major Ruptures: Unknown
Probable Magnitudes: M6.0 - 7.2
Other Notes: The Whittier fault dips toward the northeast.

FIGURE 16: WHITTIER M6.8 FAULT SCENARIO



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+

FIGURE 17: RSCCD IMPACT FROM A M6.8 WHITTIER FAULT



USGS ShakeMap for the M6.8 Scenario Earthquake on the Whittier Fault: Peak Ground Acceleration
MMI ENGINEERING

TABLE 14: RSCCD SITE IMPACT FROM A M6.8 WHITTIER FAULT

Site	District Location	Peak Ground Acceleration	Modified Mercalli Intensity	Perceived Shaking	Potential Damage
1	District Operations Center	0.1 – 0.2g	VI	Strong	Light
2	Santa Ana College (SAC)	0.1 – 0.2g	VI	Strong	Light
3	Santiago Canyon College (SCC)	0.2 – 0.3 g	VII	Very Strong	Moderate
4	Centennial Education Center (CEC)	0.1 – 0.2g	VI	Strong	Light
5	Orange Education Center (OEC)	0.2 – 0.3 g	VII	Very Strong	Moderate
7	Orange County Sheriff's Regional Training Academy (OCSRTA)	0.1 – 0.2g	VI	Strong	Light
8	Digital Media Center (DMC)	0.1 – 0.2g	VI	Strong	Light

Highlighted sites are the most heavily impacted sites

SAN ANDREAS FAULT ZONE

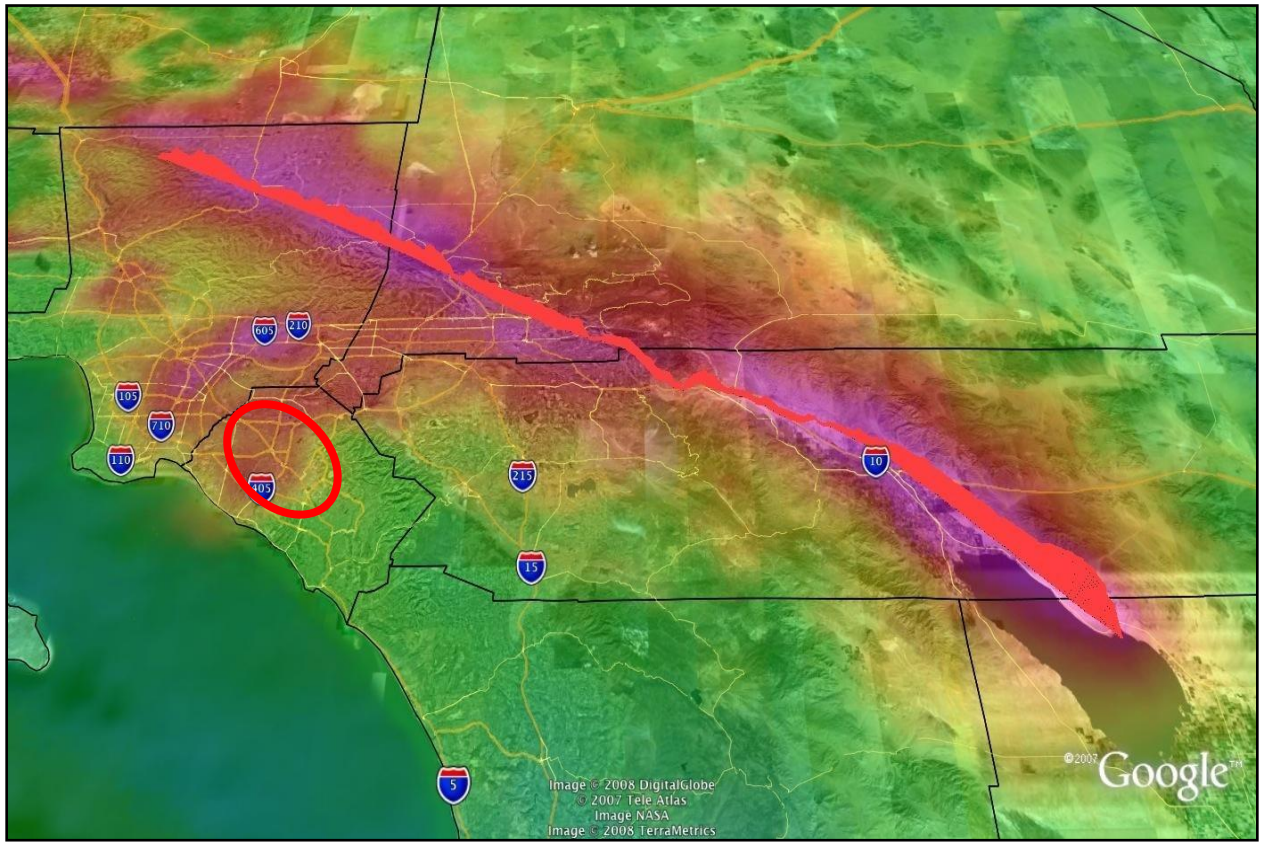
The dominant active fault in California, it is the main element of the boundary between the Pacific and North American tectonic plates. The longest and most publicized fault in California, it extends approximately 650 miles from Cape Mendocino in northern California to east of San Bernardino in southern California, and is approximately 35 miles northeast of Orange County. This fault was the source of the 1906 San Francisco earthquake, which resulted in some 700 deaths and millions of dollars in damage. It is the southern section of this fault that is currently of greatest concern to the scientific community. Geologists can demonstrate that at least eight major earthquakes (Richter magnitude 7.0 and larger) have occurred along the Southern San Andreas Fault in the past 1200 years with an average spacing in time of 140 years, plus or minus 30 years. The last such event occurred in 1857 (the Fort Tejon earthquake). Based on that evidence and other geophysical observations, the Working Group on California Earthquake Probabilities (SCEC, 1995) has estimated the probability of a similar rupture (M7.8) in the next 30 years (1994 through 2024) to be about 50%. The range of probable Magnitudes on the San Andreas Fault Zone is reported to be 6.8 - 8.0.

In Orange County, large urban fires and some wildland fires have been predicted. Major breaks in water lines are expected to seriously impede firefighting operations. Fire stations, police stations, City and School District Emergency Operations Centers may be damaged and unusable slowing coordination of response resources. The 2008 ShakeOut Report by Scawthorn states: The spread of fire within the built environment could be limited to several city blocks. However, of concern are fires in Orange County and the central Los Angeles basin, where a large plain of relatively uniform dense low-rise buildings provides a fuel bed such that dozens to hundreds of large fires are likely to merge into dozens of conflagrations. These fires could destroy tens of city blocks, and several of these large fires could merge into one or several super conflagrations that could destroy hundreds of city blocks.



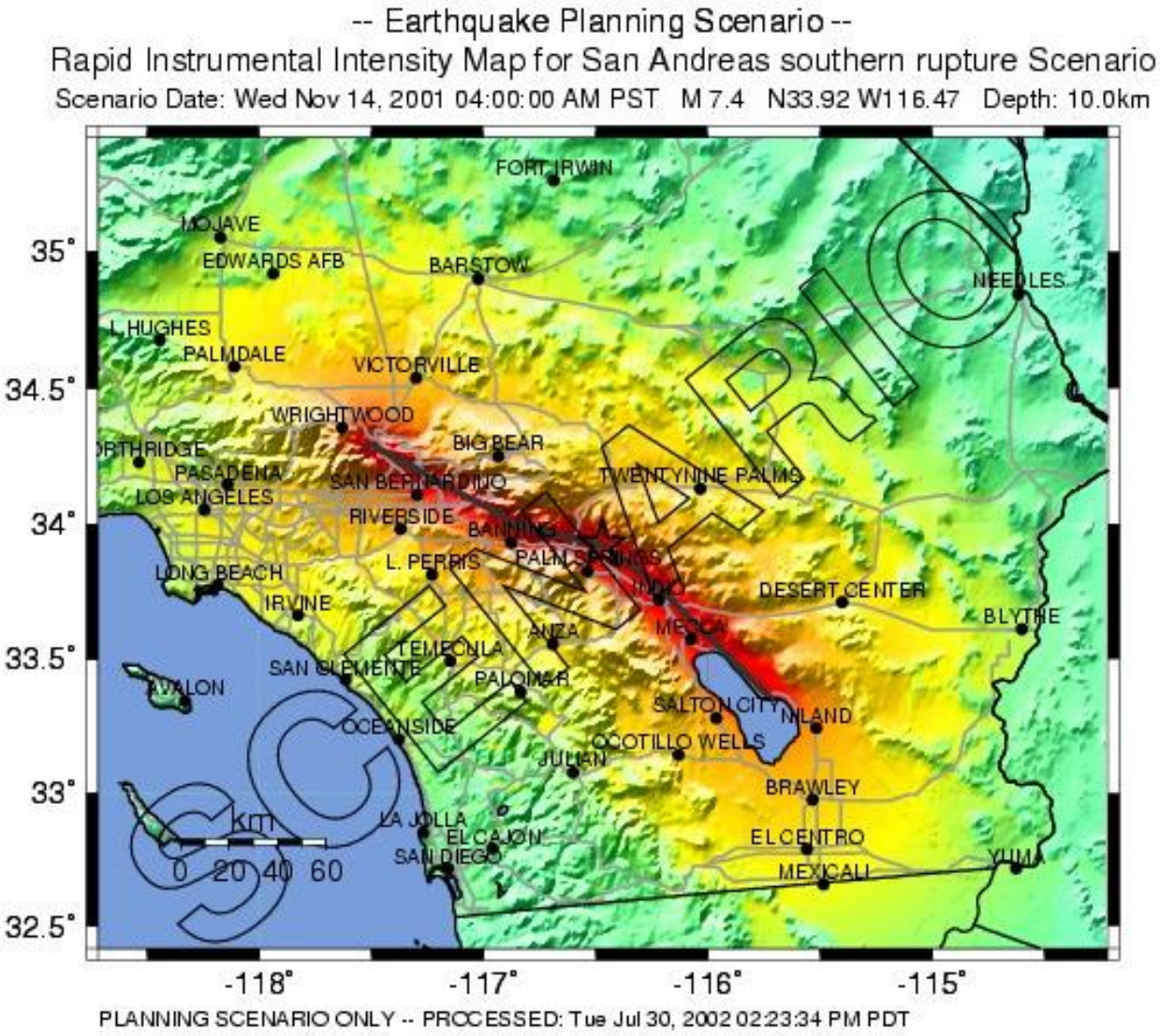
SHAKEOUT REPORT BY SCAWTHORN

FIGURE 18: M7.8 SAN ANDREAS – REPEAT OF THE 1857 FORT TEJON



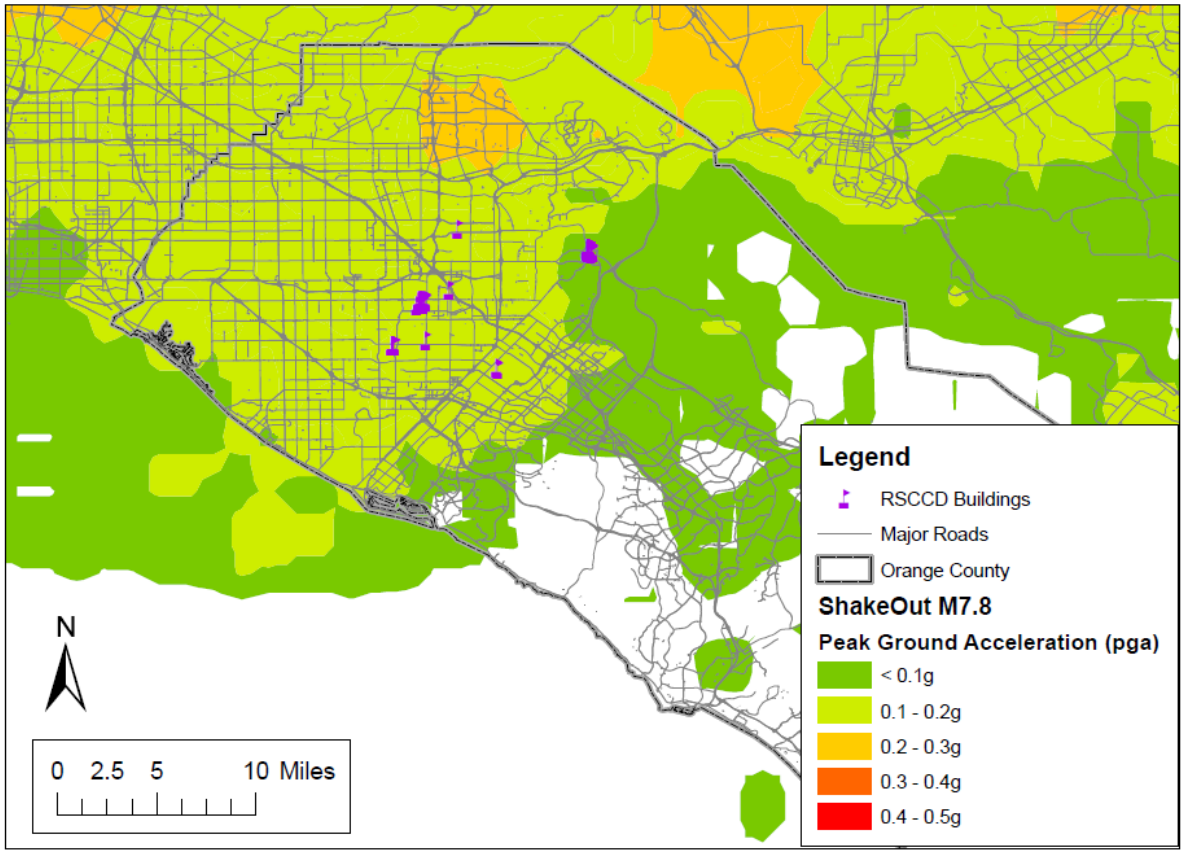
USGS

FIGURE 19: SHAKEMAP M7.4 SOUTHERN SAN ANDREAS SCENARIO (USGS, 2001)



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+

FIGURE 20: RSCCD IMPACT SCENARIO M7.8 "SHAKEOUT" SO. SAN ANDREAS FAULT



USGS ShakeMap for the M7.8 "ShakeOut" Scenario on the Southern San Andreas Fault: Peak Ground Acceleration
MMI ENGINEERING

TABLE 15: RSCCD SITE IMPACT FROM A M7.8 SOUTHERN SAN ANDREAS FAULT

Site	District Location	Peak Ground Acceleration	Modified Mercalli Intensity	Perceived Shaking	Potential Damage
1	District Operations Center	0.1 – 0.2g	VI	Strong	Light
2	Santa Ana College (SAC)	0.1 – 0.2g	VI	Strong	Light
3	Santiago Canyon College (SCC)	‹0.1 g	V	Moderate	Very Light
4	Centennial Education Center (CEC)	0.1 – 0.2g	VI	Strong	Light
5	Orange Education Center (OEC)	0.1 – 0.2g	VI	Strong	Light
7	Orange County Sheriff's Regional Training Academy (OCSRTA)	0.1 – 0.2g	VI	Strong	Light
8	Digital Media Center (DMC)	0.1 – 0.2g	VI	Strong	Light

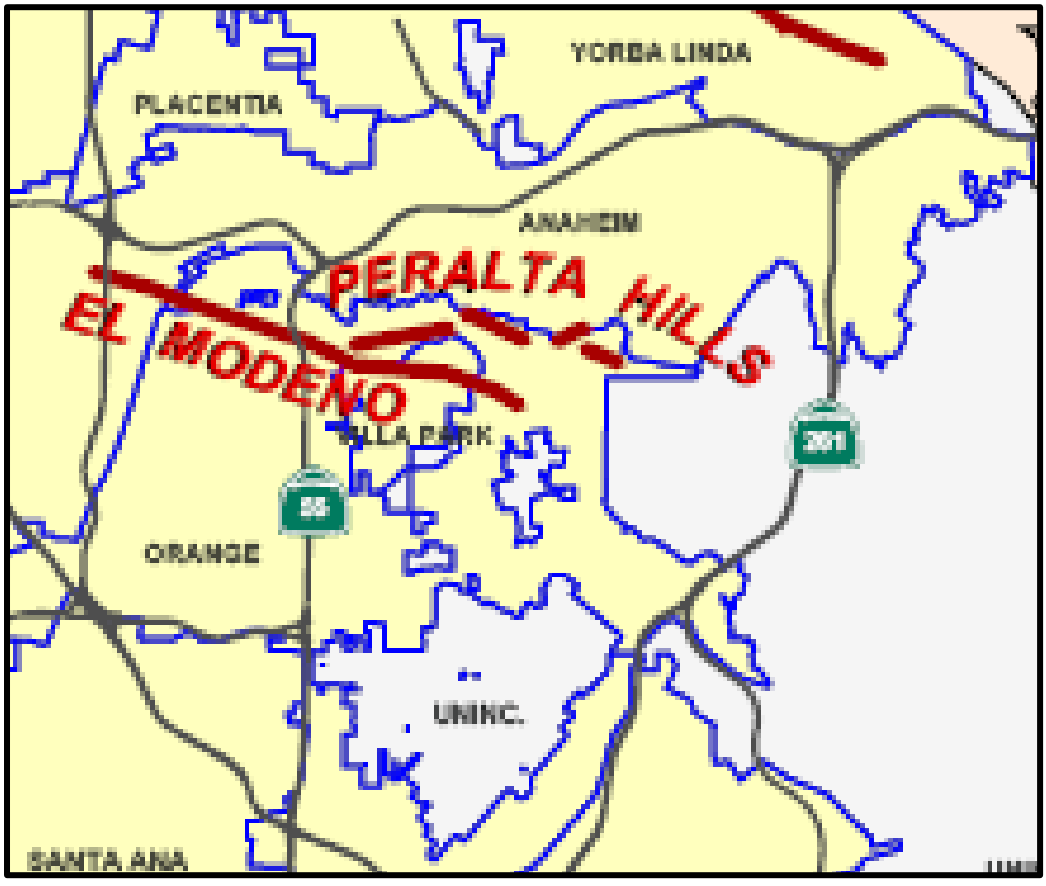
Highlighted sites are the most heavily impacted sites

EL MODENO FAULT

Not a lot is known about the El Modeno Fault. Lisa B. Grant, PhD at UCI conducted the Active Deformation and Earthquake Potential of Southern Los Angeles Basin, Orange County, CA.

ASHBY, JAMES R., Mission Geoscience, Inc., Newport Beach, CA, and BROOKS R. SMITH, LSA Associates, Inc., Irvine, CA writes in the abstract on The El Modeno Fault in Orange County, California: New Evidence for Holocene Activity

FIGURE 21: EL MODENA FAULT MAP



The El Modeno fault in north-central Orange County has long been suspected of being active in accordance with the guidelines of the Alquist-Priolo Special Studies Zones Act of 1972. The El Modeno fault was uncovered during a preliminary geotechnical investigation for a proposed shopping center development just south of the intersection of Chapman Avenue and Newport Boulevard in the City of Orange. Topsoil observed within the shear zone of the fault appeared to be visibly offset. As a result of this discovery, an Alquist-Priolo fault investigation was initiated,

involving fault trenches excavated across the site. Close examinations of the fault trace exposed in the trenches conclusively showed that the surficial soil horizon was truncated. Previous geologic and geotechnical investigations in the vicinity of the site have failed to document undisputed evidence for Holocene activity (truncated geologic units proven to be less than 11,000 year old) along the El Modeno fault. This lack of previous conclusive evidence is perhaps due in part to the general lack of datable organic material in Holocene soil horizons, and the distribution of displaced materials over a broad zone, a trait characteristic of reverse/right-lateral strike-slip displacement such as that along the El Modeno fault. Carbon-14 radiometric dating of the truncated soils revealed that surficial soils at this site are less than 2500 years old. Thus, the El Modeno fault should be considered active in accordance with the present guidelines of the Alquist-Priolo Special Studies Act.

The potential zoning of this fault through urbanized areas of Orange County will undoubtedly create some zoning restrictions and may have implications for future planning and redevelopment activities in the area. Earthquakes, such as the 1992 Landers, California, have provided us with interesting insight into the behavior of fault ruptures through both urbanized and unimproved land. Additionally, examination of the behavior of the Landers rupture may have serious implications for our interpretation of expected fault kinematics along faults with similar types of displacements directly related to the El Modeno fault, such as the Peralta Hills thrust and the Whittier-Elsinore fault zone.

AAPG Search and Discovery Article #90992©1993 AAPG Pacific Section Meeting, Long Beach, California, May 5-7, 1993.

EL MODENO FAULT/from Caltrans study in 2007
The El Modeno fault is located east of the study area within the Peralta Hills area of Orange County. The El Modeno fault is a southwest-dipping, north/south trending, normal fault that extends from the Peralta Hills area south into Santiago Creek in the Peters Canyon Wash, approximately 6.5 kilometers (four miles) northeast of the SR-22. This fault may be capable of an earthquake of magnitude 6.0 on the Richter scale (SCEDC, 2000).

El Modeno Fault So CA Earthquake Data Center
Type of Fault: reverse
Length: about 10 km
Nearest Communities: Anaheim, Orange
Most Recent Surface Rupture: Quaternary

Cenozoic Era
The Cenozoic Era is the current and most recent of the three Phanerozoic geological eras, following and covering the period from 65 million years ago to present day. It began 65 million years ago with an asteroid impact that killed off a majority of the dinosaurs and ends at the present day. The Cenozoic is commonly divided into three periods:
Paleogene (65.5 to 23.03 million years ago)
Neogene (23.03 to 2.6 million years ago)
Quaternary (2.6 million years ago to present)

PERALTA HILLS FAULT

The Peralta Hills Fault is a previously unrecognized active transverse range ‘blind thrust” fault in Orange County, California.

The Peralta Hills fault is an east-west a "blind thrust” except where it surfaces as a low angle thrust in Anaheim Hills. Two tree stumps radiocarbon dated at 3,500 years BP (Fife and Bryant, 1983), have been displaced 15 m. in the lower plate of the fault. Many structures have been constructed on or near the trace or multiple traces of this active fault as a result of the failure to place the Peralta Hills fault in an Earthquake Hazard Studies Zone.

When the California Geological Survey contracted with the U.S. Geological Survey to digitize their Geological/Landslide Hazard Map of the Orange Quad (Tan, 1995) the Survey “moved” the Peralta Hills fault trace “around” Reservoir 1-A, a 5 million gallon semi-buried hillside steel tank and apparently through or adjacent to a second buried hillside 3.500 gallon steel tank .

The Orange City Department of Public Works continues to fill the 5 million gallon tank, possibly jeopardizing down slope structures should the fault rupture. The fault trace forms a perfect diameter through the middle of the 200-foot diameter tank with differential settlement along the contact with Holocene gravels and Miocene siliceous shale. The fault passes through portions of the Edison Serrano Substation and a key transmission tower atop the upper plate and will likely sustain damage during a major earthquake. The fault passes through a gas station and Eisenhower Lake above commercial and residential structures.

Many homes in Anaheim Hills are set back from the fault trace to avoid fault rupture, while other homes are built on areas where multiple thrust fault traces and thrust fault-rooted landslides have been buried. The 15 m set-back from the fault trace that is commonly required for structures may not be sufficient when a low angle thrust passes less than 15 m. beneath the structure.

The Peralta Hills fault has a known sinuous trace of about 10 km. The fault consists, in some locations; of multiple imbricate thrusts. Based on fault length it is estimated that the Peralta Hills fault is capable of a 6 to 7 magnitude earthquake and several meters of left oblique surface rupture.

FIFE, Donald L., Donald L. Fife & Associates, Box 1054, Tustin, CA 92781-1054, donfife@dslextreme.com and SHLEMON, Roy, Geology, UC Davis, One Shields Ave, Davis, CA 95616

PUENTE HILLS THRUST FAULT

This is another recently discovered blind thrust fault that runs from northern Orange County to downtown Los Angeles. This fault is now known to be the source of the 1987 Whittier Narrows earthquake. Recent studies indicate that this fault has experienced four major earthquakes ranging in Magnitude from 7.2 to 7.5 in the past 11,000 years, but that the recurrence interval for these large events is on the order of several thousand years.

HISTORIC EARTHQUAKES

Whittier Narrows, California October 01, 1987, Magnitude 5.9

The Whittier Narrows earthquake caused eight fatalities, injured several hundred, and left property damage estimated at $358 million in the East Los Angeles area, mainly at Whittier. The Modified Mercalli intensity VII to VIII covered an area of about 500 km2 from Monrovia and Pasadena in the north to beyond Whittier in the southeast. MM Intensity VI was assigned to an additional area of 1,500 km2. It was originally thought to be on the Whittier Fault.

Business structures in the old Whittier commercial district were the most severely damaged by the main earthquake. In the 24-square-block shopping area known as Whittier Village, 12 commercial buildings had to be razed, and another 20 buildings were declared unsafe. An inspection of residential houses in Los Angeles, Orange, and Ventura Counties indicated that 123 single-family houses and 1,347 apartment units were destroyed, and about 513 single-family houses and 2,040 apartment units sustained major damage. Property damage on the UCLA campus (about 10 km west of the epicenter) was estimated at more the $20 million.

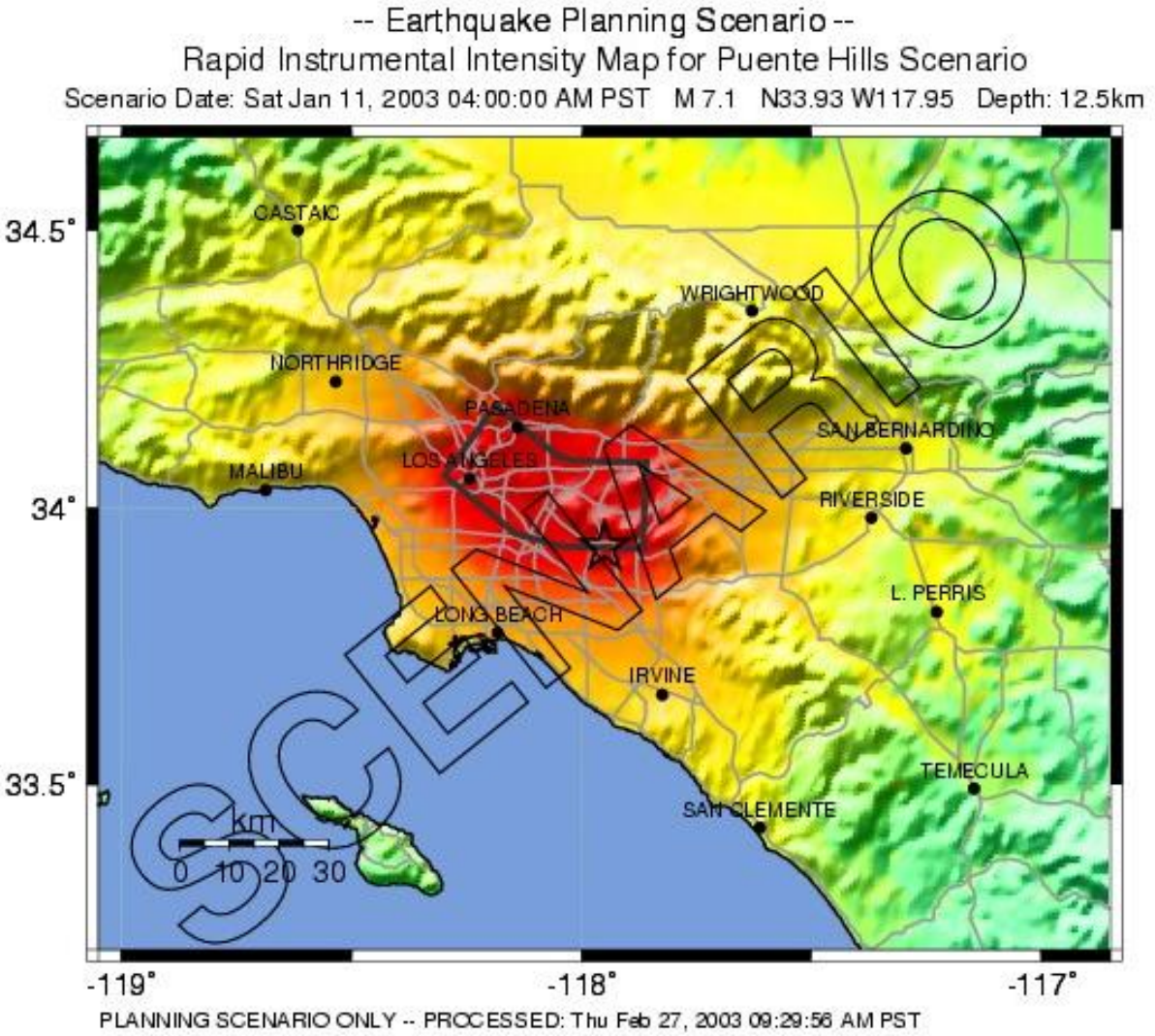
The most severe damage to transportation systems was the Interstate 605 Interstate 5, a major nine-span bridge that was built in 1964. The five supporting columns sustained severe shear fractures and the overpass was closed temporarily. Minor damage also occurred on 23 other bridges in the area.

Damage and dysfunction of lifelines included the often observed failure of ceramic elements on high-voltage substation equipment, damage to large liquid-storage tanks, and saturation of the telephone system with inappropriate calls. The natural-gas transmission system was not damaged, and only one cast-iron pipe failed in the distribution system. However, about 1,400 gas leaks occurred on customer property, and many fires were ignited.

This earthquake sequence ruptured a small and previously unidentified, gently north-dipping, west-striking thrust fault beneath the uplifted Puente Hills and Elysian Park-Montebello Hills. However, tectonic slippage was not observed during a field study of the faults in the epicenter area. Geologic surface expression appeared to be limited to secondary nontectonic breaks caused by acceleration at the surface. Although many ground cracks formed along the base of the Puente Hills between Turnbull Canyon and Norwalk Boulevard, ground breakage in that area was limited to slope failures, including extensional cracks, minor landslides, and rock falls. Ground-surface cracks also were observed at Worsham Creek oil field and Whittier Narrows golf course.

The main shock was followed by about 500 locatable aftershocks, an unusually small number for an earthquake of this magnitude. The largest aftershock, which occurred on October 4 about three km northwest of the epicenter of the main shock, caused further damage to weakened buildings.

FIGURE 22: SHAKEMAP M7.1 PUENTE HILLS (USGS, 2003)



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+

F. EARTHQUAKE RELATED HAZARDS

Ground shaking, landslides, amplification and liquefaction 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.

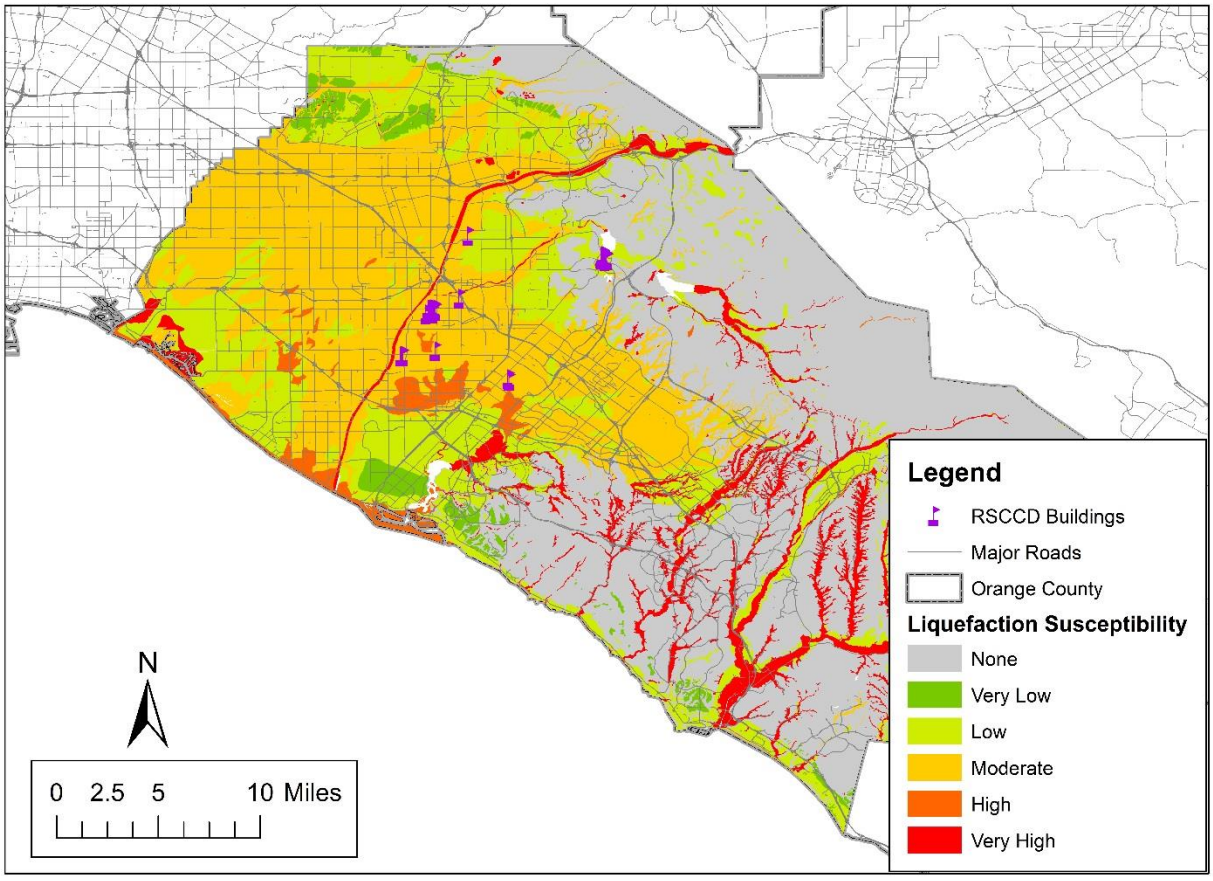
AMPLIFICATION

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. Orange County coastal communities are built on alluvial soils which can increase ground shaking and damage. Amplification can also occur in areas with deep sediment filled basins and on ridge tops.

G. RSCCD LIQUEFACTION SUSCEPTIBILITY

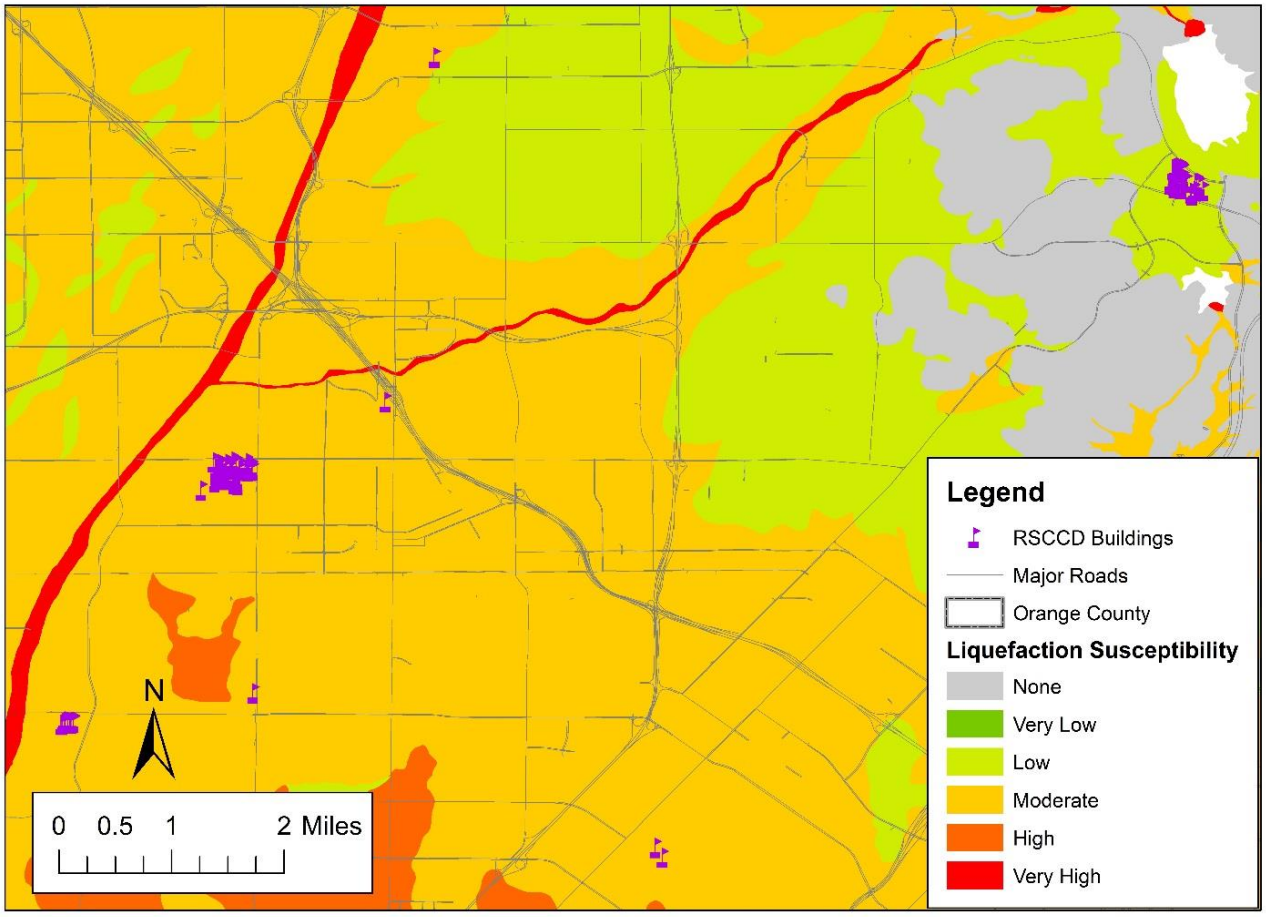
Liquefaction occurs when ground shaking causes wet granular soils to change from a solid state to a liquid state. This results in the loss of soil strength and the soil's ability to support weight. Buildings and their occupants are at risk when the ground can no longer support these buildings and structures.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

FIGURE 23: ORANGE COUNTY/RSCCD LIQUEFACTION SUSCEPTIBILITY MAP



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FIGURE 24: RSCCD LIQUEFACTION SUSCEPTIBILITY MAP



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TABLE 16: RSCCD FACILITY EXPOSURE TO LIQUEFACTION SUSCEPTIBILITY

Site	# Buildings	Liquefaction Susceptibility Zone
Centennial Education Center	15	Moderate
Digital Media Center	1	Moderate
District Office	1	Moderate
Orange County Sheriff's Regional Training	2	Moderate
Orange Education Center	1	Moderate
Santa Ana College	76	Moderate
Santiago Canyon College	50	Low
TOTAL	146	

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H. COMMUNITY EARTHQUAKE ISSUES



RSCCD PREVIOUS OCCURRENCES

Although the RSCCD sites were impacted several moderate and many minor earthquakes, fortunately none of the incidents caused deaths, injuries or heavy financial damage to the RSCCD properties. At the RSCCD sites occupants would have felt the 1987 Whittier Earthquake and the 1994 Northridge Earthquake along with numerous minor earthquakes. The Whittier and Northridge quakes both required evacuation of some facilities in Orange County, damage assessment inspections, and activation of City Emergency Operations Centers (EOCs). In the Northridge Earthquake. there were items off shelves but not facility damage or dollar losses. Both quakes hit early in the morning making it less likely the colleges were impacted. The Northridge earthquake hit on Martin Luther King Day and the sites were not operating.

SUSCEPTIBILITY 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 Californians.

DAMS

There are a total of 32 dams in Orange County. The ownership ranges from the Federal government to Home Owners Associations. These dams hold billions of gallons of water in reservoirs. The major reservoirs are designed to protect Southern California from flood waters and to store domestic water. Seismic activity can compromise the dam structures resulting in catastrophic flooding. The major dam that could impact the coastal Orange County is the Prado Dam. Following a major earthquake in Southern California, all public safety and school districts should be aware that earthquakes can cause dam failures. The Prado Dam is managed by the Army Corps of Engineers. Following an earthquake, the Army Corps of Engineers will assess the dam for damage and if damaged, issue evacuation orders through the Orange County Sheriffs Department.



On February 9, 1971 at 6:02 AM, the Los Angeles basin shook for over one minute from what was called the San Fernando Earthquake. There were 65 deaths and a financial cost of over $500 million. The earthquake resulted in a crack in the Van Norman Dam where an 80-square mile area had to be evacuated due to fear the dam would break. Scores of people were trapped

in buildings and fires were started from natural gas line breaks. Two hospitals collapsed killing nine persons.

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 damage is great. In most California communities, including the County of Orange and the RSCCD sites, many buildings were built before 1993 when building codes were not as strict. In addition, retrofitting is not required except under certain conditions and can be expensive. Therefore, the number of buildings at risk remains high. The California Seismic Safety Commission makes annual reports on the progress of the retrofitting of unreinforced masonry buildings.

INFRASTRUCTURE AND COMMUNICATION

Residents in Orange County commute frequently by automobiles and much less by 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.



BRIDGE DAMAGE

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

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

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 earthquakes 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, schools and colleges, and other facilities that provide important services to the community. These facilities and their services need to be functional after an earthquake event.

NUCLEAR POWER PLANT ACCIDENTS

The March 11, 2011 Japan M9.0 earthquake resulted in three nuclear power plant meltdowns. Following this earthquake, many Californians began asking how a major earthquake would impact their community. Because of this, the Nuclear Regulatory Commission is now reviewing nuclear power plants near earthquake faults and their emergency plans. More information will become available in the future.

The only nuclear power plant that could impact the RSCCD is the San Onofre Nuclear Generating Station located south of Orange County in San Diego County. The site is now in the process of closure, however, all nuclear waste remains on site. Three cities in Orange County would be impacted initially: San Clemente, Dana Point and San Juan Capistrano. The district has no sites in these three cities.

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 businesses who may have difficulty recovering from their losses.

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.

INDIVIDUAL PREPAREDNESS

Because the potential for earthquake occurrence and earthquake related property damage may be relatively moderate to high in Orange County, making individual preparedness a significant need. The RSCCD Emergency Response Program teaches employees evacuation procedures and has assigned and trained Building Captains at each of its sites. The District has identified Campus Emergency Operations Centers (EOCs) for each of its sites. (For a complete list, see Risk Assessment Critical Facilities, page 20.)

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

FIRE
Downed power lines or broken gas mains can trigger fires. When fire stations suffer building or lifeline damage, firefighters may not be able to respond. 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 firefighting ability. Water main breaks also increases the threat of fire.

Should an earthquake occur during a Santa Ana Wind condition, the threat of fire would increase considerably. This could result in a catastrophic fire that could cause more damage than the earthquake which is what occurred in the 1906 San Francisco Earthquake.

DEBRIS
After damage to a variety of structures, much time is spent cleaning up brick, glass, wood, steel or concrete building elements, office and home contents, and other materials. Developing a strong debris management strategy is essential in post-disaster recovery. Occurrence of a disaster does not exempt Orange County from compliance with AB 939 regulations covering recycling debris.

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

BUILDING CODES
Since the RSCCD does not have its own building codes, they must follow the California Division of State Architect (DSA). The RSCCD facilities are located within the two cities of Santa Ana and Orange. Some city coordination may be required on zoning, infrastructure and street issues.

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

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

When the Hospital Act was passed in 1973, the State anticipated that, based on the regular and timely replacement of aging hospital facilities, the majority of hospital buildings would be in compliance with the Act's standards within 25 years. However, hospital buildings are not being replaced at that anticipated rate. In fact, the great majority of the State's urgent care facilities are now more than 40 years old.

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

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

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

In 2001, recognizing the continuing need to assess the adequacy of policies, and the application of advances in technical knowledge and understanding, the California Seismic Safety Commission created an Ad Hoc Committee to re-examine the compliance with the Alquist Hospital Seismic Safety Act. The formation of the Committee was also prompted by the recent evaluations of hospital buildings reported to OSHPD revealing that a large percentage (40%) of California's operating hospitals are in the highest category of collapse risk."

I. California Earthquake Mitigation Legislation

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

TABLE 17: EARTHQUAKE SAFETY LAWS

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

COUNTY OF ORANGE AND OCFA HAZARD MITIGATION PLAN

J. EARTHQUAKE EDUCATION

Earthquake research and education activities are conducted at several major universities in the Southern California region, including Caltech, USC, UCLA, UCSB, UCI, and UCSD. The local clearinghouse for earthquake information is the Southern California Earthquake Center located at the University of Southern California, Los Angeles, CA 90089, Email: SCEinfo@usc.edu, Website: http://www.scec.org. The Southern California Earthquake Center (SCEC) is a community of scientists and specialists who actively coordinate research on earthquake hazards at nine core institutions, and communicate earthquake information to the public. SCEC is a National Science Foundation (NSF) Science and Technology Center and is co-funded by the United States Geological Survey (USGS).

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

The RSCCD works closely with the county and the cities where their facilities are located to coordinate earthquake education and exercises. Examples include: Orange County ShakeOut Earthquake Exercises, annual Orange County Operational Area exercises, and ReadyOC website where Orange County residents and RSCCD students and faculty can find earthquake educational resources. The district personnel can also turn to the American Red Cross for earthquake preparedness information and training as well as for volunteer opportunities to assist in disasters.

The RSCCD has on its website “Safety and Risk Management” where emergency preparedness is discussed, disaster preparedness training classes, fire extinguisher training, and other safety information.

All managers, as part of their professional development, are required to take the National Information Management System (NIMS) on-line courses to prepare to manage incidents in the district’s Emergency Operations Center which would be set up on the first floor district board room, Room 107.



On September 17, 2015 the RSCCD Risk Manager and Security Team set up and operated an emergency preparedness booth at Santiago Canyon Community College. They displayed enlarged hazard maps from the earthquake section of this Hazard Mitigation Plan (in progress).



A sign was displayed inviting students, faculty and staff to join the District’s Hazard Mitigation Team.

K. EARTHQUAKE PROBABILITY OF FUTURE OCCURRENCES

A Southern California Earthquake Center (SCEC) report published Seismic Hazards in Southern California stated: Probable earthquakes 1994 to 2024 indicated that the probability of an earthquake of a Magnitude 7 or larger in Southern California before the year 2024 is 80 to 90 percent. The San Andreas Fault is approximately 35 miles northeast of Orange County. This fault is capable of producing earthquakes in the magnitude of 8+ range. It has been scientifically determined through a carbon dating process that a major earthquake on this fault has occurred approximately every 130 years plus or minus 20 years. The last major earthquake on the Southern San Andreas Fault occurred in 1857 (158 years ago as of 2015). The San Andreas is considered one of the most active faults in the world today and located on the Pacific Ring of Fire where most of the world's earthquakes occur. A major earthquake up to an 8.3 magnitude is expected to occur again within the next 20 years.

There are still undiscovered faults throughout California. An example of that is the San Joaquin Hills Fault, was only discovered in 1999. One of these undiscovered faults could cause an earthquake that impacts the RSCCD. The following provides us an historic view of the faults that would most impact the RSCCD and the intervals between major ruptures. Intervals can be between hundreds and thousands of years.

TABLE 18: EARTHQUAKE RECURRENCE INTERVALS/PROBABILITY WHERE KNOWN

Fault	Magnitude	Last Major Earthquake	Earthquake Recurrence Intervals
San Joaquin Hills	M6.6	Possibly 1769	The minimum average recurrence interval is between about 1650 and 3100 years
Newport-Inglewood	M6.9	1933	The Newport-Inglewood fault has an unknown interval between major ruptures. However, the recurrence interval for a similar quake of the M6.4 1933 Long Beach quake is once every 1000 years.
Whittier	M6.8	Unknown	The recurrence interval is unknown for the Whittier fault.
San Andreas	M7.8	1857	Every 150 years. The probability of a M7.8 rupture in the next 30 years (1994 through 2024) is about 50%
El Modeno	M6.0	Unknown	The recurrence interval is unknown for the El Modeno fault.
Puente Hills	M7.1	1987	The recurrence interval for large events is on the order of several thousand years

An earthquake can strike 100% of the planning area making it **Extensive**. The probable extent of an incident is **Severe**, and would strike without warning, sites all ranked VII to VIII Modified Mercalli Scale, and the recovery time would be a long duration resulting in loss of services for months and to one site, the Santa Ana College campus, a year or more (due to the high number of buildings identified by this study as needing seismic evaluations.) After reviewing all earthquake data and history, the Hazard Mitigation Team ranked earthquake as ***Highly Likely*** (recurrence interval 1-10 years.) The Team rated an earthquake as ***Highly Likely*** because of the many known and unknown faults in Southern California and the SCED prediction.

L. POTENTIAL INTENSITY BY SITE OF FUTURE OCCURRENCES

This section summarizes and compares the impact of each of the five earthquake faults with each other where data is available and will help the Hazard Mitigation Team, district personnel, faculty, students and the public to understand the potential impact of earthquake on the RSCCD facilities.

TABLE 19: RSCCD SITES MODIFIED MERCALLI INTENSITY RANKINGS BY SITE

#	Site	San Joaquin Hills	Newport-Inglewood	Whittier	San Andreas
1	District Operations Center	VII	VI	VI	VI
2	Santa Ana College (SAC)	VIII	VII	VI	VI
3	Santiago Canyon College (SCC)	VII	VI	VII	V
4	Centennial Education Center (CEC)	VIII	VII	VI	VI
5	Orange Education Center (OEC)	VII	VI	VII	VI
7	Orange County Sheriff's Regional Training Academy (OCSRTA)	VIII	VII	VI	VI
8	Digital Media Center (DMC)	VIII	VII	VI	VI

Worse threats are highlighted

The worst-case scenario for the RSCCD is the San Joaquin Hills Fault where four sites are expected to have severe shaking and moderate to heavy damage, and VIII on the Modified Mercalli Scale.

The next worst-case scenario is the Newport Inglewood Fault where four sites are expected to have very strong shaking, moderate damage and a VII on the Modified Mercalli Scale.

The third worst-case scenario is the Whittier Fault where two sites are expected to have very strong shaking, moderate damage and a VII on the Modified Mercalli Scale.

Surprisingly, in the San Andreas scenario which has the greatest potential of occurring, the shaking is expected to be strong but the damage fortunately is expected is to be light.

This information is not available for the El Modeno or Puente Hills faults.

Note: The RSCCD 2015 Insurance Property Evaluation Report (completed every 5 years) referenced in this plan can be accessed through the RSCCD Risk Management Department Office.

TABLE 20: HAZUS ESTIMATED IMPACTS - RSCCD FACILITIES (IN $1,000) BY SITE

	RSCCD Sites							
Damage Type	District Office	Santa Ana College	Centennial Education Center	Digital Media Center	Orange Education Center	Santiago Canyon College	OC Sheriff's Regional Training	Total
M6.9 Newport-Inglewood Fault Scenario Earthquake								
Structural Damage	135	973	57	74	75	89	96	1,498
Non-Str. Damage	370	7,690	551	446	307	1,253	847	11,463
Building Damage (Str+Non-Str.)	505	8,663	608	520	382	1,342	942	12,962
Net Damage Ratio	3.4%	6.4%	7.6%	7.6%	2.2%	1.3%	7.0%	4.3%
Contents Damage	27	993	58	128	0	170	85	1,462
Total Building & Contents Damage	***532***	***9,656***	***665***	***648***	***382***	***1,513***	***1,028***	***14,423***
M6.6 San Joaquin Hills Fault Scenario Earthquake								
Structural Damage	265	1,976	101	125	208	224	175	3,074
Non-Str. Damage	762	14,441	955	762	894	2,714	1,524	22,052
Building Damage	1,027	16,417	1,056	887	1,102	2,938	1,698	25,126
Net Damage Ratio	7.0%	12.0%	13.2%	12.9%	6.3%	2.8%	12.5%	8.4%
Contents Damage	56	1,786	99	222	0	468	156	2,788
Total Building & Contents Damage	***1,083***	***18,204***	***1,155***	***1,109***	***1,102***	***3,405***	***1,855***	***27,914***
M6.8 Whittier Fault Scenario Earthquake								
Structural Damage	99	578	7	13	211	303	16	1,226
Non-Str. Damage	300	4,727	101	86	904	3,441	165	9,725
Building Damage	399	5,305	109	98	1,115	3,744	180	10,951
Net Damage Ratio	2.7%	3.9%	1.4%	1.4%	6.3%	3.6%	1.3%	3.6%
Contents Damage	23	617	11	26	0	537	18	1,232
Total Building & Contents Damage	***423***	***5,922***	***120***	***124***	***1,115***	***4,282***	***198***	***12,183***

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No financial data is available at this time for the Whittier or El Modeno Faults.

The estimated total building and contents damage for the 6.9 magnitude on the Newport-Inglewood Fault is $14,423,000.

The estimated total building and contents damage for the 6.6 magnitude on the San Joaquin Hills Fault is $27,914,000. This is the worst case scenario.

The estimated total building and contents damage for the 6.8 magnitude on the Whittier Fault is $12,183,000.

As shown above, according to MMI Engineering: the earthquake scenario causing the largest economic loss is the M6.6 San Joaquin Hills Fault scenario, which could result in just under $28 million in building and content damage to the 146 buildings modeled for the District. The M6.9 Newport-Inglewood Fault and the M6.8 Whittier Fault scenarios would both cause about half this amount of damage or less, on the order of $14 million and $12 million, respectively. Fortunately the expected damage is modest; all of the RSCCD buildings are expected to be "green-tagged" (may have suffered some damage, but continued occupancy is allowed) in the three events studied. While the net damage ratio for the District is expected to range between 4 and 8% of building replacement value in the three events, maximum expected individual building damage ratios' could be as large as 16% in the San Joaquin Hills event, 8% in the Newport-Inglewood event and 6% in the Whittier event.

Most of the damage is expected to be non-structural in nature with non-structural damage accounting for just under 90% of building damage in all three events. Non-structural components commonly include non-bearing walls and partitions, veneers and finishes, mechanical and electrical building systems and equipment, HVAC system, lighting fixtures, suspended ceiling systems, etc. Non-structural mitigation such as conducting a non-structural component survey resulting in anchorage and bracing recommendations would be a valuable way for the District to reduce potential earthquake damage.

The total number of expected casualties in each event (including both non-fatal and fatal injuries), as well as overall casualty rates are summarized by site in the following table. The earthquake scenario causing the greatest number of casualties is the San Joaquin Hills Fault scenario earthquake, which could cause between 250-200 non-fatal injuries (most occurring on the Santa Ana College campus) and could potentially cause as many as 15 deaths.

It should be noted that high occupancy facilities, even when moderately damage, may generate more casualties than buildings with lower occupancy levels. To better understand the range of vulnerability to casualties, casualty data in Table 23 (below) are presented in terms of both the number of expected casualties, and the expected casualty rates. As shown in the table below, the site with the largest number of expected casualties in all three events is Santa Ana College; the site which also has the highest daytime peak population levels (14,925). Buildings with the largest injury and/or fatality rates would be considered the most dangerous to their occupants. Although the actual number of expected fatalities at the Orange Education Center in the San Joaquin Hills scenario is smaller than that for Santa Ana College, the fatality rate at this facility is the same order of magnitude as Santa Ana College as a whole. Further, this facility has a higher fatality rate than Santa Ana College in the Whittier event. The individual buildings with non-zero injury and fatality estimates are identified in Table 24, along with each building's peak daytime occupancy, demonstrating that many of the buildings on the list are high occupancy facilities. Buildings that also have non-zero fatality estimates have been highlighted in red for the scenario in which the non-zero rate occurs. A total of 41 buildings could have injured occupants in the San Joaquin Hills scenario event, while 32 and 23 buildings could have injured occupants in the Newport-Inglewood and Whittier scenarios respectively. For each of these buildings, the assumed building characteristics should be verified. To reduce potential risk to building

occupants, these especially those of higher occupancy levels or higher injury or fatality rates, as shown in Appendix ? would be good candidates for structural review and evaluation.

TABLE 21: HAZUS-ESTIMATED CASUALTIES FOR RSCCD FACILITIES BY SITE

Name	RSCCD Sites							
	District Office	Santa Ana College	Centennial Education Center	Digital Media Center	Orange Education Center	Santiago Canyon College	OC Sheriff's Regional Training	Total
M6.9 Newport-Inglewood Fault Scenario								
Expected Injuries	≤ 5	50 - 75	6 - 10	≤ 5	≤ 5	≤ 5	≤ 5	75 - 100
Expected Fatalities	None	≤ 5	None	None	None	None	None	≤ 5
Expected Injury Rate	<1%	~1%	<1%	~1%	<1%	<1%	~1%	<1%
Expected Fatality Rate	None	~0.02%	None	None	None	None	None	~0.01%
M6.6 San Joaquin Hills Fault Scenario								
Expected Injuries	≤ 5	100 - 150	11 - 20	≤ 5	6 - 10	6 - 10	≤ 5	150 - 200
Expected Fatalities	None	6 - 10	None	None	≤ 5	None	None	11- 15
Expected Injury Rate	~1%	~1%	~1%	1 – 2%	<1%	<1%	1 – 2%	1%
Expected Fatality Rate	None	~0.06%	None	None	~0.06%	None	None	~0.04%
M6.8 Whittier Fault Scenario								
Expected Injuries	≤ 5	25 - 50	None	None	6 - 10	6 - 10	None	50 - 75
Expected Fatalities	None	≤ 5	None	None	≤ 5	None	None	≤ 10
Expected Injury Rate	<1%	<1%	None	None	<1%	<1%	None	<1%
Expected Fatality Rate	None	~0.1%	None	None	~0.6%	None	None	~0.1%

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TABLE 22: BUILDINGS WITH NON-ZERO INJURY ESTIMATES/RATES BY SCENARIO

Highlighted entries below indicate buildings that have non-zero fatality rates. They are the buildings we need to be most concerned about and should be considered for structural engineering evaluation, especially the higher occupancy buildings

Building Name	Peak Occupancy	M6.9 Newport-Inglewood	M6.6 San Joaquin Hills	M6.8 Whittier
District Office - Admin Building	399	☑	☑	☑
SAC - Administration Building	231	☑	☑	☑
SAC - Cesar Chavez Building	1,236	☑	☑	☑
SAC - Fine Arts Building	414	☑	☑	☑
SAC - Music Building	179	☑	☑	
SAC - Theater Building	575	☑	☑	☑
SAC - Dunlap Hall Building	1,636	☑	☑	☑
SAC - Planetarium Building	127	☑	☑	
SAC - Library Building	958	☑	☑	☑
SAC - Russell Hall Building	1,293	☑	☑	☑
SAC - Hammond Hall Building	452	☑	☑	☑
SAC - Technical Arts Building	254	☑	☑	☑
SAC - Women's PE Building	227	☑	☑	☑
SAC - Gymnasium Building	2,535	☑	☑	☑
SAC - Lockers Building *	136	☑	☑	
SAC – Fitness Center	84		☑	
SAC - Campus Center Building	727	☑	☑	☑
SAC - Auto Shop Building	159	☑	☑	
SAC - Maintenance and Publication	159	☑	☑	
SAC - Welding/Maintenance	112	☑	☑	
SAC - Classroom Building I	725	☑	☑	☑
SAC - Middle School (Business/Computer) Bldg	480	☑	☑	☑
SAC - Child Development Building 100	126	☑	☑	
SAC - Child Development Building 300	96		☑	
SAC - Child Development Building 400	96		☑	
CEC - Admin/Classroom Building A Wing	265	☑	☑	
CEC - Classroom Building B Wing	200	☑	☑	
CEC - Child Development Building C Win	223	☑	☑	
CEC - Art Building D Wing	316	☑	☑	
CEC - TV Studio/Classroom Building E W	189	☑	☑	
CEC - Classroom Building F Wing	261	☑	☑	
CEC – Portable Classroom	92		☑	
Digital Media Center	283	☑	☑	
Orange Education Center	1,600	☑	☑	☑
SCC – Classroom Building B	529			☑
SCC – Lecture Hall/Classroom Building	999		☑	☑
SCC – Admin/Office/Classroom Building	675		☑	☑
SCC - Library	661		☑	☑
SCC – Science Center	918		☑	☑
SCC - Physical Education Building	2,438	☑	☑	☑
SCC – Humanities Building	1,560		☑	☑
OCSRT - Administration/Training Academy	304	☑	☑	
	24,929	32 buildings	41 buildings	23 buildings

MMI ENGINEERING TABLE

* CURRENT DATA WERE UNAVAILABLE

It should be noted that buildings designed to older versions of the building code tend to be more vulnerable to damage than equivalent buildings designed to more recent codes. The District has a number of these older buildings on the Santa Ana College Campus, and including the District Office. The 23 buildings currently modeled in HAZUS as designed to a "Moderate Code" level (built between 1941 and 1976, i.e., prior to the release of the 1976 Uniform Building Code) are identified in **Table 24** below. These buildings house close to 110,000 occupants and would be good candidates for structural engineering evaluation, especially the higher occupancy buildings, many of which appear in the list of buildings with non-zero injury estimates below.

TABLE 23: "MODERATE CODE" BUILDINGS DESIGN LEVELS IN HAZUS

Site/Building Number from 2015 Insurance Appraisal Report	Site – Building Name	Year Built	Peak Daytime Occupancy
Site 1 Building 01	District Office - Admin Building	1970	399
Site 2 Building 01	SAC - Administration Building	1972	231
Site 2 Building 03	SAC - Fine Arts Building	1972	414
Site 2 Building 04	SAC - Music Building	1970	179
Site 2 Building 05	SAC - Theater Building	1955	575
Site 2 Building 06	SAC - Dunlap Hall Building	1973	1,636
Site 2 Building 07	SAC - Planetarium Building	1967	127
Site 2 Building 08	SAC - Library Building	1956	958
Site 2 Building 09	SAC - Russell Hall Building	1967	1,293
Site 2 Building 10	SAC - Hammond Hall Building	1954	452
Site 2 Building 11	SAC - Technical Arts Building	1970	254
Site 2 Building 12	SAC – Wrestling Room	1972	227
Site 2 Building 13	SAC - Gymnasium Building	1954	2,535
Site 2 Building 15	SAC - Fitness Center	1972	84
Site 2 Building 18	SAC - Auto Shop Building	1958	159
Site 2 Building 19	SAC - Maintenance And Publication	1950	159
Site 2 Building 20	SAC - Campus Vehicles Building	1950	10
Site 2 Building 21	SAC - Welding/Maintenance	1958	112
Site 2 Building 25	SAC - Maintenance Storage Building	1950	10
Site 2 Building 26	SAC - Mechanical Pool Building	1947	1
Site 2 Building 28	SAC - Office/Storage Building	1947	10
Site 2 Building 32	SAC - Pool Equipment Building	1947	1
			9,826

MMI ENGINEERING TABLE UPDATED (BUILDING 14/LOCKER BLDG. REMOVED -REBUILT IN 2009)

M. CONCLUSIONS AND RECOMMENDATIONS

As described in the MMI Engineering HAZUS study: the Rancho Santiago Community College District's facilities could suffer as much as $28 million in damage to the buildings and their contents in the San Joaquin Hills scenario earthquake and between $12 and $14 million in the two other scenario events modeled. Much of this damage is expected to be non-structural in nature. To minimize this type of damage and its effects on operations, the District could conduct detailed non-structural evaluations of their facilities, in order to identify and mitigate potentially vulnerable non-structural components and systems.

The results of the current study may be used to identify and prioritize other mitigation activities, including recommending the "Moderate Code" buildings at the Santa Ana College campus and the District Office (Table 24), and those buildings representing a higher life-safety risk to their occupants (Table 23) as potential candidates for detailed engineering evaluations (if such studies do not exist or are out of date), design of building strengthening or retrofit recommendations, as necessary, and implementation of such retrofit activities.

A large number of loss estimates have been produced in the current study; detailed building level results are provided in the Appendices. Every effort has been made to accurately classify each building's structural system and design level from available data in the Appendices. For buildings where the current categorization differs from user expectations, sensitivity studies or "what-if" analyses could be conducted to shed further light on the potential variations in performance resulting from a range of building categorizations, or a more detailed engineering review could be implemented to fine-tune the categorization. Further, a similar analytical approach can be used to assess the potential improvement in performance associated with various conceptual mitigation strategies.

The district should take action on these facilities as soon as possible.

N. RSCCD FUNDED SHORT TERM DEVELOPMENT TRENDS

1998 California Seismic Survey Report
In 1998, California completed a seismic survey of all existing community colleges. Six buildings at Santa Ana Community College were recommended for seismic upgrades. To date, five of those have been completed and the sixth is scheduled for demolition in 2016.

2002 Measure E – Recently Completed Projects
In 2002, voters approved Measure E, a $337 million general obligation bond to renovate existing campus buildings and construct new classrooms to alleviate over-crowding and expand the educational and training programs at Santa Ana College, Santiago Canyon College, the regional education centers and the district operations center of the Rancho Santiago Community College District (RSCCD).

To date, every priority project earmarked for funding under Measure E has been or will be completed on schedule, according to the facility master plan for each college.

The Rancho Santiago Community College District issued $337,000,000 in bonds from Measure E which was passed in 2002.

Measure E Projects

In developing the Project list Santa Ana College and Santiago Canyon College faculty, staff and students have prioritized key health and safety needs so the most critical needs are addressed. The Project list was developed with the input of several hundred faculty, community and business leaders who determined that if these needs were not addressed now, the problems would only get worse. They advised the Board of Trustees that it would be less expensive to upgrade and repair aging community college buildings and classrooms now, than in the future. The Board of Trustees of the Rancho Santiago Community College District has evaluated safety, class size reduction, and information technology needs in developing the scope of repair and building projects to be funded, as outlined in the District's Master Plan, as amended from time to time, on file at the Public Information Office of the District, including the following projects:

1. *SAC Repair and renovate deteriorating classrooms and labs in fourteen (14) aging buildings (C, D, G, H, J, K, M, N, P, R, S, T, U, W).
$17,500,000

2. SAC Repair and renovate the library, its classrooms, labs and support areas and wire for computers and technology.
$1,700,000

3. SAC
Repair and renovate aging and deteriorating data and electric wiring, plumbing, sewer and storm drain systems, improve accessibility, fix safety hazards including earthquake dangers and otherwise bring aging structures into code compliance.
$15,000,000

4. SAC
To insure student safety and prepare to construct campus classrooms, labs and buildings, provide for site grading, electrical wiring,
Vehicular /pedestrian access, lighting, landscape development and water, sewer, and storm drain systems.
$25,000,000

5. SAC Repair, renovate and rewire for technology and computers of classrooms and learning spaces in the Workforce and Career Development Center.
$400,000

6. SCC Repair and renovate classrooms and labs in Buildings "A", "B" and "D".
$4,000,000

7. SAC/OFF-SITE Repair and renovate classrooms, for science, math, English labs and other academic and vocational programs at continuing education centers.
$2,500,000

8. SAC
Repair, renovate and expand outdoor field space for physical education, physical therapy, orthopedic exercise and rehabilitation, exercise physiology and exercise learning facilities
$850,000

9. DISTRICT-WIDE
Replace aging telephone/computer network including software and hardware to enable students to register, receive assignments /grades, and communicate with faculty on-line and to improve overall academic management.
$11,000,000

10. SAC/OFF-SITE Build/acquire/equip classrooms, science, math and English labs in Garden Grove Center.
$13,000,000

11. SCC To enhance student safety, acquire land to expand the campus academic and extracurricular programs, and support services.
$18,000,000

12. SCC/OFF-SITE Build/acquire/equip classrooms and English, math, science, and computer labs for a continuing education center.
$11,000,000

13 SAC To enhance student safety, acquire land and construct facilities to expand the campus academic, extracurricular programs, and support services.
$8,000,000

14. SCC Build and equip college library and learning resource center including study areas, seminar rooms, classrooms, and academic computer areas.
$10,000,000

15. SAC Build classrooms, labs, and provide computer network and equipment for a math and science building.
$31,000,000

16. SAC Build and equip classrooms and labs for teacher training/child development building.
$4,500,000

17. SAC Build and equip women's restrooms and changing facilities. $4,000,000

18. SAC Build and equip classrooms and labs for digital technologies including computer graphics, arts, video/sound design, animation and related academic, vocational and learning support programs.
$14,000,000

19. SAC/OFF-SITE Build and equip classrooms and labs and academic support facilities for public safety training programs.
$15,500,000

20. SAC/OFF-SITE Build and equip classrooms, labs for technology-based business incubator.
$13,000,000

21. SCC Build and equip study areas, counseling rooms, computer hook-ups, lecture/meeting/seminar rooms, and support facilities for providing student and faculty access to grades, course listings, and class assignments in new classrooms/services center.
$6,500,000

22. SCC Build and equip classrooms and labs for arts and humanities building.
$25,000,000

23. SCC Build and equip study areas, computer network, lecture/meeting/seminar rooms, and support facilities for student academic and community service programs and projects.
$18,000,000

24. SCC Build and equip classrooms, seminar rooms, and labs for arts and communication instruction.
$12,000,000

25. SCC Build and equip classrooms and learning facilities for use and instruction in exercise, exercise physiology, physical therapy, orthopedic exercise, rehab and other related disciplines.
$9,000,000

26. SCC Build and equip classrooms, labs, computer hook-ups and learning support facilities for math and science center.
$30,000,000

27. SCC Improve traffic safety, relieve traffic congestion on campus and alleviate campus and neighborhood parking issues and safety concerns, improve access for fire and emergency vehicles.
$1,200,000

28. SAC Improve traffic safety, relieve traffic congestion on campus and alleviate campus and neighborhood parking issues and safety concerns, improve access for fire and emergency vehicles.
$ 15,350,000

Measure Q – Future Projects

Measure Q was approved by the electorate of the Santa Ana College Facilities Improvement District No. 1 of the Rancho Santiago Community College District on November 6, 2012. This measure authorizes Rancho Santiago Community College District (RSCCD) to issue up to $198 million in general obligation bonds to finance renovation, repair and construction at Santa Ana College.

Capital Improvement Projects

- Central Plant & Infrastructure
- Dunlap Hall Renovation
- Health Sciences Building
- Johnson Student Center
- STEM Building
- 17th & Bristol Parking Lot

O. RSCCD Long Term Development Trends

Table 24: Facilities Recommended for Engineering Eval (2016 District Update)

This table was updated by Darryl Taylor, RSCCD Director of District Construction on February 2016. The table represents the RSCCD future hazard mitigation priority facilities.

High Priority **Moderate Priority** **Planned for future demolition**

Building Site/ Building Name	Occupancy	Non-Zero Injury Rate 3 Eq Scenarios	Non-Zero Fatality Rates 3 Eq Scenarios	Moderate Bldg. Codes/ Year Built
District Office - Admin Building/District EOC	399	YES		YES 1970
SAC – Bldg 01 Administration Building	231	YES		YES 1972 Upgraded 2009
SAC – Bldg 02 Cesar Chavez Building	1,236	YES	YES	NO
SAC – Bldg 03 Fine Arts Building	414	YES		YES 1972
SAC – Bldg 04 Music Building	179	YES		YES 1970
SAC – Bldg 05 Theater Building	575	YES		YES 1955
SAC – Bldg 06 Dunlap Hall Building ($15 million upgrade & additions complete) *REMOVE FROM HIGH PRIORITY LIST/Darryl Taylor*	1,636	YES	YES	YES 1973
SAC – Bldg 07 Planetarium Building	127	YES		YES 1967 Renovation 2015
SAC – Bldg 08 Library Building Facilities Master Plan - To be demolished in the future - *REMOVE FROM HIGH PRIORITY LIST/D. Taylor*	958	YES	YES	YES 1956
SAC – Bldg 09 Russell Hall Building Facilities Master Plan - *Remove from high priority list/D .Taylor*	1,293	YES	YES	YES 1967 Significant Structural Upgrade 2014
SAC – Bldg 10 Hammond Hall Building Facilities Master Plan -*Remove from high prioritiy list/D .Taylor*	452	YES	YES	YES 1954
SAC – Bldg 11 Technical Arts Building	254	YES		YES 1970
SAC – Bldg 12 Exercise Science	227	YES		YES 1972 Retrofitted
SAC – Bldg 13 Gymnasium Building (*Some upgrades in 2010. No future plans at this time)/D. Taylor*	2,535	YES	YES	YES 1954
SAC – Bldg 14 Locker Building	136	YES		NO 2009 Rebuilt
SAC – Bldg 15 Fitness Center	84	YES		YES 1972

SAC – Bldg 16 Johnson Center Building/ U Building Johnson	727	YES	YES	Scheduled for demolition in 2016
SAC – Bldg 18 Auto Shop Building	159	YES		YES 1958 Retrofitted
SAC – Bldg 19 Maintenance & Publication	159	YES		YES 1950
SAC – Bldg 20 Campus Vehicles Bldg	10			YES 1950
SAC – Bldg 21 Welding/Maintenance	112	YES		YES 1958
SAC – Bldg 23 Classroom Building I	725	YES	YES	NO
SAC – Bldg 25 Maintenance & Storage	10			YES 1950
SAC – Bldg 26 Mechanical Pool Building	1			YES 1947
SAC – Bldg 28 Office/Storage	10			YES 1947
SAC – Bldg 32 Pool Equipment	1			YES 1947
SAC – Bldg 31 Middle School Bldg	480	YES		NO
SAC –Bldg 100 Child Development	126	YES		NO
SAC – Bldg 300 Child Development	96	YES		NO
SAC – Bldg 400 Child Development	96	YES		NO
CEC - Admin/Classroom Building A Wing	265	YES		NO
CEC - Classroom Building B Wing	200	YES		NO
CEC - Child Development Building C Win	223	YES		NO
CEC - Art Building D Wing	316	YES		NO
CEC - TV Studio/Classroom Building E W	189	YES		NO
CEC - Classroom Building F Wing	261	YES		NO
CEC – Portable Classroom	92	YES		NO
Digital Media Center	283	YES		NO
Orange Education Center	1,600	YES	YES	NO
SCC – Classroom Building B	529	YES		NO
SCC – Lecture Hall/Classroom Building	999	YES		NO
SCC – Admin/Office/Classroom Building	675	YES		NO
SCC - Library	661	YES		NO
SCC – Science Center	918	YES		NO
SCC - Physical Education Building	2,438	YES		NO
SCC – Humanities Building	1,560	YES		NO
OCSRT - Sheriff Administration/Training Academy	304	YES		NO

High Priority/Highlighted in Yellow

- Yes to non-zero injury, Yes to non-zero fatality, and Yes to moderate building codes

Moderate Priority/Highlighted in Green

- Yes to non-zero injury, Yes to non-zero fatality and No to Moderate Code as well as any with Yes and Moderate Code

Planned for future Demolition in the RSCCD Facilities Master Plan

P. RSCCD EARTHQUAKE MITIGATION STRATEGIES

Hazard	EARTHQUAKE ACTIVITY #1
Action Item	**Identify and mitigate potentially vulnerable <u>non-structural</u> components and systems**
Coordinating Organization	Facilities Manager
Ideas for Implementation	▪ Determine if a Facilities Safety Committee needs to be formed. It could include RSCCD Facilities, City Building Officials and a representative from the Department of State Architect (EQ-2) ▪ Work with contractors to provide cost estimates for this project. ▪ Write a FEMA Hazard Mitigation project grant to develop a complete Non-Structural Hazard Mitigation Program for the RSCCD ▪ As part of the grant, research what steps have already been taken by the district; determine steps still needed to prepare all sites for their sites worst case scenario and prepare a Non-Structural Hazard Mitigation Plan ▪ Implement the Non-Structural Hazard Mitigation Plan ▪ Develop a long-term maintenance plan for the program
Time Line	3 years and ongoing
Constraints	Grant approval by Cal EMA and FEMA
Funding Sources	25% General Fund and 75% FEMA Maintenance costs are 100% RSCCD
Cost Estimate	$21 million
Benefits: Losses Avoided	Life Safety and reduced injuries; reduced property damage from earthquakes; in older and critical facilities such as the campus EOCs, it will allow for continued emergency management operations during a disaster
Priority	**Extremely High**
Plan Goals Addressed	
	Promote Public Awareness
X	Create Partnerships and Implementation
X	Protect Life and Property
	Protect Natural Systems
X	Strengthen Emergency Services

Hazard	EARTHQUAKE ACTIVITY #2
Action Item	Phase 1: (Phase 2 is a long term strategy) **Conduct a structural engineering evaluation of RSCCD facilities to determine if they meet today's building codes and if structural retrofits are needed in older facilities. Note: See attached list of facilities.**
Coordinating Organization	Director District Construction
Ideas for Implementation	▪ Determine if a structural evaluation has ever been conducted and on which buildings ▪ Review Bond measures to see what facility replacements/upgrades are planned for the future ▪ Research and document what has been accomplished and what still needs to be done ▪ Decide if a formal assessment of facilities is needed. If so, determine how facilities will be prioritized (by year, by site, etc.). See Table 25 for a start on a priorities list. This is not a final list; it is a starting point for discussion. ▪ Get a cost estimate from a contractor ▪ Prepare a priority list, plans and timelines ▪ Develop an RFP Note: This is Phase 1 and Phase 2 is Long Term Activity #1
Time Line	10 years
Constraints	Time (shortage of facility personnel); Costs
Funding Sources	California Community College State Capital Outlay Fund FEMA Hazard Mitigation Grant
Cost Estimate	$5 – 7 million
Benefits: Losses Avoided	Life Safety; Reduced property damage due to earthquakes; Continuity of operations critical facilities; Creates partnerships
Priority	Extremely High

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

Note: There is no requirement on RSCCD by State DSA to repair these facilities due to lacking construction. These are voluntary upgrades.

TABLE 25: FACILITIES RECOMMENDED FOR ENGINEERING EVALUATION (MMI DATA)

High Priority Moderate Priority

Building Site/ Building Name	Occupancy	Non-Zero Injury Rate 3 Eq Scenarios	Non-Zero Fatality Rates 3 Eq Scenarios	Moderate Bldg. Codes/ Year Built
District Office - Admin Building/District EOC	399	YES		YES 1970
SAC – Bldg 01 Administration Building	231	YES		YES 1972
SAC – Bldg 02 Cesar Chavez Building	1,236	YES	YES	NO
SAC – Bldg 03 Fine Arts Building	414	YES		YES 1972
SAC – Bldg 04 Music Building	179	YES		YES 1970
SAC – Bldg 05 Theater Building	575	YES		YES 1955
SAC – Bldg 06 Dunlap Hall Building	1,636	YES	YES	YES 1973
SAC – Bldg 07 Planetarium Building	127	YES		YES 1967
SAC – Bldg 08 Library Building	958	YES	YES	YES 1956
SAC – Bldg 09 Russell Hall Building	1,293	YES	YES	YES 1967
SAC – Bldg 10 Hammond Hall Building	452	YES	YES	YES 1954
SAC – Bldg 11 Technical Arts Building	254	YES		YES 1970
SAC – Bldg 12 Exercise Science	227	YES		YES 1972 Retrofitted
SAC – Bldg 13 Gymnasium Building	2,535	YES	YES	YES 1954
SAC – Bldg 14 Locker Building	136	YES		NO 2009 Rebuilt
SAC – Bldg 15 Fitness Center	84	YES		YES 1972
SAC – Bldg 16 Johnson Center Building	727	YES	YES	NO/Scheduled for demolition in 2016
SAC – Bldg 18 Auto Shop Building	159	YES		YES 1958 Retrofitted
SAC – Bldg 19 Maintenance & Publication	159	YES		YES 1950
SAC – Bldg 20 Campus Vehicles Bldg	10			YES 1950
SAC – Bldg 21 Welding/Maintenance	112	YES		YES 1958
SAC – Bldg 23 Classroom Building I	725	YES	YES	NO
SAC – Bldg 25 Maintenance & Storage	10			YES 1950
SAC – Bldg 26 Mechanical Pool Building	1			YES 1947
SAC – Bldg 28 Office/Storage	10			YES 1947
SAC – Bldg 32 Pool Equipment	1			YES 1947
SAC – Bldg 31 Middle School Bldg	480	YES		NO
SAC –Bldg 100 Child Development	126	YES		NO
SAC – Bldg 300 Child Development	96	YES		NO
SAC – Bldg 400 Child Development	96	YES		NO
CEC - Admin/Classroom Building A Wing	265	YES		NO
CEC - Classroom Building B Wing	200	YES		NO
CEC - Child Development Building C Win	223	YES		NO
CEC - Art Building D Wing	316	YES		NO
CEC - TV Studio/Classroom Building E W	189	YES		NO

CEC - Classroom Building F Wing	261	YES		NO
CEC – Portable Classroom	92	YES		NO
Digital Media Center	283	YES		NO
Orange Education Center	1,600	YES	YES	NO
SCC – Classroom Building B	529	YES		NO
SCC – Lecture Hall/Classroom Building	999	YES		NO
SCC – Admin/Office/Classroom Building	675	YES		NO
SCC - Library	661	YES		NO
SCC – Science Center	918	YES		NO
SCC - Physical Education Building	2,438	YES		NO
SCC – Humanities Building	1,560	YES		NO
OCSRT - Sheriff Administration/Training Academy	304	YES		NO

High Priority/Highlighted in Yellow

- Yes to non-zero injury, Yes to non-zero fatality, and Yes to moderate building codes

Moderate Priority/Highlighted in Orange

- Yes to non-zero injury, Yes to non-zero fatality and No to Moderate Code as well as any with Yes and Moderate Code

Moderate Code Buildings – Buildings built prior to 1976 (reflect post-San Fernando earthquake changes in the Uniform Building code)

Scenarios Include:

- 6.9M Newport-Inglewood Fault
- 6.6M San Joaquin Hills Fault
- 6.8M Whittier Fault

NOTE:
So there is no confusion, Table 24 (below) is the updated version of Table 25 (above). Table 24 (below) is also the same table listed in "Future Development Trends." After considerable research of the Facilities Master Plan, Bond Measures, and all facility planning documents by the Director of District Construction, this table summarizes the RSCCD earthquake hazard mitigation goals for the future. Many *of these projects are already funded while others are not funded.*

TABLE 25: FACILITIES RECOMMENDED FOR ENGINEERING EVAL (2016 RSCCD UPDATE)

This table was updated by Darryl Taylor, RSCCD Director of District Construction on February 2016. The table represents the RSCCD future hazard mitigation priority facilities.

High Priority **Moderate Priority** **Planned for future demolition**

Building Site/ Building Name	Occupancy	Non-Zero Injury Rate 3 Eq Scenarios	Non-Zero Fatality Rates 3 Eq Scenarios	Moderate Bldg. Codes/ Year Built
District Office - Admin Building/District EOC	399	YES		YES 1970
SAC – Bldg 01 Administration Building	231	YES		YES 1972 Upgraded 2009
SAC – Bldg 02 Cesar Chavez Building	1,236	YES	YES	NO
SAC – Bldg 03 Fine Arts Building	414	YES		YES 1972
SAC – Bldg 04 Music Building	179	YES		YES 1970
SAC – Bldg 05 Theater Building	575	YES		YES 1955
SAC – Bldg 06 Dunlap Hall Building ($15 million upgrade & additions complete) *REMOVE FROM HIGH PRIORITY LIST/Darryl Taylor*	1,636	YES	YES	YES 1973
SAC – Bldg 07 Planetarium Building	127	YES		YES 1967 Renovation 2015
SAC – Bldg 08 Library Building Facilities Master Plan - To be demolished in the future - *REMOVE FROM HIGH PRIORITY LIST/D. Taylor*	958	YES	YES	YES 1956
SAC – Bldg 09 Russell Hall Building Facilities Master Plan - *Remove from high priority list/D .Taylor*	1,293	YES	YES	YES 1967 Significant Structural Upgrade 2014
SAC – Bldg 10 Hammond Hall Building Facilities Master Plan -*Remove from high prioritiy list/D .Taylor*	452	YES	YES	YES 1954
SAC – Bldg 11 Technical Arts Building	254	YES		YES 1970
SAC – Bldg 12 Exercise Science	227	YES		YES 1972 Retrofitted
SAC – Bldg 13 Gymnasium Building (*Some upgrades in 2010. No future plans at this time)/D. Taylor*	2,535	YES	YES	YES 1954
SAC – Bldg 14 Locker Building	136	YES		NO 2009 Rebuilt
SAC – Bldg 15 Fitness Center	84	YES		YES 1972
SAC – Bldg 16 Johnson Center Building/ U Building Johnson	727	YES	YES	Scheduled for demolition in 2016
SAC – Bldg 18 Auto Shop Building	159	YES		YES 1958

				Retrofitted
SAC – Bldg 19 Maintenance & Publication	159	YES		YES 1950
SAC – Bldg 20 Campus Vehicles Bldg	10			YES 1950
SAC – Bldg 21 Welding/Maintenance	112	YES		YES 1958
SAC – Bldg 23 Classroom Building I	725	YES	YES	NO
SAC – Bldg 25 Maintenance & Storage	10			YES 1950
SAC – Bldg 26 Mechanical Pool Building	1			YES 1947
SAC – Bldg 28 Office/Storage	10			YES 1947
SAC – Bldg 32 Pool Equipment	1			YES 1947
SAC – Bldg 31 Middle School Bldg	480	YES		NO
SAC –Bldg 100 Child Development	126	YES		NO
SAC – Bldg 300 Child Development	96	YES		NO
SAC – Bldg 400 Child Development	96	YES		NO
CEC - Admin/Classroom Building A Wing	265	YES		NO
CEC - Classroom Building B Wing	200	YES		NO
CEC - Child Development Building C Win	223	YES		NO
CEC - Art Building D Wing	316	YES		NO
CEC - TV Studio/Classroom Building E W	189	YES		NO
CEC - Classroom Building F Wing	261	YES		NO
CEC – Portable Classroom	92	YES		NO
Digital Media Center	283	YES		NO
Orange Education Center	1,600	YES	YES	NO
SCC – Classroom Building B	529	YES		NO
SCC – Lecture Hall/Classroom Building	999	YES		NO
SCC – Admin/Office/Classroom Building	675	YES		NO
SCC - Library	661	YES		NO
SCC – Science Center	918	YES		NO
SCC - Physical Education Building	2,438	YES		NO
SCC – Humanities Building	1,560	YES		NO
OCSRT - Sheriff Administration/Training Academy	304	YES		NO

High Priority/Highlighted in Yellow

- Yes to non-zero injury, Yes to non-zero fatality, and Yes to moderate building codes

Moderate Priority/Highlighted in Green

- Yes to non-zero injury, Yes to non-zero fatality and No to Moderate Code as well as any with Yes and Moderate Code

Planned for future Demolition in the RSCCD Facilities Master Plan

Hazard	EARTHQUAKE ACTIVITY #3
Action Item	**Increase Earthquake Risk Awareness (EQ-7)**
Coordinating Organization	Chief District Safety & Security
Ideas for Implementation	▪ As part of the planning process for this plan, present the RSCCD Hazard Mitigation Plan to as many RSCCD staff, faculty, students and the public as possible ▪ Every occasion the Risk Manager or Chief, Security and Safety presents the districts emergency preparedness program, include information on the RSCCD Hazard Mitigation Plan and ask for input into future projects. ▪ Utilize the maps in the plan for employee and public education ▪ Include an overview of the plan, its goals, maps and lists of "moderate code" buildings when training Building Captains. Discuss which buildings are more vulnerable to earthquake and should not be used following an earthquake
Time Line	Ongoing
Constraints	Chief District Safety & Security can only offer the training; attendance is voluntary
Funding Sources	General Fund
Cost Estimate	Staff Time
Benefits: Losses Avoided	Sustained mitigation outreach programs have minimal cost and will help build and support district-wide capacity. This type of activity enables the district faculty, students and the public to better prepare for, respond to and recover from disasters.
Priority	High

Plan Goals Addressed	
X	Promote Public and College Community Awareness
X	Create Partnerships and Implementation
X	Protect Life and Property
	Protect Natural Systems
X	Strengthen Emergency Services

Hazard	EARTHQUAKE ACTIVITY #4
Action Item	**Prepare to conduct post-earthquake inspections (EQ-4)**
Coordinating Organization	Chief, District Safety & Security
Ideas for Implementation	▪ Train Facilities Planning and Maintenance personnel on how to conduct building inspections following disasters using Cal EMA Safety Assessment Program and update the training every other year ▪ Establish a campus survey procedure manual to inventory structural and non-structural hazards in and around campus'. Include lists of critical facilities that should be inspection priorities. Include lists of "moderate code" facilities that may have more damage than other buildings. Identify all hazardous chemicals at each site to be checked. ▪ Develop Inspection Kits that include ATC 20 forms, placards (SAFE, UNSAFE, LIMITED ACCESS, etc.), manual, publications, and tools needed to inspect, document and communicate ▪ Conduct an annual tabletop exercise to practice: (1) Reporting to work and being assigned by the EOCs (2) Initial assignments and tracking of Facilities and Maintenance personnel for inspections; (3) Documentation required by FEMA (4) Use of ATC 20 forms to provide rapid visual screenings to quickly inspect a building and identify disaster damage or potential seismic structural and non-structural weaknesses to determine if buildings are safe to re-occupy (special forms exist for schools) (5) Mutual Aid requirements to get additional inspectors from the City, Operational Area, Cal OES, Department of State Architect, FEMA and their reporting and documentation requirements ▪ Develop a program using SHAKECAST, a HAZUS software to prepare the district to conduct post-earthquake inspections. Hire personnel to enter data into the program. (This is a "nice to do" project that can be done in the future as time permits.) ▪ Print and become familiar with publications such as American Society of Civil Engineers (ASCE) 31 – Seismic Evaluation of Existing Buildings, ASCE 41 – Seismic Rehabilitation of Existing Buildings and Applied Technology Council ATC) 20 – Procedures for Post-earthquake Safety Evaluation of Buildings ▪ Set up Inspection Team #1 – Initial or Rapid Inspection Teams (District Maintenance) to placard buildings and identify hazardous chemical incidents. (Print up and have in place ATC Forms, placards and lists of sites with chemicals at each Site.) ▪ Set up Inspection Team #2 – Detailed Evaluation which would include the Construction Manager and personnel from Facilities Planning for a higher level/more detailed inspection and re-placarding. (If Team #1 does its job, Team #2 has many less buildings to inspect than Team #1 but the inspections will each take much more time.) From there, FEMA and the Department of State Architect would have to be involved.

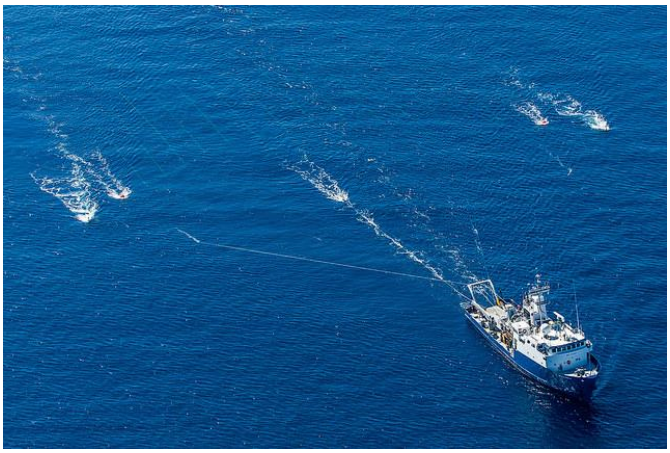
	▪ Team #2 would have to work with FEMA inspectors to re-inspect (FEMA calls it the FEMA Preliminary Damage Assessments), work with them on repair/rebuild cost estimates and rebuilding of all facilities, and on providing repair or demolition and rebuilding costs. (Fight FEMA all the way to have them provide costs!) ▪ SAC and the District Office are the site priorities for inspections due to the sites being identified in the RSCCD Hazard Mitigation Plan as "moderate code' buildings. ▪
Time Line	3 years and ongoing
Constraints	Pending Funding and Available Personnel
Funding Sources	General Fund
Cost Estimate	Staff Time
Benefits: Losses Avoided	By educating the existing employees on how to conduct an initial damage assessment following a disaster, the campus' can inspect and quickly post facilities "safe" or "unsafe" keeping students, faculty and the public out of dangerous buildings and areas. If damage exists, the employees will be using these State of California approved forms and process which will facilitate the district's disaster assistance process. Low cost item.
Priority	High

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

Hazard:	EARTHQUAKE ACTIVITY #5
Action Item	Phase 2: (Phase 1 is a Evaluation Phase that determines which facilities need strengthened and determines costs of projects) **Seismically strengthen RSCCD facilities that do not meet current seismic codes. Ensure critical facilities are a priority.**
Coordinating Organization	Asst. Vice Chancellor of Facilities Planning
Ideas for Implementation	▪ Prioritize facilities ▪ Seismically retrofit high occupancy and critical facilities ▪ Seismically retrofit all other RSCCD facilities
Time Line	10 years
Constraints	Time, Expertise and Budget
Funding Sources	General Fund, California Community College State Capital Outlay Fund or California Community College Scheduled Maintenance Program, and FEMA Hazard Mitigation Grant
Cost Estimate	Receiving the cost estimates is part of the Phase 1 of this project
Benefits: Losses Avoided	This project is essential to life safety, property protection and reducing recovery costs. Earthquake and liquefaction are major threats to the district and reducing damage to structures is critical to the faculty, students, and public's survival.
Priority	**Extremely High**
Plan Goals Addressed	
	Promote Public Awareness
	Create Partnerships and Implementation
X	Protect Life and Property
	Protect Natural Systems
X	Strengthen Emergency Services

FIGURE 27: 2017 ARTICLE ON ROSE CANYON FAULT– INCLUDE FAULT IN 5-YEAR UPDATE

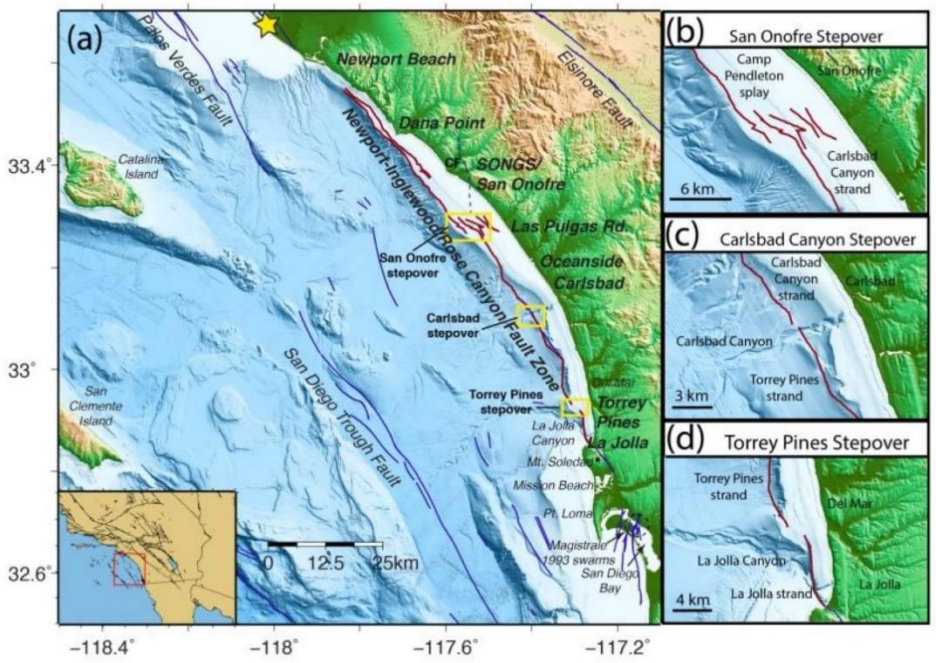
New study finds Los Angeles and San Diego are at risk from M=7.3+ offshore earthquakes



POSTED ON MARCH 8, 2017MARCH 8, 2017 BY TEMBLOR
By David Jacobson, Temblor

This picture from the Scripps Institution of Oceanography shows the research vessel New Horizon towing a hydrophone to map the bathymetry of the Newport-Inglewood/Rose Canyon fault zone. (Photo from: Scripps Institution of Oceanography)

A new study by researchers at the Scripps Institution of Oceanography, the Nevada Seismological Laboratory, and USGS has revealed that the Newport-Inglewood/Rose Canyon fault zone, which extends offshore from San Diego to Los Angeles, is capable of rupturing in M=7.3+ earthquakes. Such a quake could cause significant damage to some of the most densely populated areas in California.

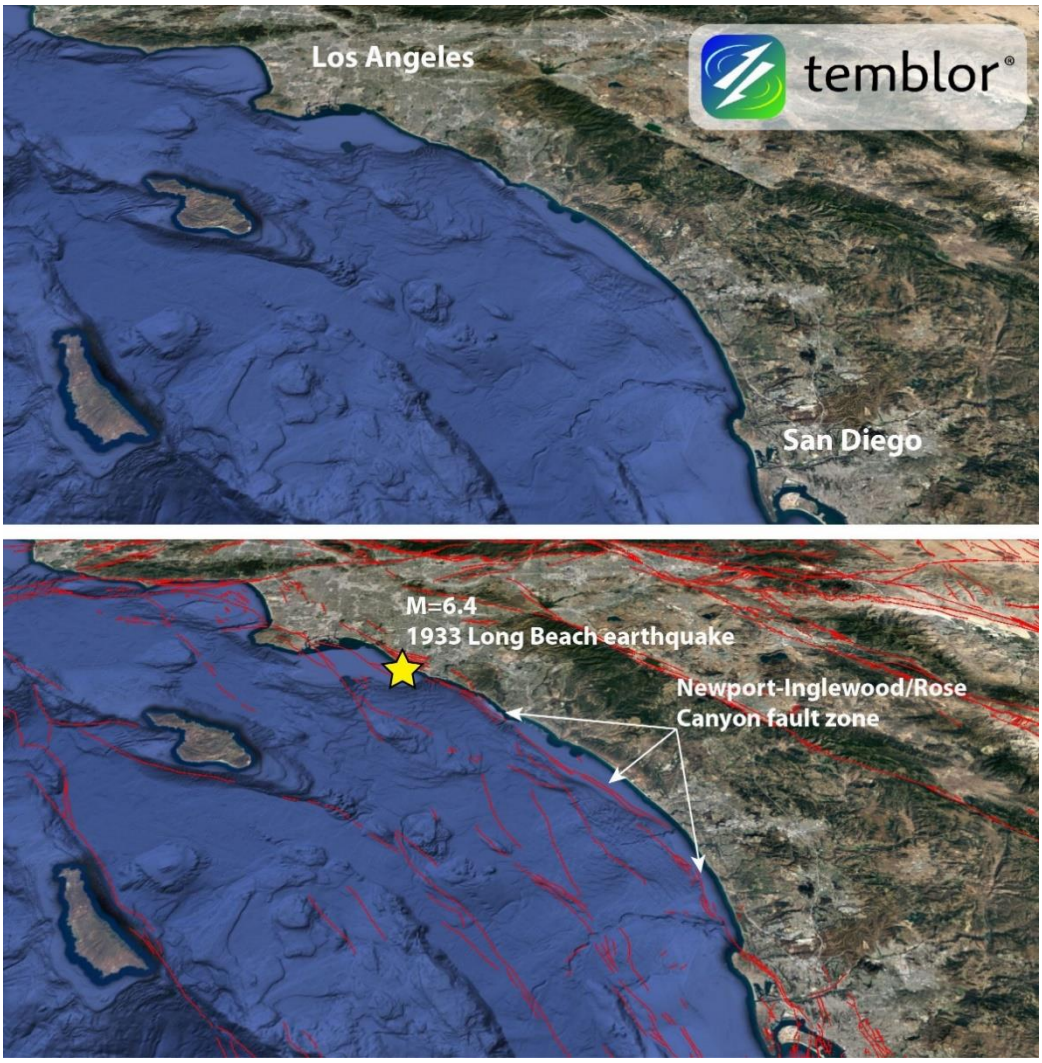


This figure from Sahakian et al., 2017 shows the location of the Newport-Inglewood/Rose Canyon fault zone. Additionally, the yellow boxes highlight the three stepovers within the fault zone. This study showed that the stepovers are likely not wide enough to prevent through-going ruptures. (Figure from:

Sahakian, V., J. Bormann, N. Driscoll, A. Harding, G. Kent, and S. Wesnousky (2017), Seismic Constraints on the Architecture of the Newport-Inglewood/Rose Canyon Fault: Implications for the Length and Magnitude of Future Earthquake Ruptures, J. Geophys. Res. Solid Earth, 122, doi:10.1002/2016JB013467.)

The Newport-Inglewood/Rose Canyon fault zone is a strike-slip system in Southern California, and is part of the Pacific-North American plate boundary. Prior to this study, the Newport-Inglewood and Rose Canyon faults were believed to be separate systems. However, using a combination of seismic surveys, and high-resolution bathymetric data, the researchers determined that they are actually a continuous fault system, posing an even greater hazard to millions of people. By using these two types of data, which differ in their resolution and depth of penetration, the team was able to define the fault structure in great detail, which could then be used to calculate earthquake magnitudes.

The Newport-Inglewood/Rose Canyon fault zone exhibits a mainly continuous fault trace over four distinct segments. These segments are separated by what geologists term as stepovers, which are where a fault is horizontally offset. Most scientists believe that stepovers at least 3 km wide are likely to prevent through-going ruptures. However, along the Newport-Inglewood/Rose Canyon fault zone, none of the three stepovers exceed 2 km in width, leading the team to believe that an earthquake could rupture the entire length of the fault zone in M=7.3+ events. This was based historical ruptures worldwide which have been shown to rupture through stepovers of this width.



This Temblor figure shows the Southern California coastline both with and without faults. The offshore Newport-Inglewood/Rose Canyon fault zone poses a significant threat to both Los Angeles and San Diego. The new research shows that M=7.3+ earthquakes are possible along this fault zone. The yellow star in this figure marks the location of the 1933 M=6.4 Long Beach earthquake which killed 113 people.

While the likelihood of a full rupture sits at 30-40%, lead author Valerie Sahakian, who is now a postdoctoral fellow at the USGS in Menlo Park, says that a smaller earthquake in the magnitude 5 or 6 range could still have a significant impact on the region. Such an earthquake happened in 1933, when the M=6.4 Long Beach earthquake killed 113 people.

Overall, this new study provides additional evidence showing the risk offshore faults pose to Southern California. Because the Newport-Inglewood/Rose Canyon fault is never more than four miles from the coast, significant shaking from an earthquake could have great impacts to the cities of Los Angeles and San Diego. Therefore, further research is needed to improve the seismic hazard models for the Southern California coast.

References

Sahakian, V., J. Bormann, N. Driscoll, A. Harding, G. Kent, and S. Wesnousky (2017), Seismic Constraints on the Architecture of the Newport-Inglewood/Rose Canyon Fault: Implications for the Length and Magnitude of Future Earthquake Ruptures, J. Geophys. Res. Solid Earth, 122, doi:10.1002/2016JB013467.

Scripps Institution of Oceanography press release (Fault System off San Diego, Orange, Los Angeles Counties Could Produce Magnitude 7.3 Quake)

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SECTION IV-C FLOOD/STORM

A. THE CALIFORNIA FLOOD THREAT

California has a great history of both floods and droughts throughout its history. When in a major drought like in 2015, we must never forget to continue our planning and preparedness for floods, the most common natural disaster in California's history.

California has a massive and complex system of State, Federal and local sponsored dams, canals, pipelines, tunnels, by which water is stored and transferred within 10 hydrologic regions. The three major aqueducts (1) California Aqueduct, (2) Colorado River Aqueduct, and (3) Los Angeles Aqueduct transport water to Southern California and together traverse nearly 1,000 miles.

Figure 1 - California Aqueducts, Canals and Natural Hydrologic Regions



According to the State of California Multi-Hazard Mitigation Plan, floods represent the second most destructive source of hazard, vulnerability and risk, both in terms of state history and the probability of future destruction at greater magnitudes than previously recorded.

Floods represent a significant concern for the State of California for several reasons. California has a chronic and destructive flood history. Since 1950, 30% of federally declared disasters in California were the result of floods. During this history, flood disasters have claimed 292 lives, resulting in 759 injuries and over $4.8 billion in Cal EMA-administered disaster costs.

California has widespread flood vulnerability as indicated by FEMA Flood Insurance Rate Map (FIRM) designations with their common presence in populated areas.

CALIFORNIA FLOOD HAZARDS

Every county in the state experiences floods, although the nature of these events varies due to the diverse climate and geography. Disparate climate patterns present challenges to flood mitigation planning in California. These patterns include:

- El Niño conditions
- La Niña conditions
- Drought
- Desert monsoons
- Northwest coastal conditions
- Tropical storms
- Gulf of Alaska storms
- Pineapple Express patterns

In addition, California's geographic diversity represents a difficult challenge to planning for flood mitigation. California has a 1,100 mile-long coastline; prominent coastal and inland mountain ranges, including the Sierra Nevada; and extensive and highly varied deserts. These geographical factors combine to create various types of flood hazards:

- Alluvial
- Fan
- Coastal
- Flash
- Fluvial
- Lake
- Levee
- Mudslide
- Riverine
- Seiche
- Tsunami

CALIFORNIA FLOOD HISTORY

Since 1950 the state has had 32 state-proclaimed flood emergencies and 18 federally declared flood disasters. Since 1992, every county in California was declared a federal disaster area at least once for a flooding event.

Table 1 - California Flood Disasters 1992-2010

Disaster #	Date	Scope (# of Counties)	# of Deaths	Damage in $
935-DR-CA	Feb-92	6	5	$123.2 million
979-DR-CA	Jan-93	25	20	$600 million
1044-DR-CA	Jan-95	45	11	$741.4 million
1046-DR-CA	Feb-95	57	17	$1.1 billion
1155-DR-CA	Jan-97	48	8	$1.8 billion
1203-DR-CA	Feb-98	40	17	$550 million
1498-DR-CA	Jun-03	2	16	--[b]
1529-DR-CA	Jun-04	1	0	$57 million
1577-DR-CA	Feb-05	8	24	$573.1 million
1585-DR-CA	Apr-05	7	0	$198.7 million
1628-DR-CA	Feb-06	40	5	$327.8 million
1646-DR-CA	Jun-06	16	1	$129.5 million
1884-DR-CA	Mar-10	6	0	Preliminary Damage Estimate: $50 million

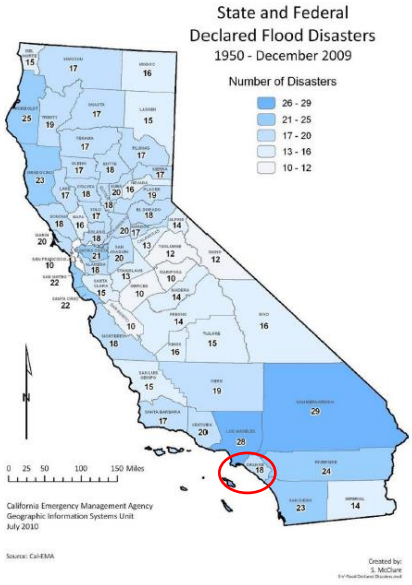
Source: Cal EMA Origins and Development - A Chronology 1917-2010; Cal EMA After Action Reports; FEMA: California Disaster History (www.fema.gov/news/disasters_state.fema)

[b] DR-1428, 2003 Southern California Fires, caused the elimination of vegetation securing soils to the hillsides. In December 2003, mild flooding caused mudflows and landslides killing 16 people. The costs of the flood damages were not segregated from the fire damages

STATE OF CALIFORNIA MULTI-HAZARD MITIGATION PLAN

Orange County was included in all disaster declarations highlighted in red above.

Figure 2 - State/Federal Floods 1950-2009



This map shows the distribution of floods leading to disaster declarations from 1950 to 2009 in California. Counties with 21 or more declared disasters during this period include:

Northern California: Humboldt and Mendocino counties

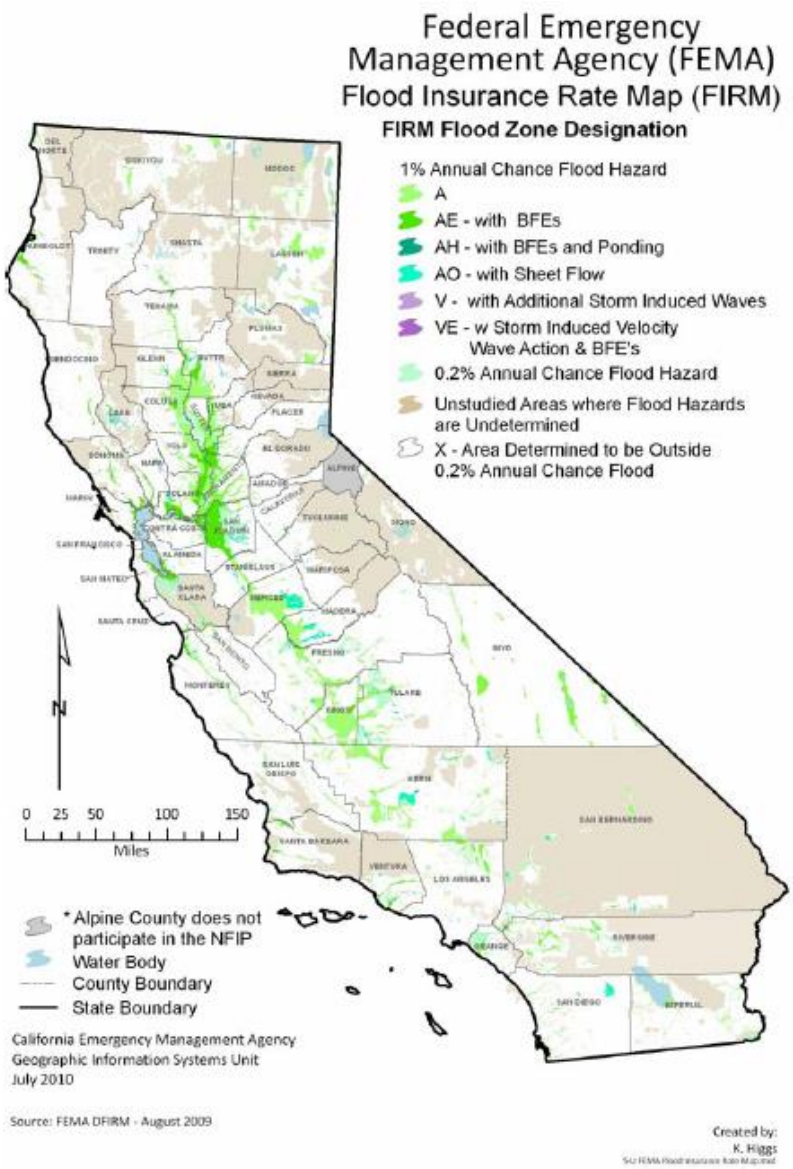
San Francisco Bay Area: Contra Costa, San Mateo and Santa Cruz

Southern California: Los Angles, Riverside, San Bernardino and San Diego.

Orange County had 18 declared flood disasters during his period.

STATE OF CALIFORNIA MULTI-HAZARD MITIGATION PLAN

Figure 3 - FEMA Flood Insurance Rate Map Flood Zone Designation



STATE OF CALIFORNIA MULTI-HAZARD PLAN

This map shows the FEMA-designated 100-Year Flood Zone. High concentrations of 100-Year Flood areas are shown throughout the Central Valley, especially in the Sacramento-San Joaquin Delta region.

Flood zones are areas depicted on a FIRM map defined by FEMA according to levels of risk. Zones with a 1% annual chance of flooding or a 100-Year Flood Zone are part of the Standard Flood Hazard Area (SFHA) and considered to have high risk. In communities that participate in the NFIP, mandatory flood insurance purchase requirements apply to these zones: A, AE, A1-30, AH, AO, AR, A99, V and VE or V1 through 30.

Table 2 - FEMA FIRM Descriptions

ZONE	DESCRIPTION
A	Area with a 1% annual chance of flooding. No depths or Base Flood Elevations (BFEs) are shown.
AE	Base floodplain where BFEs are provided. AE Zones are now used on digital FIRMs instead of A1-A30 Zones.
A1 through 30	Known as numbered A Zones, these are the base floodplains in the old FIRM format where a BFE is shown.
AH	Area with a 1% annual chance of shallow flooding with an average depth ranging from 1 to 3 feet. BFEs are shown at selected intervals.
AO	River or stream flood hazard area, or area with a 1% or greater chance of shallow flooding each year, usually in the form of sheet flow with an average depth ranging from 1 to 3 feet. Average flood depths derived from detailed analyses are shown.
AR	Area with a temporarily increased flood risk due to the building or restoration of a flood control system (such as a levee or a dam).
A99	Area with a 1% annual chance of flooding protected by a federal flood control system where construction has reached specified legal requirements. No depths or BFEs are shown.
V	Coastal area with a 1% or greater chance of flooding and an additional hazard associated with storm waves. No BFEs are shown within these zones.
VE or V1 through 30	Coastal area with a 1% or greater chance of flooding and an additional hazard associated with storm waves. BFEs are shown at selected intervals.
B, C, X	Zones considered to have moderate to low risk of flooding, although flood insurance is available to property owners and renters in communities that participate in the NFIP.
D	Area with possible but undetermined flood hazards, where no flood hazard analysis has been conducted.

Studies comparing 2000 U.S. Census data with FIRM maps found that over 5 million Californians (15% of the population) live in FIRM-designated floodplain and nearly 2 million (5.8% of the population) live in the 100-year floodplain. Based on these studies, California would normally expect approximately 20,000 people per year to be affected by a 100-Year Flood and 500-Year Flood annual flooding; however, the state's flood risk is not evenly distributed. Approximately 84% of the 5 million Californians living in a FIRM-designated floodplain were in 13 counties having 100,000 or more people within 100-year and 500-year FIRM designated floodplains. In 2000, the leader by far was Orange County, with almost 1.4 million people at risk.

Table 3 - Counties with 100,000+ People Living in Floodplain, 2000

County	Total Population in FIRM Zone
Orange	1,384,403
Sacramento	490,014
Los Angeles	390,305
Santa Clara	304,511
Riverside	295,081
San Joaquin	287,742
Fresno	205,235
Monterey	198,283
San Bernardino	196,945
Ventura	187,179
San Diego	181,757
Tulare	154,184
Alameda	103,162

Source: U.S. Census; FEMA

Analysis of Damage from Historic Flood Events

Damage data from California's historic flood events are useful for characterizing flood risk and identifying areas that probability-based assessments such as FIRM floodplains may miss. According to a study of population living in floodplains as of 1998, a majority of NFIP flood loss claims occur during flood events that do not rise to the level of a federal disaster declaration. Thus, the event of flood disaster declarations is not a complete measure of vulnerability.

Table 4 - Historic Damage Claims and Repetitive Loss Payments from 1992 to 2002
Individual Assistance (IA), Public Assistance (PA), Repetitive Loss (RL)

IA: County with greatest number of damage locations (accounts for 45% of total state dollar damage claims)	Los Angeles
PA: Counties with greatest dollar damage claims (accounts for 50% of total state dollar damage claims)	Los Angeles
	Santa Barbara
	Monterey
	Ventura
	Orange
	San Mateo
	Santa Clara
	Alameda
	Sonoma
RL: County with greatest dollar payments (accounts for 34% of total state dollar payments)	Sonoma

Source: FEMA; Cal EMA

PARTICIPATION IN THE NATIONAL FLOOD INSURANCE PROGRAM (NFIP)

U.S. Congress established the NFIP with the passage of the National Flood Insurance Act of 1968. The NFIP is a program administered by FEMA enabling property owners in participating community floodplain management regulations that reduce future flood damages. In California, approximately 97% of the communities participate in the NFIP.

Currently there are 518 NFIP-participating communities throughout the state. With 274,683 flood insurance policies, California has the fourth largest policy count nationwide. Among other activities, the Department of Water Resources provides services in support of the NFIP program.

California Community College Districts are not participants in the National Flood Insurance Program or the Community Rating System programs. However, the cities of Santa Ana, Orange and Tustin as well as the County of Orange are participants.

COMMUNITY RATING SYSTEM PARTICIPATION

The Community Rating System (CRS), part of the NFIP, is a voluntary incentive program that recognizes and encourages community floodplain management activities that exceed the minimum NFIP requirements. This is done by providing flood insurance premium discounts to property owners in communities participating in the CRS program. Credit points are earned for a wide range of local floodplain management activities; the total number of points determines the amount of flood insurance premium discounts to policyholders.

In California, there are 164,273 flood insurance policies in CRS communities, representing a total of $111,069,562 in premiums paid by policyholders who realized $12,326,101 in savings from their communities' participating in CRS.

STRATEGY FOR MITIGATING SEVERE REPETITIVE LOSS PROPERTIES

The Flood Insurance Reform Act of 2004 provided a new opportunity for state governments to mitigate the most flood-prone properties by creating the Severe Repetitive Loss (SRL) Pilot Program. In order to qualify for the SRL program, the properties must meet the following criteria based on paid flood losses since 1978:

There must be four or more separate claim payments of more than $5,000 each (building and/or contents), or two or more claim payments (building only) where the total exceeds the current market value of the property. At least two of the referenced claims must have occurred within any 10-year period and must be greater than 10 days apart.

The RSCCD has never made a flood claim to State OES or FEMA and does not have any repetitively flood damaged facilities. One minor flood/mud flow occurred on one of the seven sites. Santiago Canyon College in Orange was hit on 11/25/2008 by rain, flooding and some mud which caused $51,777 in damage to the college. No flood or mudflow incident has occurred since. However, the area has been part of a drought State of Emergency most of that time.

FLOOD MITIGATION ASSISTANCE PROGRAM

The Flood Mitigation Assistance (FMA) program assists states and local communities in implementing flood hazard mitigation measures before a major disaster occurs. The program

targets NFIP communities with numerous repetitive loss structures. The program offers two types of grants to local communities; planning and project grants. A community must have a FEMA-approved Floodplain Management Plan (FMP) to be eligible for FMA grant funding.

SOUTH COAST HYDROLOGIC REGION

The RSCCD is located in the South Coast hydrologic region which extends up from the U.S.-Mexico border to the Tehachapi, San Bernardino, San Gabriel and San Jacinto mountains. Nearly one-third of the area is coastal plain. This region contains major urban centers, including the counties of Los Angeles, Orange and San Diego. Much of the flooding is sudden and severe, resulting in massive slides, debris flows and mudflows. Typical of the flooding that occurs in this area are the 1969 winter storms that killed 47 and resulted in $300 million in property damage. During these storms, an alluvial flood and debris flow on Deer Creek in San Bernardino County killed 11.

Orange County consists of:
8-1 Ground Water Basin - Coastal Plain of Orange County, 224,000 acres
9-1 Ground Water Basin - San Juan Valley, 16,700 acres

The RSCCD is all located in the Coastal Plain of Orange County.

LOCAL GOVERNMENTS

Section 201.2 of 44 CFR defines Local Government as:
Any county, municipality, city, town, township, public authority, school district, special district, intrastate district, council of governments (regardless of whether the council of governments is incorporated as a nonprofit corporation under State law), regional or interstate government entity, or agency or instrumentality of a local government.

FEMA recognizes that local governance structures vary, and that the authority to implement mitigation strategies (e.g., land use planning and zoning, building code enforcement, infrastructure improvements, floodplain management, etc.) may not reside within a single governmental entity. In addition certain FEMA hazard mitigation assistance programs accept applications from private, non-profit organizations and other quasi-governmental entities that do not necessarily align with traditional geopolitical boundaries. To ensure these potential sub applicants to FEMA mitigation assistance programs met the eligibility requirements for mitigation plans under 44 CFR 201.6 FEMA has identified procedurals of these entities.

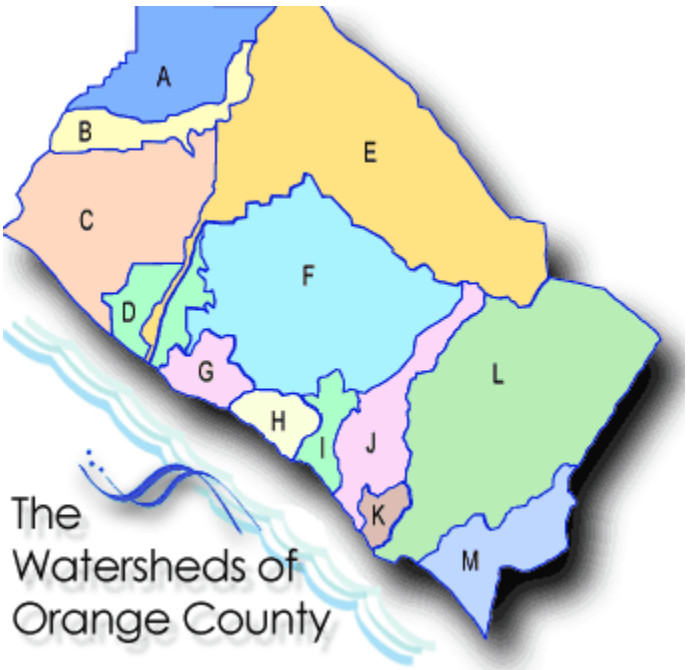
B. THE ORANGE COUNTY FLOOD THREAT

Orange County's 510,000 acres are comprised of mountain terrain (on the northeast and southeast) and floodplain (in the central and western section). The County's rapid growth and transformation from an agricultural community to an urban community has changed flood control of large flows from mountains and hills to include control of additional runoff produced by development of the plains. Although there is a countywide system of flood control facilities, the majority of these are inadequate for conveying runoff from major storms, such as the Standard Project Flood or the 100-year flood.

The infrequency of very large floods further obscures the County's flood hazard. Storms labeled "severe" have occurred in less than 10 of the past 175 years. In particularly disastrous storms, a false sense of security prevailed following long periods of mild semi-arid years.

The following map provides locations of the various watersheds throughout Orange County.

Figure 4 - Watersheds of Orange County



A = Coyote Creek
B = Carbon Canyon
C = Westminster
D = Talbert
E = Santa Ana River
F = San Diego Creek
G = Newport Bay
H = Los Trancos/Muddy Creek
I = Laguna Canyon
J = Aliso Creek
K = Salt Creek
L = San Juan Creek
M = Prima Deshecha/Segunda Deshecha

COUNTY OF ORANGE AND OCFA HAZARD MITIGATION PLAN

To provide quantitative information for flood warning and detection, Orange County began installing its ALERT (Automated Local Evaluation in Real Time) system in 1983. Operated by the County's Public Works in cooperation with the National Weather Service, ALERT uses remote sensors located in rivers, channels and creeks to transmit environmental data to a central computer in real time. Sensors are installed along the Santa Ana River, San Juan Creek, Arroyo Trabuco Creek, Oso Creek, Aliso Creek, as well as flood control channels and basins. The field sensors transmit hydrologic and other data (e.g., precipitation data, water levels, temperature, wind speed, etc.) to base station computers for display and analysis. In addition, seven pump stations (Huntington Beach, Cypress, Seal Beach, Los Alamitos, Rossmoor, Harbor-Edinger, and South Park) regulating storm water discharge to flood control channels are also instrumented. Their monitoring system includes automated call-out of operations personnel in the event of a crisis.

Activation of the Storm Operations Center operated by the OC Public Works takes place when heavy rainfall occurs or is predicted, and/or when storm runoff conditions indicate probable flood damage. The Center monitors the situation on a 24-hour basis. Response may include patrols of flood control channels and deployment of equipment and personnel to reinforce levees when needed. The Center activation and various emergency response actions are based on the following Emergency Readiness Stages:

Stage I - Mild rainfall (watch stage).

Stage II - Heavy rainfall or potential thereof. OCPW Storm Operations Center activated and surveillance of flood control facilities in effect.

Stage III - Continued heavy rainfall or deterioration of facilities. County OCPW Director in charge. County's personnel assume assigned emergency duties.

Stage IV - Conditions are or are likely to be beyond County control. The Board of Supervisors, or DES when the Board is not in session, proclaims Local Emergency and assumes special powers. Mutual Aid requested.

Stage V - Damage beyond control of all local resources. State forces are required. Governor requested to proclaim State of Emergency.

Stage VI - Damage beyond control of local and State resources. Federal forces are required. President requested to declare Major Disaster.

ORANGE COUNTY FLOOD THREAT

The Santa Ana River, flowing through the heart of Orange County to the Pacific Ocean is the county's greatest flood threat. Research of flooding in Orange County illustrates these flood hazard issues, sighting loss of life as well as damage to personal and public property.

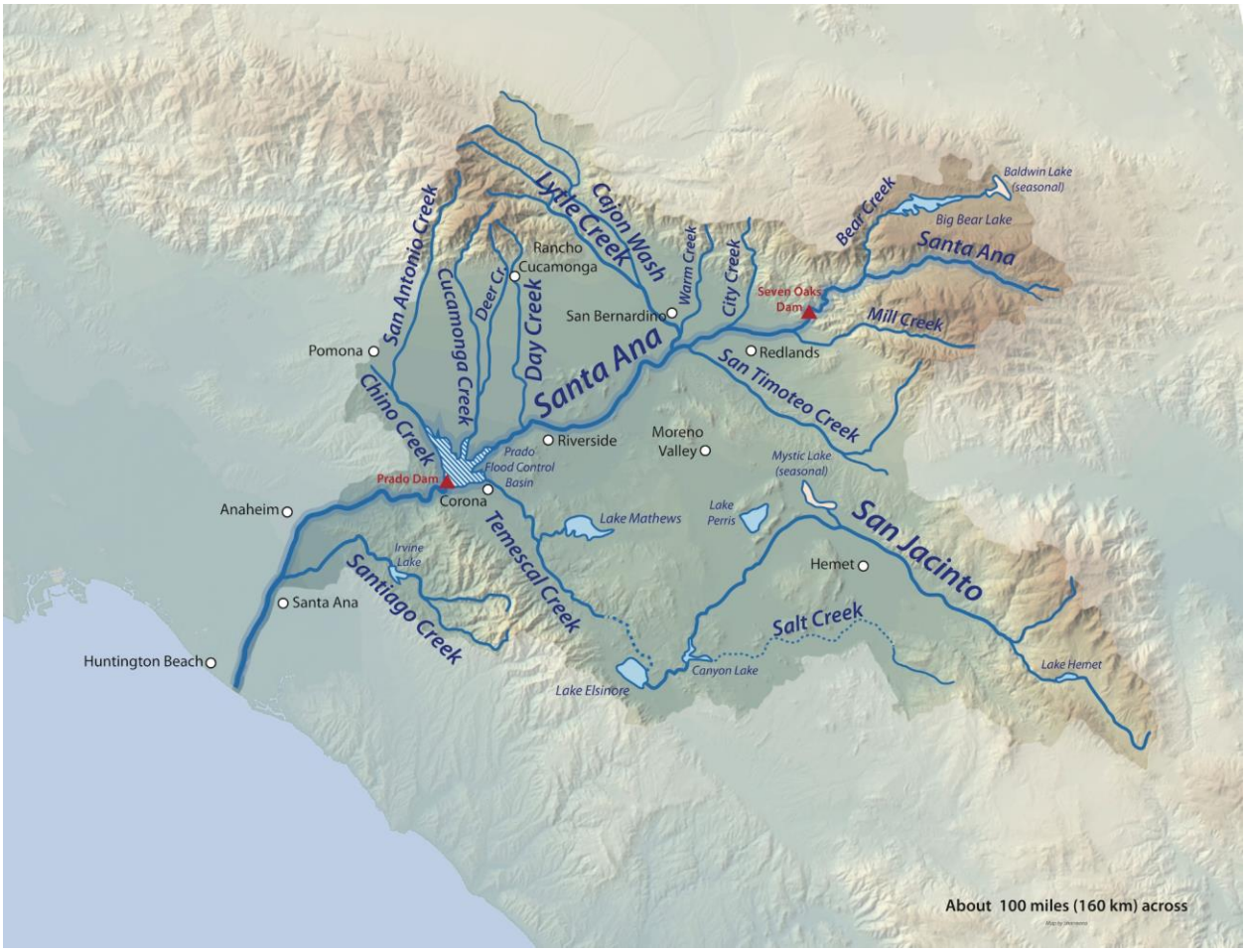
One such flood occurred in 1938, wiping out roads, bridges, and railroads near the river when an 8-foot wall of water swept out of the Santa Ana Canyon. Anaheim, Santa Ana, and Garden Grove were hardest hit and 34 lives were lost because of the flood. The flood and its damage were a catalyst for construction of Prado Dam, developed as part of the Army Corps of Engineers flood control protection plan. Government officials estimated that today without the protection of Prado Dam, a flood of this magnitude would cause as many as 3,000 deaths and top $25 billion in damages. More than 110 acres would be flooded with 3 feet of water and 255,000 structures damaged as documented by S. Gold, in the Los Angeles Times, in 1999.

The Army Corp of Engineers is tasked with the project of increasing the level of protection at Prado Dam from the current 70-year level to a 190-year level of protection. This project was recently completed. Further, portions of the County not inundated by river overflow during a 100-year event could be subject to flooding from overflow of water drainage facilities currently inadequate for carrying the 100-year discharge.

Other areas subject to flooding during severe storms include areas adjacent to Atwood Channel, Brea Creek Channel, Fullerton Creek Channel, Carbon Creek Channel, San Juan Creek Channel, and East Garden Grove-Wintersburg Channel. Areas adjacent to Santiago Creek and Collins Channel in the central portion of the County and large portions of the San Diego Creek watershed in the City of Irvine and unincorporated areas of the County are also subject to inundation. In the southern portion of the county, canyon areas are subject to flooding. However, with increase in development in these areas the flood hazard becomes even greater.

The RSCCD has reviewed the **Orange County Flood Control Project Seven-Year Plan** which heavily impacts the district's facilities and supports this document and its concepts. These projects will provide additional flood protection for five sites threatened by flood and listed in Table 19.

Figure 5: Orange County Rivers and Creeks



HISTORIC DATA FOR ORANGE COUNTY

Residents reported damaging floods caused by the Santa Ana River, known as the "Great Floods," as early as 1770. A massive flood recorded on January 7, 1770 is in the Notes of Father John Crespi. Major floods in Orange County on the Santa Ana River have occurred in 1810, 1815, 1825, 1884, 1891, 1916, 1927, 1938, 1969, 1983, 1993 and 1997. The greatest flood in terms of water flow was in 1862 with an estimated flow rate of 317,000 cubic feet per second (cfs). This was three times greater than the Great Flood of 1938 estimated at 110,000 cfs. The most damaging flood in terms of cost was the Great Flood of 1969. The County's population had significantly increased by this time creating greater potential for loss.

Great Flood of 1862- The storm and flood of January 1862, called the NOACHIAN deluge of California, were unusual in two ways: 1) the storm occurred during the very severe drought of 1856-1864 and 2) the flooding was extremely long, lasting 20 days. Under normal circumstances, major floods last no longer than a few days. The only structure left standing was a chapel called Aqua Mansa on high ground above the river. The priest rang the chapel bell

and the settlers fled the rising waters. Small villages along the Santa Ana River were completely destroyed. Miraculously, there were no recorded deaths.

Great Flood of 1916 – The flood on January 27, 1916 inundated a large area in Santa Ana, flooding Main Street with water 3 feet deep. The farming area, today known as City of Westminster, was also flooded. A total of six bridges, three traffic bridges and three railroad bridges washed away and four people drowned.

Great Flood of 1938 – The flood of 1938 considered the most devastating of all County floods in the 20th Century, affected all of Southern California. The storm began on February 27 lasting until March 3. In the Santa Ana Basin, 34 people died and 182,300 acres were flooded. All buildings in Anaheim were damaged or destroyed. Two major railroad bridges, seven traffic bridges, and the little town of Atwood were completely destroyed. As the Santa Ana River inundated the northwestern portion of Orange County, train service to and from Santa Ana was cancelled and communication with the outside world was essentially nonexistent. Damage exceeded $50 million.

Great Flood of 1969 – The floods of January and February were the most destructive on record in Orange County. Previous floods had greater potential for destruction, but the County was then relatively undeveloped. The intensity of the 1938 flood was greater, however, of shorter duration. A drought that began in 1945 was relieved by only two wet years until the floods in 1969. An annual overdraft of 100,000 acre-feet brought the average groundwater level to 15 feet below sea level, and ocean water moved into the aquifers. Some wells along the coast began producing brackish water and had to be abandoned.

Rainfall was continuous from January 18-25 resulting in widespread flooding January 25-26. Orange County was declared a national disaster area on February 5. A storm on February 21-25 once again brought rain to the already saturated ground, culminating in a disastrous flood on February 25. The largest peak outflow from Santiago Reservoir since its inception in 1933 occurred in February. On February 25, the reservoir at Villa Park Dam reached its capacity. This was the first time since its construction in 1963 with a maximum outlet inflow of 11,000 cfs. Even though the outlet conduit was discharging up to 4,000 cfs, spillway overflow occurred at 1:30 p.m. on February 25 and continued 36 hours. The maximum peak outflow from the dam reached 6,000 cfs. The safety of the dam was never threatened. However, the outflow caused serious erosion downstream in Orange and Santa Ana and in portions of parks and golf courses. Trees and debris inundated the streambed. Houses, apartments, gardens, swimming pools, and bridges eroded away. Numerous residents and volunteers, worked around the clock to remove debris, sandbag eroding embankments, cordon off danger zones, issue warnings, and make temporary repairs. U.S. Marine Corps helicopters dropped junked cars along the banks of the creek below Bristol Street in an effort to prevent further undermining of homes. A Southern Pacific Railroad bridge, water and sewer lines, a pedestrian over crossing, and three roads washed out. Approximately 2,000 Orange and Santa Ana residents were evacuated from houses bordering Santiago Creek.

Great Flood of 1983 – The presence of El Niño spawned the flood of 1983. The intense downpour concentrated in a local area and the highest waves to crest on shore in 10 years. Meanwhile, the Santa Ana River crested at the mouth of the ocean; creating a disaster for the low-lying areas of Huntington Beach with floodwaters three to five feet deep. In addition, the pounding surf destroyed a section of the Huntington Beach Pier, resulting in a complete renovation of the pier.

A city owned and operated dirt lined flood channel was destroyed causing flooding in the South

end of Huntington Beach. Over 3,000 persons in Huntington Beach had to be evacuated and sheltered.

Great Floods of 1993 – In 1993, El Niño spawned a storm and flood. This storm was concentrated in the Laguna Canyon Channel area from Lake Forest to downtown Laguna Beach. In spite of a valiant effort to save downtown merchants by sandbagging, the stores were flooded anyway. Laguna Canyon Road was damaged extensively as well as homes and small businesses in the Laguna Canyon Channel. There were no fatalities reported.

Flood of 1995 – In 1995, the Edinger Flood Channel overflowed into the streets and residential areas. Golden West Community College was located just a block from the severe flooding.

Flooding of 1997 & 1998 – From December 1997 through March 1998 an El Niño condition pounded the north west Orange County. On December 7, 1997, three senior mobile home parks in Huntington Beach were flooded. Due to the age of the residents, they had to be helped in evacuating and moved to shelters. This heavy rain pattern continued into March1998 where flood channels reached capacity on numerous occasions.

Flooding during the 1997/1998 El Niño Storm season affected Orange County. Extensive storm damage to private property and public infrastructure (County and cities) reached approximately $50 million. Storm conditions caused numerous countywide mudslides, road closures, and channel erosion. Hillside erosion and mudslides forced continual clearing of County roads of fallen trees and debris. Protective measures, such as stabilizing hillside road slopes with rock or K-rail at the toe of slopes, were taken to keep the normal flow of transportation on the County's road system. County harbors, beaches, parks, and trails also sustained substantial storm damage.

High ocean waves and storm activity forced the closure of Aliso Beach Pier when it was declared unsafe to the public and as a result, eventually required demolition. The high ocean waves also severely damaged the Laguna Beach boardwalk. Flooding occurred in the city, causing injuries and two deaths as a result of water and mudflow. Lateral erosion occurred to the natural banks of Serrano Creek and Aliso Creek. Storm flows destroyed portions of San Juan Creek and Trabuco Creek levees and channel linings. The U.S. Army Corps of Engineers assumed responsibility for the channel restoration following initial emergency response repairs made by the County. Substantial silt and sedimentation deposits at Santa Ana-Delhi and San Diego Creek Channels contributed to severe dredging problems at the Upper Newport Bay Regional Park, with costs estimated in excess of $2 million. Major landslides in Laguna Niguel caused millions of dollars in damage. Deterioration and collapse of a culvert 25 feet beneath the asphalt forced closure of Santiago Canyon Road for three weeks.

Assistance from resources such as the Army Corps of Engineers and the Federal Highway Administration minimized the overall reimbursement from FEMA (P.L. 93-288, Stafford Act for Public Assistance). Still, the FEMA/NDAA reimbursement to the County unincorporated area alone still reached approximately $4 million.

Although the 1997/1998 floods resulted in substantial damage to Orange County, it was not unprecedented. In January 1995, a disaster was declared in the County as extremely heavy and intense rains quickly exceeded the storm runoff capacity of local drainage systems in many Orange County cities and regional Flood Control District systems. As a result, widespread flooding of homes and businesses occurred throughout these cities. There were approximately 1000 people evacuated and extensive damage sustained to both private and public property. Unincorporated areas of the county received $12.5 million in reimbursement through Public

Assistance programs.

Between 2010 and 2016, Orange County California has been included in one State of Emergency incident, in 2011. The RSCCD was not heavily impacted by this flood.

California Winter Storms, Flooding, and Debris and Mud Flows (DR-1952)

Incident period: December 17, 2010 to January 04, 2011

Major Disaster Declaration declared on January 26, 2011

NO DAMAGE TO RSCCD

Orange County is in close proximity to Los Angeles, San Bernardino, Riverside, and San Diego Counties. Heavy rain affecting any one of these counties can easily affect Orange County. In addition, the towering mountains trap eastern-moving winter storms and draw out the rain. The rainwater moves rapidly down the steep slopes and across the coastal plains on its way to the ocean. Orange County averages about thirteen inches of rain a year, yet some mountain peaks in the County receive more than forty inches of precipitation annually.

Naturally, this rainfall moves rapidly downstream, often with severe consequences for anything in its path. Flood-generated debris flows roar down canyons at speeds near 40 miles per hour carrying with it a wall of mud, debris, and water ten feet high.

In Southern California, stories of floods, debris flows, and persons swept away by the Santa Ana River flowing at thirty-five miles an hour are without end. The good news is that through the Main Stem Project (Santa Ana River and Prado Dam), much of the flooding has been mitigated in the late 1990s and early 2000s. Orange County and its cities have taken flood mitigation seriously and considerable improvements have been made. These improvements are due to the excellent working relationship between the federal, state, counties and cities.

SANTA ANA RIVER IMPROVEMENTS

The Santa Ana River Mainstem Project (SARP) was initiated in 1964, in partial response to a resolution of the House Committee on Public Works adopted May 8, 1964. A survey report was completed by the District in 1975. The report was reviewed, and then submitted to Congress in September 1978.



To protect both upper and lower Mainstem project communities, Seven Oaks Dam, a 550-foot-high and 2,980-foot long rockfill dam with a gross capacity of 145,600 acre feet, has been constructed in the upper Santa Ana Canyon. The dam reduce the Reservoir Design Flood inflow of 85,000 cfs, to a controlled outflow of 7,000 cfs, to provide 350-year flood protection. The project is operated in tandem with Prado Dam, also located on the Santa Ana River 38 miles (61.1 km) downstream, to provide flood protection to Orange County, California.

Congress authorized Santa Ana River Mainstem Project for construction in 1986 under new guidelines for cost sharing of water resources projects between Federal and local governments. The local sponsors must pay between 25% and 50% of total cost of the project with the remaining cost provided by the Federal government.

In September 1980, the Army Corps of Engineers completed the Phase I. The General Design Memorandum (GDM) for the Santa Ana Mainstem. Construction of the SARP was authorized by Section 401(a) of the Water Resources Development Act of 1986. Construction of SARP was initiated in 1989, and completion scheduled for 2014.

On December 14, 1989, the U.S. Army Corps of Engineers (COE) and the County Flood Control District of Orange, Riverside and San Bernardino as Local Sponsors, entered into a four-party Local Cooperation Agreement (LCA) defining the responsibilities and cost-sharing of each party for each feature.

The Local Sponsors are to acquire all lands, easements, rights-of-way and perform relocations required to make way for construction of the Mainstem Project. The Army Corps of Engineers constructed the improvements. On completion, the Local Sponsors are responsible for the operation and maintenance of the Project features; except for Prado Dam where Orange County is responsible to pay for incremental operations/maintenance costs and the Corps of Engineers will continue to operate the Dam.

In 2003, a new agreement was entered between the Corps of Engineers and Orange County Flood Control District where the Prado Dam feature of the Santa Ana Mainstem Project were separated and Orange County was the sole local sponsor for Prado Dam. The project was designed to prevent flooding of 110,000 acres and causing 3,000 fatalities and more than $15 billion in property damage. The project featured constructing 23 miles of the Lower Santa Ana River from the Pacific Ocean to Prado Dam; raising Prado Dam elevation and reservoir capacity and construction of Seven Oaks Dam, the 6th tallest earth dam in the United States.

Implementer: Orange County Flood Control District/Orange County Public Works Flood Control Section

Estimated Cost: $1,890,000,000

Time Period: 25 years

Funding Source: Federal and local sponsorship

Source and Date: Orange County Strategic Financial Plan (2009)

Adopted Plan Number: Local Cooperation Agreement

Initiative and Implementation Status:
The U.S. Army Corps of Engineers has completed construction of the Lower Santa Ana River from the Pacific Ocean to Prado Dam to convey the 190-year storm event and the Seven Oaks Dam. The next step was Orange County Flood Control District acquiring land necessary to accommodate the increase in reservoir capacity with the Prado Dam spillway elevation being raised by the US Army Corps of Engineers.

FACTORS CREATING FLOOD RISK

Flooding occurs when climate, geology, and hydrology combine to create conditions of water flow outside its usual course.

WINTER RAINFALL

Over the last 100-Years, the average annual rainfall in Orange County was 13.03 inches. However, the term “average” means very little as the annual rainfall during this period has ranged from 4.35 inches in 2001-2002 to 38.2 inches in 1883-1884. This makes Orange County a land of extremes in terms of annual precipitation. Orange County is in the southern section of the Los Angeles Basin fringing the border of the Saddleback Range on the east increasing the possibility collection of rainwater within the county.

Another relatively regular source for heavy rainfall, particularly in the mountains and adjoining cities is from summer tropical storms. Tropical storms usually coincide with El Niño year and cause heavy rain and flooding.

EL NIÑO

Like many weather patterns, El Niño is one of those systems that nearly everyone has heard of, but whose origins are not so widely known. An elixir of unusual trade wind patterns and warming waters, the weather event can dominate climatic conditions across the world. El Niño is a disruption of the ocean-atmosphere system in the tropical Pacific having important consequences for weather around the globe.

Nineteenth century anglers coined the name "El Niño.” Anglers plying the waters off the coast of Peru in the late 1800s were the first to notice an occasional seasonal invasion of warm, southward ocean current that displaced the north-flowing, cold stream in which they normally fished. Typically, it happened around Christmas, or the first of the year – hence the name "El Niño," which means "little boy" or "Christ Child" in Spanish.

El Niño is falsely linked to global warming, unfairly blamed for hurricanes in the Atlantic, but properly takes credit for droughts in Australia and floods in California. It also is responsible for regional depletion of fish stocks and fluctuations in seasonal temperatures.

An El Niño occurs when the ocean-atmosphere system in the tropical Pacific Ocean is disrupted. Normally, trade winds blow toward the west across the tropical Pacific Ocean, piling up warm surface water in the western Pacific. In a classic El Niño, the trade winds relax in the central and western Pacific, leaving warm water in the eastern Pacific. Heavy rainfall follows the warm water eastward, leading to flooding in Peru and California. Meanwhile, areas farther west, such as Indonesia and Australia, suffer droughts.

Displacing heat in the eastern Pacific prompts changes in the global atmospheric circulation, bringing changes in weather in regions far removed from the Pacific. The alteration in water temperature also affects fish reproduction, which has repercussions in the aquatic food chain. The most recent El Niño event occurred in 1997-98. The 1983-84 El Niño is considered the strongest and most devastating on record, responsible for more than 1,000 deaths, causing weather-related disasters on nearly every continent and totaling $10 billion in damages to property and livestock. El Niño conditions typically last one or two years, and are followed by "La Niña," or "little girl," in which a cooling of the same mid-Pacific waters triggers a reverse in climate impacts.

Table 5 - Tropical Storms that Affected Southern California in the 20th Century

Month-Year	Date(s)	Area(s) Affected	Rainfall
July 1902	20th & 21st	Deserts & Southern Mountains	up to 2"
Aug. 1906	18th & 19th	Deserts & Southern Mountains	up to 5"
Sept. 1910	15th	Mountains of Santa Barbara County	2"
Aug. 1921	20th & 21st	Deserts & Southern Mountains	up to 2"
Sept. 1921	30th	Deserts	up to 4"
Sept. 1929	18th	Southern Mountains & Deserts	up to 4"
Sept. 1932	28th to Oct 1st	Mountains & Deserts, 15 Fatalities	up to 7
Aug. 1935	25th	Southern Valleys, Mountains & Deserts	up to 2"
Sept. 1939	4th - 7th	Southern Mountains, Southern & Eastern Deserts	up to 7
	11th & 12th	Deserts, Central & Southern Mountains	up to 4"
	19th - 21st	Deserts, Central & Southern Mountains	up to 3"
	25th	Long Beach, W/ Sustained Winds of 50 Mph	5"
		Surrounding Mountains	6 to 12"
Sept. 1945	9th & 10th	Central & Southern Mountains	up to 2"
Sept. 1946	30th- Oct 1st	Southern Mountains	up to 4"
Aug. 1951	27th - 29th	Southern Mountains & Deserts	2 to 5"
Sept. 1952	19th - 21st	Central & Southern Mountains	up to 2"
July 1954	17th - 19th	Deserts & Southern Mountains	up to 2"
July 1958	28th & 29th	Deserts & Southern Mountains	up to 2"
Sept. 1960	9th & 10th	Julian	3.40"
Sept. 1963	17th - 19th	Central & Southern Mountains	up to 7"
Sept. 1967	1st - 3rd	Southern Mountains & Deserts	2"
Oct. 1972	6th	Southeast Deserts	up to 2"
Sept. 1976	10th & 11th	In Central and Southern Mountains. Ocotillo, CA was destroyed and there were 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"

STATE OF CALIFORNIA MULTI-HAZARD MITIGATION PLAN

GEOGRAPHY AND GEOLOGY

Southern California is the product of rainstorms and erosion for millennia. Most of the mountains surrounding the valleys and coastal plain are deeply fractured faults. As the mountains grew taller, their brittle slopes eroded. Rivers and streams carried boulders, rocks, gravel, sand, and silt down these slopes to the valleys and coastal plain. Today, much of the coastal plain rests on the ancient rock debris and sediment washed down from the mountains.

This sediment acts like a sponge, absorbing vast quantities of rain in years when heavy rains follow a dry period. Like a sponge near saturation, the same soil fills up rapidly when heavy rain follows a period of relatively wet weather. Even so, in some years of heavy rain, flooding is minimal because the ground is relatively dry, yet the same amount of rain following a wet period can cause extensive flooding.

Essentially all of Orange County is built out leaving little open land to absorb rainfall. The lack of open land forces water to remain on the surface rapidly accumulating. If it were not for the massive flood control system with its concrete lined river and streambeds, flooding would be a much more common occurrence. In addition, the tendency is toward less and less open land. In-fill building is becoming a much more common practice in many areas. Developers tear down an older home, typically covering up to 40% of the lot, replacing the single home with three or four town homes or apartments covering 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. When water leaves property and accumulates in the street, it is directed toward 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 resurfacing streets, a one to two inch layer of asphalt is laid 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.

BRIDGES

In flood events, bridges are key points of concern because of their importance in the transportation network for the movement of goods, travel, and emergency services. During flood events, scouring of bed material supporting their foundation can occur. Historically, this is the most common cause of bridge failures. Bridges in and of themselves may also be obstructions in a watercourse, restrict flows, and cause stream instability.

Bridges in the County are Federal, State, County, Flood Control District, City, or privately owned property. County owned bridges that are on the public roadway system are inspected by Caltrans in accordance with National Bridge Inspection Standards. Inspections are performed at regular intervals not to exceed two years unless justification to do otherwise is approved by the Federal Highway Administration. Bridges, which are not a part of the public roadway system or listed in the States Inventory of Bridges, will not be subject to inspection and are consequently a reason for concern.

In the last 20 years, the following bridges owned and maintained by the County have been retrofitted to address scour and/or seismic concerns:

- Hamilton Street-Victoria Street at Santa Ana River Channel (Bridge No. 55C-0103)
- Adams Avenue Bridge at Santa Ana River Channel (Bridge No. 55C-0344)
- Edinger Avenue Bridge at Santa Ana River Channel (Bridge No. 55C-0154)
- Warner Avenue Bridge at Santa Ana River Channel (Bridge No. 55C-0148)
- Harbor Boulevard Bridge at Santa Ana River Channel (Bridge No. 55C-0631)
- Lincoln Avenue Bridge at Santa Ana River Channel (Bridge No. 55C-0017)
- Glassell Street Bridge at Santa Ana River Channel (Bridge No. 55C-0130)
- Santiago Canyon Road Bridge at Santiago Creek (Bridge No. 55C-0049)
- Island Way Bridge at Harbor Waterway (Bridge No. 55C-0561)
- Brea Boulevard Bridge at Brea Creek (Bridge No. 55C-0122)
- Brea Boulevard Bridge at Brea Creek (Bridge No. 55C-0123)
- Santa Margarita Parkway Bridge at Arroyo Trabuco (Bridge No. 55C-0520)
- Slater Avenue-Segerstrom Avenue Bridge at Santa Ana River Channel (Bridge No. 55C-0371)

FLOOD TERMINOLOGY

100-YEAR FLOOD

A 100-year flooding event is a 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. Figure 6 bellow illustrates the 100-year floodplain in Orange County.

BASE FLOOD ELEVATION (BFE)

The term "Base Flood Elevation" refers to the expected elevation (normally measured in feet above sea level) of a base flood. Base flood elevations can be set at levels other than a 100-year flood. Some communities choose to use higher frequency flood events as a 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 a 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.

DEVELOPMENT

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

Uses permitted within the FP-1 District include agriculture, public flood control facilities and devices, public utility facilities, public parks and recreation areas. Specifically prohibited within all Floodplain Zones (FP-1, FP-2, and FP-3) are structures and uses increasing flood elevations

during the course of a base flood discharge. Prohibited are landfills, excavations and grading or the storage of materials and equipment resulting in the diversion or increase in erosion, flood elevations, or related hazards to people or property and storage or disposal of floatable substances and materials or of chemicals, explosives, and toxic materials. The "Base Flood" is defined in the Zoning Code as "the flood having a one percent chance of being equaled or exceeded in any given year, a.k.a. 100-year flood."

DRY FLOODPROOFING

A dry flood proofed structure is made of water tight below the level that needs water protection to prevent flood waters from entering. Making the structure water tight requires sealing the walls with water proof coatings, impermeable water membranes, or a supplemental layer of masonry or concrete.

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, stores excess floodwater. The floodplain is made up of two sections: the floodway and the flood fringe.

FLOODWAY

The floodway is one of two main sections creating the floodplain. Regulatory purposes require floodways be defined. Unlike floodplains, floodways do not reflect a recognizable geologic feature. For National Flood Insurance Program (NFIP) purposes, floodways are defined as the channel of a river or stream, and the over bank areas adjacent to the channel. The Orange County Zoning Code defines a “Floodway” as “the channel of a river or other watercourse and that part of the floodplain reasonably required to discharge the base flood without cumulatively increasing the water surface elevation more than one foot.”

The floodway carries the bulk of the floodwater downstream and is usually the area where water velocities and forces are the greatest. NFIP regulations require the floodway be open and free from development or other structures that can obstruct or divert flood flows.

FLOOD FRINGE

The flood fringe refers to outer portions of the floodplain, beginning at the edge of the floodway and continuing outward. It is generally defined as "the land area, which is outside of the stream flood way, but is subject to periodic inundation by regular flooding.” This is the area where development is most likely to occur, and where precautions to protect life and property must be taken. In Section 7-9-113-1 of the Orange County Zoning Code (Zoning Ordinance), the flood fringe encompasses the FP-2 and FP-3 Districts.

The FP-2 is intended to be applied to areas shown as "A," "A1" through "A30," "AO," "AE," "AH," "A99," and "M," on the September 15, 1989 or most current federal Flood Insurance Rate Maps and areas in which Orange County has determined to be a "Special Flood Hazard Area" (SFHA).

The FP-3 is intended to be applied to areas shown as "V," "V1" through "V30," and "VE," "AH," "A99," and "M," on the September 15, 1989 or most current federal Flood Insurance Rate Maps and areas in which the County has determined to be a coastal high hazard area.

WET FLOODPROOFING

Wet Floodproofing includes permanent or contingent measures applied to a structure or its contents that prevent or provide resistance to damage from flooding while allowing floodwaters to enter the structure or area. Generally, this includes properly anchoring the structure, using flood resistant materials below the Base Flood Elevation (BFE), protection of mechanical and utility equipment, and use of openings or breakaway walls.

CHARACTERISTICS OF FLOODING

Two types of flooding primarily affect Orange County: riverine flooding and urban flooding (see descriptions below). In addition, any low-lying area has the potential to flood. The flooding of developed areas may occur when the amount of water generated from rainfall and runoff exceeds a storm water system's capability to remove it.

RIVERINE FLOODING

Riverine flooding is the over bank flooding of rivers and streams. The natural process of riverine flooding adds sediment and nutrients to fertile floodplain areas. Flooding in large river systems typically results from large-scale weather systems generating prolonged rainfall over a wide geographic area. Flooding occurs in hundreds of smaller streams, which then drain into the major rivers.

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 floodwaters that rise very rapidly peaking with violent force.

DAM FAILURE FLOODING

Loss of life and damage to structures, roads, and utilities may be the result of a dam failure. Economic loss can result in a lowered tax base and lack of utility profits. The failure of one of the major dams in Orange County would certainly have this effect. FEMA requires all dam owners to develop Emergency Action Plans (EAP) for warning, evacuation, and post-flood actions, because dam failure can have severe consequences. Although there may be coordination with county officials in the development of the EAP, the responsibility for developing potential flood inundation maps and facilitation of emergency response is the responsibility of the dam owner. For more detailed information regarding dam failure flooding, refer to Section III-D of this plan.

WATER TANK FAILURE

In September of 1998, a smaller version of a municipal water storage unit in the City of Westminster failed collapsing about 12 feet of the 100,000 gallon tank. The flow of water from the tank destroyed most of the facility and inundated approximately 30 homes with water and silt. Through the Public Works Mutual Aid Agreement, the Orange County Public Works Department assisted in the clean-up and temporary repair of the streets.

This is an example of one of many water tanks that could cause flooding in Orange County.



This 31-year-old storage tank ruptured in Westminster, California, sending a 6-foot wave of water through the city that damaged or destroyed about 50 buildings and over a dozen vehicles. Storage tanks should be replaced or periodically rehabilitated to preserve their structural integrity.

COUNTY OF ORANGE AND OCFA-HAZARD MITIGATION PLAN

DAMS

Since the 19th century, 45 dam failures have occurred in California. The two most significant dam failures are St. Francis Dam in 1928 and the Baldwin Hills Dam in 1963.

DEBRIS FLOWS

Another flood related hazard that can affect certain parts of the Southern California region are debris flows. Typically, debris flows occur in mountain canyons and the foothills. 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. They usually start on steep hillsides as shallow landslides that liquefy, accelerating to speeds that are typically about 10 miles per hour, but can exceed 35 miles per hour. The consistency of debris flows range from watery mud to thick, rocky mud and can carry items as large as boulders, trees, and cars. Debris flows from many different sources can combine in channels, greatly increasing their destructive power. As the flow reaches flatter ground, debris spreads causing damage in developed areas."

COASTAL FLOODING

Low-lying coastal communities of Southern California also contend with coastal flooding. This occurs most often during storms with higher than normal tides. Storms, the time of year, and the tidal cycle can bring much higher than normal tides, causing flooding in low-lying coastal areas. This hazard however is limited to those areas.

EFFECT OF DEVELOPMENT ON FLOODS

Development raises the river levels by forcing the river to compensate for the flow space obstructed by the inserted structures and/or fill. Serious problems arise with structures or a material added to floodways or floodplains and there is no removal of fill to compensate. Flood waters may be forced away from historic floodplain areas. As a result, other existing floodplain areas may experience floodwaters 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 occurring within the floodway to ensure 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. Consideration taken in the development and the implementation of storm-water management systems ensures effective displacement of runoff waters.

C. ORANGE COUNTY FLOOD CONTROL DISTRICT (OCFCD)

Around the turn of the 20th century, farming interest began development of the land today known as Orange County. Farms and factories were soon established and as farming intensified and prospered, a better drainage system was required. The Orange County Board of Supervisors formed several “drainage districts”. Eventually the drainage districts merged and the Orange County Flood Control District (OCFCD), was established May 23rd, 1927 under authorization of the Orange County Flood Control Act. The state statute was created to provide control of flood and storm waters of the district and streams flowing into the district (such as: the Santa Ana River, San Juan Creek, East Garden Grove-Wintersburg Channel and Santa Ana Delhi Channel); to mitigate the effects of tides and waves; and to protect the harbors, waterways, public highways and property in the district from such waterways.



It is the mission of the Orange County Flood Control District to “protect Orange County areas from the threat and damage of flooding”.

During the 1950’s and 1960’s and fueled by the “Baby Boomers”, urban sprawl began and suburbs were developed over agricultural fields. The infrastructure of drainage ditches once used for agriculture now needed improvement to the level of, flood control channels.

In 1968, the US Congress created the National Flood Insurance Program (NFIP). The criterion was established to provide 100-year flood protection. In 1972, the first Flood Insurance Rate Map (FIRM) was distributed; a majority of Orange County was in a flood zone. Since the creation of NFIP, OCFCD goal is to completely reduce the floodplain within OCFCD infrastructure by constructing flood control channels that convey 100-year flood protection,



constructing retarding basins, pump stations and dams throughout the County. Over several decades, OCFCD has reduced and removed several homes from the floodplains. OCFCD continues to remove more floodplains.

Hydrologic and hydraulic data are obtained for specific floodplains; these floodplains are analyzed for elimination or reduction to containment within the flood control facility. Strategic planning, including preliminary engineering analysis and engineering reports, for the construction of channel segments for entire channel systems is developed; these channel segments are at the infancy stage of becoming a project.

Projects are nominated before the City Engineers Flood Control Advisory Committee (CEFCAC). The committee composed of the OCFCD and cities decide the best deployment of money and manpower to accomplish conservation of water and protection of existing public and private property from floods. Selected projects are slated into the **Flood Control Project Seven-Year Plan.**

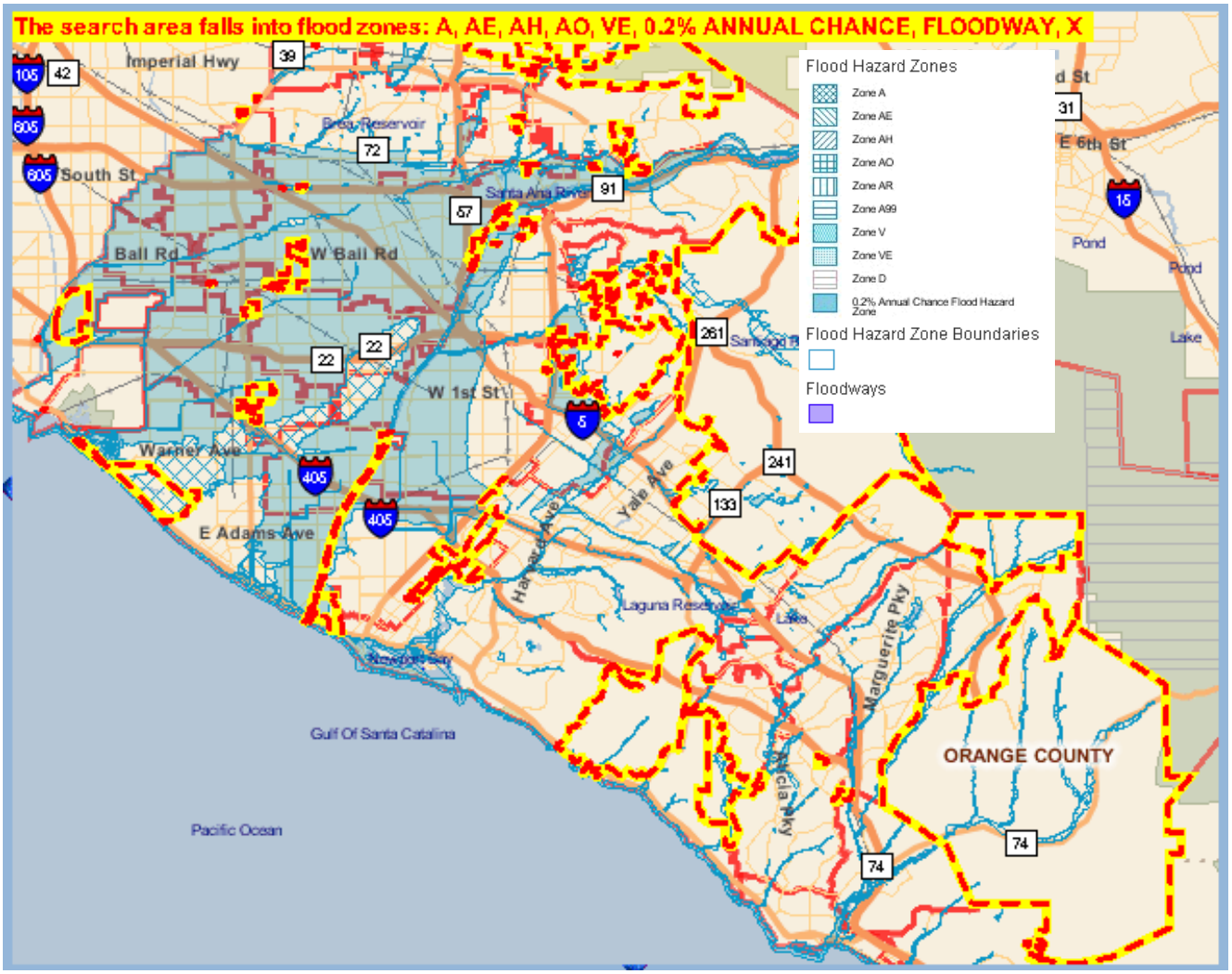
IDENTIFICATION OF ORANGE COUNTY FLOOD-PRONE AREAS

Flood maps and Flood Insurance Studies are often used to identify flood-prone areas. The NFIP was established in 1968 to provide low-cost flood insurance to the nation's flood-prone communities. The NFIP also reduces flood losses through regulations focusing on building codes and sound floodplain management. NFIP regulations (44 Code of Federal Regulations (CFR) Chapter 1, Section 60, 3) require all new construction in floodplains be elevated at or above the 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 delineating Standard Flood Hazard Area (SFHA) in communities where NFIP regulations apply. FIRMs are also used by insurance agents and mortgage lenders to determine flood insurance requirements and applicable rates.

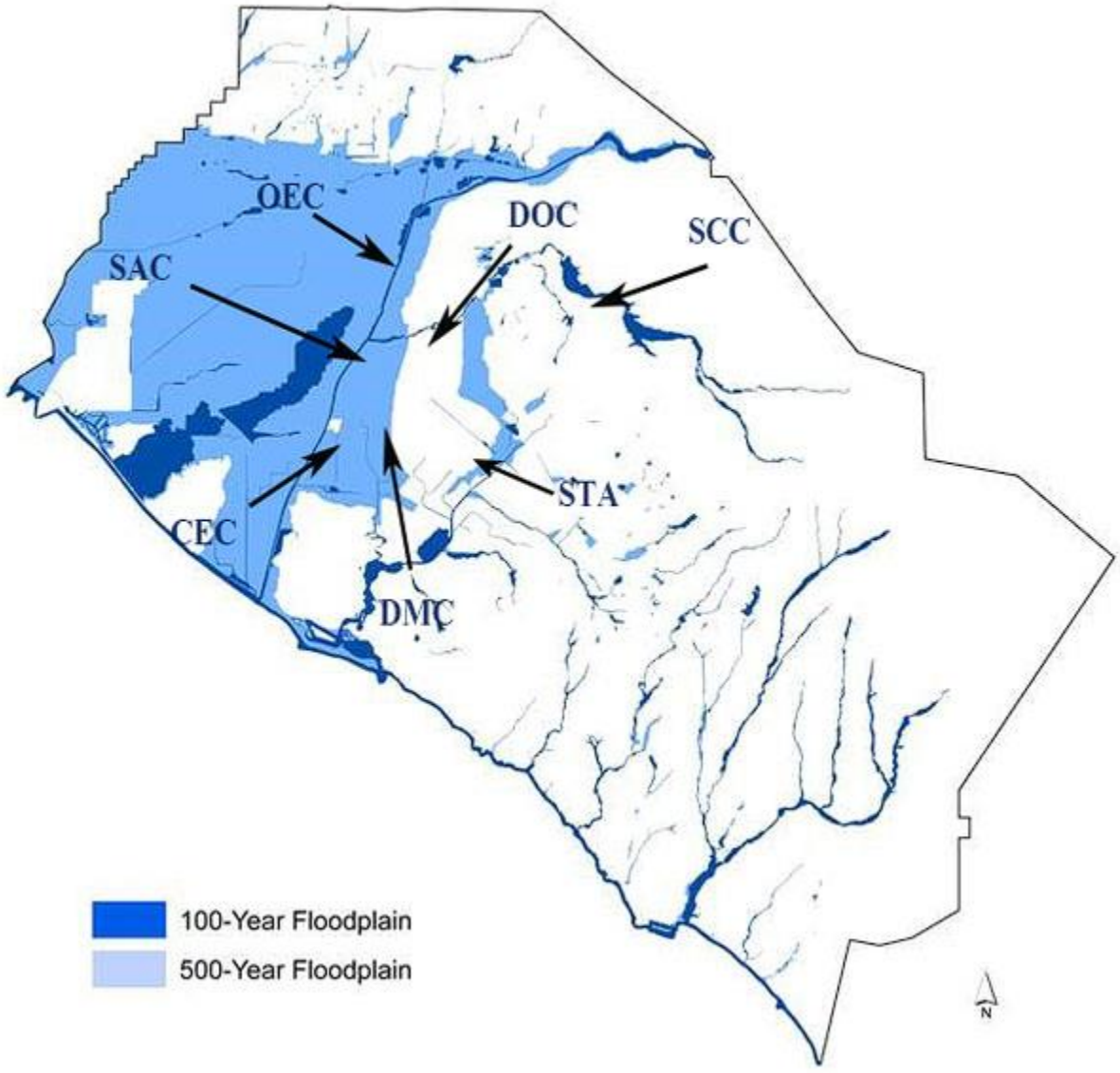
FIRMs are developed by combining water surface elevations with topographic data. Information derived through this process illustrates areas with the potential for inundation during a 100-year flood. They may also include base flood elevations (BFEs) and areas located within the 500-year floodplain. Flood Insurance Studies and FIRMs produced for the NFIP provide assessments of the probability of flooding in a specific location. Flood Insurance Studies conducted in the late 1970's and early 1980's by FEMA show flood risk in specific areas. However, FEMA has not mapped all 100-year or 500-year floodplains and does not incorporate planning for floodplain changes in the future due to new development. Although FEMA is considering changing this policy, it is optional for local communities. Human caused and natural changes to the environment continue to change the dynamics of storm water run-off.

Figure 6 - 100-Year Floodplain in Orange County



COUNTY OF ORANGE AND OCFA HAZARD MITIGATION PLAN

Figure 7 - FEMA Q3 Flood Data for Orange County



COUNTY OF ORANGE & OCFA HAZARD MITIGATION PLAN

FLOOD MAPPING METHODS AND TECHNIQUES

Although many communities rely exclusively on FIRMs to characterize the risk of flooding in their area, some flood-prone areas are unmapped, but remain susceptible to flooding. These areas include locations next to small creeks, local drainage areas, and human caused flooding. To address this lack of data, Orange County, as well as other jurisdictions, has taken efforts to develop more localized flood hazard maps. One method includes using high water marks from flood events or aerial photos, in conjunction with the FEMA maps, to better reflect the true flood risk. The use of GIS (Geographic Information System) is becoming an important tool for flood hazard mapping. FIRM maps can be imported directly into GIS, which allows for GIS analysis

of flood hazard areas. Orange County and most of the larger Orange County cities are now using GIS.

Flood hazard areas on tax assessment parcel maps are particularly useful to communities, allowing evaluation of the flood hazard risk for specific parcels during review of a development request. Coordination between FEMA and local planning jurisdictions is key to making a strong connection with GIS technology for flood hazard mapping.

FEMA and the Environmental Systems Research Institute (ESRI), a private company, have formed a partnership providing multi-hazard maps and information to the public via the Internet. The ESRI web site has information on GIS technology and downloadable maps.

FLOOD COMMUNITY IMPACT

SUSCEPTIBILITY TO DAMAGE DURING A FLOOD EVENT

The largest impact to communities in a flood event is the loss of life and property to both private and public entities. Development in the floodplains of Orange County increases the risk of extensive property loss resulting flooding and flood damage.

PROPERTY LOSS RESULTING FROM FLOODING EVENTS

The type of property damage resulting from flood events is dependent upon the depth and velocity of the floodwaters. Fast moving floodwaters can wash buildings off their foundations and sweep cars downstream. High waters combined with flood debris can damage infrastructure, pipelines, and bridges. Landslide damage related to soil saturation can cause extensive damage. Water saturation of materials susceptible to loss (i.e., wood, insulation, wallboard, fabric, furnishings, floor coverings, and appliances), in many cases, renders a home unlivable.

SCHOOLS AND BUSINESSES

Flooding impacts schools and businesses when damaged property interrupts operation, forcing closure for repairs, and students and customer's access is cut off. A community maintains economic vitality in the face of flood damage with quick response to the needs of businesses affected by the flood. Response to business damages can include funding to assist owners in elevating or relocating flood-prone business structures. The same with schools; getting students back to schools then allows parents to get back to work and gets the community on to recovery. Public school districts are eligible for recovery funding through FEMA Public Assistance program.

PUBLIC INFRASTRUCTURE

Publicly owned facilities are a key component to the daily life of all residents. Damage to public water and sewer systems, transportation networks, flood control facilities, emergency facilities, and offices hinder the government in delivering services. By taking action to create public policy, government can reduce risk to public infrastructure and private property resulting from flood events.

ROADS

During a natural hazard event, or any type of emergency or disaster, dependable road connections are critical for providing emergency services. Orange County road systems often traverse floodplain and floodway areas. Federal, state, county, and city governments all have a stake in protecting roads from flood damage. Transportation agencies responsible for road

maintenance are typically aware of roads at risk from flooding. In the 1990's when severe floods hit the coastal Orange County over five times, potholes became a constant problem.

BRIDGES

Bridges are key points of concern during flood events. They are important links in road networks and river crossings and can be obstructions in watercourses, inhibiting the flow of water. A state-designated inspector must inspect all public bridges every two years, looking at everything from seismic capability to erosion and scour. Private bridges, not inspected, can be very dangerous. Five of the highest priority bridges in Orange County are currently being upgraded by replacing earthquake resistant bearing pads.

STORM WATER SYSTEMS

Local drainage problems are common throughout Orange County. There is a drainage master plan. The Orange County Public Works staff and Orange County cities are aware of local drainage threats. The problems are often present where storm water runoff enters culverts or goes underground into storm sewers. Inadequate maintenance also contributes to the flood hazard in urban areas.

WATER/WASTEWATER TREATMENT FACILITIES

There are six sanitary districts in Orange County with sewage treatment facilities located in local jurisdictions. There are 31 water service districts in the County.

WATER QUALITY

Environmental quality problems include bacteria, toxins, and pollution. In early 2002, the California Regional Water Quality Control Board, Santa Ana, and San Diego Regions issued orders under the National Pollution Discharge and Elimination System (NPDES) regarding the regulation of urban storm water. Each jurisdiction, including Orange County must comply. Procedures established assist Orange County Public Works and city staff in implementing NPDES requirements designed for reducing or eliminating the discharge of pollutants into the waters of Orange County because of construction activity. Orange County has invested heavily in efforts to implement a watershed approach to improve known water quality deficiencies. This comprehensive but lengthy planning tool addresses water quality as well as habitat restoration, recreation, and flood control.

EXISTING FLOOD MITIGATION ACTIVITIES

Flood mitigation activities include current mitigation programs and activities that are being implemented by Orange County agencies or organizations. County and city engineers work closely together to coordinate mitigation projects.

ORANGE COUNTY CODES

Orange County and Orange County cities use building codes, zoning codes, and various planning strategies to address the goals aimed at restricting development in areas of known hazards, and applying the appropriate safeguards.

ACQUISITION AND PROTECTION OF OPEN SPACE IN THE FLOODPLAIN

Current efforts to increase public open space in Orange County coupled with the need to restore and preserve natural systems providing a wildlife habitat also help to mitigate flood events. Publicly owned parks and open spaces provide a buffer linking flood hazards and private property.

RIPARIAN AREAS

Riparian areas are important transitional areas linking water and land ecosystems. Vegetation in riparian areas is dependent on stream processes and is composed of plants requiring large amounts of water, such as willows and cottonwood trees. Healthy vegetation in riparian buffers can reduce streamside erosion during flood events normally affected by the high water.

WETLANDS

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

STORM WATER SYSTEMS

Orange County, the Orange County Flood Control District, and the Cities of Orange County (collectively referred to as Permittees) received their first National Pollutant Discharge Elimination System (NPDES) Permit in 1990 from the Santa Ana Regional Water Quality Control Board. This Permit authorized the discharge of runoff to the municipally owned and operated storm drain system provided pollutants be prevented or minimized to the Maximum Extent Practicable (MEP). Each subsequent NPDES Permit renewal has increased the responsibility of Orange County Permittees to manage runoff entering the storm drain system.

To achieve compliance with NPDES requirements, Orange County Permittees drafted a Drainage Area Management Plan (DAMP) in 1993. The DAMP is updated periodically reflecting the increased requirements of the NPDES Permits. The main objectives of the DAMP are to present a plan that satisfies NPDES permit requirements and to evaluate the impacts of urban storm water discharges on receiving waters.

The DAMP is the principal policy; guidance and reporting document for Orange County Permittees, implemented within each Permittee's jurisdiction as documented within its Local Implementation Plan (LIP).

FLOOD MANAGEMENT PROJECTS

Flood management structures assist in regulating flood levels by adjusting water flows upstream of flood-prone areas. There are 32 dams in Orange County holding millions of gallons of water in reservoirs. Release of reservoir water is designed to protect the County from floods.

COMMUNITY ISSUES SUMMARY

Orange County, it's 34 cities and special districts work to mitigate flood issues as they arise. However, funding, time, and personnel are often unavailable, causing unresolved problems. Areas within the county are more susceptible to flooding issues than others are and have incurred repetitive loss. The Orange County Emergency Management Bureau has documented the problem areas in the community.

The US Army Corps of Engineers (USACE) is engaged in helping Orange County identify problem areas, partnered with property owners to mitigate flooding and associated stream bank issues. However, as the USACE moves away from in-stream stabilization projects, many

projects are not maintained. The USACE will continue to assist Orange County in appropriate mitigation projects.

SANTA ANA RIVER HAZARD MITIGATION PROJECT

The Santa Ana River Mainstem Project was designed to provide flood protection to the growing urban communities in Orange, Riverside and San Bernardino Counties. The improvements to the system covered 75 miles, from the headwater of Santa Ana River east of the city of San Bernardino to the mouth of the river at the Pacific Ocean between the cities of Newport Beach and Huntington Beach.

The project increased levels of flood protection to more than 3.35 million people within the three county areas. The project includes seven independent features: Seven Oaks Dam, Mill Creek Levee, San Timoteo Creek, Oak Street Drain, Prado Dam, Santiago Creek and Lower Santa Ana River.

Seven Oaks Dam accounts for about $534 million of the total new estimate $2.09 billion project cost. The Dam is made of 38 million cubic yards of soil, rock and clay that will form ten mostly vertical zones. These zones will help control the water while protecting the integrity of the dam. The pervious material acts as drain-channeling water out of the dam, while zones of impervious material keeps the water out. The Dam is designed to resist an earthquake measuring 8.0 on the Richter

The rapid growth and development of Southern California has decreased effectiveness of the present flood control system. Areas that would absorb rainfall runoff have been reduced as well as the water holding capacities of reservoirs. Today, the most severe flood likely to occur along the river would cover more than 110,000 acres to a depth of three feet and would amount to more than $15 billion in economic losses.

The Santa Ana River Mainstem project is designed to provide flood protection for residences and business in the Southern California communities of Orange, Riverside, and San Bernardino counties. All three counties, collectively, worked closely with the U.S. Army Corps of Engineers to design and construct the project.

The Santa Ana River Mainstem Project (SARP) was initiated in 1964, in partial response to a resolution of the U.S. House Committee on Public Works adopted May 8, 1964. A survey report was completed by the District in 1975. The report was reviewed and then submitted to Congress in September 1978.

In September 1980, the Corps of Engineers completed the Phase I General Design Memorandum (GDM) for the Santa Ana Mainstem. Construction of the SARP was authorized by Section 401(a) of the Water Resources Development Act of 1986. Construction of SARP was initiated in 1989, and completion is scheduled for 2010.

LOWER SANTA ANA RIVER SECTION

The Lower Santa Ana River project cost $367 million dollars, was started in 1991 and completed in 2006. The Federal Government paid 70%; Orange County 27%; San Bernardino County 1.71%; and Riverside County .73% of the three part project (Seven Oaks Dam, Prado

Dam and Lower Santa Ana River).

Improvements to 23 miles of existing channel from Weir Canyon Road to the Pacific Ocean include channel widening, improvement to the existing Greenville-Banning Channel located parallel to the river near the coast, relocation of Talbert Channel ocean outlet and construction of rock jetties and derrick stone jetties at the mouth of the river, and bridge modifications to accommodate the widened channel. In the Santa Ana Canyon area, construction will be limited to levee extension and a dike to protect a mobile home park.



The construction in the Santa Ana Canyon Area also include the bank protection on the south side along the SR-91 (upstream of SAVI Ranch) and on the north side upstream of Weir Canyon Road.

LOWER SANTA ANA RIVER PROJECT FEATURES

- Improve 23 mile channel from Prado Dam to the Pacific Ocean
- Restore/Enhance 92 acre (8-acre mitigation) wetlands
- Estimated Cost: $367 million
- Acquire 1,123 acres of canyon lands to ensure safe releases from Prado Dam and provide open space habitat
- Relocate 60 various utility lines and 15 oil wells/lines
- Modify 37 bridges
- Landscaping and esthetic treatment
- Sucker Fish Conservation Program
- Habitat Management Plan
- Cooperation with the SARI proponents



LOCAL COOPERATION AGREEMENT

On December 14, 1989, the U.S. Army Corps of Engineers (COE) and the County Flood Control District of Orange, Riverside and San Bernardino as Local Sponsors, entered into a four party Local Cooperation Agreement (LCA) defining the responsibilities and cost-sharing of each party for each feature.

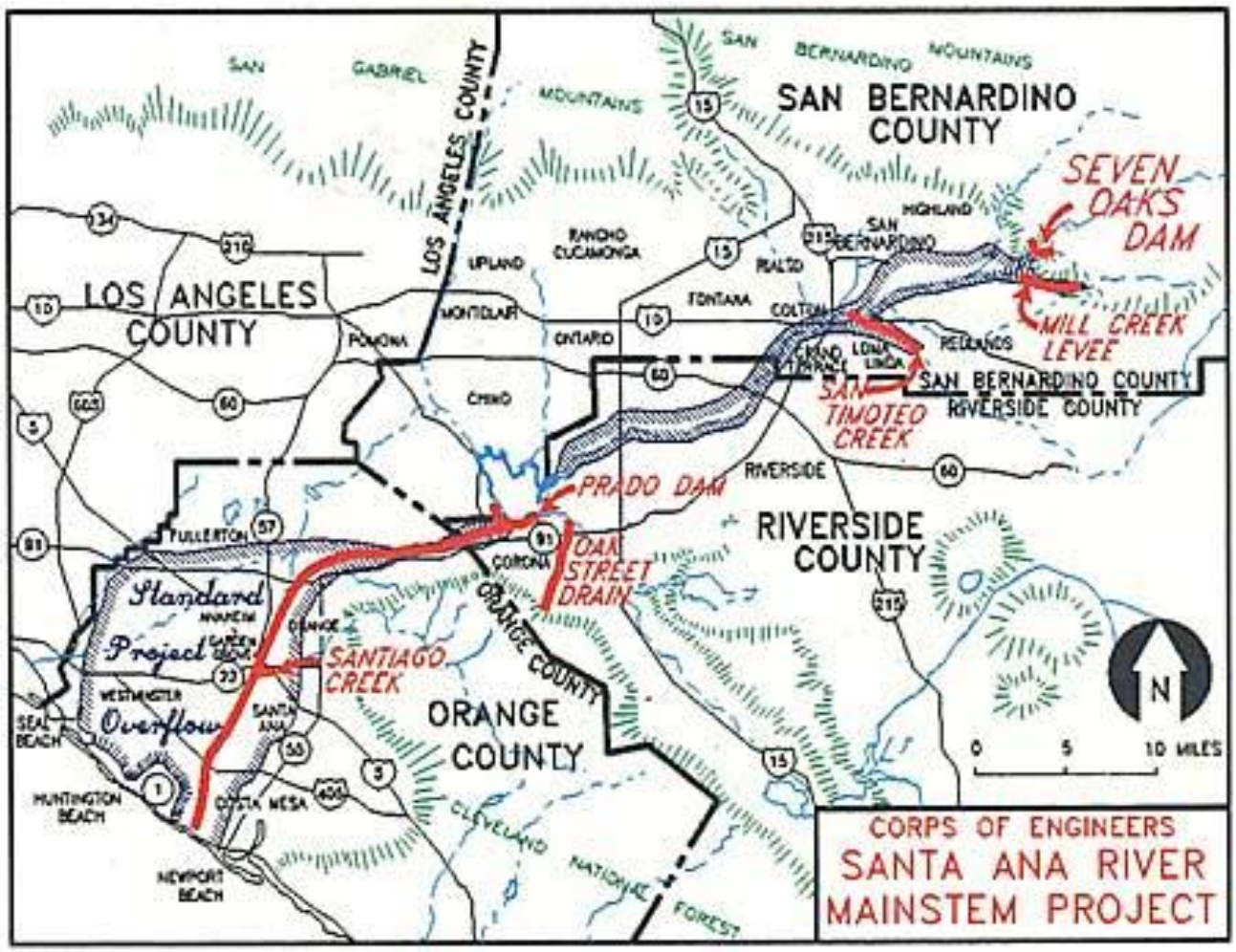
The Local Sponsors are to acquire all lands, easements, rights-of-way and perform relocations required to make way for construction of the Mainstem Project. The COE will construct the improvements. On completion, the Local Sponsors are responsible for the operation and maintenance of the Project features; except for Prado Dam where Orange County is responsible to pay for incremental operations/maintenance costs and the COE will continue to operate the Dam.

Congress authorized Santa Ana River Mainstem Project for construction in 1986 under new guidelines for cost sharing of water resources projects between Federal and local governments. The local sponsors must pay between 25% and 50% of total cost of the project with the

remaining cost provided by the Federal government.

In 2003, a new agreement was entered between the Corps of Engineers and Orange County Flood Control District where Prado Dam feature of the Santa Ana Mainstem Project was separated and Orange County was a sole local sponsor for Prado Dam.

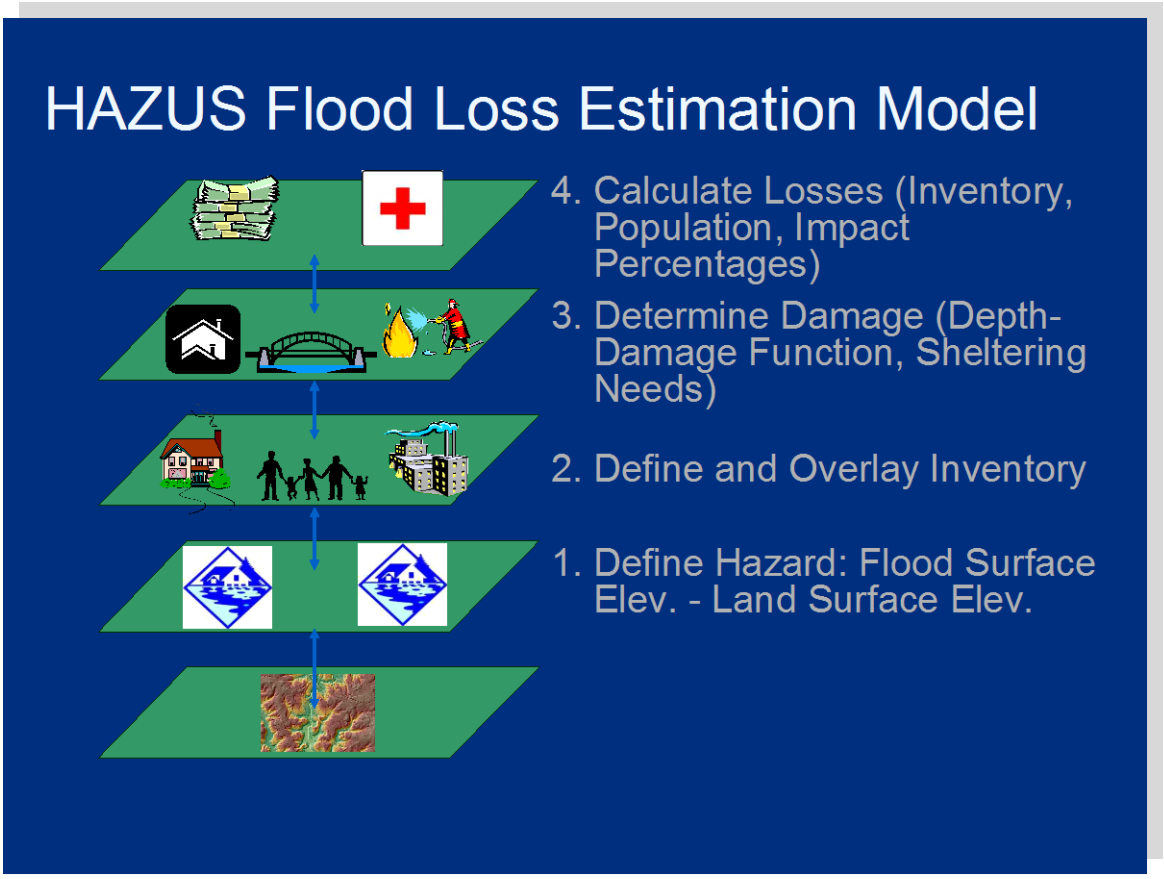
Figure 8 - Santa Ana River Mainstem Project



D. ORANGE COUNTY HAZUS FLOOD STUDY

HAZUS FLOOD LOSS ESTIMATION MODEL

Orange County completed a HAZUS Flood Loss Estimate to help define the potential flood loss in Orange County from both 100 and 500 year floods. . The flood risk assessment has been conducted using HAZUS - FEMA's GIS-based nationally applicable hazard risk assessment software.



FEMA

GENERAL BUILDING STOCK

HAZUS estimates that there are 738,000 buildings in the region which have an aggregate total replacement value of 247,000 million (2006 dollars). The tables below present the relative distribution of the value with respect to the general occupancies by Orange County Study Region and Scenario respectively.

Table 6 – Building Exposure by Occupancy Type for Study Region & Scenario

Building Exposure by Occupancy Type for the Study Region

Occupancy	Exposure ($1000)	Percent of Total
Residential	189,774,227	76.7%
Commercial	41,092,855	16.6%
Industrial	11,227,549	4.5%
Agricultural	401,767	0.2%
Religion	2,370,944	1.0%
Government	602,072	0.2%
Education	1,835,325	0.7%
Total	**247,304,739**	**100.00%**

Table 2
Building Exposure by Occupancy Type for the Scenario

Occupancy	Exposure ($1000)	Percent of Total
Residential	41,132,313	74.6%
Commercial	9,712,308	17.6%
Industrial	3,135,431	5.7%
Agricultural	95,599	0.2%
Religion	528,509	1.0%
Government	157,241	0.3%
Education	407,177	0.7%
Total	**55,168,578**	**100.00%**

ORANGE COUNTY ESSENTIAL FACILITIES RISK ASSESSMENT REPORT PREPARED FOR FEMA

The “education” buildings are 0.7% of the building stock. For the Study Region there is $1.8 billion in exposure and for the Flood Scenarios there is just over $400 million exposure.

Essential Facility Inventory (including schools):
For essential facilities, there are 157 hospitals in the region with a total bed capacity of 6,317 beds. There are 5,733 schools, 139 fire stations, 67 police stations and 38 emergency operations centers.

HAZUS estimates that about 9,719 buildings will be at least moderately damaged. This is over 28% of the total number of buildings in the scenario. There are an estimated 211 buildings that will be completely destroyed. The table below summarizes the expected damage by general building type.

Table 7 - Expected Building Damage by Occupancy and Building Type

Table 3: Expected Building Damage by Occupancy

Occupancy	1-10		11-20		21-30		31-40		41-50		Substantially	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Agriculture	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Commercial	45	39.13	52	45.22	17	14.78	0	0.00	1	0.87	0	0.00
Education	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Government	2	100.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Industrial	9	75.00	1	8.33	1	8.33	0	0.00	0	0.00	1	8.33
Religion	1	50.00	1	50.00	0	0.00	0	0.00	0	0.00	0	0.00
Residential	116	1.19	1,909	19.56	5,473	56.07	241	2.47	1,812	18.56	210	2.15
Total	**173**		**1,963**		**5,491**		**241**		**1,813**		**211**	

Table 4: Expected Building Damage by Building Type

Building Type	1-10		11-20		21-30		31-40		41-50		Substantially	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Concrete	14	37.84	18	48.65	4	10.81	0	0.00	1	2.70	0	0.00
ManufHousing	0	0.00	0	0.00	0	0.00	0	0.00	1,003	85.65	168	14.35
Masonry	11	26.83	23	56.10	5	12.20	0	0.00	2	4.88	0	0.00
Steel	10	37.04	12	44.44	4	14.81	0	0.00	1	3.70	0	0.00
Wood	116	1.36	1,861	21.84	5,464	64.12	239	2.80	800	9.39	42	0.49

Table 5: Expected Damage to Essential Facilities

Classification	Total	# Facilities		
		At Least Moderate	At Least Substantial	Loss of Use
Fire Stations	139	5	0	4
Hospitals	157	1	0	0
Police Stations	67	4	0	2
Schools	5,733	148	0	69

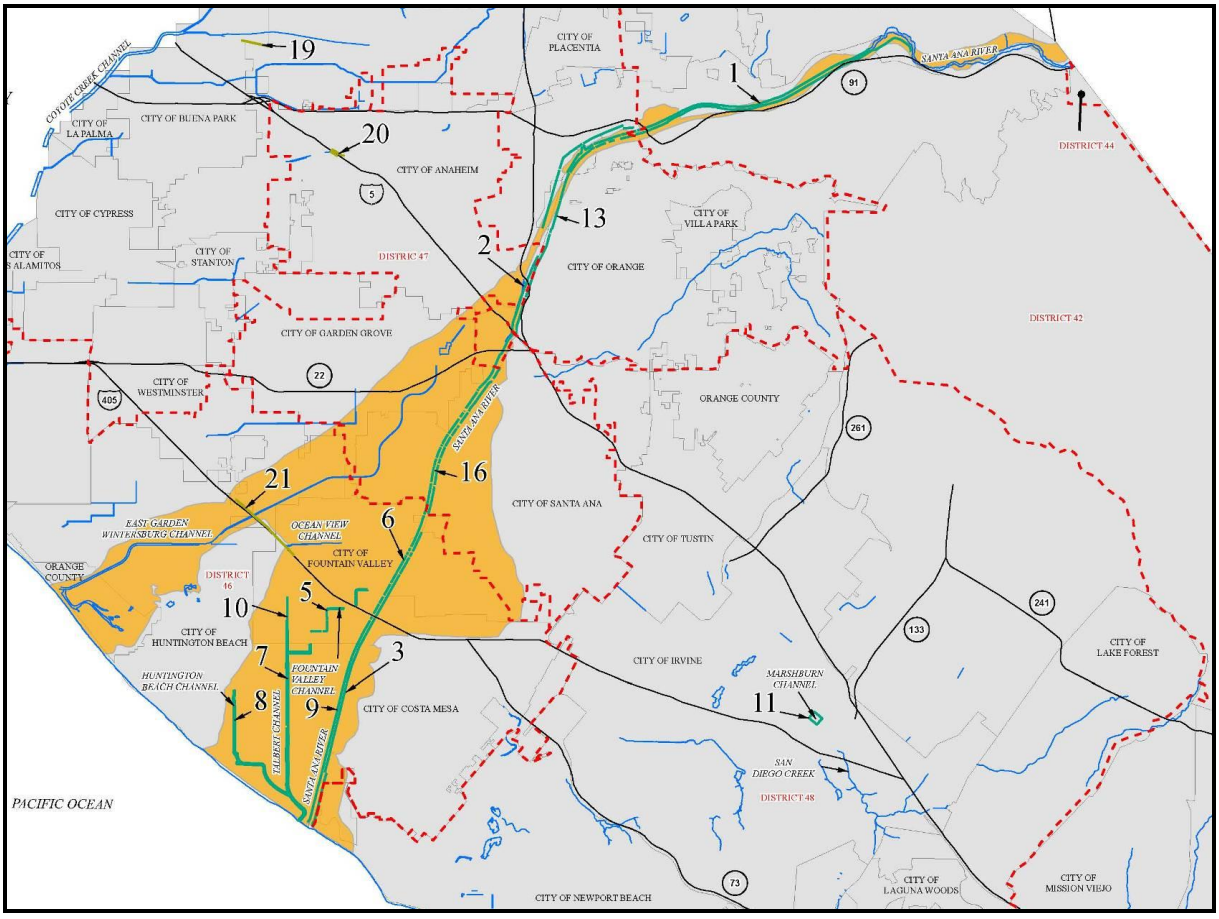
If this report displays all zeros or is blank, two possibilities can explain this.

(1) None of your facilities were flooded. This can be checked by mapping the inventory data on the depth grid.

(2) The analysis was not run. This can be tested by checking the run box on the Analysis Menu and seeing if a message box asks you to replace the existing results.

Out of the 5,733 school buildings in Orange County, 148 are expected to have at least moderate damage. None are expected to have substantial damage.

Figure 9 - Orange County Levee System Protected Areas



COUNTY OF ORANGE AND OCFA HAZARD MITIGATION PLAN

HAZUS estimates the number of households that are expected to be displaced from their homes due to the flood and the associated potential evacuation. HAZUS also estimates those displaced people that will require accommodations in temporary public shelters. The model estimates 52,692 households will be displaced due to the flood. Displacement includes households evacuated from within or very near to the inundated area. Of these 144,893 people will seek temporary shelter in public shelters.

This is a double hit to schools since their sites are utilized as public shelters. School Districts have to deal with both the repairs of their sites as well as the up to 144,893 people living in the schools because they have no other place to go. Typically 10% of the population relies on public shelters. Others go to family, friends and hotels or out of the area. That means that schools should plan for 14,400 individuals. With an average high school gymnasium holding around 400 people, RSCCD may be needed to shelter these victims.

Orange County Hazard Mitigation Committee conducted a study with three different scenarios. The following scenarios will help the reader understand the flood impact on Orange County.

SCENARIO #1 - 100-YEAR FLOOD (LEVEES INTACT)

Table 8 - Summary of Impacts due to 100-Year Flood (Levees Intact)

Impact Category	HAZUS®MH-Estimated Impact
Economic Loss due to Building Damage Total Building-related Direct Economic Loss	$1.1 B $2.3 B
# Buildings in Complete Damage State	211
Debris Generated (million tons)	0.24
Displaced Households People Needing Short-term Shelter	52,692 Households 144,893 People
# Highway Bridges w/ at least Moderate Damage (potentially closed)	0

COUNTY OF ORANGE AND OCFA HAZARD MITIGATION PLAN

In a 1% annual chance flood event (100-year flood) in the county, direct economic losses due to building damage are estimated to reach $1.1 billion and total building direct economic losses are expected to reach $2.3 billion. The geographic distribution of total direct economic loss is mapped below. Note that while the total direct economic losses for this flood scenario are roughly 3.6 to 6 times lower that the earthquake scenarios examined, the recurrence period for this flood hazard is 10 to 25 more frequent.

Of the approximately 738,000 buildings modeled within the general building stock for Orange County, much less than 1% (211) are expected to suffer “Complete” damage in the 1% annual chance flood event (100-year flood) scenario. These building would be considered “red-tagged” or unsafe for continued occupancy. Almost three-fourths of the 211 buildings are manufactured housing (i.e., mobile homes). Approximately 7,700 buildings (1%) are expected to suffer more than 20% damage or more, while about 2,100 buildings are estimated to suffer flood damage of less than 20%. As much as 0.24 million tons of debris may result from these damaged buildings and 25% is expected to be heavy debris (concrete and steel), requiring heavy equipment to break down and remove, while 75% is expected to be light debris (wood, brick, drywall and other debris).

Damage to single family and multi-family dwellings is expected to result in the displacement of almost 53,000 households. While many of the displaced may find shelter with friends and family, or in available hotels, as many as 145,000 people are expected to seek short-term public shelter. This large number of people could tax the emergency sheltering capacity of the county. Displaced populace should be able to move to safe locations without too much difficulty. While 4 bridges in the county’s transportation system are expected to suffer minor flood damage, the bridges are expected to remain operational.

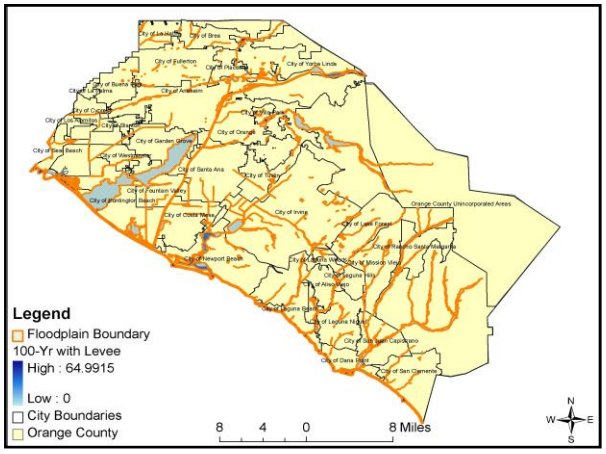


Figure 10 – 100-Year Flood Event Floodplain and Depth Grid

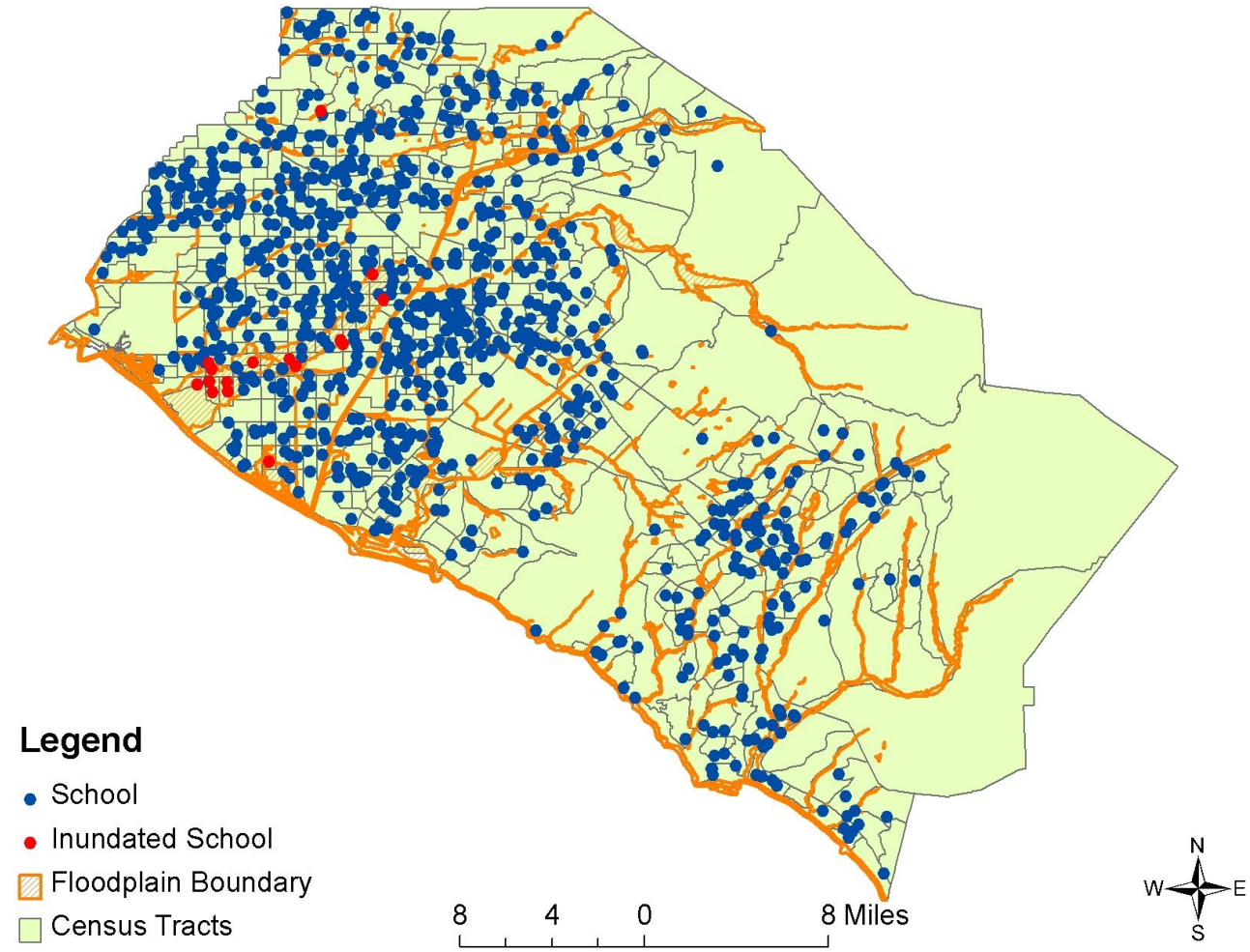
Table 9 - Impacts OC School Districts 100-Year Flood (Levees Intact)

Category	District Name	Number of Facilities/ Sites*	No. of Buildings	Replacement Cost ($1,000)	# Buildings w/ replacement cost data	# Non-Functional Buildings	Restoration Time (Days)	Mean Damage	Economic Loss ($1,000)
K-12 (default data)		560	569	$335,710	569	0	480	5.0%	$207
K-12 (providing data)	Brea Olinda USD	11	118	$83,802	117	0	0	0.0%	$0
	Capistrano USD	60	1,035	$387,399	1,029	0	0	0.0%	$0
	Fullerton Joint UHSD	12	156	$219,752	156	0	480	7.0%	$2,222
	Fullerton SD	22	267	$121,646	267	0	0	0.0%	$0
	Huntington Bch SD	15	176	$115,876	176	11	360-480	5.0%	$407
	Huntington Bch UHSD	9	163	$237,697	163	0	0	0.0%	$0
	Laguna Beach USD	7	54	$60,212	54	0	0	0.0%	$0
	Newport-Mesa USD	36	518	$402,503	518	0	0	0.0%	$0
	Ocean View SD	24	238	$149,274	238	58	360-480	5.0%	$2,973
	Orange Co DOE	33	180	$54,255	75	0	0	0.0%	$0
	Plac-Yorba Linda USD	30	641	$292,554	641	0	0	0.0%	$0
	Santa Ana USD	57	1,046	$623,817	1,046	0	0	0.0%	$0
	Tustin USD	30	360	$234,841	360	0	0	0.0%	$0
CCD (providing data)	North Orange Co CCD	7	90	$304,134	90	0	0	0.0%	$0
	Rancho Santiago CCD	15	122	$157,542	117	0	0	0.0%	$0
TOTALS		**928**	**5,733**	**$3,781,014**	**5,616**	**69**	**360-480**	**5.5%**	**$5,809**

COUNTY OF ORANGE AND OCFA HAZARD MITIGATION PLAN

Note: the RSCCD data displayed on this table was from a previous Insurance Report

Figure 11 - OC School Districts Functionality – 100-Year Flood (Levees Intact)



COUNTY OF ORANGE AND OCFA HAZARD MITIGATION PLAN

SCENARIO 2 – 100-YEAR (WITHOUT LEVEES)

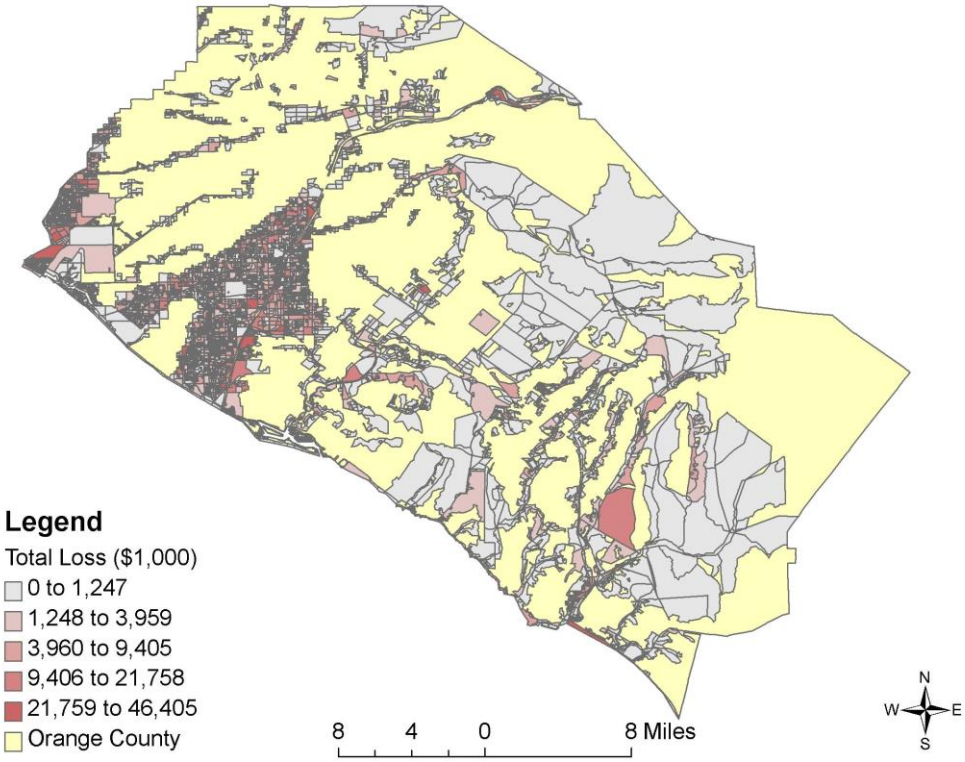
Table 10 - Summary Impacts for OC due to a 100-Year Flood

Impact Category	HAZUS®MH-Estimated Impact
Economic Loss due to Building Damage Total Building-related Direct Economic Loss	$3.3 B $6.9 B
# Buildings in Complete Damage State	1,394
Debris Generated (million tons)	0.76
Displaced Households People Needing Short-term Shelter	160,653 Households 463,751 People
# Highway Bridges w/ at least Moderate Damage (potentially closed)	0

ORANGE COUNTY ESSENTIAL FACILITIES RISK ASSESSMENT REPORT PREPARED FOR FEMA

In a 100-year flood in the county, direct economic losses due to flood building damage are estimated to reach $3.3 billion and total building direct economic losses are expected to reach $6.9 billion. The geographic distribution of total direct economic loss is mapped in Figure 12. In this more severe flooding scenario, total direct economic flood losses are much on par with the earthquake scenario losses estimated (roughly 30% to 80% lower).

Figure 12 - Total Direct Economic Loss – 100-Year Flood



ORANGE COUNTY ESSENTIAL FACILITIES RISK ASSESSMENT REPORT PREPARED FOR FEMA

Of the approximately 738,000 buildings modeled within the general building stock for Orange County, about 0.2% (1394) are expected to suffer "Complete" damage in the 100-Year without levee flood scenario. These building would be considered "red-tagged" or unsafe for continued occupancy. Almost three-fourths of the 1,394 buildings are manufactured housing (i.e., mobile homes). Approximately 27,000 buildings (3.6%) are expected to suffer more than 20% damage or more while about 8,100 buildings are estimated to suffer flood damage of less than 20%. As much as 0.76 million tons of debris may result from these damaged buildings – 21% is expected to be heavy debris (concrete and steel), requiring heavy equipment to break down and remove, while 79% is expected to be light debris (wood, brick, drywall and other debris).

Damage to single family and multi-family dwellings is expected to result in the displacement of almost 161,000 households. While many of the displaced may find shelter with friends and family, or in available hotels, as many as 464,000 people are expected to seek short-term public shelter. This large number of people would likely overwhelm the emergency sheltering capacity of the county. Displaced populace should be able to move to safe locations without too much difficulty. While 6 bridges in the county's transportation system are expected to suffer minor flood damage, the bridges are expected to remain functional.

Table 11 - Essential Facility Loss Estimates – 100-Year Flood

Essential Facility	Category	No. of Facilities /Sites	No. of Bldgs	No. of Beds	Replace-ment Cost ($1,000)	# Builds w/ Replace-ment Cost Data	# Non-Function-al Bldgs	Time to Restore Days	Economic Loss ($1,000)
	Small	2	3	78	$0	0	0	0	$0
	Medium	10	33	1,018	$50,000	7	6	540	$0
Hospital	Large	20	121	5,221	$677,998	12	10	360-900	$0
	K-12 (default data)	560	569		$335,710	569	0	480-630	$832
	K-12 (providing data)	346	4,952		$2,983,628	4,840	155	360-720	$29,370
Schools	CCD providing data	22	212		$461,676	207	0	480	$3,432
EOCs		38	38		$368,079	38	5	0-630	$4,015
Police Stations		67	67		$770,105	67	8	0-630	$5,194
Fire Stations		139	139		$316,580	135	8	360-900	$2,044
TOTALS		**1,204**	**6,134**	**6,317**	**$5,963,776**	**5,875**	**192**	**0-900**	**$44,887**

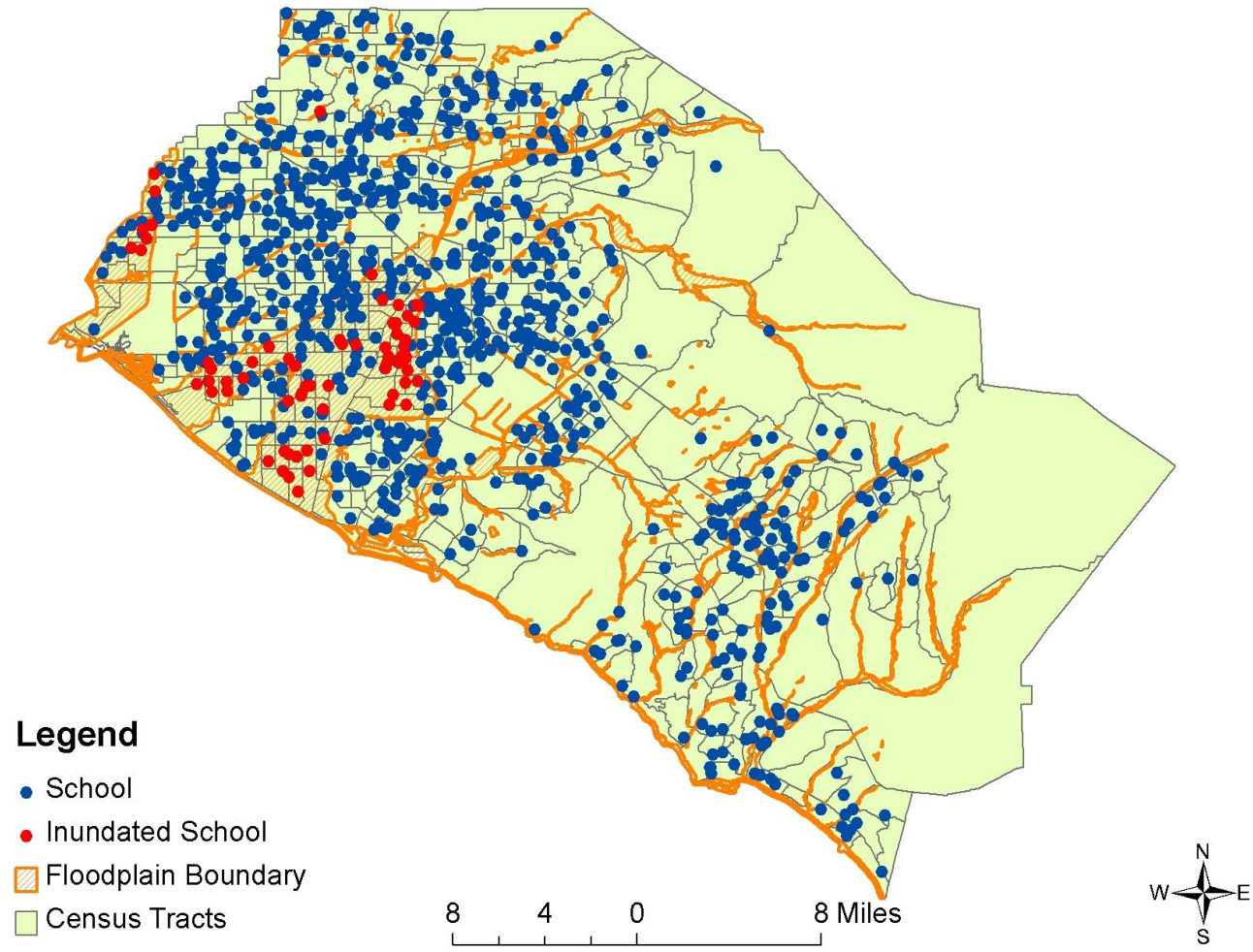
ORANGE COUNTY ESSENTIAL FACILITIES RISK ASSESSMENT REPORT PREPARED FOR FEMA

Table 12 - Impacts on OC Schools Districts – 100-Year Flood

Category	District Name	Number of Facilities/ Sites*	No. of Buildings	Replacement Cost ($1,000)	# Buildings w/ replacement cost data	# Non-Functional Buildings	Restoration Time (Days)	Mean Damage	Economic Loss ($1,000)
K-12 (default data)		560	569	$335,710	569	0	480-630	5.4%	$832
K-12 (providing data)	Brea Olinda USD	11	118	$83,802	117	0	0	0.0%	$0
	Capistrano USD	60	1,035	$387,399	1,029	0	0	0.0%	$0
	Fullerton Joint UHSD	12	156	$219,752	156	0	480	7.0%	$2,222
	Fullerton SD	22	267	$121,646	267	0	0	0.0%	$0
	Huntington Bch SD	15	176	$115,876	176	64	360-480	5.5%	$3,076
	Huntington Bch UHSD	9	163	$237,697	163	18	360-720	10.4%	$10,947
	Laguna Beach USD	7	54	$60,212	54	0	0	0.0%	$0
	Newport-Mesa USD	36	518	$402,503	518	0	0	0.0%	$0
	Ocean View SD	24	238	$149,274	238	69	360-480	5.3%	$3,238
	Orange Co DOE	33	180	$54,255	75	4	360	0.0%	$0
	Plac-Yorba Linda USD	30	641	$292,554	641	0	0	0.0%	$0
	Santa Ana USD	57	1,046	$623,817	1,046	0	480	5.3%	$9,887
	Tustin USD	30	360	$234,841	360	0	0	0.0%	$0
CCD (providing data)	North Orange Co CCD	7	90	$304,134	90	0	0	0.0%	$0
	Rancho Santiago CCD	15	122	$157,542	117	0	480	6.3%	$3,432
TOTALS		**928**	**5,733**	**$3,781,014**	**5,616**	**155**	**360-720**	**6.5%**	**$33,634**

ORANGE COUNTY ESSENTIAL FACILITIES RISK ASSESSMENT REPORT PREPARED FOR FEMA

Figure 13 - OC School Districts Functionality following – 100-Year Flood



ORANGE COUNTY ESSENTIAL FACILITIES RISK ASSESSMENT REPORT PREPARED FOR FEMA

SCENARIO #3 – 500-YEAR FLOOD (WITHOUT LEVEES)

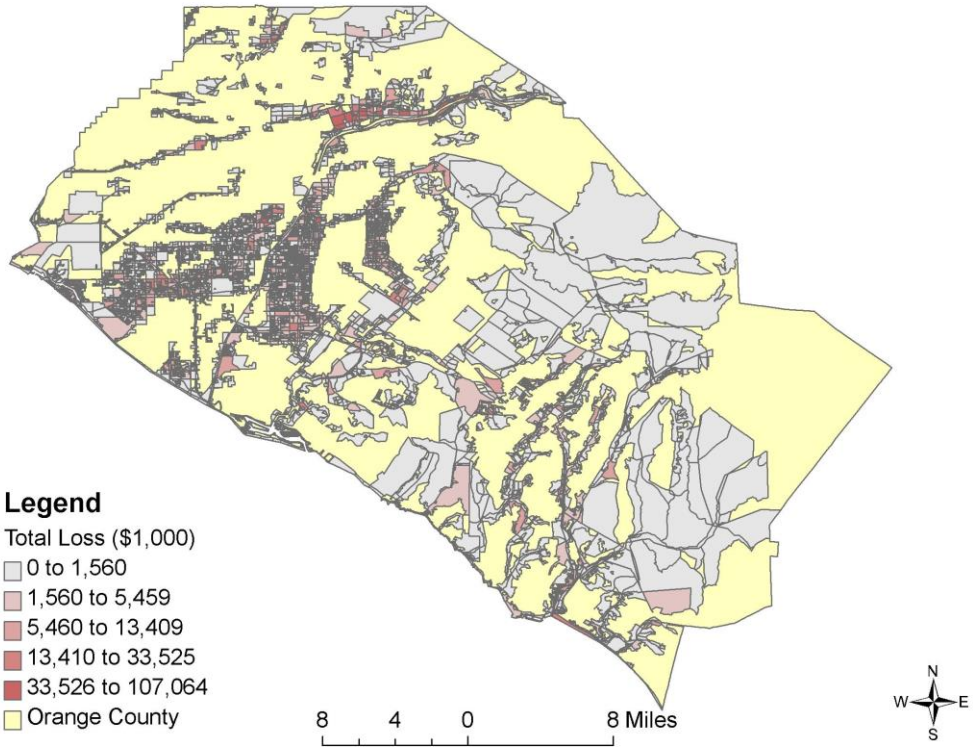
Table 13 - Summary Impacts for 500-Year Flood (Levees Intact)

Impact Category	HAZUS®MH-Estimated Impact
Economic Loss due to Building Damage Total Building-related Direct Economic Loss	$3.7 B $8.8 B
# Buildings in Complete Damage State	2,048
Debris Generated (million tons)	0.85
Displaced Households People Needing Short-term Shelter	159,474 Households 458,535 People
# Highway Bridges w/ at least Moderate Damage (potentially closed)	0

ORANGE COUNTY ESSENTIAL FACILITIES RISK ASSESSMENT REPORT PREPARED FOR FEMA

In a 0.2% annual chance flood event or 500-Year Flood in the county, direct economic losses due to flood building damage are estimated to reach $3.7 billion and total building direct economic losses are expected to reach $8.8 billion. The geographic distribution of total direct economic loss is mapped in Figure 13. Note that while the total direct economic losses for this flood scenario are roughly equivalent to the M6.9 Newport-Inglewood Fault Scenario modeled. However, this earthquake has an estimated return interval of 1000 years, twice as long as the return period of this flood.

Figure 14 - Total Direct Economic Loss 500-Year Flood



ORANGE COUNTY ESSENTIAL FACILITIES RISK ASSESSMENT REPORT PREPARED FOR FEMA

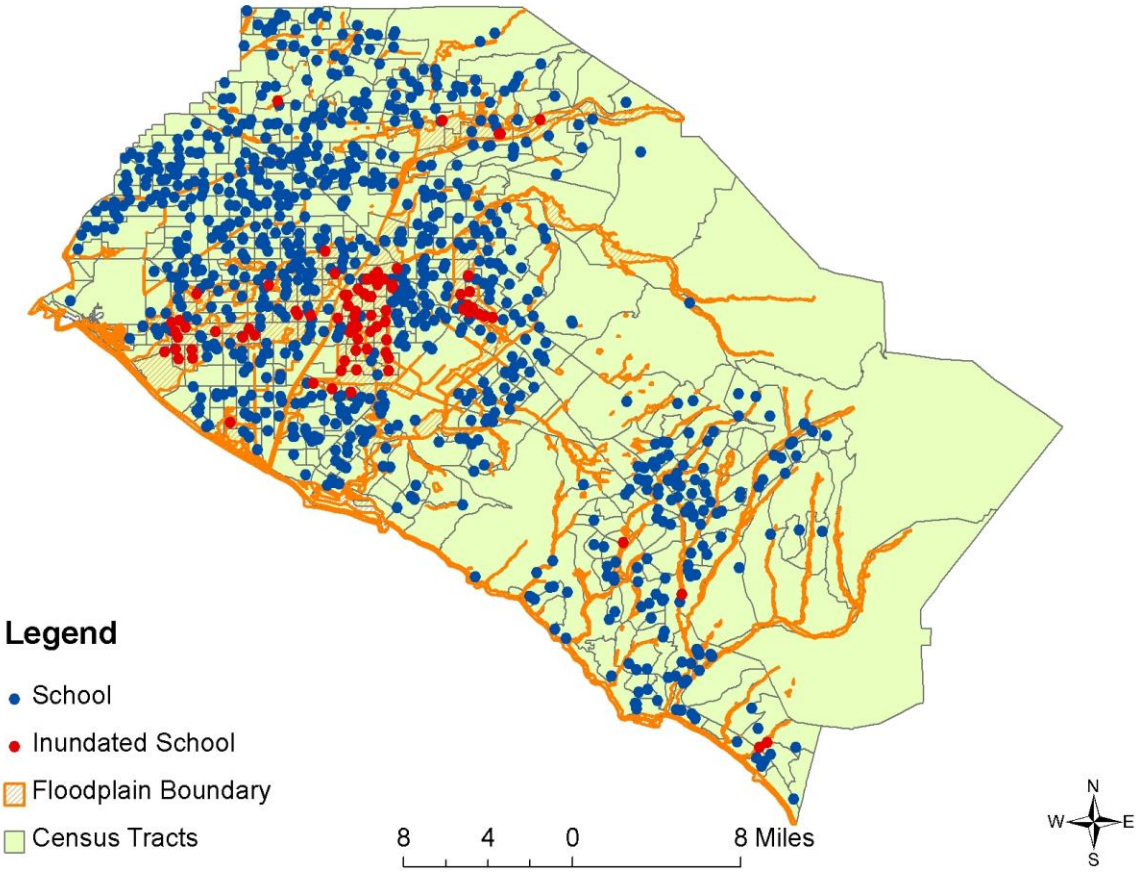
Table 14 - Impacts on OC School Districts - 500-Year Flood (Levees Intact)

Category	District Name	Number of Facilities/ Sites*	No. of Buildings	Replacement Cost ($1,000)	# Buildings w/ replacement cost data	# Non-Functional Buildings	Restoration Time (Days)	Mean Damage	Economic Loss ($1,000)
K-12 (default data)		560	569	$335,710	569	4	480-720	4.7%	$994
K-12 (providing data)	Brea Olinda USD	11	118	$83,802	117	0	0	0.0%	$0
	Capistrano USD	60	1,035	$387,399	1,029	14	360-720	5.2%	$5,065
	Fullerton Joint UHSD	12	156	$219,752	156	0	480	7.0%	$2,222
	Fullerton SD	22	267	$121,646	267	0	0	0.0%	$0
	Huntington Bch SD	15	176	$115,876	176	0	480	4.3%	$778
	Huntington Bch UHSD	9	163	$237,697	163	13	360-630	4.3%	$5,689
	Laguna Beach USD	7	54	$60,212	54	0	0	0.0%	$0
	Newport-Mesa USD	36	518	$402,503	518	25	360-480	5.0%	$625
	Ocean View SD	24	238	$149,274	238	84	360-630	4.3%	$3,247
	Orange Co DOE	33	180	$54,255	75	0	0	0.0%	$0
	Placentia-Yorba Linda USD	30	641	$292,554	641	8	360-720	4.7%	$1,424
	Santa Ana USD	57	1,046	$623,817	1,046	0	480	5.0%	$16,407
	Tustin USD	30	360	$234,841	360	59	360-480	5.0%	$2,750
CCD (providing data)	North Orange Co CCD	7	90	$304,134	90	0	0	0.0%	$0
	Rancho Santiago CCD*	15	122	$157,542	117	0	480	5.0%	$3,060
TOTALS		**928**	**5,733**	**$3,781,014**	**5,616**	**207**	**360-720**	**5.0%**	**$42,261**

ORANGE COUNTY ESSENTIAL FACILITIES RISK ASSESSMENT REPORT PREPARED FOR FEMA

*Based on past insurance data

Figure 15 - School Districts Functionality following – 500-Year (Levees Intact)



ORANGE COUNTY ESSENTIAL FACILITIES RISK ASSESSMENT REPORT PREPARED FOR FEMA

Table 15 - Summary of Impacts on Orange County for Three Flood Scenarios

Impact Category	*100-Year*	*100-Year w/o Levee*	*500-Year*
Economic Loss due to Building Damage	$1.1 B	$3.3 B	$3.7 B
Total Building-related Direct Economic Loss	$2.3 B	$6.9 B	$8.8 B
# Buildings in Complete Damage State	211	1,394	2,048
Debris Generated (million tons)	0.24	0.76	0.85
Displaced Households People Needing Short-term Shelter	52,692 Households 144,893 People	160,653 Households 463,751 People	159,474 Households 458,535 People
# Highway Bridges w/ at least Moderate Damage (potentially closed)	0	0	0

ORANGE COUNTY ESSENTIAL FACILITIES RISK ASSESSMENT REPORT PREPARED FOR FEMA

E. THE RSCCD FLOOD PREVIOUS OCCURRENCES AND THREAT STUDY

The only known flood financial damage to a RSCCD property is the following incident:

Table 16: RSCCD Flood History

Date	Location	Type of Damage	Details (from insurance records)	Costs
11/25/2008	Santiago Canyon College	Rain, flooding and mud	Rain caused flooding and mud at SCC buildings	$51,777

Numerous storms and flood incidents have hit Orange County in 1939, 1964, 1983 and four in the 1990's. However, the only records of flood damage to the RSCCD is the 11/25/2008 incident where rain caused flooding and mud at Santiago Canyon College buildings. An insurance claim was filed and the mud was cleaned up. No other notable incidents have been found in the RSCCD records.

To support the development of a Hazard Mitigation Plan (HMP) for the Rancho Santiago Community College District (RSCCD), MMI Engineering (MMI) conducted a flood risk assessment on District facilities.

Orange County Hazard Mitigation Committee conducted a study with three different scenarios. MMI Engineering conducted a HAZUS study using two scenarios. The data used for the Orange County FEMA study referenced in the County Hazard Mitigation Plan was more detailed than the MMI Engineering default analysis. In that analysis, the DFIRM data was reformatted for use in Hazus. Bearing in mind that the two analyses do not use the exact same input data, and that the MMI Engineering study uses a default Hazus analysis, the closest analog of MMI Engineering study is the Orange County 100 year flood scenario is their Scenario #2, without levees. The losses would change if the levees were intact.

Building data provided by the District that had been categorized and geocoded (i.e., latitude and longitude have been determined) for use in the hazard identification and earthquake risk assessment processes have been re-evaluated for use in the flood risk assessment. The flood risk assessment has been conducted using HAZUS - FEMA's GIS-based nationally applicable earthquake, flood and hurricane risk assessment software. This section describes the facility data used in the flood assessment, discusses the flood hazards as modeled in the risk assessment, and summarizes the flood risk assessment results from the MMI Engineering study.

Table 17: Summary of RSCCD Building Data Considered in the Study

Site	No. of Buildings	Peak Daytime Occupancy (No. of People)	Building Area (Square Feet)	2015 Building Replacement Value ($1,000)	2015 Content Replacement Value ($1,000)
Centennial Education Center (CEC)	15	1,809	49,263	8,008	1,352
Digital Media Center (DMC)	1	283	28,184	6,877	3,049
District Office (DO)	1	399	61,002	14,744	1,895
Orange County Sheriff's Regional Training (OCSRT)	2	305	52,455	13,547	2,121
Orange Education Center (OEC)	1	1,600	84,404	17,609	0
Santa Ana College (SAC)	76	14,925	599,107	136,298	30,010
Santiago Canyon College (SCC)	50	9,513	406,026	103,223	25,323
TOTAL	146	28,834	1,280,441	300,306	63,750

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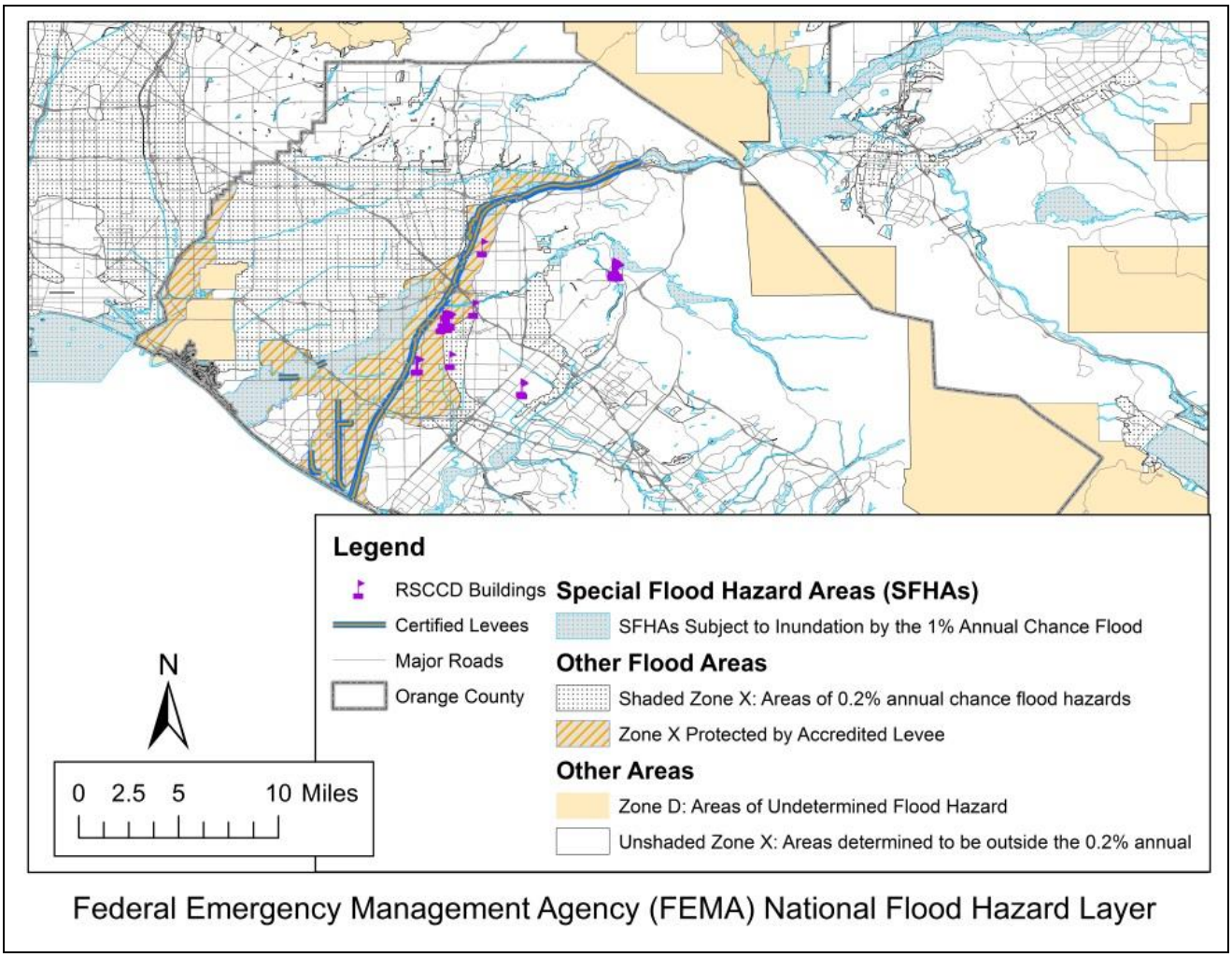
These building data were used in the hazard identification process, and to execute both the Hazus earthquake and flood risk assessments. The 146 buildings represent more than $300 million in building replacement value, more than $63 million in building contents value, and house more than 28,800 people during peak daytime occupancy.

Flood Hazard Identification

Flood hazard zones are delineated by the Federal Emergency Management Agency (FEMA) and distributed as the National Flood Hazard Layer (NFHL). The NFHL is a digital database that contains flood hazard mapping data from FEMA's National Flood Insurance Program (NFIP). The map data are derived from Flood Insurance Rate Map (FIRM) databases and Letters of Map Revision (LOMRs). The NFHL is GIS data for community officials and community members looking to view effective regulatory flood hazard information. Flood hazard zones for Orange County are shown in Figure 13, and for RSCCD facilities in Figure 14. Table 19 provides a summary of facility exposure, by site, to the regulatory flood hazards as mapped by FEMA.

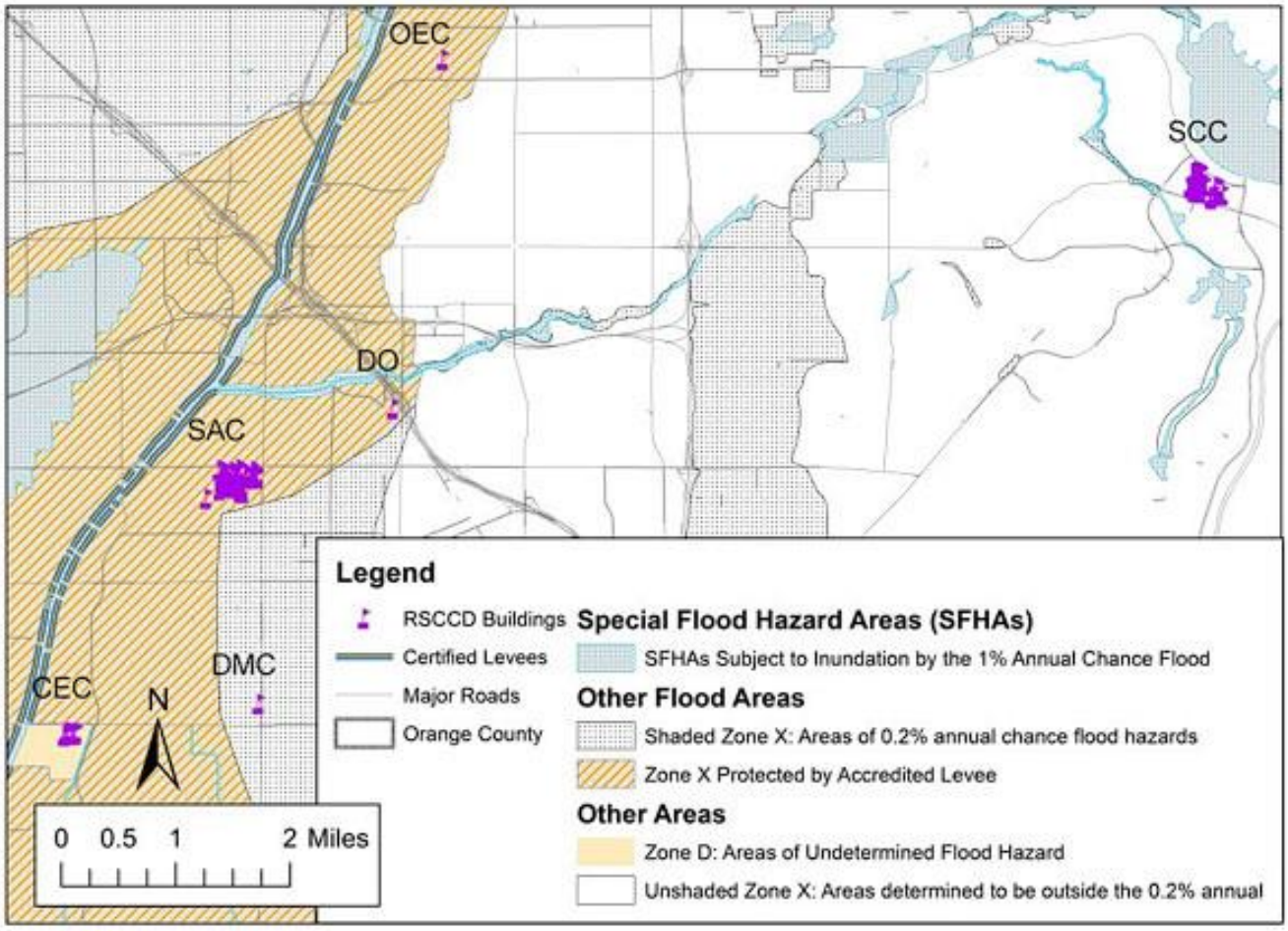
Areas subject to inundation in the 100-Year Flood are identified on the FEMA maps as "special flood hazard areas". The 100-Year Flood has a 1% chance (one out of 100) of occurring in any given year. Similarly, there is a 0.2% annual chance (one out of 500) of the 500-Year Flood occurring in any given year. As shown in the figures and Tables 17 and 18, one RSCCD site, (the Digital Media Center) is located within the mapped 500-Year) flood zone. Three sites (the District Office, Orange Education Center and Santa Ana College) are located in an area expected to be inundated in the 500-Year flood, but are protected from the 100-Year Flood by levees. One additional site (the Centennial Education Center) is located within a mapped area of undetermined flood hazard.

Figure 16: FEMA Flood Hazard Zones for Orange County



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Figure 17: FEMA Flood Hazard Zones for RSCCD Facilities



Federal Emergency Management Agency (FEMA) National Flood Hazard Layer

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Table 18: Summary of RSCCD Building Exposure to Mapped Flood Hazards

Flood Hazard	Site	Centennial Education Center	Digital Media Center	District Office	Orange County Sheriff's Regional Training	Orange Educ. Center	Santa Ana College	Santiago Canyon College	Total
	Total Number of Buildings	15	1	1	2	1	76	50	146
Special Flood Hazard Areas Subject to Inundation by the 1% Annual Chance (100-year) Flood	Zone A - no base flood elevations determined	0	0	0	0	0	0	0	0
	Zone AE - base flood elevations determined	0	0	0	0	0	0	0	0
	Zone AH - Flood depths of 1 - 3 feet (usually areas of ponding); base flood elevations determined	0	0	0	0	0	0	0	0
	Zone AO - Flood depths of 1 - 3 feet (usually sheet flow on sloping terrain); average depths determined.	0	0	0	0	0	0	0	0
Other flood areas	Zone X (Shaded) - areas of 0.2% annual chance (500 yr.) flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile.	0	1	0	0	0	0	0	1
	Zone X Protected by Levee - areas protected by levees from the 1% annual chance flood	0	0	1	0	1	76	0	78
Other Areas	Zone D - areas in which flood hazards are undetermined, but possible	15	0	0	0	0	0	0	15
	Zone X (Unshaded) - areas determined to be outside the 0.2% annual chance (500-year) floodplain	0	0	0	2	0	0	50	52

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Table 19: RSCCD Site Impact Results

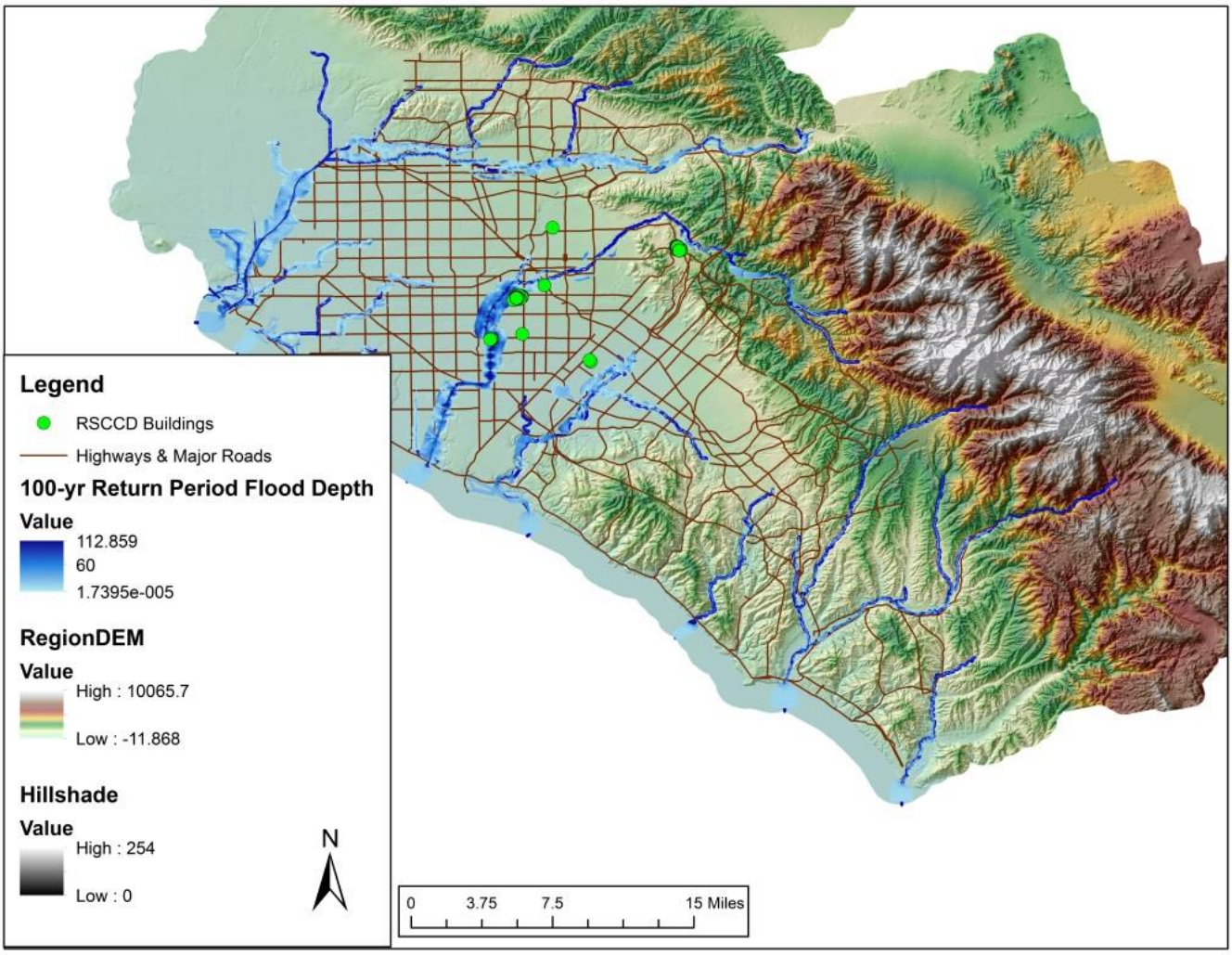
Site	Address	Impact
Digital Media Center	1300 South Bristol SA	500-Year Flood Zone
District Office	2323 N. Broadway SA	500-Year Inundation Area/Protected from the 100-Year Flood by Levees
Orange Education Center	1465 N. Batavia Orange	500-Year Inundation Area/Protected from the 100-Year Flood by Levees
Santa Ana College	1530 W. 17th St. SA	500-Year Inundation Area/Protected from the 100-Year Flood by Levees
Centennial Education Center	2900 W. Edinger SA	Located within a mapped area of undetermined flood hazard

Flood hazards, as determined by Hazus, are developed independently of the FIRM data mapped in the NFHL. Hazus was not intended for regulatory use, but to produce loss and damage estimates for use in planning and preparedness. Further, Hazus does not include data on the location of existing levees and their accreditation. If levees are not captured in the publicly-available Digital Elevation Model (DEM) data used by Hazus to develop flood depth data, the levees will not be explicitly considered in the Hazus flood depth analysis. This is of particular interest for the current study, as the District Office, the Orange Education Center, and Santa Ana College are all located within an area assumed to be protected from the 100-Year flood by levees ("Zone X Protected by Levee - areas protected by levees from the 100-Year Flood see Figure 14). Accordingly, any losses estimated for these facilities by Hazus under the

100-Year flood would be considered worst case (i.e., levee failure) losses.

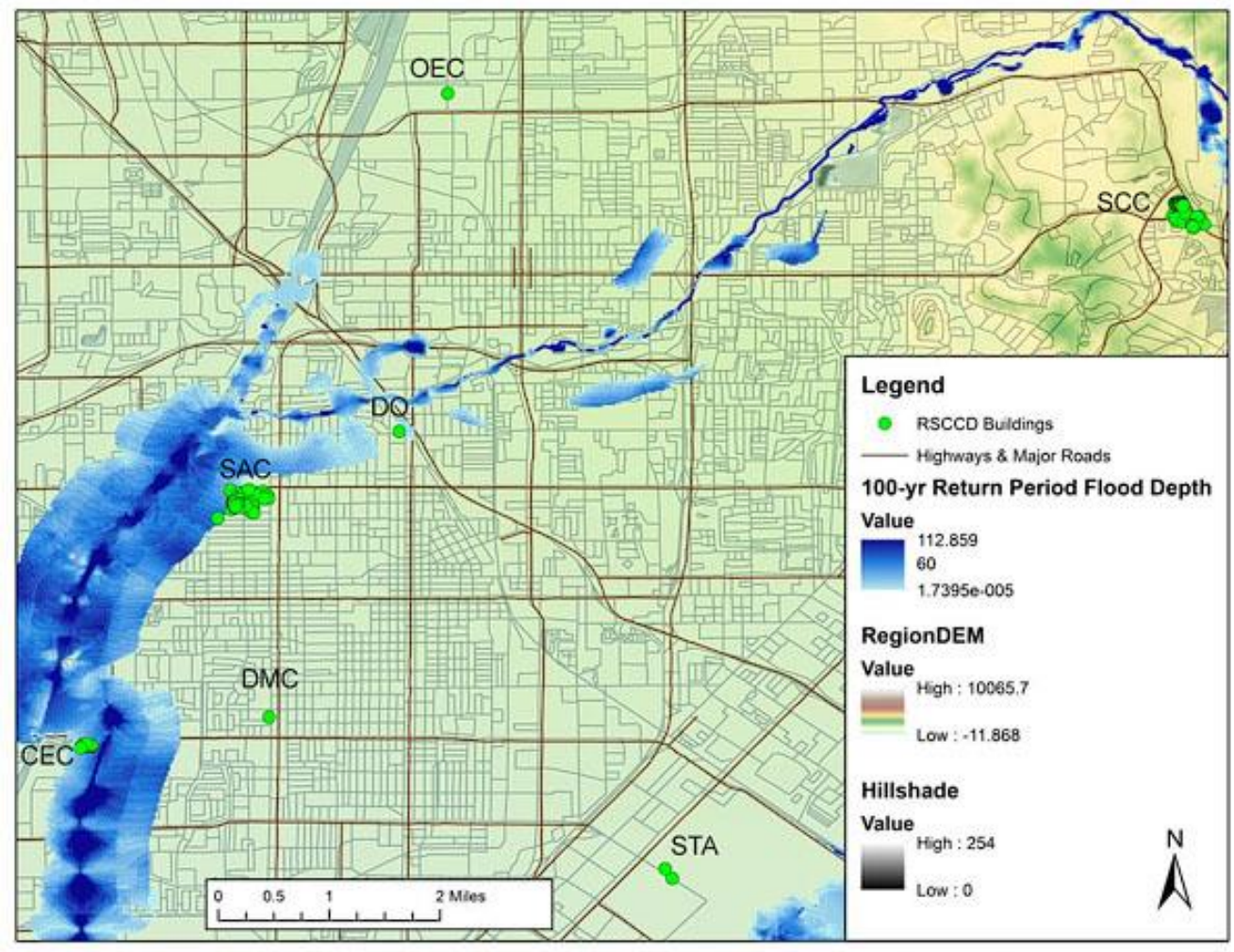
Hazus' built-in (default) flood modeling capabilities have been utilized to develop maps of potential flood depths for the one percent annual chance (100-Year) flood, shown in Figures 15 and 16 for Orange County and in the vicinity of RSCCD facilities, respectively, and the 0.2 percent annual chance (500-Year) flood, shown in Figures 17 and 18. The most significant differences between the 100 and 500-Year flood depth maps occur along the San Gabriel River and its tributaries in northwestern Orange County. The differences are less noticeable for the Santa Ana River, to which the RSCCD facilities are closer. In some locations, Hazus predicts that the 500-Year flood would have a wider footprint than the 100-Year flood, but shallower predicted flooding. It should be noted that while this default Hazus analysis was conducted using best-available data, damage patterns in an actual flood event will be different. Lack of damage in the two modeled events should not be taken to mean that a facility will not experience some flood damage during its useful lifetime.

Figure 18: HAZUS Estimated Flood Depths for the Orange County 100-Year Flood



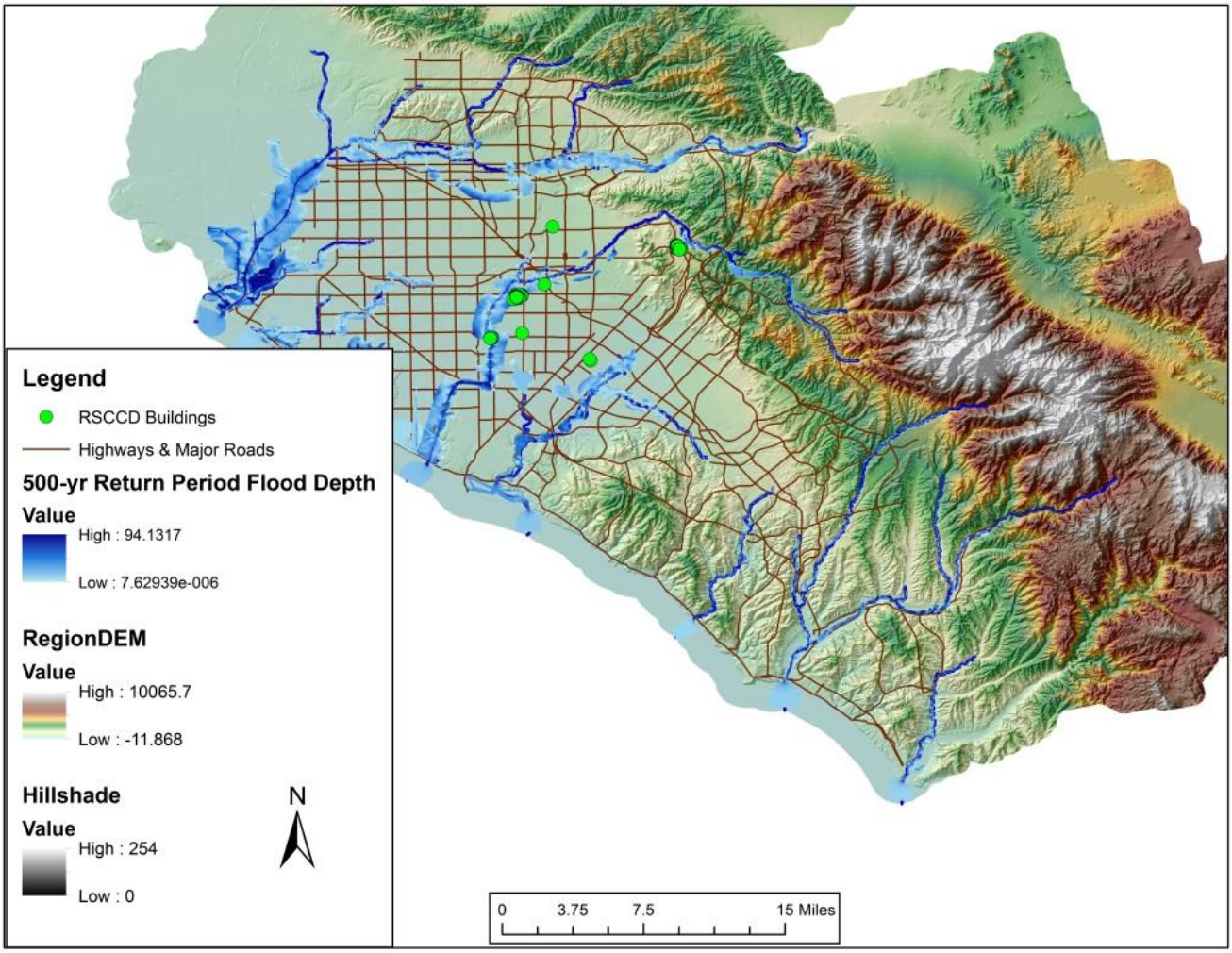
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Figure 19: HAZUS-Estimated Flood Depths for the 100-Year Flood in Vicinity of RSCCD Facilities



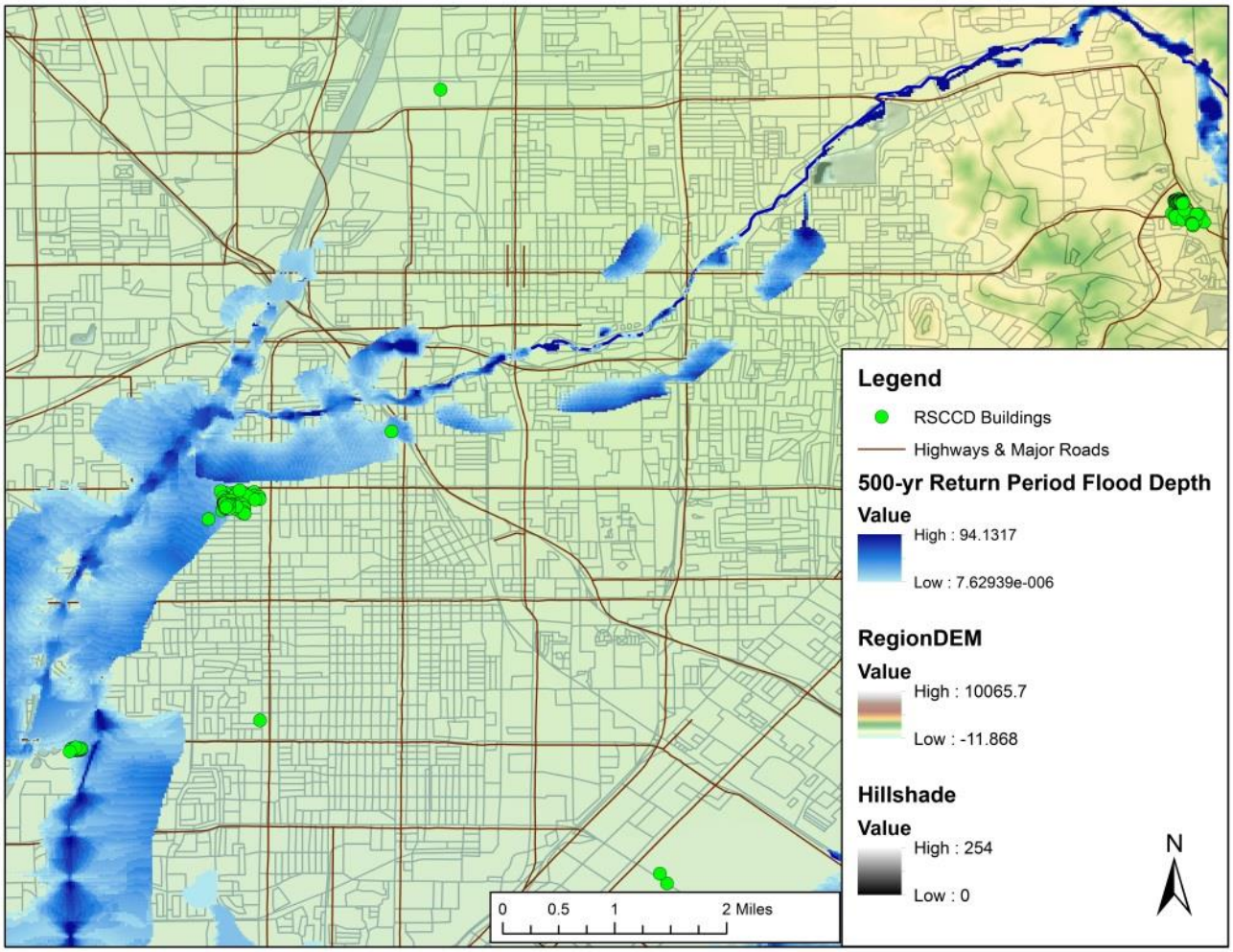
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Figure 20: HAZUS Flood Depths for Orange County for the 500-Year Flood



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Figure 21: HAZUS-Estimated Flood Depths for 500-Year Flood in the Vicinity of RSCCD Facilities



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BUILDING CLASSIFICATION FOR RISK ASSESSMENT

Using the building inventory data described previously, each building has been assigned Hazus-specific classifications required for analysis in the Hazus Flood *User-Defined Facilities* (UDF) module. These parameters are described below, and are provided for each building in **Appendix A**.

- *Hazus Occupancy classes* have been assigned based on the predominant use of the building, including:
    - COM4 – Office buildings
    - COM8 – Entertainment and recreation (e.g., snack and dining facilities, physical education)
    - EDU2 – Colleges and universities
    - GOV2 – Emergency response facilities (e.g., security facilities)
    - IND2 – Light industrial (e.g., auto shop, maintenance buildings)
    - IND5 – High technology
- Buildings are classified into Hazus flood *Building Types* based on their construction material, i.e., concrete, masonry, steel, wood, etc. Information used to determine *Building Type* was contained in the insurance appraisal reports, in data fields "ISO Class" (providing basic information about a buildings fire-resistance and construction materials), supplemented by data in the "Exterior Wall Type" field. Classifications have been assigned using the same methodology as was implemented for the 2009 OCEFRA Study conducted for FEMA (*FEMA, 2009*), which was incorporated into the Orange County HMP (*County of Orange, 2010*). Relevant examples of *Building Types* common among RSCCD facilities include masonry, steel, concrete and wood, many of which are portable structures. It should be noted that these data are included for completeness of the database, but are not considered by the default Hazus depth-damage functions in use for the current study.
- For the Hazus flood model, *Design Level* is considered to be pre-FIRM (i.e., built prior to the adoption of flood-related building regulations) if the construction date of the building pre-dates the community's first Flood Insurance Rate Map, and post-FIRM if constructed after the initial FIRM was identified. FIRM-related dates are published by FEMA in the state-specific "Community Status Book for California" (*FEMA, 2015*). Relevant FIRM-entry dates for RSCCD communities include:
    - Orange County - 09/14/79
    - City of Orange - 09/30/82
    - City of Santa Ana - 09/14/79
- Data on building foundations were also required. Most RSCCD buildings are built on slab foundations, although a number of portable buildings at Santa Ana College and Santiago Canyon College are elevated. In addition, Dunlap Hall at Santa Ana College has a small basement which houses building equipment.
- The final critical type of data for flood risk assessment is *First Floor Height* (FFH). FFH is the height, in feet, of the top of the finished floor surface for the first floor above ground, relative to the ground outside (i.e., how high the water has to rise to enter the structure). For the current assessment, FFH has been determined from review of building photos included in the insurance appraisal report, internet tools, such as Google Street View, and confirmed by limited site visits conducted by the RSCCD Risk Management Team. The following assumptions have been made:

- Raised portables have been assumed to have a FFH of 18 inches, consistent with assumptions made in the previous Hazus study conducted for Orange County (*FEMA, 2009*), and confirmed by RSCCD site visit. There are 36 such raised portables at Santa Ana College and 4 at Santiago Canyon College.
- When a building has steps at the entrance, a stair height of six inches is assumed. If a building has multiple entrances with differing numbers of steps (e.g., 5 steps at one side, 2 steps at another), the lower height is used to be conservative. Based on available photos, ten buildings were observed to have stairs or ramps at their entrances (other than portables described above); assumed FFH are provided in Table 19 below.
- All other buildings are assumed to have entries at grade with an assumed FFH of 6 inches.

Table 20: Assumed First Floor Heights for Selected Buildings

Building Name	Entry Description	Assumed FFH
District Office - Admin Building	2 steps/5 steps	12 inches
SAC - Theater Building	4 steps	24 inches
SAC - Gymnasium	6 steps	36 inches
SAC - Mechanical Pool Building	ramp	18 inches
CEC - Portable Classroom (Building 907)	short ramp	12 inches
SCC - Admin/Office/Classroom Building	4 steps/10 steps	24 inches
SCC - Science Center	5 steps/entry at grade	6 inches
SCC - Humanities Building	3 – 5 steps/entry at grade	6 inches
SCC - PE Building	entries at grade and at the second level	6 inches
SCC - Portable Survey Office	ramp	18 inches

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In addition to the building classification data described above, information taken directly from the insurance appraisal report to build the required Hazus UDF input database included building square footage, building replacement value, contents replacement value, location (latitude and longitude), number of stories and year built. The Hazus UDF also requires data on applicable building and content damage functions, determined from the Hazus default recommendations by occupancy class. No customization has been included; each building is represented by the default damage function associated with the identified occupancy class and foundation type.

FLOOD RISK ASSESSMENT RESULTS

RSCCD facility flood damage and associated losses have been estimated for the 100-Year Flood scenario and 500-Year Flood hazard using Hazus. Damage estimates for the District's buildings, generated using Hazus' User Defined Facilities (UDF) Module, are provided in Table 20 by site and are discussed in more detail below. (Detailed results for individual buildings are provided in the full reports appendix.) For the 100-Year Flood, the results for the three sites located within levee protected areas are shaded in light orange in Table 20. For these sites, the "worst-case" estimates, determined by Hazus assuming no levee protection, are provided in the Table 20. "Best-case" estimates (full levee protection) would show no losses.

As shown in Table 20, just two sites – Santa Ana College and the Centennial Education Center – are expected to suffer damage under 100-Year flood conditions, and Santa Ana College would only be expected to suffer these damages should there be levee failure. Under 500-Year flood conditions, one additional site – the District Office – can also expect to be subject to potential inundation. District-wide losses for the 100-Year flood would exceed $5 million at Centennial Education Center, and could exceed $9 million, if levees protecting Santa Ana College fail. For the 500-Year flood, district-wide losses are actually lower (just under $4.7 million), due to the wider predicted footprint and shallower depths predicted by Hazus for the 500-Year flood. It should be noted that the results presented here are the product of a default Hazus flood analysis conducted using best-available data; damage in an actual flood event will be different. The results of this Hazus analysis are intended to be used for relative-risk assessment and screening for further study. Lack of damage in the modeled events should not be taken to mean the facility will not experience some flood damage during its useful lifetime.

Most of the cost of the expected flood damage will result from damage to building contents, ranging from 58% of the loss at the District Office in the 500-Year flood, to 89% of the loss at Centennial Education Center in both the 100 and 500-Year floods. Accordingly, flood damage mitigation strategies should be considered both for the structure itself, as well as for building contents. For example, vulnerable building contents can be relocated to higher parts of the building (above the anticipated flood height) or protected in place.

A large number of damaged buildings at Centennial Education Center (9 out of 15 in the 100-Year flood) are portable structures with entries at grade, but due to their modest value, damage to these buildings represents just 14% of the total cost of damage to the buildings and their contents. At Santa Ana College, damage to six portables (out of 14 damaged buildings) represents just 2% of the total damage, likely because the buildings are elevated. Accordingly, mitigation of the portable structures is expected to have lower economic benefits, but may have other, non-financial benefits, such as reduced closure times.

The distribution of flood damage by building is mapped in Figure 19 (below) for Santa Ana College for the 100-Year flood; the four maps provided depict percent building damage, building damage in dollars, percent content damage, and content damage in dollars. As shown, flooding impacts the western portion of the campus. Similar maps for Centennial Education Center are provided for the 100-Year flood in Figure 20 and for the 500-Year flood for SAC, CEC and the District Office in Figures 21, 22 and 23, respectively. A list of damaged buildings, by site, is provided in Table 21.

Table 21: Summary of Economic Impacts from Flooding for RSCCD Facilities by Site

(shading indicates sites considered protected by levees in the 100-year flood)

Damage Type	RSCCD Sites							
	District Office[1]	Santa Ana College[1]	Centennial Education Center	Digital Media Center	Orange Education Center[1]	Santiago Canyon College	OC Sheriff's Regional Training	Total
1% Annual Chance (100 year) Flood								
Number of Buildings Within the Inundated Area	0	18	15	0	0	0	0	33
Number of Buildings Within the Inundated Area Suffering Damage	0	14	15	0	0	0	0	29
Number of Portable Buildings Damaged	0	6	9	0	0	0	0	15
Building Damage ($1,000)	$0	$750	$580	$0	$0	$0	$0	$1,330
Contents Damage ($1,000)	$0	$2,850	$4,880	$0	$0	$0	$0	$7,730
Total Building & Contents Damage ($1,000)[2]	***$0***	***$3,600***	***$5,460***	***$0***	***$0***	***$0***	***$0***	***$9,060***
0.2% Annual Chance (500 year) Flood								
Number of Buildings Within the Inundated Area	1	30	14	0	0	0	0	45
Number of Buildings Within the Inundated Area Suffering Damage	1	6	13	0	0	0	0	20
Number of Portable Buildings Damaged	0	0	7	0	0	0	0	7
Building Damage ($1,000)	$560	$430	$170	$0	$0	$0	$0	$1,160
Contents Damage ($1,000)	$760	$1,380	$1,390	$0	$0	$0	$0	$3,530
Total Building & Contents Damage ($1,000)[2]	***$1,320***	***$1,810***	***$1,560***	***$0***	***$0***	***$0***	***$0***	***$4,690***

Notes: 1) The DO, SAC and OEC are all located in FEMA flood zone "Zone X Protected by Levee – areas protected by levees from the 1% annual chance flood"
2) The results presented here are the product of a default Hazus flood analysis conducted using best-available data; damage in an actual flood event will be different. The results of this Hazus analysis are intended to be used for relative-risk assessment and screening for further study. Lack of damage in the modeled events should not be taken to mean the facility will not experience some flood damage during its useful lifetime.

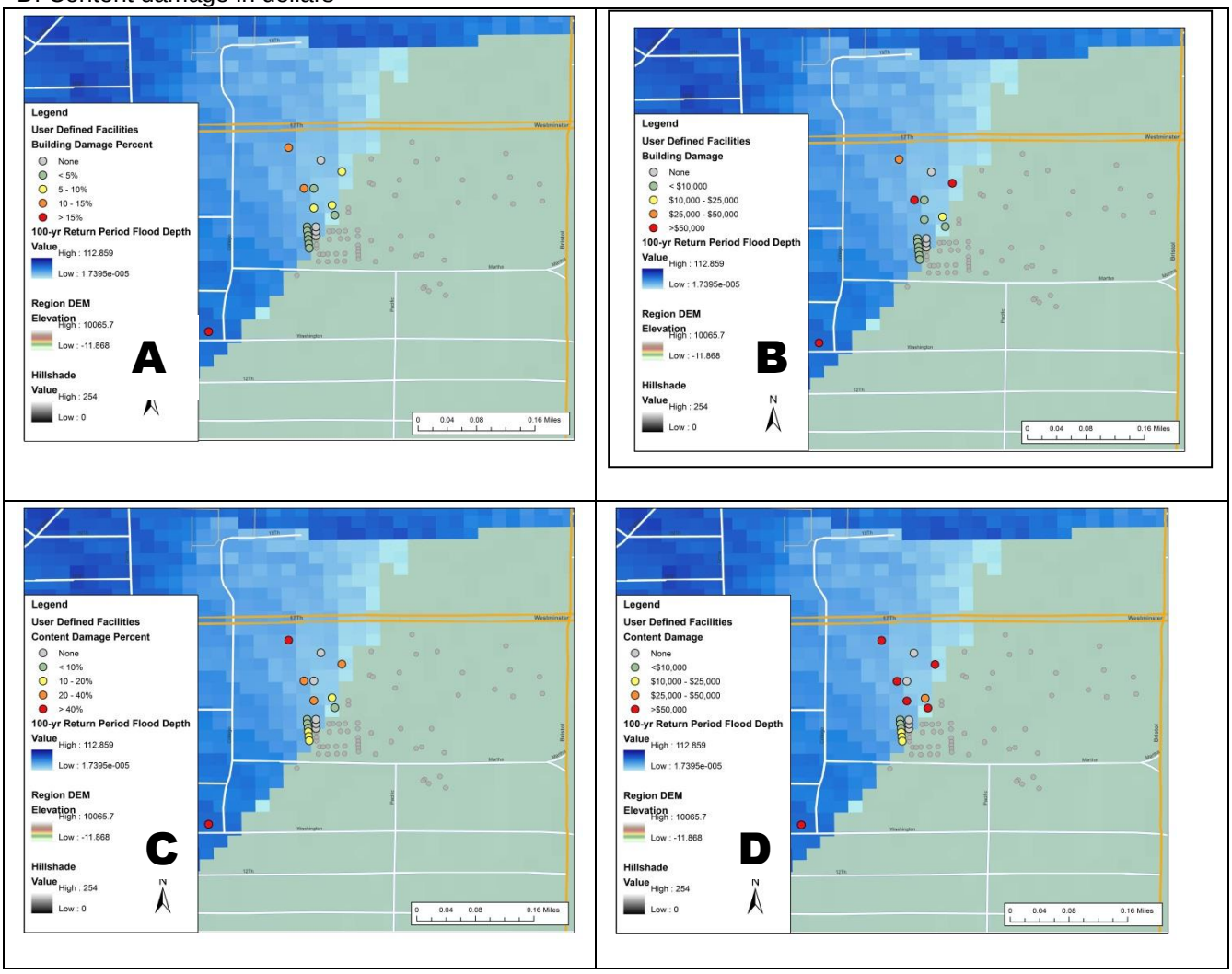
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The following five figures show flooding in the RSCCD:

- Figure 21: Santa Ana College for a 100-Year Flood
- Figure 22: Centennial Education Center for a 100-Year Flood
- Figure 23: Santa Ana College for a 500-Year Flood
- Figure 24: Centennial Education Center for a 500-Year Flood
- Figure 25: District Office for a 500-Year Flood

Figure 22: Santa Ana College for 100-Year Flood- Building and Content Damage Distributions

A. Percent building damage
B. Building damage in dollars
C. Percent content damage
D. Content damage in dollars



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(Enlargement from “D” above Content Damage with building names)

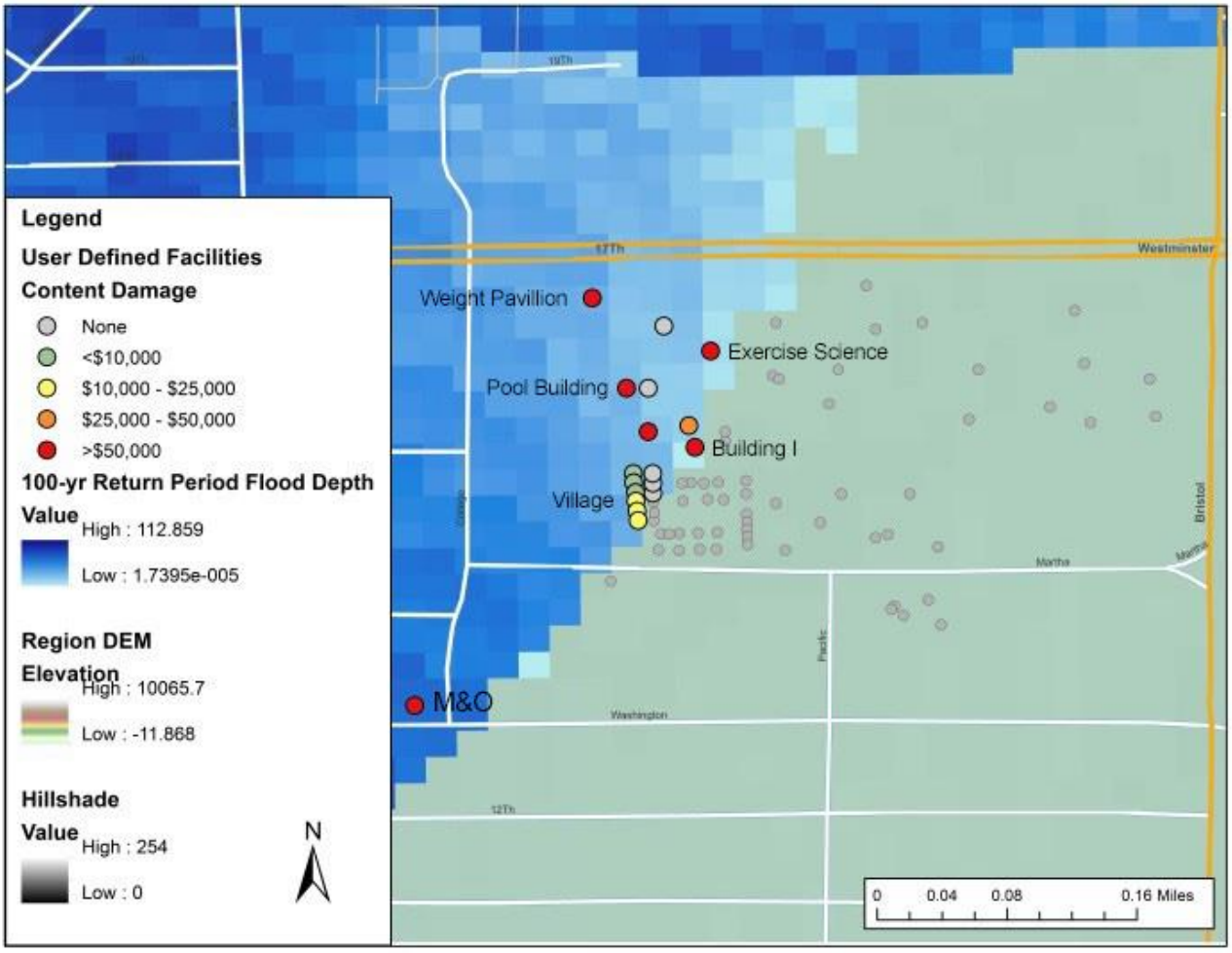
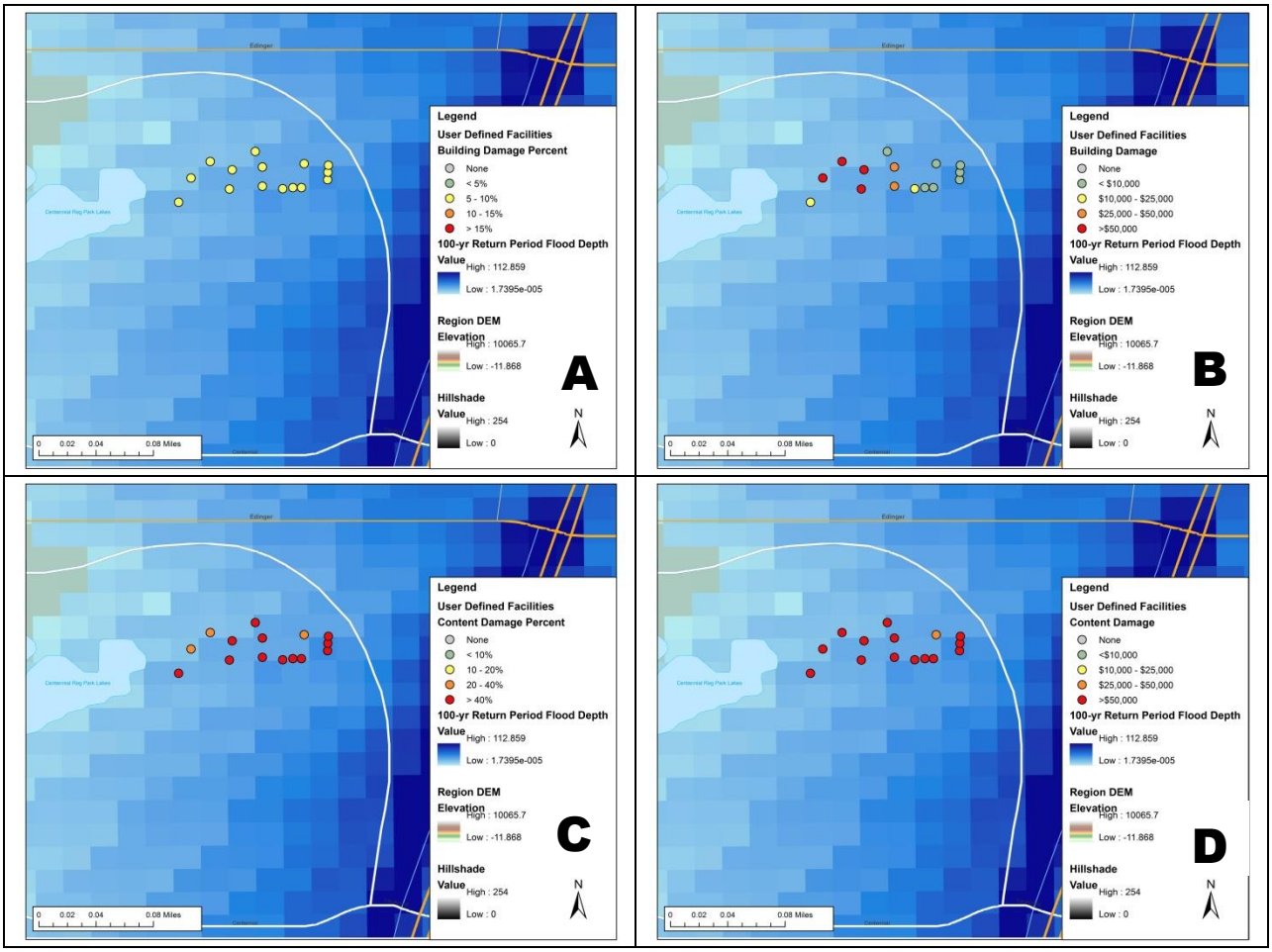


Figure 23: Centennial Ed. Center 100-Year Flood -Building & Content Damage Distributions

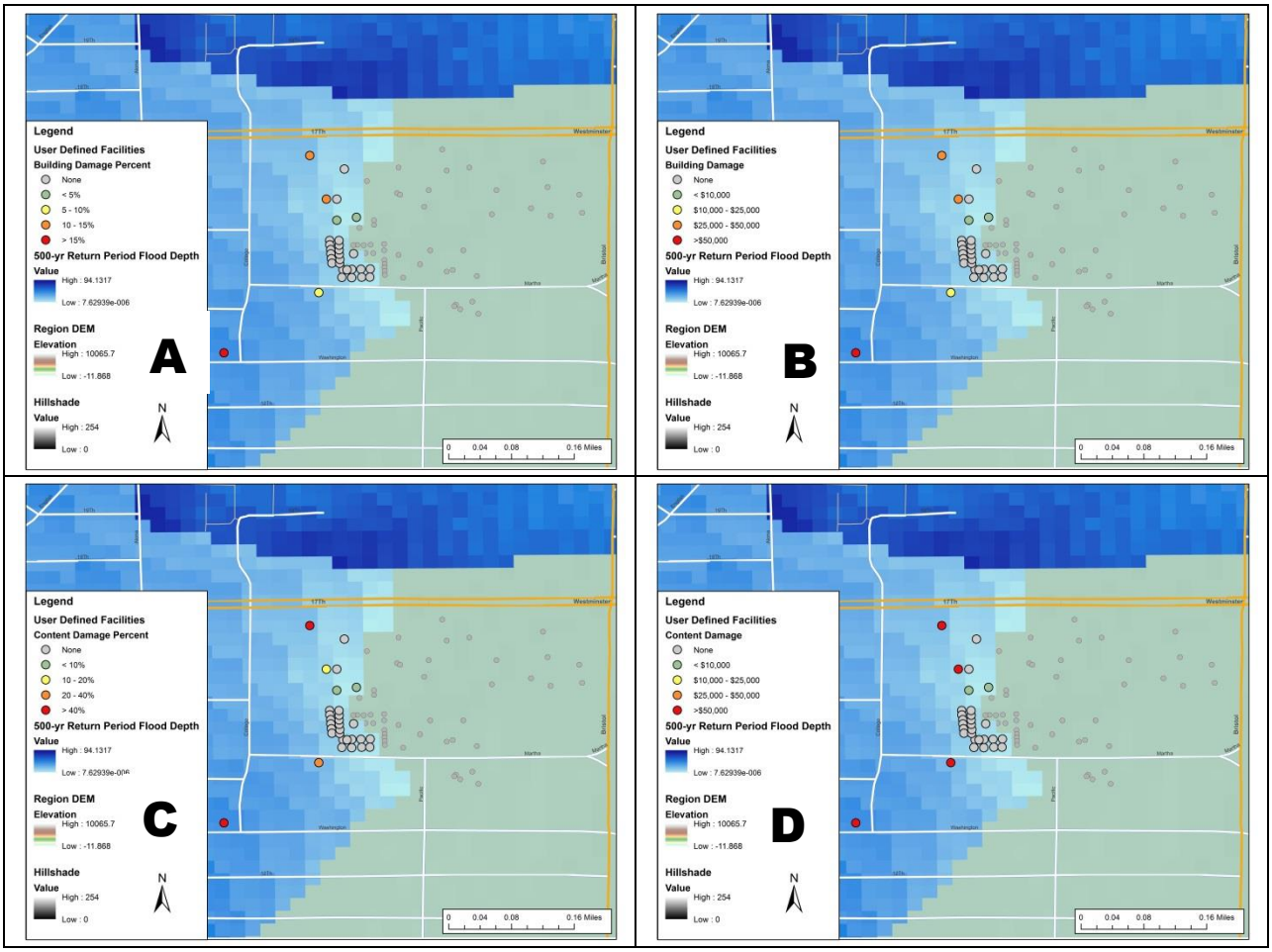
A. Percent building damage
B. Building damage in dollars
C. Percent content damage
D. Content damage in dollars



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Figure 24: Santa Ana College for 500-Year Flood - Building and Content Damage Distributions

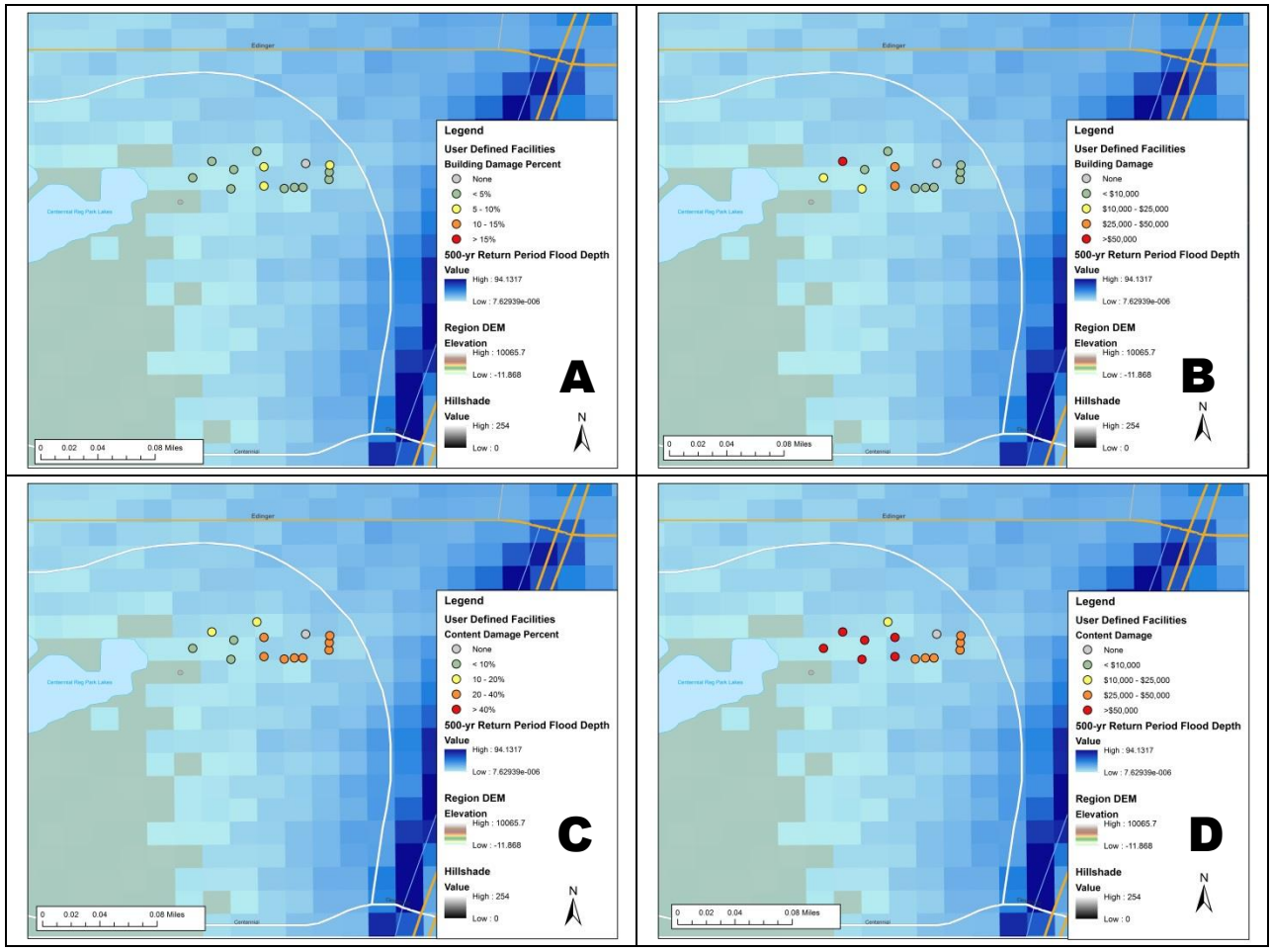
A. Percent building damage
B. Building damage in dollars
C. Percent content damage
D. Content damage in dollars



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Figure 25: A Centennial Ed. Center 500-Year Flood-Building and Content Damage Distributions

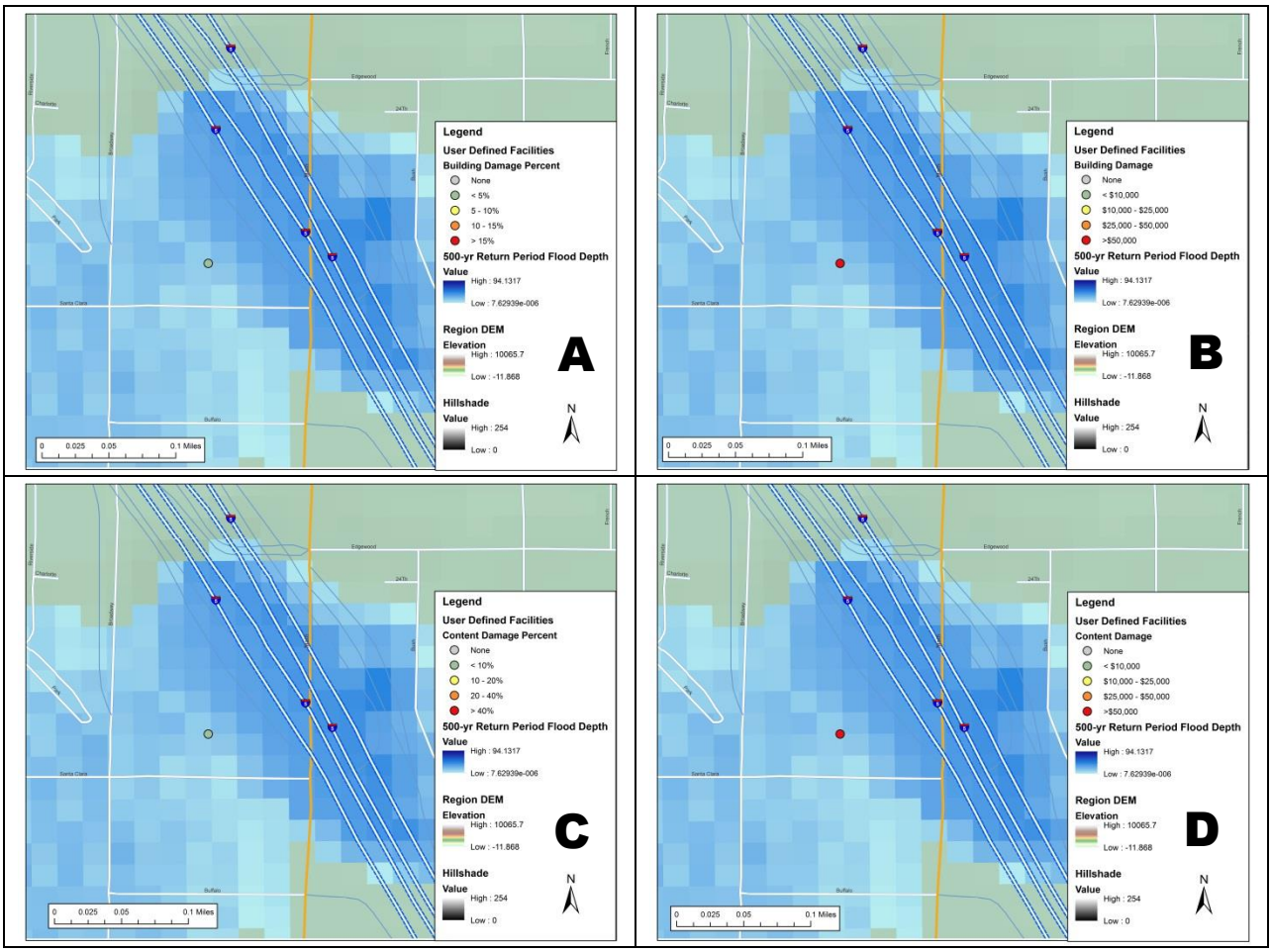
A. Percent building damage
B. Building damage in dollars
C. Percent content damage
D. Content damage in dollars



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Figure 26: District Office for the 500-Year Flood - Building and Content Damage Distributions

A. Percent building damage
B. Building damage in dollars
C. Percent content damage
D. Content damage in dollars



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Table 22: Buildings Predicted by HAZUS to Suffer Damage in 100-Year or 500-Year Flood

Building Name	Damaged in the 1% Annual Chance Flood[1]	Damaged in the 0.2% Annual Chance Flood[1]
District Office – Admin Building		☑
SAC – Exercise Science - Building-W	☑	
SAC – Baseball Office/Restroom Building		☑
SAC - Classroom Building-I	☑	
SAC - Weight Pavilion	☑	☑
SAC - Mechanical Pool Building	☑	
SAC - PE Offices – Building-F	☑	☑
SAC - Storage Building (Old Soccer Scoreboard)	☑	☑
SAC - Maintenance and Operation Buildings	☑	☑
SAC - Pool Equipment Storage Building	☑	☑
SAC - Village Classroom Rm 301	☑	
SAC - Village Classroom Rm 302	☑	
SAC - Village Classroom Rm 303	☑	
SAC - Village Classroom Rm 304	☑	
SAC - Village Classroom Rm 305	☑	
SAC - Village Classroom Rm 306	☑	
CEC - Building A	☑	☑
CEC - Building B	☑	☑
CEC - Child Development Center Building C	☑	☑
CEC - Building D	☑	☑
CEC - Building E	☑	☑
CEC - Building F	☑	☑
CEC - Portable Classroom D107 D106	☑	☑
CEC - Portable Classroom D108	☑	☑
CEC - Portable Classroom D109	☑	☑
CEC - Portable Classroom 110	☑	☑
CEC - Portable Classroom D111	☑	☑
CEC - Portable Classroom D112	☑	☑
CEC –Child Development Center C-110	☑	
CEC - Child Development Center C-111	☑	☑
CEC – F-115/F-1116	☑	

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Notes: 1) The results presented here are the product of a default Hazus flood analysis conducted using best-available data; damage in an actual flood event will be different. The results of this Hazus analysis are intended to be used for relative-risk assessment and screening for further study. Lack of damage in the modeled events should not be taken to mean the facility will not experience some flood damage during its useful lifetime.
2) Some building names have been updated from the original insurance report, as of 9/17/2015

MMI ENGINEERING STUDY CONCLUSIONS AND RECOMMENDATIONS

As described in this report, the Rancho Santiago Community College District's facilities could suffer more than $5 million in damage to the buildings and their contents at the Centennial Education Center in a100-Year Flood, increasing to as much as $9 million if the levees protecting Santa Ana College fail to provide adequate flood protection. In a 500-Year Flood as modeled by Hazus, losses may exceed $4.6 million, including damage at the District Office, Santa Ana College and the Centennial Education Center. As noted previously, the results presented here are the product of a default Hazus flood analysis conducted using best-available data; damage in an actual flood event will be different. The results of this Hazus analysis are intended to be used for relative-risk assessment and screening for further study. Lack of damage in the modeled events should not be taken to mean the facility will not experience some flood damage during its useful lifetime

While much of the predicted economic loss is a result of flood damage to building contents, damage to the inundated buildings themselves also occurs. To minimize this type of damage and its effects on operations, the District could conduct detailed flood risk reviews of their potentially flooded facilities (Table 21), in order to confirm flood risk and identify approaches to mitigate damage to both the buildings and their contents. Various strategies are available to reduce the risk of flood damage. Mitigation of potential flood damage can be accomplished by elevation, relocation, wet floodproofing (e.g., raising utilities and building contents, or configuring electrical and mechanical systems to minimize disruptions), dry floodproofing (e.g., making the building more watertight), or construction of barrier systems, such as a floodwall. A more detailed flood risk analysis would be required to assess the most cost-effective strategies for the District. A good general discussion of various flood mitigation techniques may be found in FEMA's "Homeowner's Guide to Retrofitting: Six Ways to Protect your Home from Flooding" (FEMA, 2014)

Detailed building level results are provided in the MMI Engineering Report on Flood, **Appendix B**. Every effort has been made to accurately classify each building's structural type and first floor height from available data (see MMI Engineering Report on Flood, **Appendix A**). For buildings where the current categorization differs from user expectations, sensitivity studies or "what-if" analyses could be conducted to shed further light on the potential variations in performance resulting from a range of categorizations, or a more detailed engineering review could be implemented to fine-tune the categorization. Further, a similar analytical approach could be used to assess the potential improvement in performance associated with selected physical mitigation strategies, such as building elevation.

F. THE LOCALIZED FLOODING ISSUES

Localized flood problems sometimes do not get the remedial attention they need, partly because they are not the subject of dramatic headlines or stories on the nightly news, and partly because they fall outside the scope of many local flood protection ordinances, which are geared toward the Special Flood Hazard Area (SFHA) depicted on the community's Flood Insurance Rate Map (FIRM). However, as local officials, technical staff, and residents of those areas know, this flooding is a significant—and often a recurring—problem.

Localized flooding can result from even minor storms. Runoff overloads the drainage-ways and flows into the streets and low-lying areas. Sewers back up can cause inundation. Homes and businesses are flooded, especially basements and the lower part of first floors. Localized flooding poses most of the same problems caused by larger floods, but because it typically has an impact on fewer people and affects small areas, it tends to bring less State or Federal involvement such as funding, technical help, or disaster assistance. As a result, the community and the affected residents, business owners and schools are left to cope with the problems on their own. Finally, flooding of this type tends to recur; small impacts accumulated over time can become major problems.

The RSCCD is made up of:

- Seven sites
- 146 buildings
- Daytime peak occupancy 28,834
- The district facilities affected by flood are "Moderate" or about 50% of the district's sites

Finding the elevation of each RSCCD site helped the Hazard Mitigation Committee determine the localized flooding threat.

Table 23: RSCCD Elevation by Site

Item	District Location	Address	Elevation Feet Above Sea Level
1	District Operations Center	2323 North Broadway, Santa Ana 92706	147 feet
2	Santa Ana College (SAC)	1530 West 17th Street, Santa Ana 92706	106 feet
3	Santiago Canyon College (SCC)	8045 East Chapman Avenue, Orange 92869	557 feet
4	Centennial Education Center (CEC)	2900 West Edinger Avenue, Santa Ana 92704	91 feet
5	Orange Education Center (OEC)	1465 North Batavia Street, Orange 92867	176 feet
7	Orange County Sheriff's Regional Training Academy (OCSRTA)	115991 Armstrong Avenue, Tustin 92782	57 feet
8	Digital Media Center (DMC)	1300 South Bristol Street, Santa Ana 92704	71 feet

Note: Site 6 is the Regional Fire Training Center; land not owned by RSCCD; lease terminated May 2015

The RSCCD has one recorded incident of a flood that caused damage to its facilities.

Date	Location	Type of Damage	Details (from insurance records)	Costs
11/25/2008	Santiago Canyon College	Rain, flooding and mud	Rain caused flooding and mud at SCC buildings	$51,777

G. Flood Probability of Future Occurrences

Based on history, a flood is the most common type of disaster in the US, California and Orange County. Flooding situations have occurred in all 50 states and all 58 California counties including Orange County. Land along rivers, like the Santa Ana River, are particularly susceptible to flooding.

Some flooding occurs on an average of every four years in Orange County with severe floods occurring approximately every ten years, often during an El Niño. (A drought situation like the last 10 years is the exception.) The Santa Ana River Mainstem mitigation project has lessened the probability and the impact. Floods resulting from heavy rains and storms are the most common disaster affecting the RSCCD which is why extra effort has been made to prepare for flood and mud emergencies.

Table 24: Probability for Flood Scenarios

Scenario	Probability of Future Events*
100-Year Flood	Likely
500-Year Flood	Occasional
Localized Flooding	Likely

*Based on the consensus of the Hazard Mitigation Committee
Choices: Not-Likely, Occasional, Likely or Very Likely

The area affected by flood is 5 of the 7 sites/campus' (page 73). The maximum probable extent of flooding to the RSCCD is Severe due to the scale of impact. The three hardest hit sites would be Santa Ana College (largest site with most students), Centennial Education Center (third largest site) and the RSCCD District Office who manages all 7 sites. This would impact the RSCCD Emergency Operations Center (EOC) as well as the EOCs at Santa Ana College and the Centennial Education Center.

With a **Likely** probability and the Maximum Probable Extent of flooding, "**Severe**," the RSCCD ranked this hazard's overall significance as "High."

In summary, flood probability is ranked as "Likely" for the 100-year floods, "Occasional" for the 500-year scenario and "Likely" for localized flooding. Maximum Probable Extent is Severe and the overall significance as High. RSCCD Emergency Management should place this hazard high on the preparedness list along with Earthquake.

H. FLOOD/STORM HAZARD MITIGATION STRATEGIES

SHORT TERM MITIGATION STRATEGIES

Hazard	**FLOOD ACTIVITY #1 – SHORT TERM**
Action Item	**Identify and mitigate potentially vulnerable <u>non-structural</u> components and systems from flooding as well as conducting a structural engineering evaluation of RSCCD facilities to determine if they meet today's flood building codes and are structural retrofits needed in older facilities. (See List of Facilities Recommended by the Hazard Mitigation Team below)**
Coordinating Organization	Facilities Managers and Director of District Construction
Ideas for Implementation	▪ Determine if a Facilities Safety Committee needs to be formed. It could include RSCCD Facilities, City Building Officials and a representative from the Department of State Architect ▪ Work with contractors to provide cost estimates for this project. ▪ Write a FEMA Hazard Mitigation project grant to develop a complete Non-Structural and structural engineering evaluation ▪ As part of the grant, research what steps have already been taken by the district; determine steps still needed to prepare all sites for their sites worst case scenario ▪ Develop a long-term maintenance plan for the program
Time Line	3 years and ongoing
Constraints	Grant approval by Cal EMA and FEMA
Funding Sources	25% General Fund and 75% FEMA Maintenance costs are 100% RSCCD
Cost Estimate	$7-8 million
Benefits: Losses Avoided	Life Safety and reduced injuries; reduced property damage from floods; in older and critical facilities such as the campus EOCs, it will allow for continued emergency management operations during a disaster
Priority	Extremely High
Plan Goals Addressed	
	Promote Public Awareness
X	Create Partnerships and Implementation
X	Protect Life and Property
	Protect Natural Systems
X	Strengthen Emergency Services

Buildings Predicted by HAZUS to Suffer Damage in 100-Year or 500-Year Flood

Building Name	Damaged in the 1% Annual Chance Flood[1]	Damaged in the 0.2% Annual Chance Flood[1]
District Office – Admin Building		☑
SAC – Exercise Science - Building-W	☑	
SAC – Baseball Office/Restroom Building		☑
SAC - Classroom Building-I	☑	
SAC - Weight Pavilion	☑	☑
SAC - Mechanical Pool Building	☑	
SAC - PE Offices – Building-F	☑	☑
SAC - Storage Building (Old Soccer Scoreboard)	☑	☑
SAC - Maintenance and Operation Buildings	☑	☑
SAC - Pool Equipment Storage Building	☑	☑
SAC - Village Classroom Rm 301	☑	
SAC - Village Classroom Rm 302	☑	
SAC - Village Classroom Rm 303	☑	
SAC - Village Classroom Rm 304	☑	
SAC - Village Classroom Rm 305	☑	
SAC - Village Classroom Rm 306	☑	
CEC - Building A	☑	☑
CEC - Building B	☑	☑
CEC - Child Development Center Building C	☑	☑
CEC - Building D	☑	☑
CEC - Building E	☑	☑
CEC - Building F	☑	☑
CEC - Portable Classroom D107 D106	☑	☑
CEC - Portable Classroom D108	☑	☑
CEC - Portable Classroom D109	☑	☑
CEC - Portable Classroom 110	☑	☑
CEC - Portable Classroom D111	☑	☑
CEC - Portable Classroom D112	☑	☑
CEC –Child Development Center C-110	☑	
CEC - Child Development Center C-111	☑	☑
CEC – F-115/F-1116	☑	

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Notes: 1) The results presented here are the product of a default Hazus flood analysis conducted using best-available data; damage in an actual flood event will be different. The results of this Hazus analysis are intended to be used for relative-risk assessment and screening for further study. Lack of damage in the modeled events should not be taken to mean the facility will not experience some flood damage during its useful lifetime.
2) Some building names have been updated from the insurance report, as of 9/17/2015

Hazard	FLOOD ACTIVITY #2 – SHORT TERM
Action Item	**Increase Flood Risk Awareness and Education**
Coordinating Organization	Risk Manager and Chief District Safety & Security
Ideas for Implementation	▪ As part of the planning process for this plan, present the RSCCD Flood Hazard Mitigation Plan to as many RSCCD staff, faculty, students and the public as possible ▪ Every occasion the districts emergency preparedness program is presented, include information on the RSCCD Hazard Mitigation Plan and ask for input into future projects. ▪ Utilize the maps in the plan for employee and public education ▪ Include an overview of the plan, its goals, maps and lists of at risk buildings when training Building Captains. Discuss which buildings are more vulnerable to flooding and should not be used during a flood.
Time Line	Ongoing
Constraints	Chief District Safety & Security can only offer the training; attendance is voluntary
Funding Sources	General Fund
Cost Estimate	Staff Time
Benefits: Losses Avoided	Sustained mitigation outreach programs have minimal cost and will help build and support district-wide capacity. This type of activity enables the district faculty, students and the public to better prepare for, respond to and recover from disasters.
Priority	High

Plan Goals Addressed	
X	Promote Public and College Community Awareness
X	Create Partnerships and Implementation
X	Protect Life and Property
	Protect Natural Systems
X	Strengthen Emergency Services

LONG TERM MITIGATION STRATEGIES

Hazard:	**FLOOD/STORM ACTIVITY #3 – LONG TERM**
Action Item	**Conduct the flood-proofing measures to vulnerable facilities starting with critical facilities (Phase 2 - Phase 1 is Flood/Storm Short Term #1)**
Coordinating Organization	Vice Chancellor of Administrative Services and Facility Director
Description	■ Flood-proof critical facilities identified in the assessment ■ Flood-proof all other facilities identified in the assessment ■ Flood proofing includes but is not limited to: ○ Dry Floodproofing – making a building water tight below the level that needs water protection ○ Wet Floodproofing - providing resistance to damage from flooding while allowing floodwaters to enter the structure or area ○ Flood walls or small berms ○ Installing/upgrading storm water pump stations ○ Increasing draining capacities; Increasing dimensions of drainage culverts; ○ Using vegetative management
Time Line	7 Years
Constraints	Time, Expertise and Budget
Plan Goals	Protect Life and Property
Funding Sources	California Community College Schedule Maintenance Program, California Community College Capital Outlay Fund, FEMA Hazard Mitigation Grant and partnerships with other agencies
Cost Estimate	Costing out the project is done in phase 1, short term action item
Benefits: Losses Avoided	Life safety, reduction in property losses, potential for reduced loss of life and injury due to flooding.
Priority	Extremely High

Plan Goals Addressed	
	Promote Public/College Community Awareness
	Create Partnerships and Implementation
X	Protect Life and Property
	Protect Natural Systems
	Strengthen Emergency Services

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IV-D Dam Failure

A. The California Dam Failure Threat

OVERVIEW OF DAM

What is a Dam?

A dam is a barrier preventing the flow of water or loose solid materials (such as soil or snow); or a barrier built across a watercourse for impounding water. Dams are artificial barriers, which are 25 feet or more in height or have an impounding capacity of 50 acre-feet or more.

Advantages of Dams

Dams are important because they provide water for drinking, industry, irrigation, fishing and recreation, water for hydroelectric power production, water for navigation in rivers, and other needs. Dams also protect people by reducing or preventing floods.

Causes of Dam Failure

Dam failures can result from a number of natural or man-made causes such as earthquakes, erosion of the face or foundation, and improper sitting of the dam, rapidly rising floodwaters, and structural/design flaws. Dam failure can result in severe flood events to lower-lying areas. A dam failure from Prado Dam and some of the smaller dams could severely impact much of Orange County and several of the RSCCD sites.

Impacts of Dam Failure

A dam failure may cause loss of life, damage to property, and other ensuing hazards, as well as the displacement of persons residing in the inundation path. Damage to electric generating facilities and transmission lines as well as sewer and water facilities could also impact life support systems in communities outside the immediate hazard areas.

A catastrophic dam failure, depending on the size of the dam and the population downstream, could exceed the response capability of local communities especially overtaxing the public safety personnel and resources. Damage control and disaster relief support would be required from other local government agencies, private organizations, the Orange County Operational Area, the State of California, and possibly the Federal government.

Identifying Dam Failure Hazards

Dam failure is the uncontrolled release of impounded water from behind a dam. Flooding, earthquakes, blockages, landslides, lack of maintenance, improper operation, poor construction, vandalism, and terrorism can all cause a dam to fail. Dam failure causes downstream flooding that can affect life and property.

The primary purpose of this report is to review dams that could cause a threat to the RSCCD.

PROFILING DAM FAILURE HAZARDS

Dams and reservoirs of jurisdictional size are defined in the California Water Code Sections 6000 through 6008. There are currently more than 1,400 dams of jurisdictional size in California. Approximately 1,250 of these dams are under the jurisdiction of California's Department of Water Resources, Division of Safety of Dams. Dams and reservoirs owned by the federal government are not subject to state jurisdiction except as otherwise provided by federal law. In California, there are currently 149 dams owned by federal government agencies such as the United States Forest Service, Bureau of Reclamation, Army Corps of Engineers and the U.S. Military.

Los Angeles leads the state as being the county with the most jurisdictional-size dams, with 100 dams. The county of Sonoma is second behind Los Angeles with 63 dams. Del Norte County is the only county in the state having no dams of jurisdictional size.

The term "dam failure" encompasses a wide variety of circumstances. Situations that would constitute a dam failure vary widely, from developing problems to a partial or catastrophic collapse of the entire dam. Potential causes of a dam failure are numerous and can be attributed to deficiencies in the original design of the dam, the quality of construction, the maintenance of the dam and operation of the appurtenances while the dam is in operation, and acts of nature including precipitation in excess of the design, flood and damage from earthquakes. Water over-topping the dam crest is a common cause of failure in earth dams. Overtopping will cause erosion and the dam crest and eventual dam breach. Piping of each dam is another common form of failure. Piping is a form of erosion that occurs underground caused by rodent burring and the presence of extensive root systems from vegetation growing on and around the dam.

In the past 50 years, there have been only a small number of dam failures in California. The most catastrophic dam failure in California's history is that of the infamous St. Francis Dam in Los Angeles County, which failed in March 1928 shortly after construction of the dam was completed. This failure resulted in the deaths of more than 450 people and destruction of nearly 1,000 homes and buildings. Numerous roads and bridges were also destroyed and/or damaged beyond repair. The Division of Safety of Dams came into existence as a direct result of this catastrophe. Other significant dam failures in California's history include Baldwin Hills in 1963 and the near-failure of the Lower San Fernando Dam in 1971.

ASSESSMENT OF LOCAL VULNERABILITY AND POTENTIAL LOSSES

Information related to community vulnerability and loss assessments may be found in some City and County Hazard Mitigation Plans. Local planning departments have access to the state's inventory of inundation maps, which are kept on a server and published annually as DVDs.

At this time the Cities of Santa Ana and Orange have not developed Hazard Mitigation Plans. The County of Orange has a Hazard Mitigation Plan but has not conducted an assessment of potential losses for Orange County. FEMA's Hazus software does not cover dam failure indents.

TYPES OF DAMS

There are four general types of dams: Arch, Buttress, Gravity (Prado), and Embankment (Seven Oaks). Each of these types of dams has different failure characteristics.

ARCH DAMS

Arch dams are best suited to narrow canyons where they divert the force of the water behind the dam to the sides of the cavern in order to help support the weight. Therefore, arch dams need not be as thick as gravity dams since the dam itself supports less weight making them less expensive to construct. Arch dams may carry less weight than other dams; however, they are affected by the same kinds of force. These forces must be considered when building one, and include pressure of the water, weight of the water, and weight of the dam. A well-known example of an arch dam is Hoover Dam, which sits in the Colorado River on the border of Nevada and Arizona. Dams are also used to generate energy by harnessing the potential energy of water contained in the reservoir.

Pressure of the Water

Pressure applied by the water: For any type of dam, the force of the water pushing on the dam is proportional to the depth of the water contained behind the dam. Therefore, the pressure exerted by the water in the reservoir must be considered before building a dam. So, as the depth increases, the pressure increases. At the bottom of a dam, the pressure is always the highest.

Weight of the Water and Weight of the Dam

The weight of the water and the weight of the dam must be considered to ensure that the foundation can support the dam. The earth supporting the dam must be strong enough to support the weight of the dam. Therefore, the normal force (N) must be sufficient to support the weight (W) of the dam and the water.

BUTTRESS DAMS

Buttress dams can also be called Ambursen dams after the American engineer who used this type of dam in the early 20th century.

Originally, buttress dams were used in areas requiring irrigation, but where the land was not capable of supporting the size and weight of other types of dams. Generally, buttress dams are built in wide valleys. The name "buttress" dam comes from the structure of the dam itself. The dam is supported at intervals by several buttresses, concrete slabs reinforced with steel, which form a watertight seal against the river. There are two main types of buttress dams: flat slab and multiple arch dams. Multiple arch dams are generally more expensive and time consuming to build. This is because the front of the dam consists of several arches that face upstream instead of just a flat front.

Physics Involved in Buttress Dams

As with the arch dam and the gravity dam, the same forces must be considered for a buttress dam. The weight of the dam is also another factor involved. This is the downward force exerted by the concrete. To determine this, the specific weight of the concrete is used. This is the volume of concrete times the specific weight of the concrete. The specific weight of the concrete and the ratio of the density of concrete are compared to the density of water at 4 degrees Celsius. For concrete, the specific gravity is 23.6 N/m3. The weight of the dam times the gravity is the total downward force that is exerted by the dam.

The normal force is the upward force that is exerted by the Earth. Since the dam is not in motion, the normal force provides equilibrium for the weight. Thus, the normal force for a dam is equal but opposite in direction to the weight of the dam times gravity.

GRAVITY DAMS

Gravity dams serve the same purposes as arch and buttress dams; however, they differ in structure and method of retaining water. This type of dam is solid and triangular in shape; therefore, it requires a large amount of concrete or other construction material. The immense weight of the concrete provides stabilization and allows the dam to maintain control of the water. As you can see, gravitational force holds the dam to the ground, hence the name. Some well-known examples of Gravity Dams are Prado and Friant Dam.

Forces Acting on Gravity Dams

The forces acting on gravity dams include the force of the water in the reservoir (acting horizontally and vertically), the weight of the concrete (acting in a downward direction), and the uplift force that results from the water pressure under the dam pushing in an upward direction (a result of the buoyant force of water) if there is not a drainage source. The overall force acts one-third of the way from the bottom of the dam, which is its center of gravity.

Pressure Acting on the Dam

Gravity dams must be able to withstand the pressure of the reservoir water. As a result of the triangular shape of the dam, the pressure of the water is also distributed in the shape of a triangle. The amount of pressure on the dam increases proportionally to the depth of the water; therefore, the pressure is at a maximum at the bottom of the reservoir. A portion of the weight of the dam is cancelled by the water pressure resulting from the uplift force, so if the dam is not properly constructed, it could be uplifted and overturned.

Energy Production

As far as energy production is concerned, gravity dams are also used in the generation of hydroelectric power by the conversion of the potential energy of the water into mechanical energy.

EMBANKMENT DAMS

Embankment dams in the US prior to 1930 had a poor track record. Of those over 490 feet high, almost 10% failed, usually due to overtopping in a flood. Overtopping is when the water level in the reservoir reaches maximum height and begins to flow over the top of the dam. The South Fork dam in Johnstown, PA was one of the first to use rockfills, or loose rocks, on the downstream face. This dam failed after being overtopped in 1889, killing over 2,000 people.

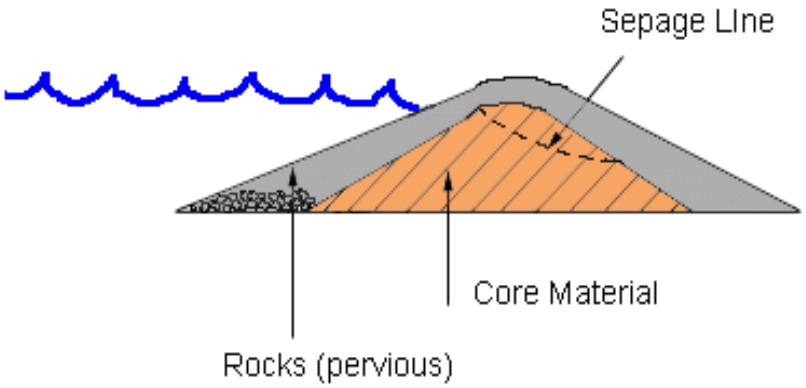
Embankment dams are massive dams made of earth or rock. Embankment dams usually have some sort of waterproof interior (called the core), which is covered with earth or rock fill. Grass may even be grown on the earth fill. Water will seep in through the earth or rock fill, but should not seep into the core. They rely on the weight to resist the flow of water, just like concrete gravity dams.

The main force on an embankment dam is the force of the water. The weight of the dam is also a force, but each material has a different weight, so it is not shown here as one force the way it is

on the concrete dams. The uplift force is also acting on the embankment dam, but some of the water seeps into the dam so the force is not the same as on a concrete dam.

The embankment dam is the only dam type that is not made of concrete. Embankment dams may be made of earth or rock, both of which are pervious to water that is, water can get into it. The water will seep into the core material and should stop at the seepage line. The core material is usually more watertight than the rock or earth that is on the outside of the dam, but the core material is still not totally impervious to water. Concrete is not truly impervious either, but it does not allow as much seepage as other materials do.

The diagram shown to the right is only one configuration of what an embankment dam may look like. It could be any combination of earth, rock, and core material in any number of arrangements. Other forces that may act on an embankment dam are:



- There may be water on the downstream side of the dam as well; this water will have the same sort of vertical and horizontal forces on the dam as the water on the upstream side
- Internal hydrostatic pressure: in pores, cracks, joints, and seams
- Silt pressure: silt will build up over time on the upstream side. Silt provides about one and a half times the horizontal pressure of water and twice the vertical pressure of water
- Ice load on the upstream side
- Wave load on the upstream side
- Earthquake loads
- Settlement of the foundation or abutments
- Other structures on top of the dam -- gates, bridge, cars, etc.

CURRENT CALIFORNIA DAM FAILURE HAZARD MITIGATION EFFORTS

Since 1929, the state has supervised all non-federal dams in California to prevent failure for the purpose of safeguarding life and protecting property. Supervision is carried out through the state's Dam Safety Program under the jurisdiction of the Department of Water Resources. The legislation requiring state supervision was passed in response to the St. Francis Dam Failure and ongoing concerns about the potential risks to the general populace from a number of water storage dams. The law requires:

- Examination and approval or repair of dams completed prior to August 14, 1929 (the effective date of the statute)

- Approval of plans and specifications for and supervision of construction of new dams and the enlargement, alteration, repair, or removal of existing dams
- Supervision of maintenance and operations of all dams under the state's jurisdiction

The 1963 failure of the Baldwin Hills Dam in Southern California led the legislation to amend the California Water Code to include within state jurisdiction both new and existing off-stream storage facilities.

Dams and reservoirs subject to state supervision are defined in California Water Code Sections 6002 through 6004, with exemptions defined in Sections 6004 and 6025. In administering the Dam Safety Program, the Department of Water Resources must comply with the provisions of the California Environmental Quality Act. As such, all formal dam approval and revocation actions must be preceded by appropriate environmental documents.

In 1972, Congress moved to reduce the hazards from the 28,000 non-federal dams in the country by passing Public Law 92-367, the National Dam Inspection Act. With the passage of this law, Congress authorized the US Army Corps of Engineers to inventory dams located in the United States. The action was spurred by two disastrous earthen dam failures during the year in West Virginia and South Dakota that caused a total of 300 deaths.

The Water Resources Development Act of 1986 (Public Law 99-662) authorized the US Army Corps of Engineers to maintain and periodically publish an updated National Inventory of Dams. The Water Resources Development Act of 1996 (Public Law 104-303, Section 2215), reauthorized periodic updates by the Army Corps of Engineers. Section 215 further established the National Dam Safety Program and named the Administrator of FEMA as its coordinator. The Dam Safety Act of 2006 (Public Law 109-460) reauthorized the National Dam Safety Program through 2011.

FEMA has recently launched an effort under its Risk MAP program to communicate risk of dam failure and to coordinate state and private mitigation and preparedness efforts. According to FEMA, most people living downstream of a dam are unaware of the potential hazards associated with dam failure, have never seen the respective dam failure inundation maps, and are unaware of an evacuation plan or an Emergency Action Plan associated with the failure of that dam. There is a need, therefore, to include dam failure risk awareness as part of a comprehensive flood risk communications strategy and develop a communications strategy that reports on dam failure risk and promotes dam safety. The audience for these strategies includes dam owners/operators, dam regulators, emergency managers, floodplain managers, planners, public and private decision makers and the population at risk.

Mitigation of dam failure is constantly occurring at both the federal and state level. For example, the US Bureau of Reclamation is planning to replace the longest earthen section of Folsom Lake's dam in order to mitigate earthquake damage. At the state level, officials are currently reviewing an $84 million project to remove a 106-foot-high dam on the Carmel River to mitigate earthquake damage and deal with flood safety issues. These are just two examples of the numerous dam mitigation projects currently being undertaken.

Engineers and engineering geologists at the California Division of Safety of Dams review and approve plans and specifications for the design of dams and oversee their construction to ensure compliance with the approved plans and specifications. Reviews include site geology, seismic

setting, site investigations, construction material evaluation, dam stability, hydrology, hydraulics and structural review of appurtenant structures. In addition, division engineers inspect over 1,200 dams on a yearly schedule to ensure they are performing and being maintained in a safe manner.

There are 696 high hazard dams in the State of California. The progress report below describes a subsection of those high hazard dams that are on the remediation list.

PROGRESS SUMMARY 6.G: REMEDIATION

Progress as of 2010: For the period 2007-2009, remediation needs were identified at 45 dams, of which 30 are high hazard. Remediation was completed at 77 dams, of which 51 are high hazard. The remediation included work to address remediation needs identified before 2007. As of July 2010, remediation was under way (i.e., identified or under construction) at 102 dams, of which 72 are high hazard.

OPPORTUNITIES FOR ENHANCED DAM FAILURE HAZARD MITIGATION

California Office of Emergency Services (OES) is required by state law to work with other state and federal agencies, dam owners and operators, floodplain managers, planners and public in making available dam inundation maps for the benefit of citizens interested in learning their dam failure inundation risk. Dam inundation maps can be useful in the preparation of Local Hazard Mitigation Plans and general plan safety elements updates. An opportunity for enhanced outreach to local governments and the public lies with inclusion of digital dam inundation mapping data on the *MyPlan* website under design by State OES. In the development of this plan, the *MyPlan* was accessed and the State OES Hazard Mitigation Section provided dam inundation disk. However, *MyPlan* does not include dam failure maps.

Unfortunately, the dam inundation maps provided were of poor quality and impossible to read.

RESULTS OF A DAM FAILURE

Levee and dam failures can result from a number of natural or human caused threats such as earthquakes, erosion of the face or foundation, improper sitting, rapidly rising flood waters, and structural/design flaws.

Extended damage may require governmental assistance which may continue for an extended period. Efforts would be required to remove debris and clear roadways, demolish unsafe structures, assist in reestablishing public services and utilities, and provide continuing care and welfare for the affected population including, as required, temporary housing for displaced persons.

B. THE ORANGE COUNTY DAM FAILURE THREAT

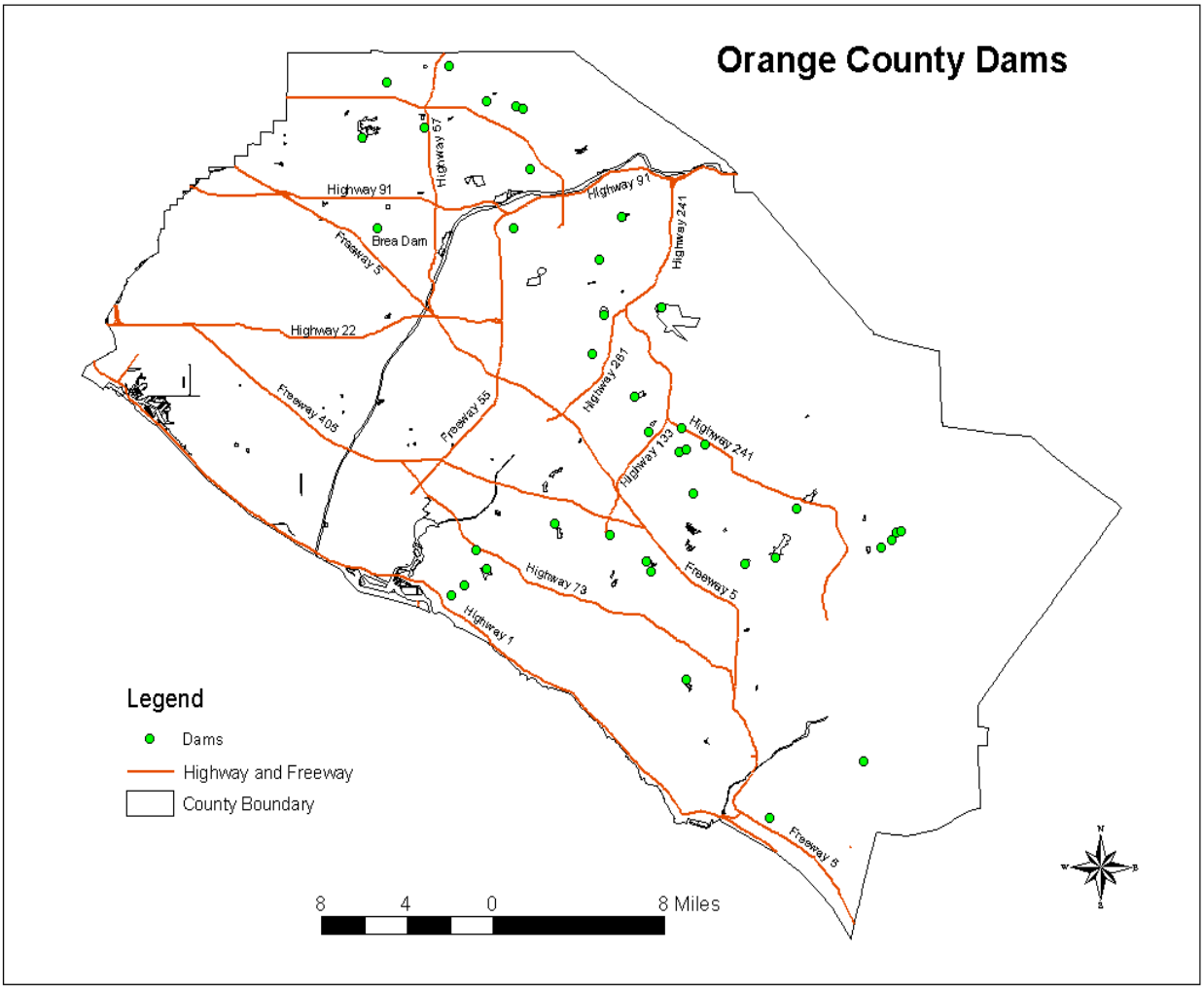
In Orange County, seismic activity can compromise the dam structures, resulting in catastrophic flooding. There are several earthquake faults located in close proximity to local dams and hundreds of thousands of individuals are in the inundation zones.

Per the Orange County Hazard Mitigation Plan, the dams in Orange County are also considered as potential terrorist targets. The weapon most likely to be used would be explosives with the goal of collapsing the dam. Such an event would result in a dam inundation event with little or no warning. The potential of using other types of weapons such as chemical or biological are considered low due to the large amount of material that would be required to contaminate dams used as reservoirs (drinking water).

There are a total of 32 dams in Orange County. The ownership ranges from the Federal government to Home Owners Associations. These dams hold billions of gallons of water in reservoirs. The major reservoirs are designed to protect Southern California from flood waters and to store domestic water. Their sizes range from 18 acre-feet to 196,235 acre-feet (Prado Dam) holding capacity. The following is a list of the larger reservoirs and dams in Orange County and their Owners/Operators:

Name of Facility	Owner
Santiago Reservoir (Irvine Lake)	Irvine Ranch Water District / Serrano Water District
Villa Park Dam	Orange County
Sulpher Creek Dam	Orange County
Peters Canyon Dam	Orange County
Walnut Canyon Reservoir	City of Anaheim
San Joaquin Reservoir	Irvine Ranch Water District
Sand Canyon Reservoir	Irvine Ranch Water District
Rattlesnake Canyon Reservoir	Irvine Ranch Water District
Big Canyon Reservoir	City of Newport
Lake Mission Viejo	Lake Mission Viejo Association
El Toro Reservoir	El Toro Water District
Orange County Reservoir (out of service)	Metropolitan Water District
Palisades Reservoir	South Coast Water District
Portola Reservoir	Santa Margarita Water District
Syphon Canyon Reservoir	The Irvine Company
Trabuco Dam	Trabuco Canyon Water District
Upper Oso Dam	Santa Margarita Water District
Brea Dam	U. S. Army Corps of Engineers
Fullerton Dam	U. S. Army Corps of Engineers
Carbon Canyon Dam	U. S. Army Corps of Engineers

FIGURE 1: ORANGE COUNTY DAMS



SANTIAGO DAM AND VILLA PARK DAM

Santiago Dam is an earth-fill structure with a 25,000 acre-feet capacity reservoir (Irvine Lake). The dam is jointly owned by the Irvine Ranch Water District and the Serrano Water District. Villa Park Dam is a flood control dam located downstream from Santiago Dam. It is an earth-fill structure with a capacity of 15,600 acre-feet and is owned by the Orange County Flood Control District.

Initial alerting is expected from Dam Keepers who are on duty at both Santiago Dam and Villa Park Dam

RATTLESNAKE DAM

Rattlesnake Dam is an earth-filled structure with a storage capacity of about 1,700 acre-feet with a surface area of approximately 46 acres. The reservoir is owned by the Irvine Ranch Water District and is presently being used for the storage of pressure pipe treated sewage effluent which in turn is used for irrigation.

Alerting is provided by Operations personnel at the Irvine Ranch Water District who will notify the Sheriff's Department Control One of dam failure or possible dam failure

WALNUT CANYON RESERVOIR

Walnut Canyon Reservoir is an earth-filled asphalt lined structure owned by the City of Anaheim and is operated by the Anaheim Water Department. The Olive Hills reservoir has a storage capacity of about 197 acre-feet with a surface area of approximately 555 sq. feet. The reservoir presently is used for the storage of potable water for use by residents of the City of Anaheim.

Alerting comes from Operations personnel at the Olive Hills Reservoir who will make the initial call to Anaheim authorities who, in turn, would contact Sheriff's Department Control One.

EL TORO RESERVOIR

El Toro Reservoir is an earth-filled structure owned by the El Toro Water District. The impounded reservoir has a storage capacity of about 722 acre-feet with a surface area of approximately 20.6 acres. The reservoir is presently being used as a seasonal and operational storage site for the El Toro Water District's imported Colorado River Water.

Alerting comes from Operations personnel at the El Toro Water District who will notify the Sheriff's Department Control One of dam failure or possible dam failure.

SAN JOAQUIN RESERVOIR

San Joaquin Reservoir is an earth-filled structure and is owned and operated by the Irvine Ranch Water District. The reservoir has a storage capacity of about 3,000 acre-feet with a surface area of about 54 acres. San Joaquin Reservoir is a recycled-water supply reservoir.

Alerting comes from Operations personnel from the Metropolitan Water District who will notify the Irvine Ranch Water District who, in turn, will notify the Sheriff's Department Control One of dam failure or possible dam failure.

SULPHER CREEK DAM

Sulpher Creek Dam is an earth-filled structure owned by Orange County. It has a capacity of 382 acre-feet and maintained at a water surface elevation of 189 feet above MSL.

Alerting comes from the Park Ranger on duty who will notify Sheriff's Department Control One of dam failure or possible dam failure.

PETERS CANYON DAM

Peters Canyon Dam is an earth-filled structure owned by Orange County and has a capacity of 626 acre-feet at the spillway pipe elevation of 537 feet MSL. Water stored varies from 200 acre-feet to 600 acre-feet depending on seasonal rain amounts.

Alerting would come primarily from the Park Ranger at Peters Canyon Regional Park who would notify the Sheriff Department, Control One of dam failure or possible dam failure.

Dams outside Orange County that may impact Orange County include:

DIAMOND VALLEY LAKE/RIVERSIDE COUNTY

This lake is in Riverside County. It is owned by the Metropolitan Water District in Riverside and a major source of water for Southern California. Diamond Valley Lake is a man-made off stream reservoir located near Hemet, California. It is one of the largest reservoirs in Southern California and also one of the newest. With a capacity of 800,000 acre feet (990,000,000 m3) (four times that of Prado Dam), the lake nearly doubled the area's surface water storage capacity and provides additional water supplies for drought, peak summer, and emergency needs. The Metropolitan Water District of Southern California began the $1.9 billion construction project in 1995. Filling of the lake, by way of the Colorado River Aqueduct, began in 1999 and was completed in 2003. The lake is currently served by the Inland Feeder. The lake features three earth fill dams, two located on either side of the valley and one on the north rim.



SEVEN OAKS DAM/SAN BERNARDINO COUNTY

Seven Oaks Dam is one of the largest earth and rock filled dams in the world. It is as high as a fifty story building and ten football fields in length from side to side. Situated between the north and south branches of the San Andreas Fault, the dam has been designed to withstand an earthquake of eight plus on the Richter scale. Seven Oaks Dam is a zoned earth and rock fill dam with a maximum height of 550 feet above the existing streambed at the dam axis and 650 feet above the lowest foundation bedrock contact. The dam crest is 40 feet wide, 2,760 feet long and has a minimum crest elevation of 2610 feet NGVD.

Installation of the Seven Oaks Dam in San Bernardino County has lessened the impact of a Prado Dam failure.

PRADO DAM/RIVERSIDE COUNTY

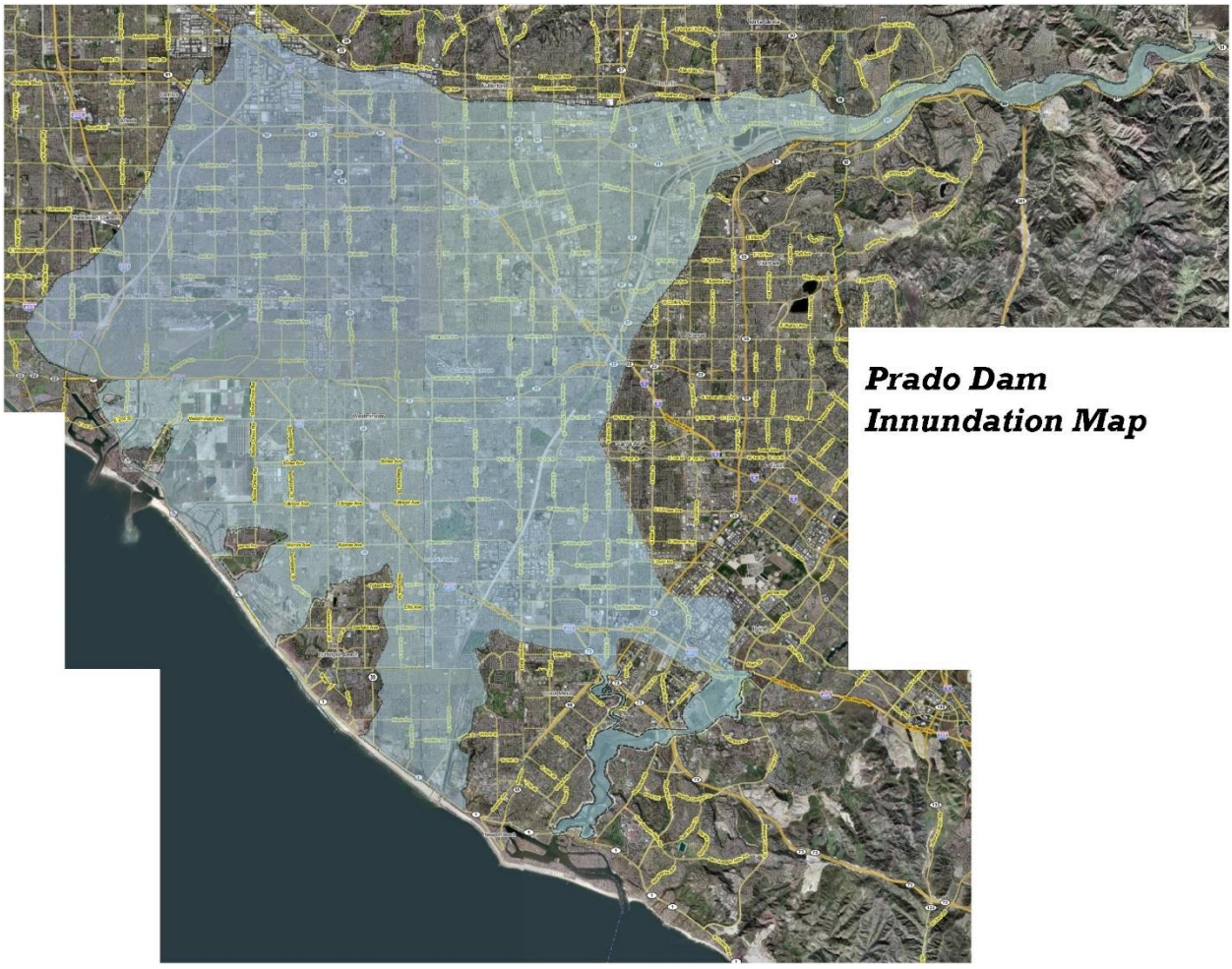
Prado Dam is owned and operated by the Los Angeles District, Corps of Engineers, and was constructed for the primary purpose of providing protection from floods for the metropolitan areas in Orange County.

In the event that downstream interests need to be alerted, the Corps of Engineers will contact the following:

Orange County Sheriff's Department Control One
Riverside County Office of Emergency Services
California Emergency Management Agency, Sacramento

Once contacted, the above agencies will notify all pertinent Federal, state, county and local agencies through the state's National Warning System hookup (fan out communication system). RSCCD will be notified by the Orange County Sheriff's Department Control One, the warning point for Orange County.

FIGURE 2: ORANGE COUNTY PRADO DAM MAP



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 Orange County. There are 10 major dams or reservoirs in Orange County some of which hold millions of gallons of water. Because dam failure can have severe consequences, FEMA and the California Emergency Management Agency require all dam owners develop Emergency Action Plans for warning, evacuation, and post-flood actions. Although there may be coordination with county officials in the development of the Emergency Action Plans, the responsibility for developing potential flood inundation maps and facilitation of emergency response is the responsibility of the dam owner.

For more detailed information regarding dam failure flooding, and potential flood inundation zones for a particular dam in the county, refer to the Orange County, Operational Area Emergency Action Plan as well as the Cities of Orange and Santa Ana Emergency Operations Plans.

ORANGE COUNTY HISTORICAL FAILURE FLOODING

WESTMINSTER WATER TANK FAILURE



This 31-year-old storage tank ruptured in Westminster, California, sending a 6-foot wave of water through the city that damaged or destroyed about 50 buildings and over a dozen vehicles. Storage tanks should be replaced or periodically rehabilitated to preserve their structural integrity.

In September of 1998, a smaller version of a municipal water storage unit in the City of Westminster failed, collapsing about 12 feet of the 100,000 gallon tank. The flow of water from the tank destroyed most of the facility as well as several private residents. Luckily, the home that was hit hardest was not occupied at the time. Additionally, there were approximately 30 more homes inundated with water and silt. An Orange County Fire Authority fire station was located within 100 feet of the water tank. The large quantity of water and its tremendous force from the dam swept the firefighters away and through the fire station. Through the Public Works Mutual Aid Agreement, the Orange County Public Works Department assisted in the cleanup and temporary repair of the streets.

BREA DAM OVERTOPPING

On February 22, 2005, the Brea Dam failed following a large rain storm. An extended period of very wet weather dumped more than 6.8 inches at the Fullerton Airport. The dam was overtopped, flooding the Fullerton Golf Course and Bastanchury Road. The road remained closed for a day, while the golf course was closed for several days. The golf course sustained damage as did a storm channel that was eroded as a result of the flooding.

PRADO DAM SEEPAGE

In January 2005, due to preceding storm activity which produced near record water levels behind Prado Dam, the reservoir water surface elevation behind the dam peaked at 527.4 feet above sea level on January 11, 2005. On January 13, the U.S. Army Corps of Engineers discovered minor seepage on the downstream face of Prado Dam, the seepage was located in an area that was under construction to build new outlet works as part of the overall flood control improvement to Prado Dam. As a precautionary measure Corona city officials evacuated over 800 homes below the dam and Orange County officials relocated campers in the Canyon RV Park because of their proximity to the adjacent floodplain.

To decrease the amount of water behind Prado dam the release of water was increased from 5,000 cubic feet per second (cfs) to 10,000 cfs to reduce the level of water being held to 505 feet. In addition to the increase in water release, the U.S. Army Corps began holding back floodwaters upstream at both the San Antonio Dam in Los Angeles County and Seven Oaks Dam near Redlands to reduce the inflow of water to Prado Dam. As the water level was lowered the hydraulic pressure on the dam abutment subject to seepage was reduced. When the water was reduced to 505 feet (25,750 acre feet of water) on Monday, January 17, 2005 the USACE was able to start the reconditioning of the cofferdam in order to be ready for subsequent flood inflows to the dam.

LOS ANGELES HISTORIC DAM FAILURES

The RSCCD is in northern Orange County and must pay attention to both Orange County and Los Angeles County dam failures. Since dam failures are rare, reviewing these incidents can help us understand the consequences of a dam failures.

ST. FRANCIS DAM

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. 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. Because Los Angeles County is adjacent to Orange County, the tales of this incident have been passed down by several Orange County generations.

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. Sixty-five 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.

BALDWIN HILLS DAM

The Baldwin Hills dam failed during the daylight hours, and was one of the first disaster events documented by a live helicopter broadcast. The telecast of the collapse from a KTLA-TV helicopter is considered the precursor to airborne news coverage that is now routine everywhere.

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 December 14, 1963. Five people were killed. Sixty-five hillside houses were ripped apart, and 210 homes and apartments were damaged. The flood swept northward in a V-shaped path roughly bounded by La Brea Avenue and Jefferson and La Cienega Boulevards.

The earthen dam that created a 19-acre reservoir to supply drinking water for West Los Angeles residents ruptured at 3:38 PM. 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. 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 water storage systems. It prompted a tightening of Division of Safety of Dams control over reservoirs throughout the state.

C. THE RSCCD DAM FAILURE THREAT

The main dam threat to the RSCCD is Prado Dam while three other dams/reservoirs could impact one or more RSCCD facility if they were to fail while at near capacity. North Orange County has two major drainage courses with potential for significant flooding: Santiago Creek and the Santa Ana River.

LIST OF DAMS AND RESERVOIRS THAT MAY THREATEN RSCCD INCLUDE:

1. Villa Park Dam
2. Santiago Dam
3. Peters Canyon Dam
4. Olive Hill Reservoir
5. Prado Dam

Two small dams are present along Santiago Creek: Villa Park Dam and Santiago Dam (Irvine Lake). Both are located in the foothills section of East Orange. Peters Canyon Dam is located along Peters Canyon about two miles west of Irvine Lake. Like Santiago Creek, which flows generally northwest, Peters Canyon drains in a similar direction, along Handy Creek and ultimately into Santiago Creek. The areas below (downstream from) the dams are areas of potential flood hazard in case of dam failure, which presumably could result from a major earthquake.

The areas below the dams are also zoned for flood hazard on the FEMA maps, and the areas of potential flooding are similar in width to other areas along Santiago Creek and Peters Canyon. Should one of these facilities fail, properties along Santiago Creek and a large section of Old Towne in Orange could be flooded. Flood flows would move at rates which would allow persons to be evacuated, but significant property damage could result. However, as is the case for Prado Dam, these facilities are maintained and safety inspected to ensure that risks are minimized. The City of Orange will minimize flood-related risks and hazards in the event of dam or reservoir failure, protecting residences and businesses by encouraging the County's Flood Control District to continue proper inspection of storm drains, ensure maintenance of the flood control facilities, and prevent earthquake damage. The City of Orange will also monitor water storage facilities to determine potential inundation hazards to surrounding properties. (City of Orange Safety Element.)

RSCCD PREVIOUS DAM FAILURE OCCURRENCES

The RSCCD has never had an occurrence of a dam failure that impacted any of its seven sites.

VILLA PARK DAM

Villa Park Dam is an embankment dam on Santiago Creek in Orange, California. Along with the upstream Santiago Dam, the dam serves primarily for flood control for the cities of Villa Park, Orange, Tustin and Santa Ana and also regulates the inflow of Santiago Creek into the Santa Ana River. RSCCD facilities are located in the cities of Orange, Santa Ana and Tustin and along the Santa Ana River.

Villa Park Reservoir, at an elevation of 581 feet, was an earthen reservoir located upstream from the RSCCD on the Santiago Creek, was created for flood control purposes for water flow from Irvine Lake. Santiago Reservoir, at an elevation of 804 feet, creates Irvine Lake and functions as a reservoir for the area. It was an earthen reservoir that was started in 1933.

Construction was completed in 1963, and the dam is owned by the County of Orange. Standing 118 feet (36 m) high, the dam forms a reservoir with a maximum capacity of 15,600 acre feet (19,200,000 m3), controlling runoff from a catchment area of 83.9 square miles (217 km2). Due to flood control requirements, the reservoir is typically at a very low level or empty during the dry season.

During years with heavy precipitation, release gates in Santiago Reservoir can be operated to prevent water from overflowing the face of the dam. Villa Park Reservoir then meters these heavy flows to prevent flooding of low lying areas downstream. Normally there is no water behind Villa Park Reservoir. These facilities are maintained and safety-inspected to ensure their integrity and that risks are minimized.

Dam History
As noted by Carl Nelson, P.E. on the 50th anniversary of the Villa Park Dam:
The Santa Ana Mountains of Orange County constitute a northwesterly extension of the Peninsular Range of Southern California trending southeasterly from the Chino Hills in Orange County to northern San Diego County. Santiago (5,687 ft.), Modjeska (5,496 ft.) and Pleasants (4,007 ft.) peaks form the ridgeline between Orange and Riverside Counties and drain westerly to Santiago Canyon, there melding with the alluvial plain of the Santa Ana River. The watershed of Santiago Creek runs westerly from Santiago Peak through the Trabuco District of the Cleveland National Forest before crossing the northerly portion of Irvine Ranch. Principal tributaries are Silverado, Black Star, Limestone and Fremont Canyons.

Long-term records kept by Orange County Flood Control District at Santiago Peak, indicate an average annual rainfall of 34 inches. In contrast, the driest year recorded at the peak was 2006-07 with a total of 8 inches, and 1997-98, the wettest total was 105 inches. Over the lower elevations of the valley, annual rainfall averages about 13 inches. Important to agriculturists, the median annual rainfall (half the years are lower and half the years higher) is only 11.85 inches.



Early settlers found water for domestic purposes only in spring-fed streams at the mouths of canyons; for instance, the narrows of Santiago Creek at Villa Park. The Carpenter and Serrano Irrigation districts, established around 1878,

constructed a clay barrier across the shallow alluvium of the creekbed, acquired riparian rights, and developed an irrigation system for orchards along the banks of lower Santiago Creek easterly of the City of Orange.

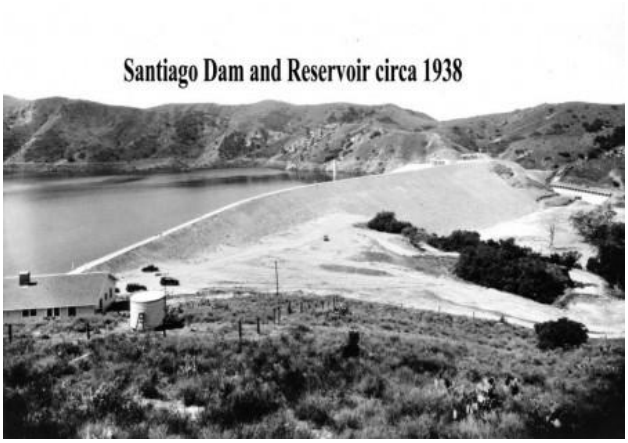
Early occupants of the floodplain lands bordering the creek would be deceived by long periods of drought between damaging floods. By the late 19th century rural and urban encroachments within the new cities of Orange and Santa Ana would be overwhelmed when the wide, sandy bed of Santiago Creek would become a raging torrent for a day or two following torrential rainstorms. The flood threat would be partially improved with the development of Santiago Dam and Reservoir upstream from the original Orange County Park.

During the 1920s James Irvine II and the Carpenter and Serrano water interests resolved a water rights dispute with a cooperative agreement to construct Santiago Dam and Reservoir for conservation of flood water. Conserved water would be shared equally, and Irvine's share would be diverted to irrigation of the Irvine's land on the Tustin Plain.



Villa Park Dam 1916

When a water supply reservoir is filled before the advent of a large flood, the emergency spillway safely passes the excess flood waters, but with only a small reduction of the peak flow. The cities of Orange and Santa Ana experienced damaging floods even after construction of the Santiago Dam and water supply reservoir (better known as Irvine Lake). A federal flood control program in1936 had authorized a flood control dam on Santiago Creek at the Villa Park narrows; however after two decades without federal appropriations, funding for the dam was included in Orange County Flood Control District's successful 1956 bond election.

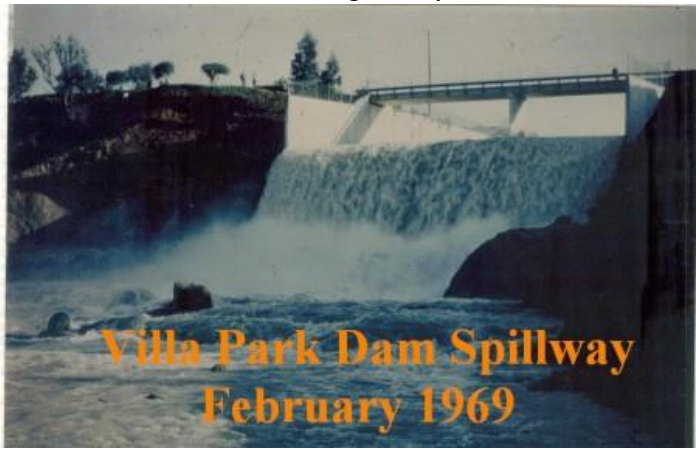


Construction of the dam was completed in 1963. Sequential floods during January and February of 1969 filled both Santiago and Villa Park dams to capacity as actual runoff volumes exceeded design estimates for the theoretical 100 year storm.

Whereas the dam had been designed for a gated discharge of 3,500 cubic feet per second for the 100 year storm, uncontrolled spillway discharge had peaked at 4,500 CFS in February 1969. For several days after the February storm residual flow from the dam damaged several highway bridges and commercial gravel pit operations. In locations where little or no bank protection existed, residential properties experienced severe damages from lateral erosion.



In view of the 1969 damages experienced in Villa Park, Orange and Santa Ana, the Corps of engineers consented to inclusion of lower Santiago Creek improvements within the Congressional legislation that authorized Santa Ana River Mainstem project.



Construction anticipated upon completion of Prado Dam enlargement by the Corps of Engineers provided increased flood storage, outlet gates at Prospect Street and downstream protection for storm runoff exceeding the 100 year Villa Park Dam design.



Villa Park Dam 1969

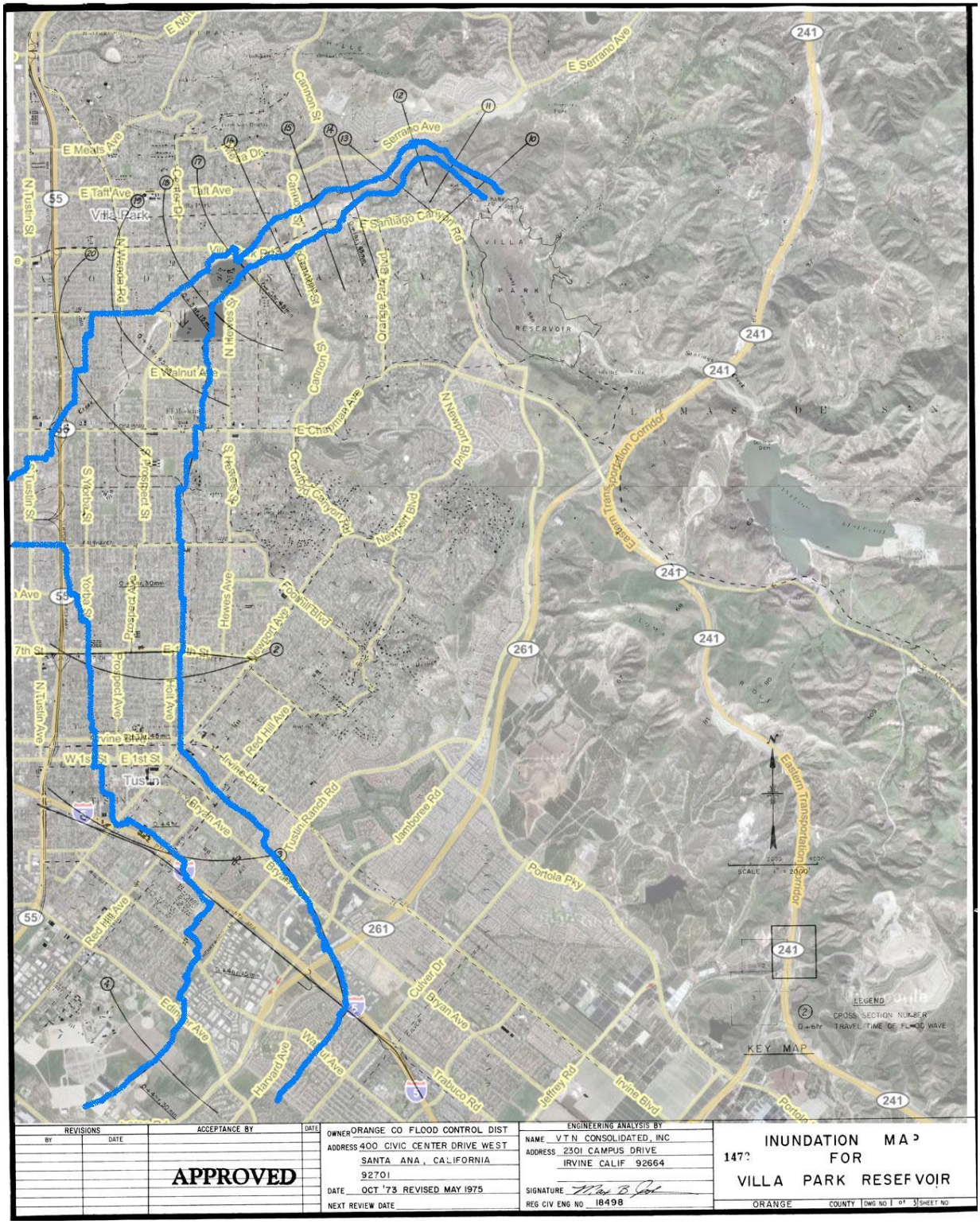
TABLE 1: VILLA PARK DAM AND RESERVOIR WATER MOVEMENT TIMETABLE

Location	Arrival Time	Distance from Dam	Peak Elevation	Time of Peak Elevation	Avg. Over Bank Depth
Santiago Canyon & Orange Park Blvd	1 hours 45 min				
Villa Park Rd & Hewes	2 hours 45 min				
North of Collins & Prospect	3 hours 15 min				
South of Collins & Prospect	3 hours 45 min				
Santa Ana River Channel Fork:					
55 Freeway & Chapman	4 hours 30 min				
22 Freeway & Cambridge	5 hours				
22 Freeway & Main Street	5 hours 30 min				
17th & Bristol	6 hours 15 min				
1st Street	6 hours 30 min				
Between Edinger & Warner	7 hours				
MacArthur	7hours 15 min				
Sunflower	7 hours 45 min				
Gisler	8 hours 15 min				
Just north of Adams	8 hours 45 min				
Victoria	9 hours 15 min				
San Diego Creek Channel Fork:					
Newport Ave & Bryan Ave	4 hours				
261 Toll Road & Edinger	4 hours 15 min				
Old Tustin USMC base	4 hours 30 min				
Red Hill & Alton Pkwy	5hours				
405 Freeway	5 hours 15 min				
South of Campus Drive	5 hours 30 min				
73 Toll Road	5 hours 15 min				
East side of Irvine Ave & Santa Isabel	6 hours 15 min				

**above reference points are the closest approximate main street along plotted timeline of RDMD inundation maps

NAVD = North American Vertical Datum (NAVD). In this report "sea level" refers to the National Geodetic Vertical Datum of 1929 (NGVD of 1929)--a geodetic datum derived from a general adjustment of the first-order level nets of both the United States and Canada, formerly called Sea Level Datum of 1929 it will differ to actual sea level by 71 cm or 2.3 feet. The acronym has been adopted by FEMA FIS and FIRM maps to NAVD.

FIGURE 3: VILLA PARK DAM OVERLAY 1



Map provided by the County of Orange

FIGURE 4: VILLA PARK DAM OVERLAY 2

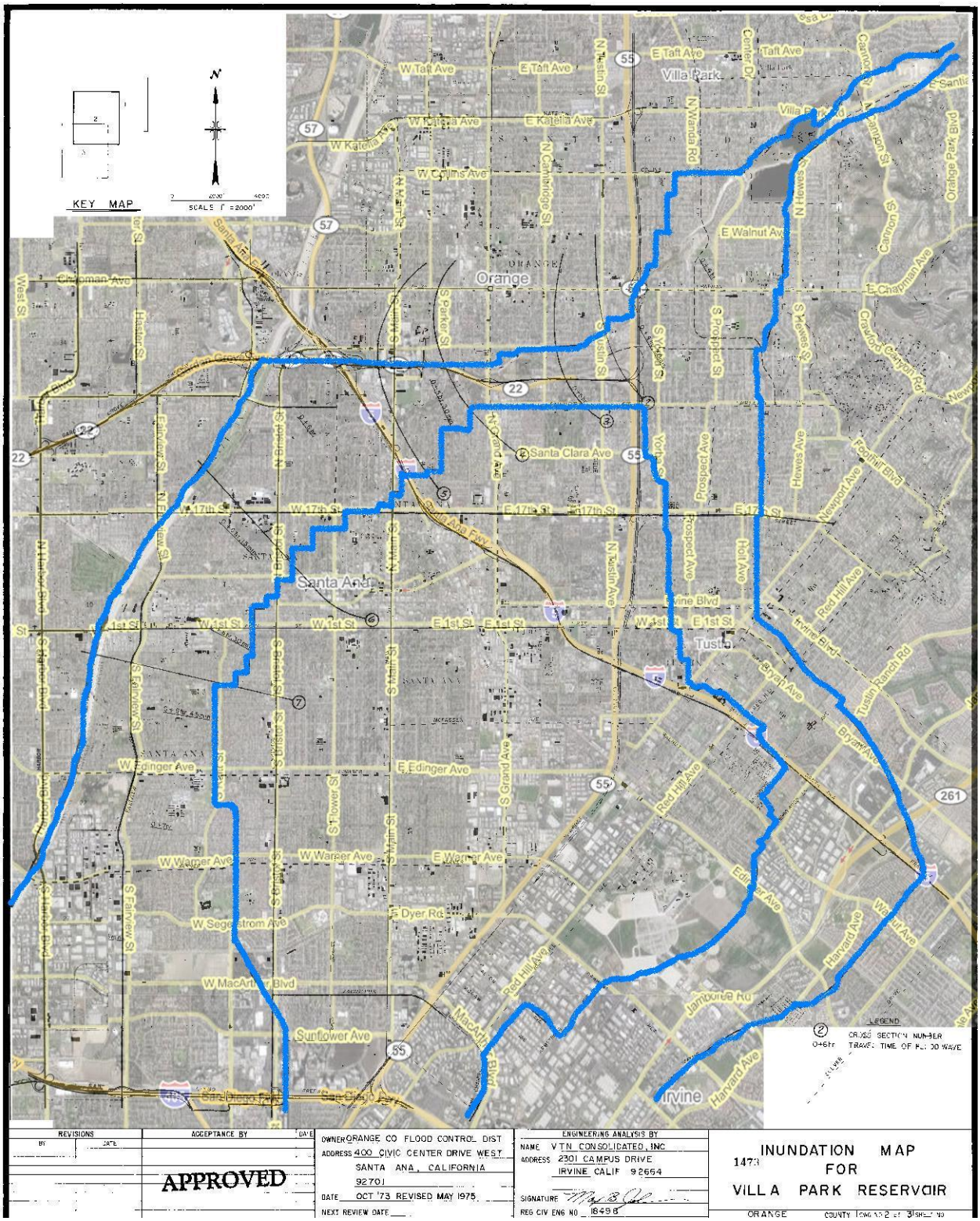


FIGURE 5: VILLA PARK DAM OVERLAY 3



Maps provided by County of Orange. These maps are such poor quality that is impossible to tell which RSCCD facilities are in which dam inundation zones

FIGURE 6: RSCCD SITE IMPACT AS A RESULT OF A VILLA PARK DAM AND RESERVOIR FAILURE

Item	District Location	Address	Elevation Feet Above Sea Level	In Dam Inundation Zone
1	District Operations Center	2323 North Broadway, Santa Ana 92706	147 feet	Yes 5 Hours 30 Minutes
2	Santa Ana College (SAC)	1530 West 17th Street, Santa Ana 92706	106 feet	Yes 6 Hours 15 Minutes
3	Santiago Canyon College (SCC)	8045 East Chapman Avenue, Orange 92869	557 feet	No
4	Centennial Education Center (CEC)	2900 West Edinger Avenue, Santa Ana 92704	91 feet	Yes 7 Hours
5	Orange Education Center (OEC)	1465 North Batavia Street, Orange 92867	176 feet	No
7	Orange County Sheriff's Regional Training Academy (OCSRTA)	115991 Armstrong Avenue, Tustin 92782	57 feet	Border
8	Digital Media Center (DMC)	1300 South Bristol Street, Santa Ana 92704	71 feet	No

Note: Site 6 is the Regional Fire Training Center; land not owned by RSCCD; lease terminated May 2015

SANTIAGO DAM

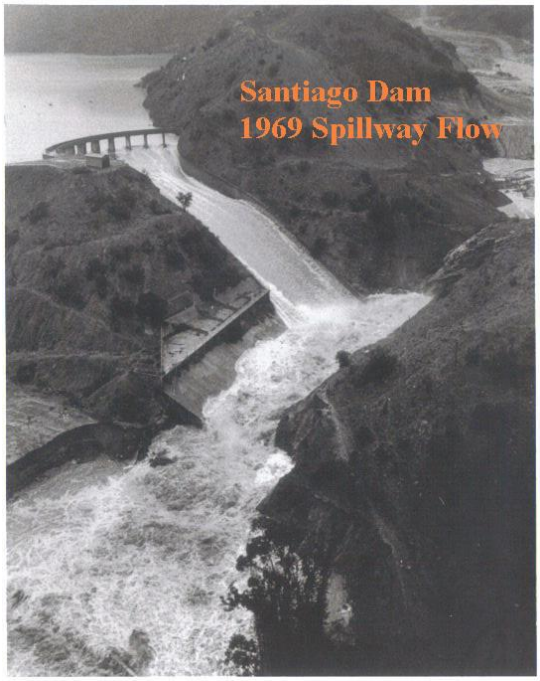
Santiago Dam is an earth-fill structure with a 25,000 acre-feet capacity reservoir (Irvine Lake). The dam is jointly owned by the Irvine Ranch Water District and the Serrano Water District. Villa Park Dam is a flood control dam located downstream from Santiago Dam. It is an earth-fill structure with a capacity of 15,600 acre-feet and is owned by the Orange County Flood Control District.



The Register

History

Construction on the dam started in 1929 with a joint venture by the Irvine Company and Serrano Irrigation District. After the site was graded, the dam was built using dirt and rock excavated from the sides of the canyon and from the streambed both above and below the dam site. The structure was completed in 1931 at a cost of $1 million and its reservoir, Irvine Lake, filled by 1933. In the late 1930s, the lake was stocked with fish, and was opened to the public for recreational use in 1941.



The dam was built to serve the purpose of flood control, irrigation and municipal water use. With heavy suburban sprawl downstream encroaching since the 1960s, agriculture along the lower Santiago Creek has practically ceased. It is currently owned by the Irvine Ranch Water District and the Serrano Water District. Today the dam marks the usual ending point of surface flow in Santiago Creek, as all the discharge is retained in the reservoir and downstream flow is limited to seepage and stormwater.

Statistics

The Santiago Dam is a roller compacted earth and rockfill structure 136 feet (41 m) high and 1,425 feet (434 m) long. It is roughly 760 feet (230 m) wide at the base and contains some 790,000 cubic yards (600,000 m3) of material. The dam's spillway is a concrete overflow structure to the left side, equipped with nine openings each 15 feet (4.6 m) wide and 28 feet (8.5 m) high, able to pass a flow exceeding 30,000 cubic feet per second (850 m3/s). This spillway has only been used a few times, such as the floods of 1938, 1969, 1983, 1998 and 2005. The dam crest is 804 feet (245 m) above sea level.

Irvine Lake is the reservoir formed behind the dam, and has a normal storage of 25,000 acre feet (31,000,000 m3) at 791 feet (241 m) elevation. Maximum storage is 28,000 acre feet

(35,000,000 m3) in the event of a flood. This reservoir is not only the largest man-made lake in Orange County, but is also the largest body of fresh water entirely in the county. The lake covers about 700 acres and is stocked with several species of fish.

The dam and reservoir receive water from a catchment area totaling 64 square miles (170 km2), controlling water from about two-thirds of the Santiago Creek watershed. Santiago Dam is designed to contain up to a 50-year flood and withstand a 500-year flood of over 30,000 cubic feet per second (850 m3/s). Aside from Santiago Creek, Limestone Wash and various unnamed streams flow into the reservoir. Upstream tributaries of Santiago Creek include Silverado and Modjeska Creeks. The dam operates in conjunction with the downstream Villa Park Dam, which can store up to 15,600 acre feet (19,200,000 m3).

Santiago Dam	
 Santiago Dam, viewed from the eastern end of the lake	
Location	Orange County, California
Coordinates	33°47'10"N 117°43'31"W33.78611°N 117.72528°WCoordinates: 33°47'10"N 117°43'31"W33.78611°N 117.72528°W[1]
Construction began	1929 (Irvine Company, Serrano Irrigation District) Opened in 1931
Owner(s)	Serrano Water District/Irvine Ranch Water District
Dam and spillways	
Type of dam	Roller-compacted earth and rock fill
Impounds	Santiago Creek
Height	136 ft (41 m)
Length	1,425 ft (434 m)(
Width (crest)	29 ft (8.8 m)
Width (base)	760 ft (230 m)
Dam volume	790,000 cu yd (600,000 m^3)
Spillway type	Uncontrolled concrete overflow
Spillway capacity	31,700 cu ft/s (900 m^3/s)

Reservoir	
Creates	Irvine Lake
Total capacity	38,800 acre·ft (47,900,000 m^3) (max) 25,000 acre·ft (31,000,000 m^3) (conservation)
Catchment area	64 square mi (170 km^2)
Surface area	700 acres (280 ha)
Power station	
Hydraulic head	120 ft (37 m)

TABLE 2: SANTIAGO DAM & RESERVOIR WATER MOVEMENT TIMELINE

Location	Arrival Time	Distance from Dam	Peak Elevation	Time of Peak Elevation	Avg. Over Bank Depth
Santiago Canyon & Orange Park Blvd	4 hours 15 min				
Villa Park Rd & Hewes	4 hours 45 min				
North of Collins & Prospect	5 hours 15 min				
South of Collins & Prospect	5 hours 45 min				
55 Freeway & 17th street	6 hours				
Santa Ana River Channel Fork:					
22 Freeway & Cambridge	6 hours 30 min				
22 Freeway & Main Street	7 hours				
17th & Bristol	7 hours 30 min				
1st Street	8 hours				
Between Edinger & Warner	9 hours				
MacArthur	10 hours				
Sunflower	10 hours 30 min				
Gisler	12 hours				
Just north of Adams	12 hours 30 min				
Victoria	13 hours				
San Diego Creek Channel Fork:					
Newport Ave & Bryan Ave	6 hours 15 min				
261 Toll Road & Edinger	6 hours 45 min				
Old Tustin USMC base	7 hours				
Red Hill & Alton Pkwy	7 hours 15 min				
405 Freeway	7 hours 45 min				
South of Campus Drive	8 hours				
73 Toll Road	8 hours 15 min				
East side of Irvine Ave & Santa Isabel	8 hours 45 min				

**above reference points are the closest approximate main street along plotted timeline of RDMD inundation maps

NAVD = North American Vertical Datum (NAVD). In this report "sea level" refers to the National Geodetic Vertical Datum of 1929 (NGVD of 1929)--a geodetic datum derived from a general adjustment of the first-order level nets of both the United States and Canada, formerly called Sea Level Datum of 1929 it will differ to actual sea level by 71 cm or 2.3 feet. The acronym has been adopted by FEMA FIS and FIRM maps to NAVD.

FIGURE 7: SANTIAGO DAM OVERLAY 1

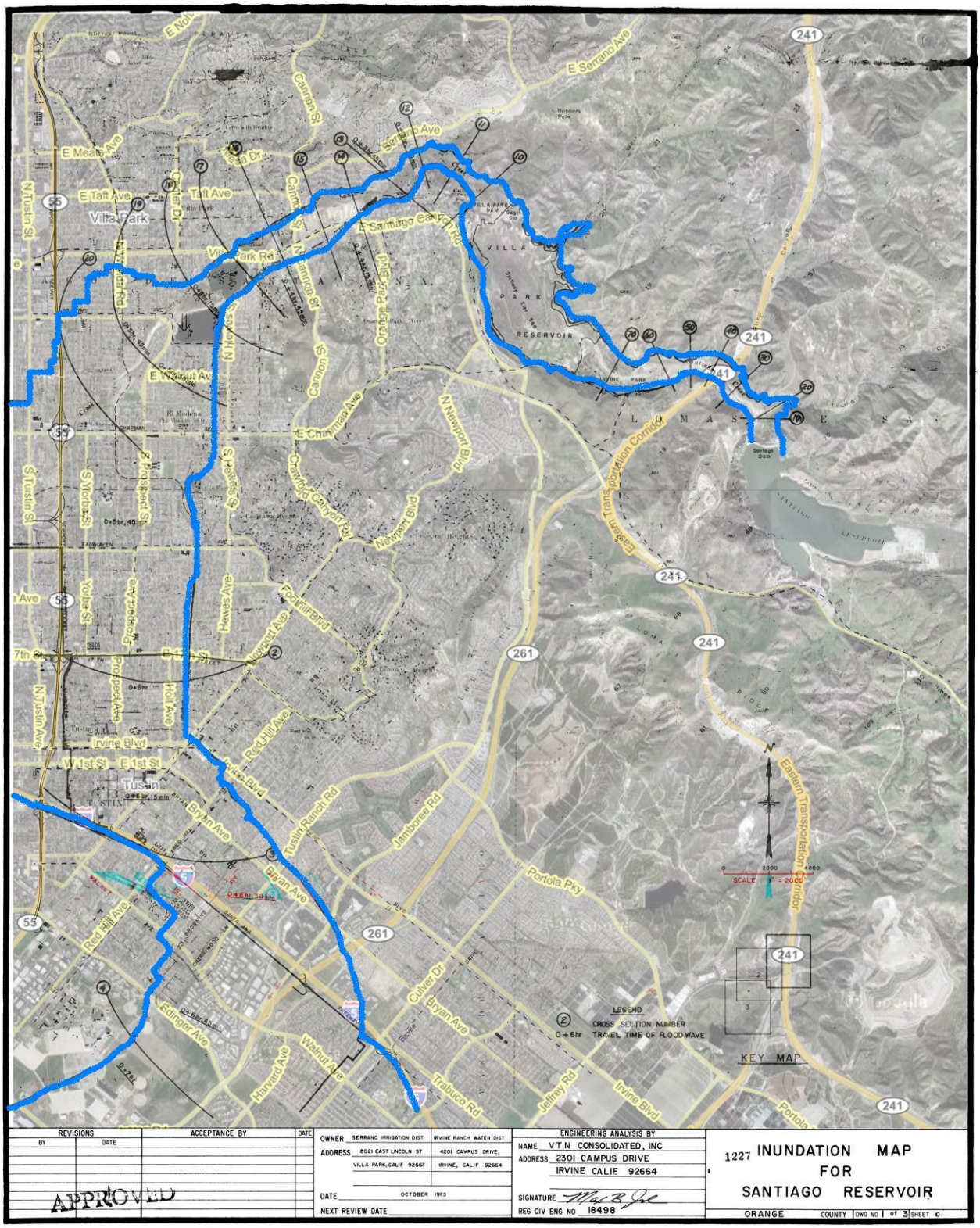


FIGURE 8: SANTIAGO DAM OVERLAY 2

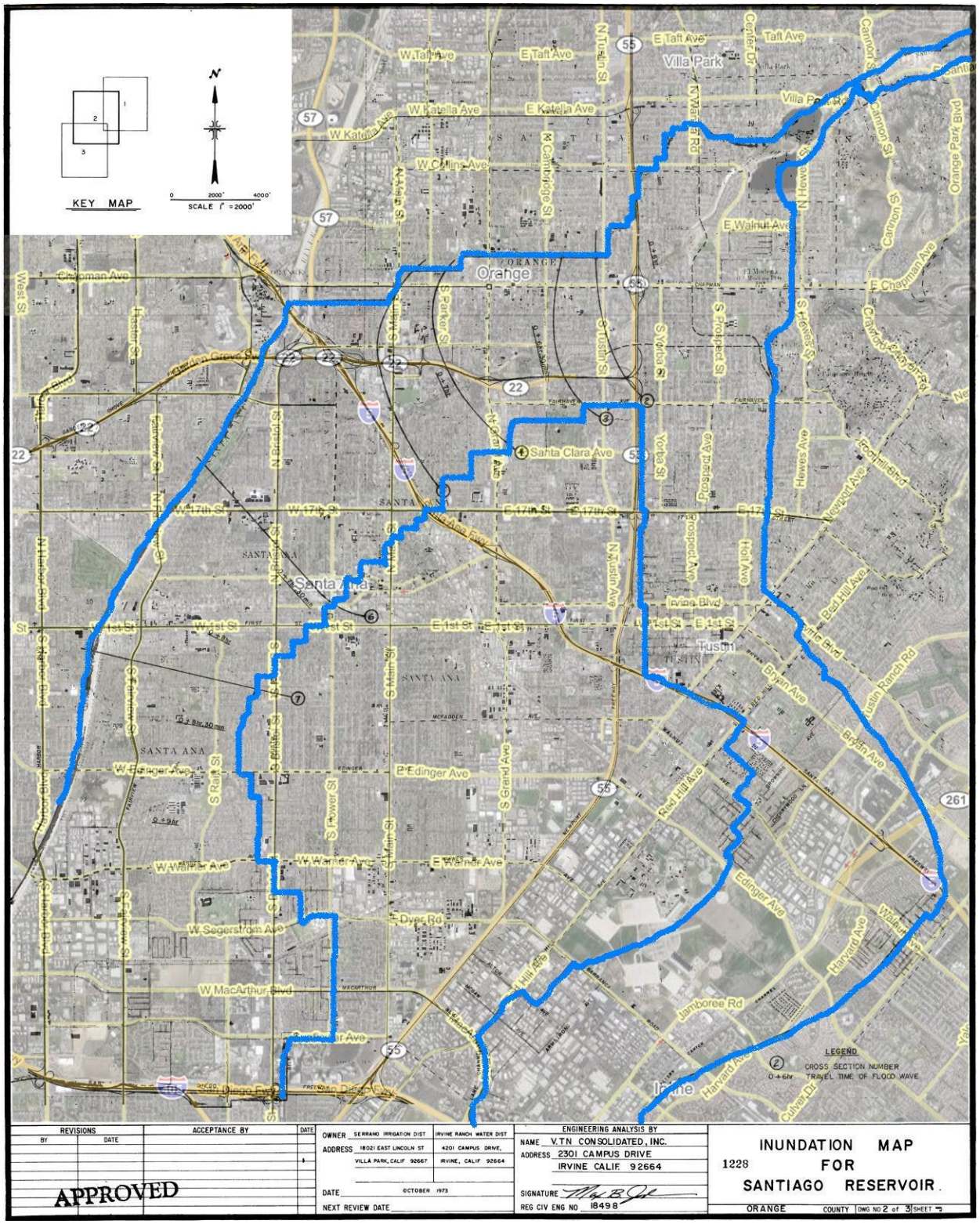


FIGURE 9: SANTIAGO DAM OVERLAY 3



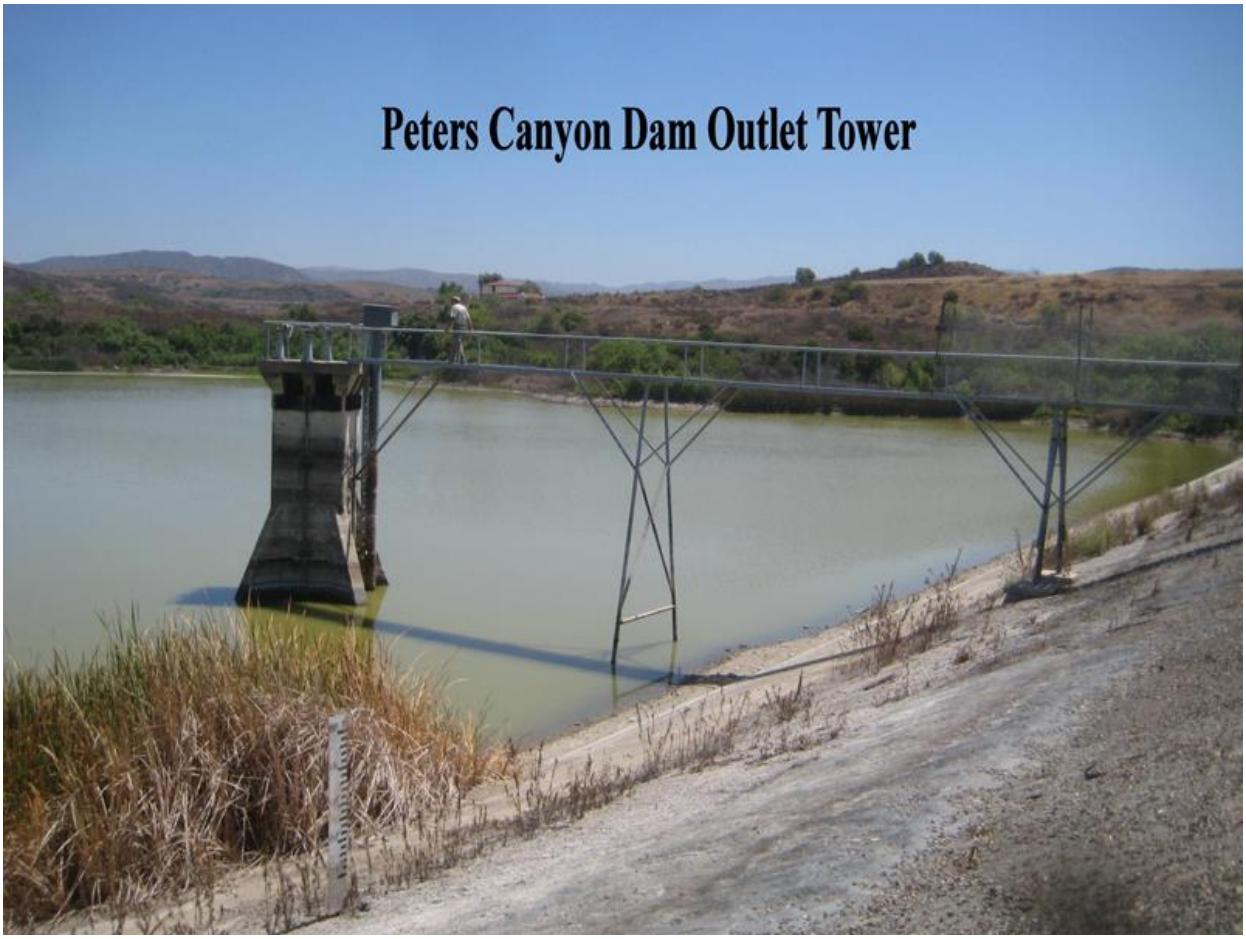
Maps provided by County of Orange.

FIGURE 10: RSCCD SITE IMPACT AS A RESULT OF A SANTIAGO DAM AND RESERVOIR FAILURE

Item	District Location	Address	Elevation Feet Above Sea Level	In Dam Inundation Zone
1	District Operations Center	2323 North Broadway, Santa Ana 92706	147 feet	Yes 7 Hours
2	Santa Ana College (SAC)	1530 West 17th Street, Santa Ana 92706	106 feet	Yes 7 Hours 30 Minutes
3	Santiago Canyon College (SCC)	8045 East Chapman Avenue, Orange 92869	557 feet	No
4	Centennial Education Center (CEC)	2900 West Edinger Avenue, Santa Ana 92704	91 feet	Yes 9 Hours
5	Orange Education Center (OEC)	1465 North Batavia Street, Orange 92867	176 feet	No
7	Orange County Sheriff's Regional Training Academy (OCSRTA)	115991 Armstrong Avenue, Tustin 92782	57 feet	Border 6 Hours
8	Digital Media Center (DMC)	1300 South Bristol Street, Santa Ana 92704	71 feet	Border 9 Hours

Note: Site 6 is the Regional Fire Training Center; land not owned by RSCCD; lease terminated May 2015

PETERS CANYON DAM



Peters Canyon Dam is located approximately 3 miles westerly of Santiago Dam, near the upper part of the Peters Canyon watershed. Irvine constructed an earth-fill dam, 50 foot high with 700 acre-feet of capacity. Its purpose is to regulate the draft from Santiago Dam (Irvine Lake) to lower reservoirs. Distribution to southerly Irvine Ranch was via underground pipeline for one mile to the "High Line Canal. The open channel then carried the flow by gravity several miles easterly across the ranch.

The County of Orange did not develop a Timetable for this dam due to its limited impact per Vicki Osborn, County of Orange Emergency Management Bureau October 2015.

Maps were reviewed by the Risk Manager and the Plan Writer and it was determined that no RSCCD sites would be impacted by a Peters Canyon Dam failure.

FIGURE 11: RSCCD SITE IMPACT AS A RESULT OF A PETERS CANYON DAM FAILURE

Item	District Location	Address	Elevation Feet Above Sea Level	In Dam Inundation Zone
1	District Operations Center	2323 North Broadway, Santa Ana 92706	147 feet	No
2	Santa Ana College (SAC)	1530 West 17th Street, Santa Ana 92706	106 feet	No
3	Santiago Canyon College (SCC)	8045 East Chapman Avenue, Orange 92869	557 feet	No
4	Centennial Education Center (CEC)	2900 West Edinger Avenue, Santa Ana 92704	91 feet	No
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8	Digital Media Center (DMC)	1300 South Bristol Street, Santa Ana 92704	71 feet	No

Note: Site 6 is the Regional Fire Training Center; land not owned by RSCCD; lease terminated May 2015

The RSCCD would like to thank Vicki Osborn, County of Orange Emergency Management Bureau, for providing dam inundation maps for this plan. The maps provided by the State were impossible to read. The maps provided by the County of Orange were difficult to read. According to Ms. Osborn, no other dams in Orange County will impact the RSCCD.

OLIVE HILL RESERVOIR (NO LONGER EXISTS)

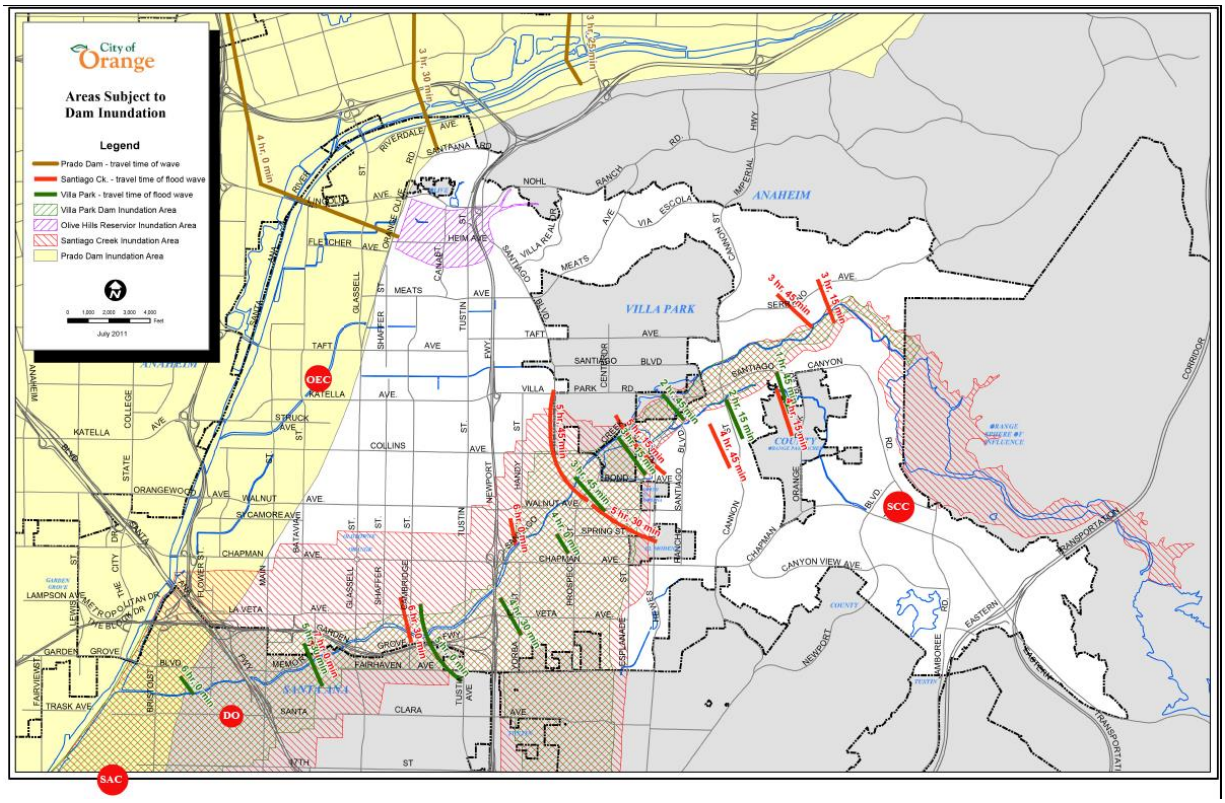
At one point, the Olive Hill Reservoir in Anaheim threatened some areas of Orange. The Olive Hill Reservoir is located in the City of Anaheim. It was an open reservoir with 80 million gallons of water. However, this reservoir was ordered in 1999 to by an Orange County judge to be drained due to possible leaks. Residents sued the City of Anaheim due to a landslide they claimed was caused by a reservoir leak. According to an interview with the City of Anaheim, Bill Moorhead, Principal Engineer (October 2015), the open reservoir was drained and closed in early 2000. A 10 million gallon enclosed water storage tank which is partially buried was built in its place. It is called Nohl Canyon Water Storage Tank. Anaheim has no reservoir/dam inundation maps for this storage tank so it is unknown if it could impact any RSCCD sites. The Olive Hill Reservoir is only being mentioned because it is listed on the City of Orange Map of Areas Subject to Dam Failure. It took considerable time and research to find out the above information and this plan writer wanted to document it for future knowledge.)

FIGURE 12 – CITY OF ORANGE MAP OF AREAS SUBJECT TO DAM INUNDATION

This map includes:

- Prado Dam Travel Time of Wave & Inundation Areas
- Santiago Dam Travel Time of Wave & Inundation Area
- Villa Park Dam Inundation Area
- Olive Hill Reservoir Inundation Areas within the City of Orange.

No City of Santa Ana or Tustin Dam Inundation maps were available in their General Plans.



PRADO DAM

Throughout the Santa Ana River Basin in Orange County the potential exists for massive downstream flooding from the failure of the Prado Dam and overflow of the Santa Ana River. Located in Riverside County at the head of Santa Ana Canyon, Prado Dam is a single purpose dam designed to reduce the flood risk for metropolitan area in Orange County.

Prado Dam is the largest dam that threatens RSCCD facilities. The Seven Oaks Dam is located above Prado dam and feeds in to Prado Dam; Prado Dam feeds into the Santa Ana River; the Santa Ana River flows through the Cities of Orange and Santa Ana where the RSCCD sites are located, to Huntington Beach and out to the ocean.

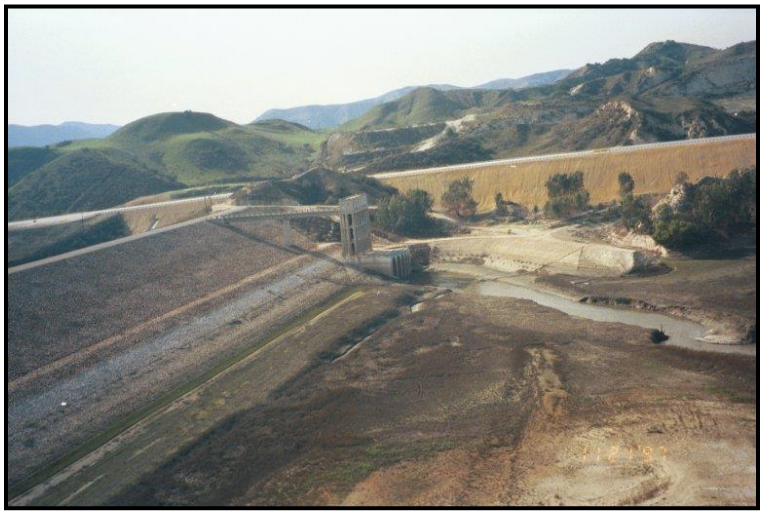
North Orange County has two major drainage courses with potential for significant flooding: Santiago Creek and the Santa Ana River. The Santa Ana River, with its normally dry riverbed and broad engineered channel and armored levees, does not appear to present a significant flood hazard. However, the Santa Ana River has a long history of overflowing its banks and flooding in the surrounding areas. To reduce this risk, the U.S. Army Corps of Engineers (Corps) constructed the $2.2 billion Santa Ana River Mainstem Project which includes raising the height of Prado Dam and constructing new gate-works allowing for controlled water releases up to 30,000 cubic feet per second and constructing channel improvements between Prado Dam and the ocean. The Corps' project provides 100-year flood protection for Orange County. When completed, the project is designed to provide 190-year level protection from flooding due to the Santa Ana River.

In order to assure acceptable levels of risk to people and property from flooding, the County of Orange and the Cities of Orange, Santa Ana and Tustin have established flood plain management regulations in the flood prone areas. The flood plain management regulations require that new construction or substantial improvements in the flood prone areas must be elevated above the base flood level.

The impact of a Prado Dam failure could cause loss of life, injuries and $15 billion of dollars in property damage, to residential, business and to educational facilities. The flood could extend to most of north, west and central Orange County.

Areas below (downstream from) Prado Dam, including large areas within the Cities of Orange and Santa Ana, as well as some areas of Tustin have high potential for inundation in the unlikely event of catastrophic dam failure. These dams and their reservoirs prevent periodic flooding that would be expected to occur in a natural setting. Recognizing and mitigating floods allows the district to avoid associated dangers. (City of Santa Ana Safety Element)

Prado Dam was completed in April 1941. It is located at the upper end of the Lower Santa Ana River Canyon, which is a natural constriction controlling 2,255 square miles (5,840 square kilometers) of the 2,450 square mile (6,345 square kilometer) Santa Ana River watershed. Authorization for the project is contained in the Flood Control Act of June 22, 1936 (PL 74-738). Modifications to the dam affect the basin below 566 feet elevation. The basin comprises more than 11,500 acres, 4,100 acres of which are riparian habitat (mostly willow woodland), a 4,823-acre recreation area (1,041 developed, 3,782 undeveloped) and 2,400 acres owned by the Orange County Water District.



Prado Dam provides flood control and water conservation storage for Orange County. It is the downstream element of the Santa Ana River flood control system. The purpose of the project is to collect runoff from the uncontrolled drainage areas upstream along with releases from other storage facilities. Generally, when the water surface elevation in the reservoir pool is below the top of the buffer pool elevation (494.0 feet NGVD during the flood season, 505.0 feet NGVD during the non-flood season), water conservation releases are made. These releases are coordinated with the Orange County Water District and are based upon the capacity of their groundwater recharge facilities and agreements with other agencies. If the water surface in the reservoir exceeds the top of the buffer pool, flood control releases commence. The objective of the flood control operation is to drain the reservoir back to the top of the buffer pool as quickly as possible without exceeding the capacity of the channel downstream. In current practice, when the water surface in the reservoir exceeds the top of the buffer pool, releases are increased to match inflow up to 5,000 cfs. When inflows exceed 5,000 cfs, the excess water is stored in the reservoir.

When the water surface elevation in the reservoir reaches 543.0 feet NGVD, uncontrolled releases from the spillway will commence. The 5000 cfs limit on controlled releases from Prado Dam is based upon the old non-damaging capacity of the downstream channel. In the event of Prado Dam failure, floodwaters would flow through the Santa Ana Canyon on its way to the Pacific Ocean. The flood would range from about 3,000 feet wide in the canyon to over 15 miles wide downstream at the Santa Ana Freeway (Interstate 5). The flooding would impact over one million people and 110,000 acres.

If the dam were at capacity, within 4 hours from the failure of Prado Dam, the water is estimated to travel 16 miles to the City of Orange at Lincoln and the Santa Ana River causing severe wave action and flooding. The water could reach heights of 7 feet high by 4 hours and 45 minutes.

By 5 hours and 15 minutes, the water would reach Katella & Batavia in Orange and be 6 feet in depth.

Within 6 hours and 15 minutes, the water would hit Bristol & Civic Center in Santa Ana and peak at 4 feet in 7.5 hours.

In some areas the water depth could reach 25 feet high. The greatest flooding would occur in the area between the Bolsa Chica Mesa in Huntington Beach and the Newport Beach Mesa where flood depths can vary from one to nine feet. From there it flows into the Pacific Ocean.

In 1983 El Nino, the flood waters and wave action were pouring down the Santa Ana River towards the ocean and at the same time, high tides hit causing major flooding in coastal areas. The Army Corps of Engineers has learned from that incident to time the water releases from Prado Dam (whether a flooding or dam failure incident) into the Santa Ana River to avoid high tides.

Once the downstream channel improvements that were part of the Corps of Engineers' Santa Ana River project were completed, the downstream channel capacity was increased dramatically to over 30,000 cfs (850 cms). The Santa Ana River project also increased the capacity of the reservoir behind Prado Dam. The modifications to the dam, which took place in three phases consisted of:

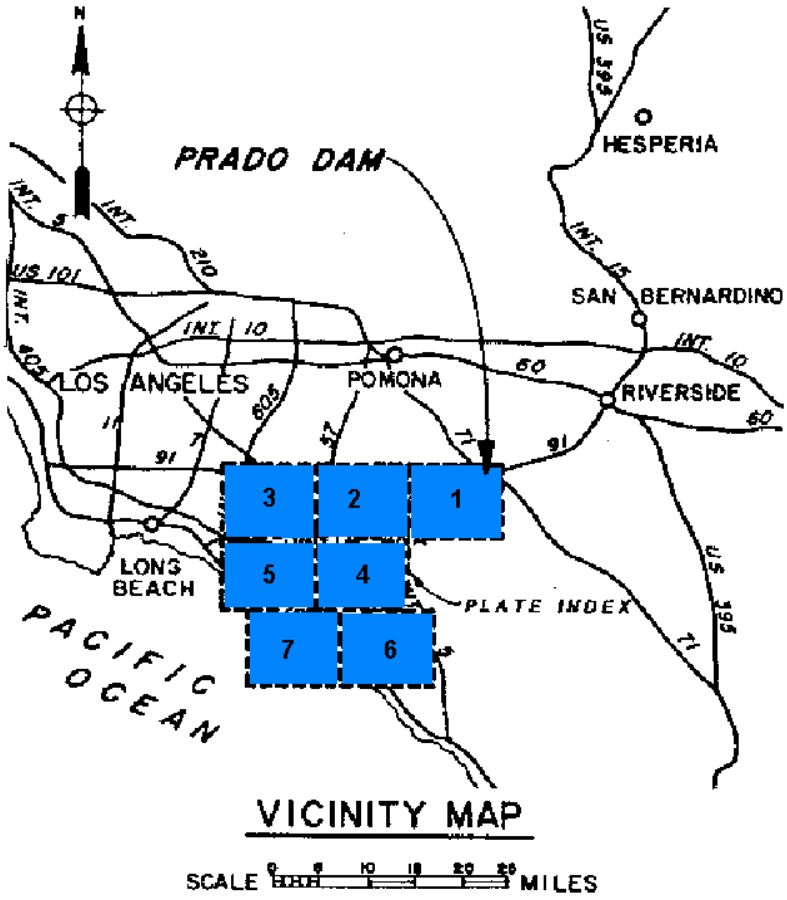
- Raising the height of the dam 30 feet; building a new intake tower; and, constructing improvements to the dam's outlet works (March 2003 – October 2006)
- Constructing dikes in the basin to protect property (September 2004 – September 2007)
- Raising the height of the adjacent spillway 20 feet (July 2006 – January 2008)

The modifications provided an additional 140,000 acre-feet to the reservoir. (One acre-foot is the volume of water that would cover one acre with one foot of water.) These changes increased Prado Dams' 70-year level of protection to 190-year protection. These improvements are expected to prevent $15 billion in damages.

The total cost of the improvements to Prado Dam was approximately $430 million ($221 federal, $209 non-federal). The non-federal sponsor for this project is Orange County Flood Control District. This project is a perfect example of a FEMA/State/Local hazard mitigation project.

The project was authorized under the 1986 Water Resources Development Act (WRDA), the 1988 Energy and Water Appropriation Act (San Timoteo), and Section 309 of WRDA 1996. In 1997 federal officials, following the appropriate laws, concluded that Prado Dam was distinct from the Santa Ana River project. ("Santa Ana Mainstem Project") These improvements enabled the dam to take full advantage of the improved channel capacity downstream and greatly increased the level of flood protection to the Orange County communities in the Santa Ana River floodplain.

FIGURE 13 - PRADO DAM DOWNSTREAM INUNDATION MAP



Plates 2 and 4 are displayed below.

No dam failure maps were available from the Cities of Santa Ana or Tustin General Plan Safety Elements.

FIGURE 14: PRADO DAM DOWNSTREAM INUNDATION MAP PLATE 2

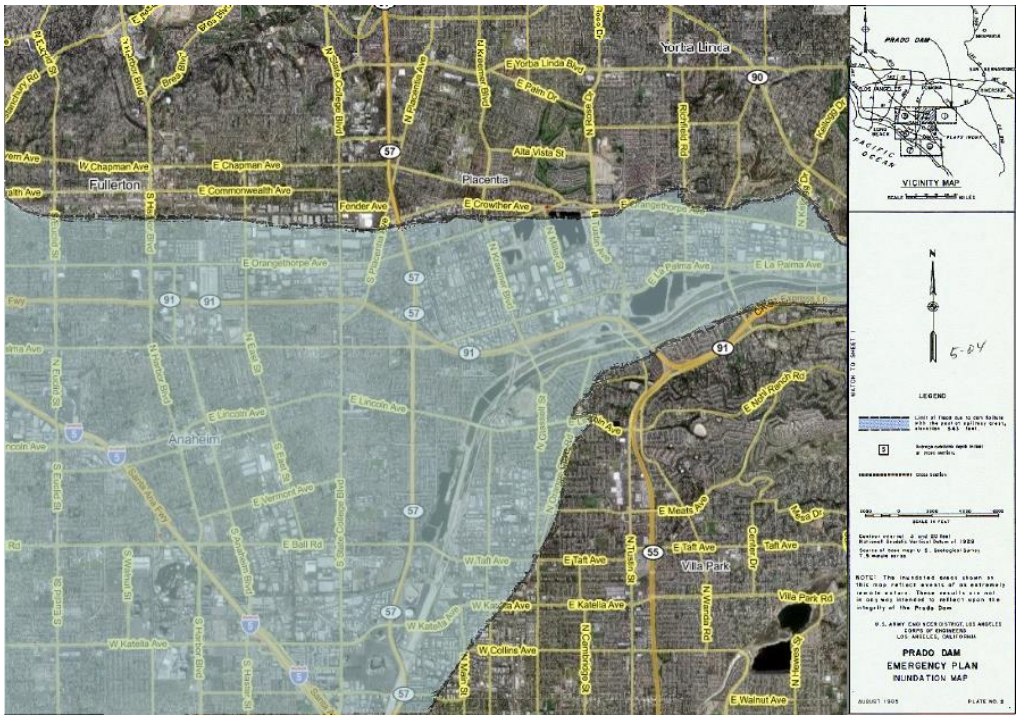


Figure 15: Prado Dam Downstream Inundation Map Plate 3

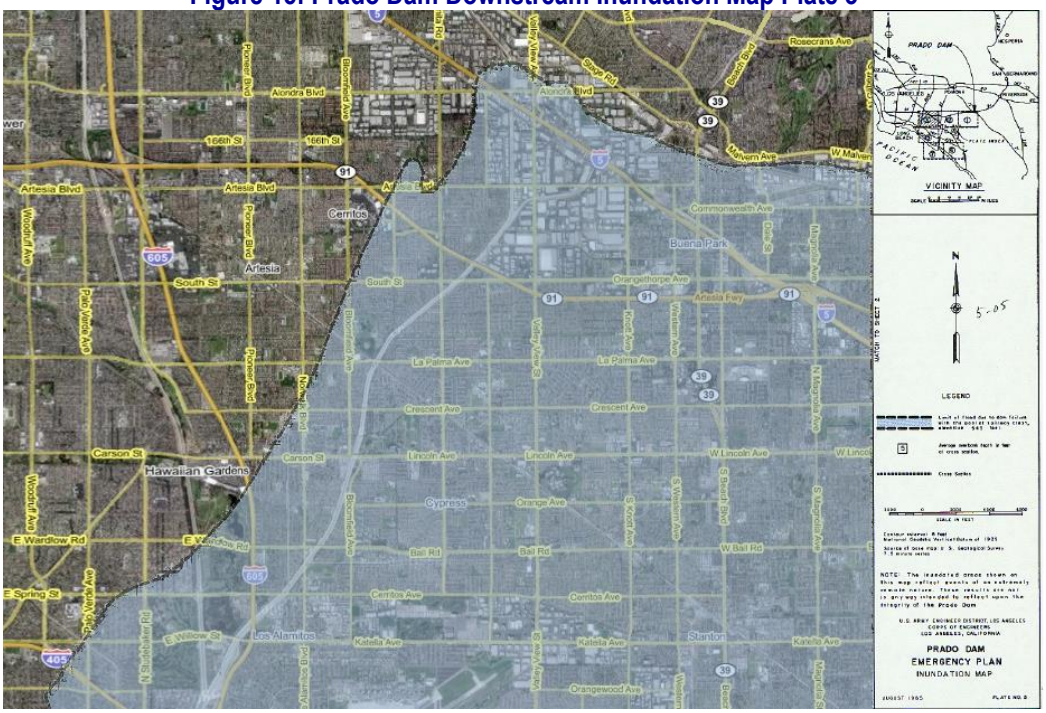


FIGURE 16: PRADO DAM DOWNSTREAM INUNDATION MAP PLATE 4

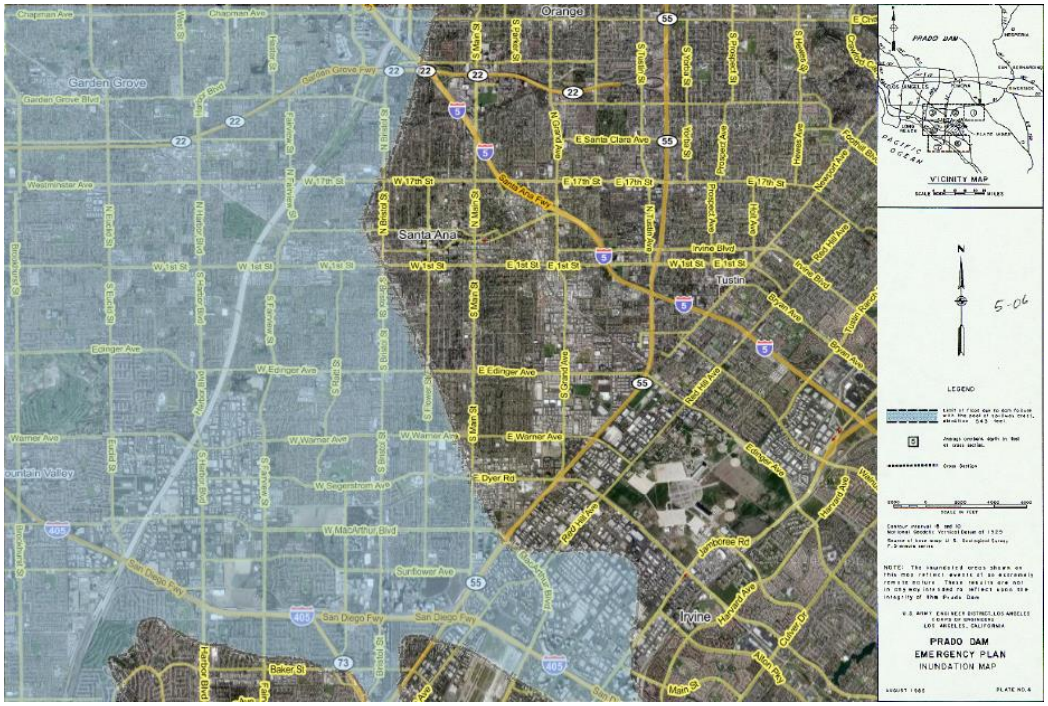


FIGURE 17: PRADO DAM DOWNSTREAM INUNDATION MAP PLATE 5



TABLE 3 - PRADO DAM PHYSICAL DATA

Embankment		
Type	Earth Fill	
Crest Elevation	566 feet NGVD	172.5 meters NGVD
Maximum height above streambed	106 feet	32.3 meters
Crest Length	2,280 feet	695 meters
Freeboard during PMF	(-4.3) feet	(-1.3) meters
Spillway		
Type	Concrete Ogee Crest with Converging Chute	
Spillway Crest	543.0 feet NGVD	165.5 meters NGVD
Crest Length	1000 feet	305 meters
Outlet Works		
Number of Passages	6	
Gate Type	Vertical Lift	
Height x Width (each)	12 x 7 feet	3.7 x 2.1 meters
Entrance Invert Elevation	460.0 feet NGVD	140.2 meters NGVD
Maximum Capacity	17,000 cfs	481 cms
Reservoir		
Debris Pool		
Elevation of top of Pool	490.0 feet NGVD	149.4 meters NGVD
Area at top of Pool	768 Acres	311 ha
Gross Storage at top of Pool	4,689 Acre-feet	5.8 MCM
Flood Season Buffer Pool		
Elevation of top of Pool	494.0 feet NGVD	150.6 meters NGVD
Area at top of Pool	1,081 Acres	438 ha
Gross Storage at top of Pool	8,437 Acre-feet	10.4 MCM
Non-Flood Season Buffer Pool		
Elevation of top of Pool	505.0 feet NGVD	153.9 meters NGVD
Area at top of Pool	2,123 Acres	859 ha
Gross Storage at top of Pool	25,760 Acre-feet	31.8 MCM
Top of Dam		
Elevation of top of Pool	566.0 feet NGVD	172.5 meters NGVD
Area at top of Pool	11,030 Acres	4,468 ha
Gross Storage at top of Pool	383,500 Acre-feet	473.0 MCM
Historic Maximum Water Surface		
Date	22 February 1980	
Maximum Elevation	528.0 feet NGVD	160.9 meters NGVD
Historic Maximum Release		
Date	22 February 1980	
Maximum Release	5,992 cfs	169.7 cms

PRADO DAM PROBABILITY OF FUTURE EVENT

Prado Dam received a Dam Safety Action Class III, or DSAC III, rating in December 2009 based on a Screening Portfolio Risk Analysis, or SPRA, completed in July 2009. A DSAC III rating is given to dams where the dam is ***significantly inadequate***, or ***the combination of life, economic or environmental consequences with probability of failure is moderate to high.***

Due to this rating and the proximity of the Prado Dam inundation map to the RSCCD sites (see page 46), the Hazard Mitigation Team voted to rank the hazard as ***Likely*** (every 10-50 years). It will not occur often but if it did, the damage would be great. (There is no HAZUS software available for a dam failure so damage estimates were not available.) The incident is considered lower probably with high consequences when it does occur.

Six of the 7 RSCCD sites could be severely impacted by a Prado Dam incident as evidenced on the map on page 46. Three of the sites are in the inundation zone and three border it.

The Maximum Probable Extent is "***Severe***." The worst hit sites are the largest and oldest. The District EOC and largest campus EOC could be underwater making the management of the incident difficult. The recovery would be slowed without these two critical sites. The District manages the response and recovery operations and would have to move its operations to a different site slowing recovery. Recovery of the Santa Ana College could take many months to years due to the age of the buildings, discussions on whether to rebuild or demolish and finding funding to recover. The overall significance is "**High**" due to **Likely** to occur/**Severe** extent.

Prado Dam received a DSAC III rating because of the potential for:

- Embankment seepage and piping
- Overtopping of the dam in the vicinity of the existing spillway

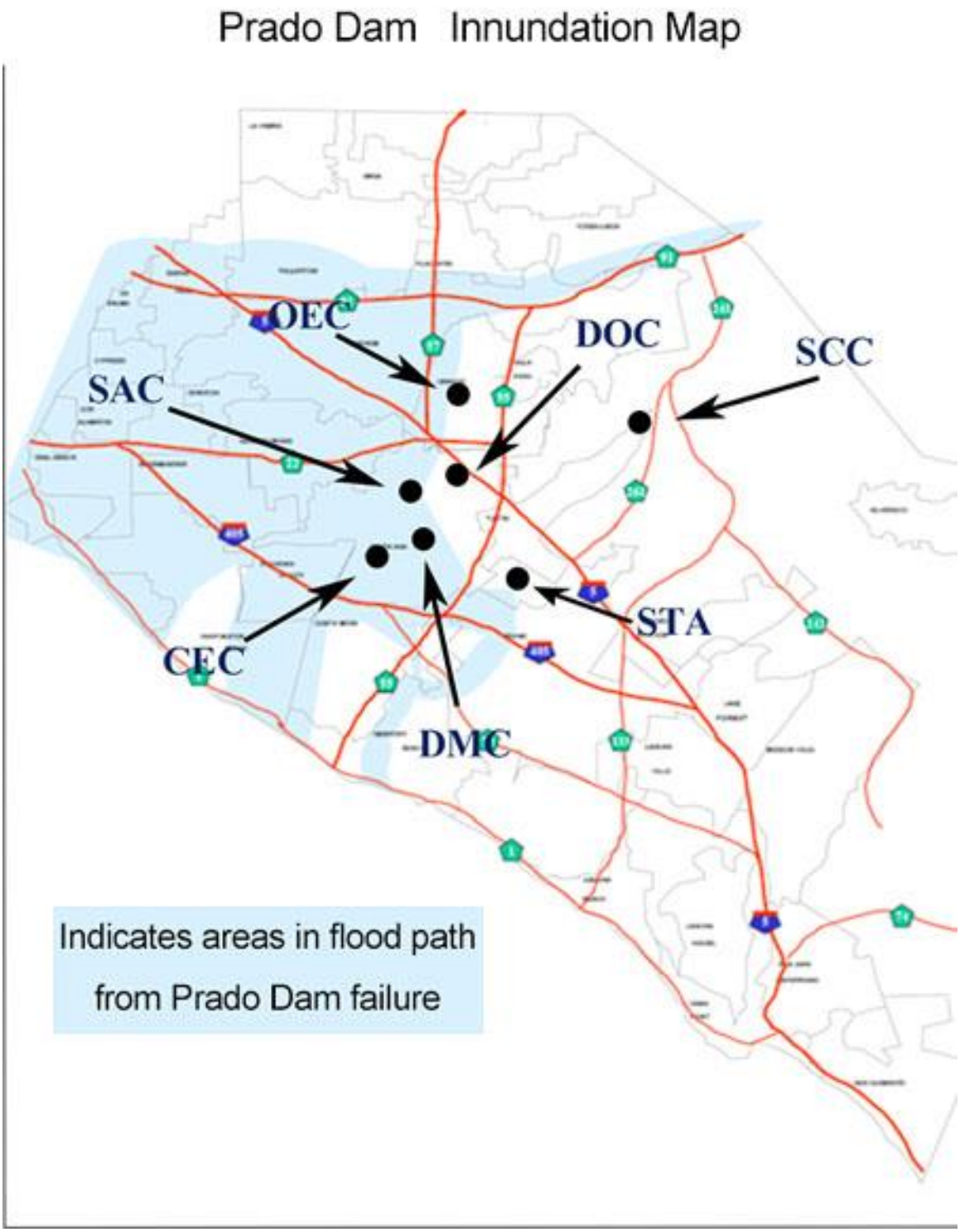
As a result of Prado Dam's DSAC III rating, the Corps has implemented the following Interim Risk Reduction Measures, or IRRMs:

- Inspection by Special Dam Inspection Team when trigger elevation of 528 feet has reached.
- Update the Emergency Action Plan annually.
- Coordinate with local interests and downstream agencies to discuss the predicted failure modes identified in the SPRA report and their associated risks.
- Conduct an orientation seminar dam safety exercise.

Prado Dam Flood Maps
The Army Corps of Engineers will be updating flood maps to derive downstream inundation mapping for various events including dam failure under different failure modes. It is anticipated that this Interim Risk Reduction Measure will be completed by 2020.

On the map on the following page, GIS was not used to place the sites on the map. Locations were estimated. Six of the seven RSCCD sites are either in or bordering the Prado Dam Inundation Zone. Santiago Canyon Community College is the only site outside or not bordering the inundation zone.

FIGURE 18 - – RSCCD PRADO DAM INUNDATION MAP



Note: GIS was not used to place the RSCCD sites on this map. Locations were estimated.

SANTA ANA RIVER

There are two flood control dams that control flood flow in the Santa Ana River. The Seven Oaks Dam is located on the river in the upper Santa Ana Canyon about eight miles northeast of the City of Redlands in San Bernardino County. This dam was completed in 1999. The Prado Dam is about 40 miles downstream of the Seven Oaks Dam. Approximately 47 billion gallons (145,600 acre-feet) of water can be stored in the Seven Oaks reservoir and 61 billion gallons (187,600 acre-feet) in the Prado Dam, reservoir.



In the event of Prado Dam failure, floodwaters would flow through the Santa Ana Canyon on its way to the Pacific Ocean. The flood would range from about 3,000 feet wide in the canyon to over 15 miles wide downstream at the Santa Ana Freeway (Interstate 5). The flooding would impact over one million people and 110,000 acres.

Most RSCCD facilities lie within the Santa Ana River floodplain. The Santa Ana River begins near the Mt. San Gorgonio summit in the San Bernardino Mountains at an elevation of over 8,000 feet. Its course drains over 90 miles through both the San Bernardino and Santa Ana ranges; 27 miles of the river course flows through Orange County to the Pacific Ocean. The Santa Ana River drainage basin covers 2,450 square miles and is the largest basin in southern California. This was once considered the "worst flood threat west of the Mississippi River." However, with the Mainstem mitigation project on the two dams, the river and flood control channels, the flood threat has been considerably decreased.

SANTA ANA RIVER PROJECT

Exerts from the Orange County Flood Control Division

Lower Santa Ana River Improvements: The Mainstem Project improved 23 miles of existing channel from Weir Canyon Road to the Pacific Ocean include channel widening, improvement to the existing Greenville-Banning Channel located parallel to the river near the coast, relocation of Talbert Channel ocean outlet and construction of rock jetties and derrick stone jetties at the mouth of the river, and bridge modifications to accommodate the widened channel. In the Santa Ana Canyon area, construction will be limited to levee extension and a dike to protect a mobile home park. The construction in the Santa Ana Canyon Area also include the bank protection on the south side along the SR-91(upstream of SAVI Ranch) and on the north side upstream of Weir Canyon Road. In the future, the stretch of channel from Coal Canyon to the Green River Golf Course entrance bridge will be improved.

LOWER SANTA ANA RIVER PROJECT FEATURES



- Improve 23 mile channel from Prado Dam to the Pacific Ocean
- Restore/Enhance 92 acre (8-acre mitigation) wetlands
- Estimated Cost: $367 million
- Acquire 1,123 acres of canyon lands to ensure safe releases from Prado Dam and provide open space habitat
- Modify 37 bridges
- Landscaping and esthetic treatment
- Sucker Conservation Program
- Habitat Management Plan
- Cooperation with the SARI proponents

SANTA ANA MAINSTEM MITIGATION PROJECT

The Santa Ana Mainstem Project extends approximately 75 miles along the Santa Ana River from the upper canyon in the San Bernardino Mountains downstream to the Pacific Ocean at Newport Beach. The project provides urban flood protection to growing communities in Orange, Riverside, and San Bernardino counties. The system is designed to provide various levels of flood protection ranging from 100 to 190 years for areas most susceptible to damages from flooding.

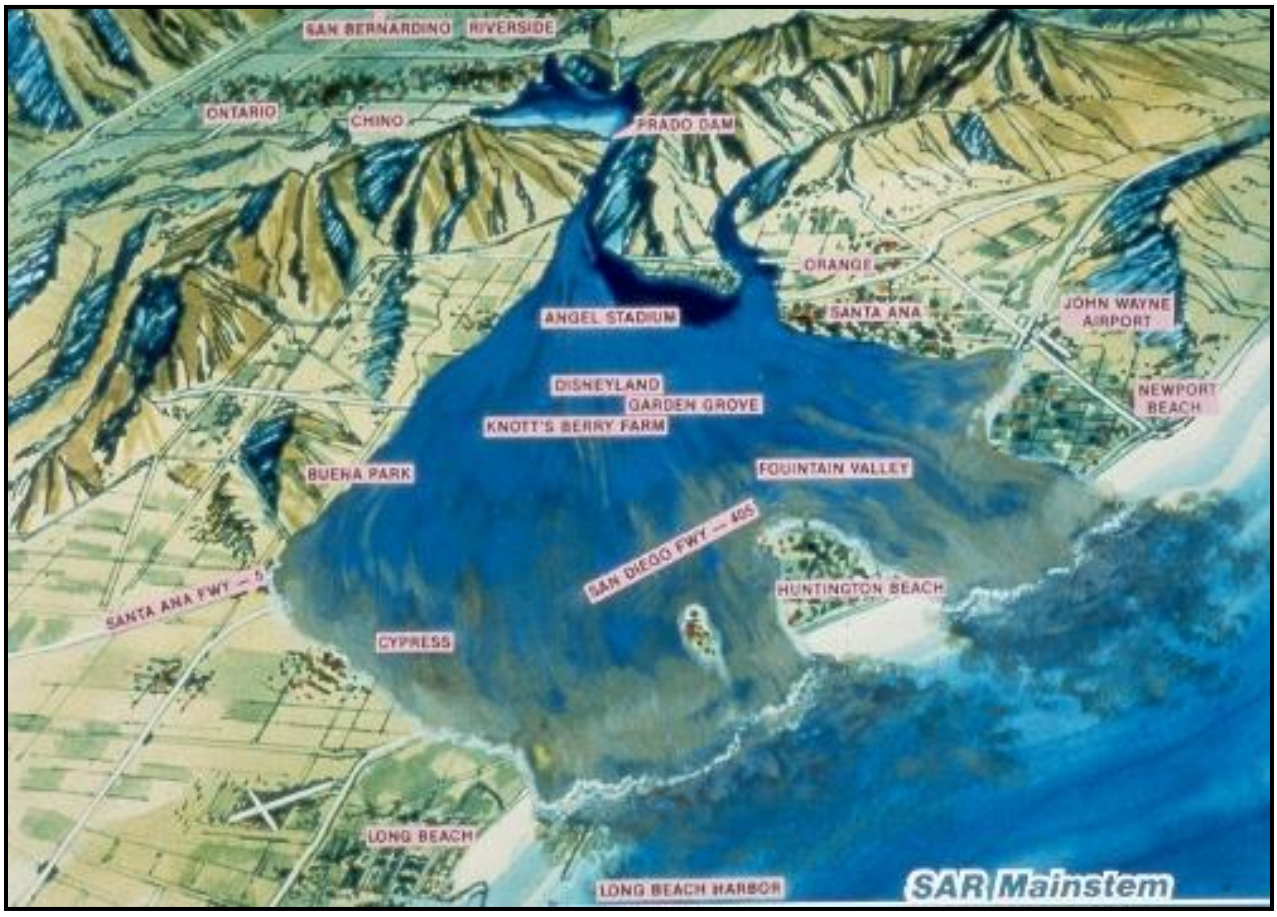
The Mainstem Project includes the following:

- Seven Oaks Dam in the upper Santa Ana River Canyon, to control a 350-year flood event at the dam site
- 5.4 miles of trapezoid-shaped channel and 18 sediment basins inside the channel of San Timoteo Creek in the cities of San Bernardino, Loma Linda, Redlands, and Colton
- Delineation of the 100-year floodway and floodway fringe between Seven Oaks Dam and Prado Dam
- Local authorities now manage this area according to guidelines established by the Federal Emergency Management Agency (FEMA)
- Modifications to the existing federal flood control levees at Mill Creek to restore the original Standard Project Flood level of protection
- Construction of a 100-year level of flood protection channel on the Oak Street Drain in the City of Corona
- Changes in the existing Prado Dam to provide a 190-year level of protection

- Channel improvements along Santiago Creek in Orange County provided 100-year-level flood protection
- Construction of the lower Santa Ana River channel provided 190-year level flood protection
- Enhancement of 84 acres of degraded marshland at the mouth of the Santa Ana River for endangered species and the restoration of eight acres of marshland for wildlife habitat

Construction of the Mainstem project started in 1990 and various stages have been phased-in based on budget approval and appropriations, engineering requirements, safety and environmental scheduling windows. This project is now complete and provides improved flood protection to the RSCCD

FIGURE 19 - SANTA ANA MAINSTEM MAP



The Mainstem project prevented this worst case flooding scenario shown above. Six of the seven RSCCD sites are in or bordering the Santa Ana River Mainstem Project improvement area. The Santa Ana River Mainstem Project is a perfect example of a successful federal, state and multi-county joint hazard mitigation partnership project.

LOCAL HISTORY OF DAM FAILURE

The RSCCD sites have never been impacted by a Prado Dam failure. However, on January 13 and 14, 2005, Prado Dam had seepage from the Prado Dam. The following are news articles and personal recollections of the incident:

A great deal of water escaped into the sea during big storms in 2005. The Jan. 13-14, 2005, deluge underscored the risk of flooding. It triggered seepage in a dike behind the dam, resulting in evacuations of some Corona residents as well as pupils at Riverdale and Woodsboro Elementary School in Anaheim Hills. OC Register

On January 14, 2005, after days of heavy rain, water began seeping through an earthen extension. Authorities released water in order to relieve pressure and sent a flood warning to areas downriver of the dam. Over 3,000 residents were evacuated from their homes for nearly twenty-four hours for fear of flooding. The gymnasium at Corona High School was converted by the American Red Cross into a temporary shelter. Wikipedia
CORONA, Calif. Authorities are evacuating 500 homes and 330 mobile homes this morning because of a possible leak in the Prado Dam east of Los Angeles. The neighborhood is near the city of Corona and north of the 91 freeway.

Corona police Sergeant Jerry Rodriguez says a series of rainstorms caused water level to rise, to the point where the dam is releasing 10-thousand cubic feet of water per second.
He says the evacuation is a "precautionary measure." KESQ News

The following is the personal recollection of Glorria Morrison, City of Huntington Beach Emergency Services Coordinator on January 13 and 14 incidents in 2005. (Glorria Morrison is the plan writer for this plan.)

Cities and other public agencies were all notified of the January 2005 Prado Dam incident by the Orange County Operational Area Emergency Operations Center (EOC). They were told that the heavy rains had caused a potential problem at Prado Dam. Huntington Beach is at the mouth of the Santa Ana River and parts of the city are at sea level and some areas below sea level. 75% of the City is in the Prado Dam Inundation Zone including Golden West College. That equates to approximately 150,000 people or ¾ of the city. Schools and the college were of particular concern. The Huntington Beach EOC had completed a Natural Hazard Mitigation Plan in 2004 and one of the hazards researched was on Prado Dam. The maps and information from the plan were immediately reviewed and duplicated on the day of the incident. The Power Point slides and maps used at the Hazard Mitigation Community Forum were set up in the EOC. The Hazard Mitigation Plan, Prado Dam section was studied. We learned that if Prado Dam failed that it would take 8 hours for the water to arrive in Huntington Beach and it could reach heights of 8 feet in depth. The Huntington Beach EOC was activated.

Management representatives were activated from the following departments:

- Police Chief and key department personnel (responsible for alerting and warning the public and evacuations)
- Fire Chief and key department personnel (responsible for emergency medical, fire suppression, search & rescue, and hazardous materials)
- Public Works Director, City Engineer and key department personnel (responsible for infrastructure [water, sewers, roads, flood channels] and debris removal)

- Marine Safety Chief (responsible for water rescues and Santa Ana swift water rescues)
- Key EOC personnel (Emergency Manager, Public Information Officer and GIS)

Not much information was available from the County or the Army Corps of Engineers. The city of Corona in Riverside County was evacuating areas of the city close to the dam. An American Red Cross shelter was set up for their evacuees. The city of Huntington Beach EOC decided to develop an Incident Action Plan should it become necessary to evacuate areas in the inundation zones. The plan discussed where would we evacuate 150,000 people to since most of Orange County was in the inundation zone and most people would have to be moved to shelters on higher elevation outside the city of Huntington Beach. The plan would only be activated if the situation worsened and the Army Corps of Engineers ordered evacuations. The Huntington Beach EOC personnel were determined to be ready to activate the plan at a moment's notice; to be prepared to activate and brief the Director of Emergency Services, City Council, all EOC personnel as well as Police, Fire, Public Works and Marine Safety field units, the 6 school districts and the public.

All public safety personnel were removed from training classes and placed in fire and police stations ready to respond. The city was prepared to respond but fortunately, the Army Corps of Engineers repaired the problem and never had to order an evacuation. The incident was informative for all EOC and public safety personnel and created a greater awareness of the threat Prado Dam poses to Orange County and particularly to Fountain Valley and Huntington Beach where all the water flows through to the ocean. The Huntington Beach/Fountain Valley Hazard Mitigation Plan provided invaluable information during this incident.

PROBABILITY OF A PRADO DAM FAILURE

The Prado Dam has a Dam Safety Action Class III (DSAC III) rating and has a probability of failure of **moderate to high**. This information was obtained from the US Army Corp of Engineers Los Angeles District website at http://www.spl.usace.army.mil/. When water surface elevation in the reservoir reaches 543.0 feet above MSL, uncontrolled releases from the spillway will commence. The 5000 cfs limit on controlled releases from Prado Dam is based upon the old non-damaging capacity of the downstream channel.

Recent modifications made to Prado Dam have upgraded the facility to ensure that it will withstand a 7.5 magnitude earthquake. Based on the proximity to activate earthquake faults within Southern California, the San Andreas Fault would be the most likely cause of an earthquake of that magnitude. However, the location of the dam in relation to the anticipated source is not anticipated to generate seismic shaking of that magnitude at the dam location. For this reason failure of the Prado Dam and resulting downstream inundation is considered unlikely. In addition, the Army Corps of Engineers has established strict protocols and procedures for assessing the dam facility after a strong seismic event, which will provide downstream communities with up to date information regarding damage that may have occurred.

Prado Dam received a Dam Safety Action Class III, or DSAC III, rating in December 2009 based on a Screening Portfolio Risk Analysis, or SPRA, completed in July 2009. A DSAC III rating is given to dams where the dam is significantly inadequate, or the combination of life, economic or environmental consequences with probability of failure is moderate to high.

Prado Dam received a DSAC III rating because of the potential for:

- Embankment seepage and piping.
- Overtopping of the dam in the vicinity of the existing spillway.

As a result of Prado Dam's DSAC III rating, the Corps has implemented the following Interim Risk Reduction Measures, or IRRMs:

- Inspection by Special Dam Inspection Team when trigger elevation of 528 ft has reached
- Update the Emergency Action Plan annually
- Coordinate with local interests and downstream agencies to discuss the predicted failure modes identified in the SPRA report and their associated risks
- Conduct an orientation seminar dam safety exercise

The probability of a dam failure on the other dams mentioned in this plan is unknown. No information could be found on their probability in either the State or Orange County Hazard Mitigation Plans.

PRADO DAM PEAK ELEVATION DISTANCE AND TIME

The following are examples of "distance from the dam" and "peak elevation times" to assist in planning evacuations. Evacuation areas would include all residents in low-lying areas.

TABLE 4 -PRADO DAM WATER MOVEMENT TIMELINE

Location	Arrival Time	Distance from Dam	Peak Elevation	Time of Peak Elevation	Avg. Over Bank Depth
Hwy 71 (Riverside Co.)	.25 hour	.4 mile	480 NAVD	1.75 hours	15 feet
Green River	.5 hour	1.7 miles	449 NAVD	2.25 hours	15 feet
91 Fwy between Green River & Weir Canyon (east)	.75 hour	2.9 miles	440 NAVD	2.5 hours	16 feet
91 Fwy between Green River & Weir Canyon (west)	1.0 hour	3.9 miles	426 NAVD	2.5 hours	25 feet
91 Fwy @ Weir Canyon	1.25 hours	5.3 miles	393 NAVD	2.75 hours	15 feet
91 Fwy between Weir Canyon & Yorba Linda Blvd	1.5 hours	6.7 miles	371 NAVD	3.0 hours	15 feet
91 Fwy @ Yorba Linda Blvd	2.0 hours	9.3 miles	325 NAVD	3.25 hours	13 feet
91 Fwy between Yorba Linda Blvd & Imperial Hwy	2.5 hours	11.1 miles	299 NAVD	3.75 hours	13 feet
91 Fwy @ Imperial Hwy	3.25 hours	13.0 miles	267 NAVD	4.0 hours	11 feet
Santa Ana Canyon & Tustin to Tustin & Orangethorpe (Anaheim)	3.5 hours	14.5 miles	239 NAVD	4.25 hours	9 feet
Lincoln & Orange Olive (Orange) to 57 Fwy & Chapman (Fullerton)	4.0 hours	16.0 miles	207 NAVD	4.75 hours	7 feet
Katella & Batavia (Orange) to Raymond Ave Commonwealth (Fullerton)	4.5 hours	17.5 miles	181 NAVD	5.25 hours	6 feet

Bristol & Civic Center (Santa Ana) to Malvern & Dale (Buena Park)	6.25 hours	22.0 miles	96 NAVD	7.5 hours	4 feet
Past LA County Line to Harbor and Baker (Costa Mesa) * timeline border runs parallel to south side of 405 Fwy.	8.5 hours	27.0 miles	32 NAVD	10.25 hours	7 feet
Past LA County Line to Warner east of PCH (Huntington Beach) to Seapoint (Huntington Beach)	9.5 hours	31.0 miles	9 NAVD	15.5 hours	4 feet
Atlanta & Beach (Huntington Beach) to Victoria east of SAR (Costa Mesa)	9.5 hours	31.5 miles	9 NAVD	15.5 hours	4 feet
Jamboree & Main St (Irvine) to Jamboree & Michaelson (Irvine)	21.5 hours	28.0 miles	32 NAVD	26.5 hours	2 feet
Campus Drive (Irvine) between Jamboree and University	21.75 hours	30.0 miles	19 NAVD	32.25 hours	9 feet
Jamboree between Bison and University (Newport Beach)	22.0 hours	31.0 miles	7 NAVD	32.75 hours	2 feet

**above reference points are the closest approximate main street along plotted timeline of USACE inundation maps

NAVD = North American Vertical Datum (NAVD). In this report "sea level" refers to the National Geodetic Vertical Datum of 1929 (NGVD of 1929)--a geodetic datum derived from a general adjustment of the first-order level nets of both the United States and Canada, formerly called Sea Level Datum of 1929 it will differ to actual sea level by 71 cm or 2.3 feet. The acronym has been adopted by FEMA FIS and FIRM maps to NAVD.

Major roads subject to flooding include Interstate Highway 5 (Santa Ana Freeway), #405 (San Diego Freeway), and #605 (San Gabriel River Freeway) and State Highways #l (Pacific Coast Highway), #22 (Garden Grove Highway), #55 (Newport Freeway), #57 (Orange Freeway), #7l (Corona Highway), #90 (Imperial Highway), and #9l (Riverside Freeway).

TABLE 5 - RSCCD SITE IMPACT AS A RESULT OF A PRADO DAM FAILURE

Item	District Location	Address	Elevation Feet Above Sea Level	In Dam Inundation Zone
1	District Operations Center	2323 North Broadway, Santa Ana 92706	147 feet	Bordering
2	Santa Ana College (SAC)	1530 West 17th Street, Santa Ana 92706	106 feet	Yes
3	Santiago Canyon College (SCC)	8045 East Chapman Avenue, Orange 92869	557 feet	No
4	Centennial Education Center (CEC)	2900 West Edinger Avenue, Santa Ana 92704	91 feet	Yes
5	Orange Education Center (OEC)	1465 North Batavia Street, Orange 92867	176 feet	Bordering
7	Orange County Sheriff's Regional Training Academy (OCSRTA)	115991 Armstrong Avenue, Tustin 92782	57 feet	Bordering
8	Digital Media Center (DMC)	1300 South Bristol Street, Santa Ana 92704	71 feet	Yes

Note: Site 6 is the Regional Fire Training Center; land not owned by RSCCD; lease terminated May 2015. The County of Orange Prado Dam Inundation Map from the county's Hazard Mitigation Plan was used to make the site impact determination.

COMMUNITY DAM FAILURE ISSUES

WHAT IS SUSCEPTIBLE TO DAM FAILURE?

Life and Property

Based on the "local" history events of flooding along the Santa Ana River, we can conclude that the RSCCD sites would be heavily impacted. The largest impact on the communities from a dam failure event is the loss of life and property.

The County and Orange County Cities would utilize every method known to warn the public of an impending dam failure including the following systems:

- Emergency Alerting System (EAS) on the AM/FM radio

- Alert OC (residents should register for this service)
- Police and Fire sirens
- Police helicopter loudspeakers
- Door-to-door canvassing
- Warning Siren System (throughout Huntington Beach; on Newport Beach beaches; and in the San Onofre planning zone)

This would greatly reduce injuries and loss of life.

Residential
Property along the flood channel and coastline could be devastated. Dam failure could potentially destroy or damage hundreds to thousands of homes spreading debris for miles. A dam failure could devastate the local economy.

Commercial
The local governments in California and Orange County rely heavily on tourism and sales tax. A dam failure event would heavily impact tourism and businesses by damaging property and infrastructure and by interrupting business and services. Any residential or commercial structure with weak reinforcement in the impact area would be susceptible to damage.

Infrastructure

A Prado Dam failure can cause damaged buildings, power lines, and other property and infrastructure due to flooding. It could 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 the life of the RSCCD students, faculty and staff.

Roads blocked by objects during a dam failure may have severe consequences to people who are attempting to evacuate campuses or who need emergency services. Emergency response operations can be complicated when roads are blocked by water 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 dam failure related to both physical damages and interrupted services.

Campuses
Campuses must evacuate as soon as a dam failure warning is issued to the local area. Each campus should understand how the threat impacts their facilities and be able to give students, staff and faculty instructions for safely evacuating the impact area. The District EOC would be activated to coordinate between the Orange County Operational Area EOC and the activated Campus EOCs.

Campuses not in the inundation zones should stand by and be ready to set up their facilities as shelters for the evacuated and displaced residents. During the recovery phase of the incident, campuses should offer their sites as Local Assistance Centers. It must be understood that the Water Movement Timeline and Over the Banks Depth figures are for worse-case scenario when the dam is filled to capacity. Less water in the dam would result in a less severe impact. All of this must be taken into consideration.

EXISTING MITIGATION ACTIVITIES

Orange County, the State of California, and Federal government agencies have implemented dam failure mitigation activities over the years. Orange County and its cities have received many awards and been acknowledged for being leaders in terms of preparing and training its residents for disasters. Some of the current mitigation programs include:

- Improvements of the Santa Ana River Flood channel (Mainstem Project)
- City/County Flood Control Projects
- City/County Master Plan Storm Drain Projects
- City/County Master Plan Pump Station Projects
- City Emergency Operations Plans
- Orange County Operational Area Emergency Operations Plans
- Rancho Santiago Community College District Emergency Operations Plan
- Orange County Operational Area Dam Failure Plan, 2006 (under revision)

CONCLUSIONS

The RSCCD sites may be impacted by the following dams:

1. Prado Dam
2. Villa Park Dam
3. Santiago Dam
4. Peters Canyon Dam

Other dams within Orange County may also impact the RSCCD sites. Any time a dam failure notice is received by the Orange County Operational Area, the incident should be taken seriously, maps should be consulted and evacuation of sites considered.

Due to the extremely poor quality of the dam inundation maps provided by State OES and the lack of maps provided by the city of Santa Ana, it was difficult to impossible to determine which other dams could impact the RSCCD sites. The County of Orange provided Prado Dam, Villa Park, Santiago and Peters Canyon Dam Inundation Maps and the City of Orange Areas Subject to Dam Inundation Map provided the best sources of information used in this plan.

The following is a summary of information on the impact of a dam failure to the RSCCD.

TABLE 6: DAM FAILURE – RSCCD SITE ESTIMATED IMPACTS

RSCCD Site	Prado Dam	Villa Park Dam	Santiago Dam	Peters Canyon	Olive Hill
District Office	Bordering	Yes	Yes	No	No
Santa Ana CC	Yes	Yes	Yes	No	No
Santiago Canyon CC	No	No	No	No	No
Centennial Education Center	Yes	Yes	Yes	No	No
Orange Education Center	Bordering	No	No	No	No
OC Sheriff Training Academy	Bordering	Bordering	Bordering	No	No
Digital Media Center	Yes	No	Bordering	No	No

Note: The City of Orange Areas Subject to Dam Failure Map was used to determine non-scientific estimates of the impact on RSCCD. The City of Santa Ana did not have a Dam Failure Map per their Emergency Manager. Neither cities have hazard mitigation plans. This table should be redone as soon as GIS Dam Inundation Maps become available and should be redone at the time of a dam failure in Orange County.

TABLE 7: DAM FAILURE – RSCCD DAM ESTIMATED IMPACT TIMES

RSCCD Site	Prado Dam	Villa Park Dam	Santiago Dam	Peters Canyon	Olive Hill
District Office	4 Hours.	6 Hours 30 Minutes	7 Hours.	No	No
Santa Ana CC	4 Hours.	6.Hours 15 Minutes.	7 Hours 30 Minutes	No	No
Santiago Canyon CC	No	No	No	No	No
Centennial Education Center	4 Hours.	7 Hours. +	9 Hours. +	No	No
Orange Education Center	4 Hours.	No	No	No	No
OC Sheriff Training Academy	4 Hours.	5 Hours. +	6 Hours. +	No	No
Digital Media Center	4 Hours.	No +	9 Hours. +	No	No

Note: The City of Orange Areas Subject to Dam Failure Map was used to determine non-scientific estimates of the impact on RSCCD sites. The City of Santa Ana did not have a Dam Failure Map available. Neither city has a hazard mitigation plan. THESE TIMES ARE ***ESTIMATES ONLY.*** This table should be redone as soon as GIS Dam Inundation Maps become available and should be redone at the time of a dam failure in Orange County.

D. THE DAM FAILURE MITIGATION STRATEGIES

A dam failure is a much larger incident than one school district can mitigate or manage. RSCCD does not own or control any dam. Prado Dam is owned by the Army Corps of Engineers and operated by the Army Corps of Engineers and the County of Orange. The RSCCD can only work in conjunction with other public agencies in most dam failure mitigation partnership projects.

The dam failure mitigation strategies provide direction or specific activities that organizations and residents can undertake to reduce risk and prevent loss from a dam failure event.

SHORT TERM MITIGATION STRATEGIES

Hazard	Dam Failure #1
Action Item	**The District needs readable, up-to-date GIS Dam Failure maps for all dams that impact the District.** **Note: The existing inundation maps are extremely poor quality. The Risk Manager and the Plan Writer reviewed every identified dam's inundation maps to determine if RSCCD facilities would be impacted but it was impossible to determine accurately which facilities would be vulnerable due to the poor quality of the maps. Need these maps in GIS format and they are not in GIS format yet.**
Coordinating Organization	Chief, District Safety & Security
Ideas for Implementation	Work closely with the County of Orange and Army Corps of Engineers (Prado Dam) to get improved GIS inundation maps. (They are not available at this time.) Once received, review and update site impact and timetable impact on each map. ▪ Contact each of these agencies annually to see if maps have been updated, are maps available in GIS, and will any of the agencies place the RSCCD sites on the inundation maps. Send a formal letter requesting this assistance. ▪ For the update of this plan (5 years), contact MMI Engineering or other engineering companies to see if GIS data is available for mapping these sites. (GIS data not available as of 2015.) ▪ Send a letter to the County of Orange and request their assistance in: ○ Determining if other dams within Orange County that may impact RSCCD facilities, especially in Santa Ana where the City General Plan did not have any information or maps on dam failures ○ Receiving improved inundation maps ○ In having Orange County provide GIS mapping information service on impact to RSCCD facilities from a dam failure
Time Line	Ongoing
Constraints	Learning of proposed projects
Funding Sources	General Fund
Cost Estimate	Staff Time
Benefits: Losses Avoided	These planning documents will improve emergency response resulting in life saving and limiting injuries at little cost to the district
Priority	Medium/High

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

Hazard	Dam Failure #2
Action Item	**Consider writing Dam Failure Evacuation Plans for each dam that may impact the 7 RSCCD sites. Complete plans for the sites with the greatest dam failure threat first and take into consideration greater populations.**
Coordinating Organization	Chief, District Safety & Security
Ideas for Implementation	▪ Review each Dam Inundation Map for dams that may impact the RSCCD sites and document site impacts ▪ Develop evacuation plans for each RSCCD site depending on which dams may impact them ▪ Conduct a tabletop exercise with the district EOC personnel and 7 site EOC personnel on dam failure ▪ Participate in any dam failure exercises held in Orange County especially Prado Dam (greatest impact on Orange County)
Time Line	Ongoing
Constraints	Learning of proposed projects
Funding Sources	General Fund
Cost Estimate	Staff Time
Benefits: Losses Avoided	These planning documents will improve emergency response resulting in life saving and limiting injuries at little cost to the district
Priority	Medium/High

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

Hazard	Dam Failure #3
Action Item	**Conduct a Dam Failure Education Campaign for Campus Facility Captains, EOC personnel and key management staff members at each site**
Coordinating Organization	Risk Manager and Chief District Safety & Security
Ideas for Implementation	Include dam failure education in all emergency preparedness training classes. Utilize research from this plan to educate staff, faculty and students
Time Line	Ongoing
Constraints	▪ Time constraint - Need to hire District Emergency Services Coordinator ▪ Classes are voluntary often resulting in low attendance
Funding Sources	General Fund
Cost Estimate	Staff Time
Benefits: Losses Avoided	Sustained education/outreach programs have minimal cost and will help build support district-wide for disaster mitigation and preparedness. This type of activity enables the district faculty, students, and the public to prepare for, respond to and recover from a dam failure.
Priority	High
Plan Goals Addressed	
X	Promote Public Awareness
	Create Partnerships and Implementation
	Protect Life and Property
	Protect Natural Systems
	Strengthen Emergency Services

Hazard	Dam Failure #4
Action Item	**Participate in the County of Orange and the Army Corps of Engineers Dam Safety Planning, Trainings, and Exercises for Prado Dam and other Orange County dams .**
Coordinating Organization	Chief, District Safety & Security
Ideas for Implementation	▪ Work through the Orange County Emergency Management Organization (OCEMO) and the Orange County Operational Area to participate in these exercises
Time Line	Ongoing
Constraints	Time
Funding Sources	General Fund
Cost Estimate	Staff Time
Benefits: Losses Avoided	Exercises allow the district to practice its emergency plans which will improve their response to life saving, limiting injuries, expedite the protection of property and the environment, and assist the district in providing community shelters and Local Assistance Centers.
Priority	High

Plan Goals Addressed	
X	Promote Public/College Community Awareness
X	Create Partnerships and Implementation
X	Protect Life and Property
	Protect Natural Systems
X	Strengthen Emergency Services

Section IV-E Drought and Climate Change

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Part IV-E Drought and *Climate Change*

A. OVERVIEW

WHAT IS DROUGHT?

Drought is a deficiency in precipitation over an extended period, usually a season or more, resulting in a water shortage causing adverse impacts on vegetation, animals, and/or people. It is a normal, recurrent feature of climate that occurs in virtually all climate zones, from very wet to very dry. Drought is a temporary aberration from normal climatic conditions, thus it can vary significantly from one region to another. Drought is different than aridity, which is a permanent feature of climate in regions where low precipitation is the norm, as in a desert. Human factors, such as water demand and water management, can exacerbate the impact that drought has on a region. Because of the interplay between a natural drought event and various human factors, drought means different things to different people, depending on its effect.

Drought can often be defined regionally based on its effects:

- **Meteorological** drought is usually defined by a period of below average water supply.
- **Agricultural** drought occurs when there is an inadequate water supply to meet the needs of the state's crops and other agricultural operations such as livestock.
- **Hydrological** drought is defined as deficiencies in surface and subsurface water supplies. It is generally measured as streamflow, snowpack, and as lake, reservoir, and groundwater levels.
- **Socioeconomic** drought occurs when a drought impacts health, well-being, and quality of life, or when a drought starts to have an adverse economic impact on a region

WHY IS DROUGHT IMPORTANT?

The U.S. is vulnerable to the social, economic, and environmental impacts of drought. The over 100-year weather record of the U.S. indicates that there were three or four major drought events during that period. Two of these, the 1930's Dust Bowl drought and the 1950's drought, each lasted five to seven years and covered large areas of the continental U.S. Droughts have been among the most costly weather-related events, in terms of economics and loss of life.

HOW IS DROUGHT MONITORED AND ASSESSED?

The U.S. Drought Monitor provides a general summary of current drought conditions. The U.S. Department of Agriculture (USDA), the National Oceanic and Atmospheric Administration (NOAA), and the National Drought Mitigation Center (University of Nebraska-Lincoln) collaborate on this weekly product, which is released each Thursday. Multiple drought indicators, including various indices, outlooks, field reports, and news accounts are reviewed and synthesized. In addition, numerous experts from other agencies and offices across the country are consulted.

The result is the consensus assessment presented on the USDM map. The image is color-coded for four levels of drought intensity. An additional category, "Abnormally Dry," is used to show areas that might be moving into a drought, as well as those that have recently come out of one.

WHICH AGENCY IS RESPONSIBLE FOR DROUGHT MANAGEMENT?

Federal Government
According to communications with Brian A. Fuchs, Associate Geoscientist/Climatologist, National Drought Mitigation Center University of Nebraska-Lincoln, "The National Drought Mitigation Center has worked in the drought area for the last 20 years and has long been the "go to" source for monitoring, planning, and mitigation related to drought. About 7 years ago, there was an effort to determine a federal lead agency which would combine the drought efforts of many federal agencies who had some interest or past record in dealing with drought. This effort was the National Integrated Drought Information System (NIDIS) and can be found at drought.gov. The National Drought Mitigation Center and NIDIS works closely addressing many issues/topics related to drought. The federal government has long delegated drought response to the states and many states have implemented drought response plans."

Several bills have been introduced into Congress in an effort to mitigate the effects of drought. In 1998, President Clinton signed into law the National Drought Policy Act, which called for the development of a national drought policy or framework that integrates actions and responsibilities among all levels of government. In addition it established the National Drought Policy Commission to provide advice and recommendations on the creation of an integrated federal policy. A more recent bill introduced into Congress was the National Drought Preparedness Act of 2003, which established a comprehensive national drought policy and statutorily authorized a lead federal agency for drought assistance. It established a National Drought Council within the Department of Agriculture, to improve national drought preparedness, mitigation, and response efforts, and for other purposes.

State of California
In California, the State National Resources Agency has appointed its Department of Water Resources as the lead for both flood and drought.

County of Orange
The Sheriff's Department Emergency Management Division is heading up a county-wide comprehensive committee on drought.

B. CALIFORNIA DROUGHT

Drought is a gradual phenomenon. Normally, one dry year does not constitute a drought in California, but rather serves as a reminder of the need to plan for droughts. California's extensive system of water supply infrastructure (reservoirs, groundwater basins and aqueducts, etc.) generally mitigates the effects of short-term dry periods for most water users.

Drought can have secondary impacts. For example, drought is a major determinant of wildfire hazards, in that it creates greater propensity for fire starts and larger, more prolonged conflagrations fueled by excessively dry vegetation, along with reduced water supply for firefighting purposes. Drought is also an economic hazard. Significant economic impacts on

California's agriculture industry can occur as a result of short- and long-term drought conditions. These include hardships to farmers, farm workers, packers and shippers of agricultural products. In some cases, droughts can also cause significant increases in food prices to consumers due to shortages. Drought can also result in lack of water and subsequent feed available to grazing livestock, potentially leading to risk of livestock death and resulting in losses to the state's agricultural economy.

Past experience with California droughts tells us that drought impacts are felt first by those most dependent on or affected by annual rainfall – agencies fighting forest fires, ranchers engaged in dryland grazing, farmers and rural residents. Almond trees in California use 10% of all the state's water to grow almond trees and such practices may not be sustainable. Droughts and floods can occur back to back in California, a state with such extremes that Northern California may receive 90 inches of rain in a year and Death Valley only two inches. The 1861-62 great floods were followed by two severely dry years, which ended the cattle rancho economy in California altering the states future.

Although droughts are sometimes characterized as emergencies, they differ from typical emergency events. Most natural disasters, such as floods or forest fires, occur relatively rapidly and afford little time for preparing for disaster response unlike droughts which are gradual phenomenon. Droughts occur slowly, over a multi-year period, and it is often not obvious or easy to quantify when a drought begins and ends.

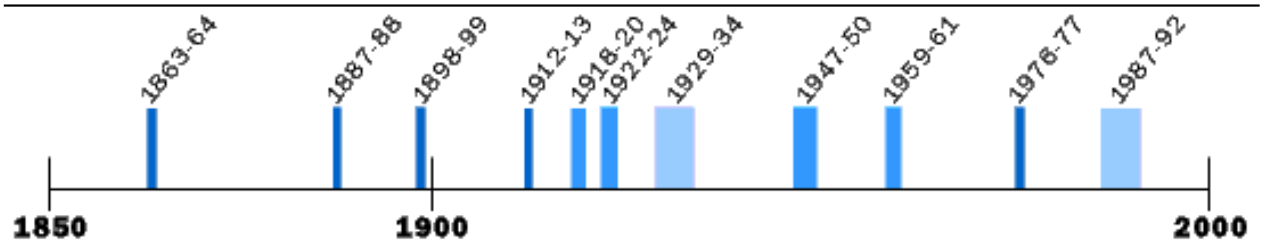
CALIFORNIA DROUGHT HISTORY

Drought has affected virtually every county in California at one time or another, causing more than $2.6 million in damages. Droughts exceeding three years are relative rare in Northern California, the source of much of the state's water supply. The 1929-1934 drought established the criteria commonly used in designing storage capacity and yield for large Northern California reservoirs. The driest single year in California's measured hydrologic history is 1977.

Prior to the current drought, a major drought occurred in 2007-2009. At a regional level, parts of Southern California experienced a series of consecutive dry years in the late 1990s/early 2000s, with water year 2002 setting records for the single driest precipitation year in cities such as Los Angeles and San Diego. The Colorado River Basin, an important source of water supply for Southern California, experienced five consecutive years of drought in water years 2000-2004.

Historically, California has experienced multiple severe droughts. The 1929-34 drought established the criteria commonly used in designing storage capacity and yield of large Northern California reservoirs. The driest single year of California's measured hydrologic record was 1977. The figure below depicts California's multi-year historical dry periods, 1850-2000.

FIGURE 1: SOUTHERN CALIFORNIA'S MULTI-YEAR HISTORICAL DRY PERIODS, 1850 - 2000



SOURCE: CALIFORNIA DEPARTMENT OF WATER RESOURCES (DWR), WWW.WATER.CA.GOV/
Note: Dry periods prior to 1900 estimated from limited data; covers dry periods of statewide or major regional extent

The HMPC identified the following droughts as having significant impacts on the planning area:

1947-1950—This drought was in effect for the entire State from 1947- 49. The most extreme drought areas were in the south, affecting Orange County.

1959-1961—This drought was in effect for the entire State from 1959-1962. The most extreme drought conditions existed in the Sierra Nevada and central coast.

1976-77—A federal disaster declaration was declared as a result of a drought affecting Orange County and much of California. This was the driest two years in California history.

1987-1992—Orange County also suffered adverse effects resulting from this statewide drought.

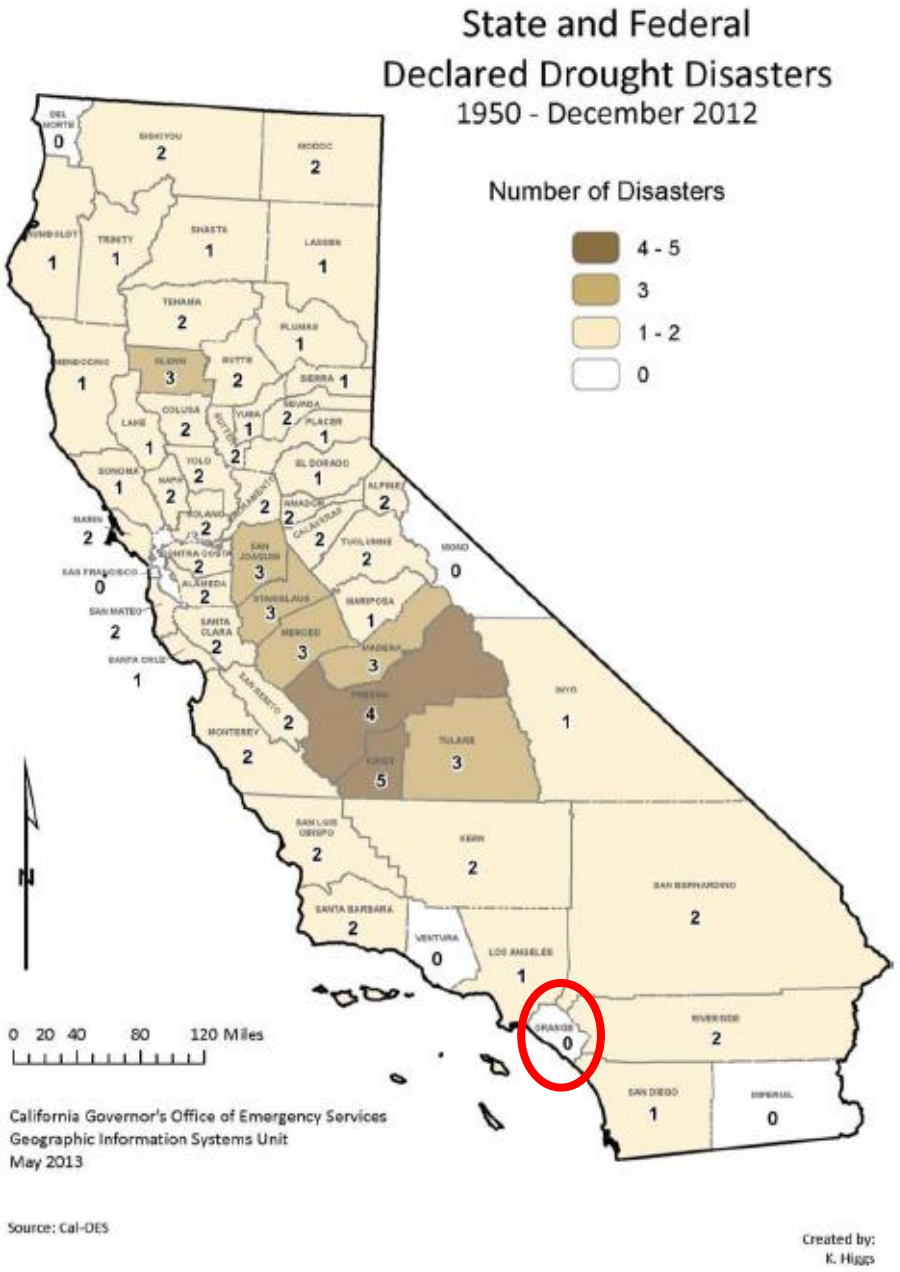
2007-2009—Water year 2007 was unusually dry across much of California. Water year 2006-2007 ended with 53 percent of normal runoff for the State. Winter snow levels in 2007-2008 were about 65 percent of average. Compounding the drought situation was the spring of 2008, which was the driest spring on record for the state. Water year 2007-2008 ended with 60 percent of normal runoff for the State. January of 2009 was the 8th driest January on record for the state and snow sensors indicated water content in the Sierra statewide snowpack at 60 percent of average.

TABLE 1: CALIFORNIA DROUGHT INCIDENTS 1972 - 2009

Year	Number of Incidents	Jurisdictions Affected (Counties, Unless Otherwise Noted)	Crop Damage
1972	1	Glenn, San Benito, Santa Clara	$8 million
1976-1977	1	Alpine, Calaveras, Colusa, Fresno, Glenn, Madera, Merced, San Diego, San Joaquin, Solano, Stanislaus, Sutter, Tuolumne, Alameda, Butte, Contra Costa, Kings, Los Angeles, Riverside, San Luis Obispo, Tulare, Yolo, Amador, Monterey, Napa, Nevada, San Benito, San Bernardino, Tehama, San Mateo, Marin	$2.67 billion
1988	1	Madera County location emergency was ratified every two weeks through 1991.	N/A
1990	2	Santa Barbara(City and County)	0
1991	1	Alameda, Alpine, Colusa, Fresno, City of Orange Cove, Glenn, Kern, Kings, Lake, Madera, Marin, Mendocino, Monterey, Placer, Santa Barbara, City of Santa Barbara, Shasta, Siskiyou, Solano, Sonoma, Sutter, Tehama, Tulare, Tuolumne, and Yuba. Many of these emergencies continued through 1992.	USDA-nationwide: $995 million for 1990-1991 crop loss. Additional $775 million in emergency funds for 1990-92 crop losses.
2001	5	Del Norte, Modoc, Siskiyou, Inyo, Humboldt, Kern, Los Angeles, Ventura, Mono, Lassen, Plumas, San Bernardino, Santa Barbara, Sierra, Shasta, Trinity	N/A
2002	3	Alpine, Amador, Calaveras, Imperial, Modoc, Nevada, Orange, Placer, Riverside, San Bernardino, Sierra, Stanislaus	$12,100
2007	1	Kings, Riverside	(data pending)
2008	1	Fresno, Kern, Kings, Madera, Merced, Sacramento, San Joaquin, Stanislaus, Tulare	(data pending)
2009	1	Fresno	(data pending)

Sources: Cal OES Individual Assistance Section, 2001& 2002 SBA Declarations/USDA Designations database; Cal OES Origins and Development- A Chronology 1917- 1999

FIGURE 2: STATE AND FEDERAL DECLARED DROUGHT DISASTERS 1950 TO DECEMBER 2012.



Map 6.J shows the pattern of drought-declared disasters in California over the past 62 years. Heaviest concentrations are in the Central Valley and inland areas.

Figure 2 shows that Orange County has not ever declared a disaster for drought from 1950 to 2012.

ISSUES RELATED TO DROUGHT

Key factors that have an effect on water demands in California have influenced water demands in the past and will continue to do so in the future:

Climate Variability
California's climate is highly variable both spatially (from temperate rain forest conditions on the North Coast to the extreme aridity of Death Valley) and temporally. Records for maximum annual precipitation range from more than 90 inches on the North Coast to a little over 2 inches in Death Valley. Droughts and floods can occur in close proximity. For example, the flooding of 1986 was followed by six years of drought (1987-92). At the beginning of the state's historical record the so-called "Noachian" floods of winter 1861-62 were followed by two severely dry years, a combination became the death knell for much of the cattle rancho economy.

Drought and Precipitation
Most of California's precipitation (rain and snow) comes from storms moving across the Pacific Ocean. The path followed by the storms is determined by the position of an atmospheric high pressure belt that normally shifts southward during the winter months, allowing low pressure zones to move into the state. On average, 75 percent of California's annual precipitation occurs from November through March, with 50 percent occurring from December through February. California's average precipitation is dependent on a relatively small number of storms; a few storms more or less during the winter season can determine if the year will be wet or dry. If a persistent Pacific high pressure zone remains over California in mid-winter, there is a tendency for the year to be dry.

Drought and Groundwater
In an average year, about 30 percent of California's urban and agricultural water supplies come from groundwater. Reliance on groundwater increases during droughts due to reduced availability of surface water. During the six-year 1987-92 drought the total number of well driller reports filed with the Department were in the range of 25,000 wells per year for several years, up from fewer than 15,000 reports per year prior to the drought. Most of the new wells were for private residential use.

California is sinking 2 inches a month because of drought-driven groundwater pumping. Scientists have known California is sinking for years, but new data from NASA show the state is subsiding even faster than previously thought due to relentless pumping of groundwater – largely for agricultural purposes. According to LiveScience, NASA officials say some parts of the state are dropping at a rate of more than 2 inches per month due to groundwater extraction, and if the trend continues, the land could permanently lose its capacity for storing water underground.

Demographic
Since water use is related to demographics, an accurate description of population and housing stock in the service area can serve as a basis for water planning activities described in the Urban Water Management Plan. California's extreme population growth over the years has placed a tremendous burden on water providers to serve their growing populations especially as the Colorado River provides less and less water to California. Over the past 5 years, Orange County has dramatically increased the density in residential areas. This high density development is placing a tremendous pressure on the decreasing water supply complicated by a four year drought.

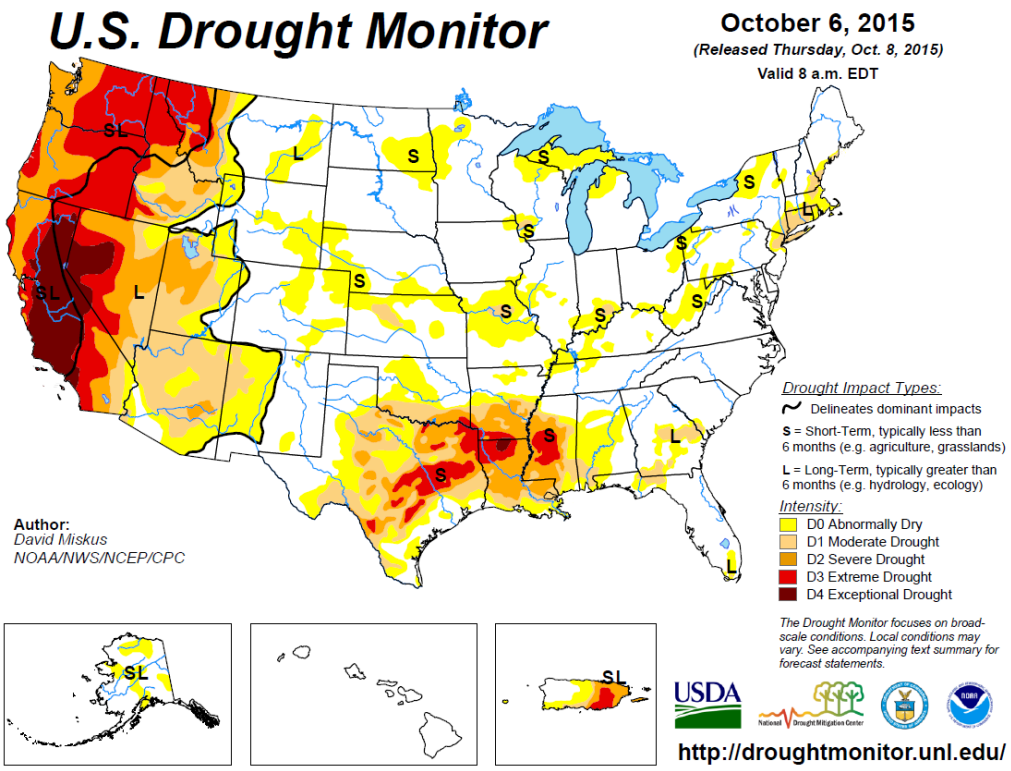
Economic

In the early 1990's, the rate of economic growth declined due to the severity and duration of the recession. The recession affected declines in the manufacturing sector, particularly in the defense and aerospace. During the late 1990's and early 2000's, the economy was strong and had an effect on increased water usage. However, even with the stronger economy, industrial demands decreased. This has been partly due to changes in operation such as installation of on-site recycled water system. In addition, several large companies have moved out of the area and have been replaced with different sectors whose water usage is lower.

CALIFORNIA'S PREVIOUS AND CURRENT DROUGHTS

RSCCD is experiencing a major drought. Southern California is currently in a major drought. The U.S. Drought Monitor, California is in an Exceptional drought. Exceptional is the worst level of a drought possible (2015). California's is currently in the fourth year (2012 - Ongoing) of a major statewide drought. Every effort is being made by both homeowners and businesses to conserve water. This is just one of many such droughts that has occurred in California's history. From 1895 to 1995, severe droughts occurred 10 to 15 percent of the time. Drought has dramatically changed California's crops, livestock industry, as well as recreation and tourism.

FIGURE 3: U.S. DROUGHT MONITOR FOR U.S., OCTOBER 2015

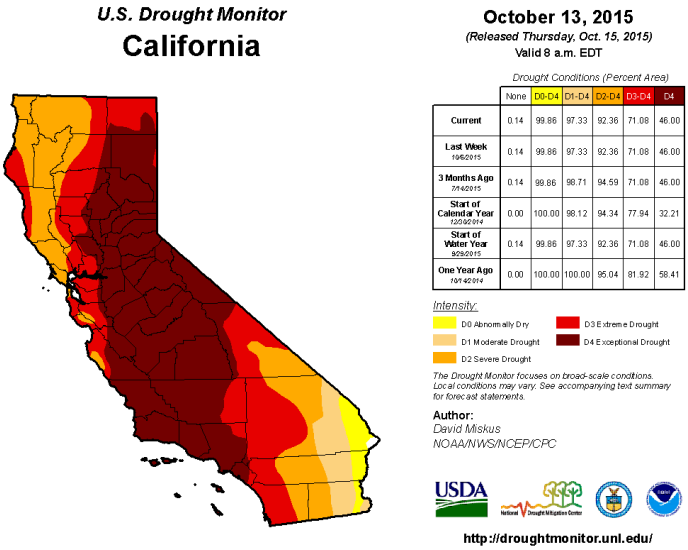


On April 1st, 2014 California Governor Jerry Brown made an executive order that requires cities and towns to cut 25% of water use (excluding agriculture) to save an estimated 1.5 million acre feet of water over the next nine months. The Governor declared a State of Emergency. **RSCCD is currently in a State of Emergency Drought which is part of a 4 year serious drought.**

In response to this issue and other timely issues, the District started the RSCCD Sustainable Committee (RSC) which addresses drought.

The following article entitled, 17 Interesting Facts About the California Drought, written by Seametrics, Technology with a Mission on April 20, 2015 sums up the 2012/2015 California Drought.

FIGURE 4: U.S. DROUGHT MONITOR FOR CALIFORNIA, OCTOBER 2015



1. The drought currently encompasses over 98% of the state of California.

2. More than 44% of California is in "exceptional" drought, the worst level of drought.

3. Some parts of the Sierra Mountains that typically have 66 inches of snow pack are barren.

4. Farmers could sell their water for $700 an acre foot, more than they would earn by using the water to grow crops.

5. Nearly 60 percent of the state's water needs are now met by groundwater, up from 40 percent in years when normal amounts of rain and snow fall.

6. The drought forced California farmers to fallow 500,000 acres of land in 2014. And the number may double by the end of 2015.

7. California-based trade organization Western Growers Association estimated 17,000 farm jobs were lost in 2014 alone.

8. California is the world's fifth-largest supplier of food.

9. California grows 43 percent of the nation's fruits, nuts, and vegetables and more than 90 percent of its almonds, grapes, and broccoli.

10. The current drought cost the (farming) sector an estimated $2.2 billion in 2014.

11. In some areas of the Central Valley, the land is sinking by one foot or more per year.

12. The Sierra Nevada snowpack, which is counted on to provide 30 percent of the state's water supply as it melts through early summer, is at its second-lowest level on record.

13. The diminished hydropower capacity of California's dams cost electricity customers a total of $1.4 billion in the past three years.

14. It will take about 11 trillion gallons of water (42 cubic kilometers) — around 1.5 times the maximum volume of the largest U.S. reservoir — to recover from California's continuing drought, according to a new analysis of NASA satellite data.

15. California's current drought is the driest period in the state's 163 years of recorded rainfall history.

16. NASA scientists predict that there is an 80 percent chance of a mega-drought in the Southwest United States before the end of the century.

17. Rows of almond trees cover nearly 1 million acres in California and consume 1.07 trillion gallons of water annually in the state, one-fifth more than California families use indoors.

The drought issue in California is further compounded by water-rights. Water is a commodity possessed under a variety of legal doctrines. The prioritization of water rights between farming and federally protected fish habitats in California is part of this issue.

The snow that blanketed the Sierra Nevada in California last winter, and that was supposed to serve as an essential source of fresh water for the drought-stricken state, was at its lowest levels in the last 500 years, according to a new study. The paper, published in the journal Nature *Climate Change*, used tree-ring data from centuries-old blue oaks to provide historical context for the mountain range's diminished snowfall. In early 2015 the snowpack levels were just 5 percent of their 50-year historical average.

As California is experiencing the fourth year of our current drought, we are learning about the extensive impacts which are wide-reaching and cause economic, environmental, and/or societal damage. The most significant impacts associated with drought in the planning area are those related to water intensive activities such as agriculture, wildfire protection, municipal usage, commerce, tourism, recreation, and wildlife preservation. Also, during a drought, allocations go down, which results in reduced water availability. Voluntary conservation measures are typically implemented during extended droughts as was done with Governor Brown's State of Emergency. A reduction of electric power generation and water quality deterioration are also potential problems. Drought conditions can also cause soil to compact and not absorb water well, potentially making an area more susceptible to flooding which often follows a drought. Weather predictions for late 2015 and early 2016 include the prediction of a great El Nino or "Godzilla El Nino" demonstrating once again the great hazard mitigation challenges that California faces. "

The current drought has had an Extremely High impact on Orange County due to the lack of rain and snowfall for the past three to four years in the Sierra water shed. With extremely low snowfall, the reservoirs in Northern California are at their lowest ever as well as Southern California reservoirs being very low. Population growth has been significant across Southern California which requires an even larger demand for water. High density housing is being built all over Orange County and will add to the long term problems. Agriculture water allocations needed in

late winter – early spring planting cycle have been cut to zero. Voluntary water restrictions have been implemented for residences. Conservation actions have been and are being taken by, residence, business, agriculture, and government. The RSCCD has formed a Sustainable RSCCD Committee to lead the district's water conservation efforts among other sustainable issues. Wildland fires will significantly affect all of California (both Northern, Central and Southern) which causes health and medical issues for all residences. Fisheries are also affected. Low to no flows on the Sacramento and American Rivers have had an adverse effect on Smelt, Salmon, Bass, Trout and other species that are native to the rivers.

The major issue directly attributed to the Drought is the economic impacts that will affect everyone. The economics loss crosses drought impacts causing loss in income, jobs, cut back in government revenue, loss of beef cattle, dairy production, vegetables, rice, nuts and other crops. The secondary, impacts of the drought have yet to be seen, reduction in in homes sold, higher unemployment, more people seeking food stamps, higher needs of staple food commodities from local Food Banks. All of this will have a significant impact on California's Economy, which is one of the top 10 Economy's in the World.

CURRENT STATE DROUGHT HAZARD MITIGATION EFFORTS

Mitigation of drought impacts includes short- and long-term water conservation measures for urban areas as called for by the past Governor's Emergency Proclamations. There is ample literature on urban water conservation measures. Agricultural water conservation measures reducing crop damage and losses include but are not limited to:

- Drought Planning
- Water Management Planning
- Land Management Planning
- Crop Management Planning

C. ORANGE COUNTY DROUGHT

Orange County relies on two major water supply sources, which includes imported water from the Metropolitan Water District of Southern California (Metropolitan) and local groundwater from the OCWD. Approximately 75 percent of the water supply is provided by 11 groundwater wells. The groundwater comes from a natural underground reservoir that stretches from the Prado Dam and fans across the northwestern portion of Orange County, excluding the communities of Brea and La Habra, and extending as far south as the El Toro "Y."

ORANGE COUNTY DROUGHT HISTORY

A significant drought, reported by many of the ranchers in Southern California, occurred in 1860. The great drought of the 1930s, coined the "Dust Bowl," was geographically centered in the Great Plains yet ultimately affected water shortages in California. The drought conditions in the plains resulted in a large influx of people to the west coast. Approximately 350,000 people from Arkansas and Oklahoma immigrated to the Great Valley of California. As more people moved into California, including Orange County, increases in intensive agriculture led to overuse of the Santa Ana River watershed and groundwater resulting in regional water shortages.

There are two beetles we have had some insolated issues with in Orange County. The beetle infestation is killing oak trees that are already weak, thirsty for water after years of drought. The dying trees raise the risk of wildfire during what is a summer of record breaking heat. To mitigate this hazard, the Orange County Fire Authority crews cut the tree down and apart, their chainsaws working like scalpels to remove the tumor from the Orange County's emblematic coast live oak woodlands. It costs about $1,000 to remove a large tree and many homeowners don't have the money or chose not to remove the tree. Standing dead trees can fall on and hurt people and structures especially in future storms and the dying trees raise the risk of urban fires. (The Register Newspaper 2016)

Goldspotted Oak Borer: First recorded in California in 2004, has killed some 17,000 oaks, all in San Diego County which is adjacent to Orange County to the south. Researchers believe the insect was brought to California from Arizona or Mexico. Orange County has had some isolated oak trees infected in South Orange County also.

Polyphagous Shot Hole Borer: An ambrosia beetle that's affected 20 species of trees in Los Angeles, Orange and Riverside counties. This is the beetle that infected the trees at UC Irvine and in Huntington Beach.

D. ORANGE COUNTY WATER SOURCES

A special thanks to Kelly Hubbard, Water Emergency Response of Orange County (WEROC) for her assistance on the Orange County Water Sources section. Ms. Hubbard was interviewed for this plan and she reviewed the competed drought section.

North and Central Orange County have a valuable asset, a local groundwater basin managed by the Orange County Water District (OCWD) that provides nearly two-thirds of the water supply for 2.4 million people. Knowing the likely occurrence of droughts in California, OCWD saves reserve funds to prepare for and respond to drought conditions. The OCWD has spent $79.3 million over the past three years purchasing imported water from Metropolitan. The water was recharged into the groundwater basin which helped to partially refill the basin and somewhat offset the impacts of the recent drought. Although groundwater levels have fallen, they are still within normal historic operating range. OCWD recently invested $142 million to expand the Groundwater Replenishment System (GWRS), an award-winning water purification system that takes treated wastewater from the Orange County Sanitation District and purifies it to meet or exceed drinking water standards. The expansion, completed in June 2015, produces an additional 30 million gallons a day (MGD), taking the GWRS total production to 100 MGD. This is enough water to meet the combined water demands of the cities of Anaheim and Huntington Beach.

In addition to being reliable during drought, GWRS water is about half the cost of imported supplies and is controlled locally, saving cities in Orange County millions of dollars annually.

There are 28 retail water utilities and 2 regional water utilities within the County of Orange.

Orange County Water Sources Summary:

48% Groundwater	7% Recycled Water
43% Imported	2% Surface Water

The imported water is 50% from the Colorado River and 50% from the State Water Project.

Single-Family homes account for 43% of all water used in Orange County. Here's how water is utilized:

65% outdoor irrigation	8% Laundry	6% Faucets
9% Toilet	6% Showers	6% Other including leaks

Where does the water come from?

STATE WATER PROJECT

The California State Water Project (SWP) is a water storage and delivery system of reservoirs, aqueducts, power plants and pumping plants. Its main purpose is to store water and distribute it to 29 urban and agricultural water suppliers in Northern California, the San Francisco Bay Area, the San Joaquin Valley, the Central Coast, and Southern California. Of the contracted water supply, 70 percent goes to urban users and 30 percent goes to agricultural users.

The Project makes deliveries to two-thirds of California's population. It is maintained and operated by the California Department of Water Resources. The Project is also operated to improve water quality in the Delta, control Feather River flood waters, provide recreation, and enhance fish and wildlife.

Today, the Project includes 34 storage facilities, reservoirs and lakes; 20 pumping plants; 4 pumping-generating plants; 5 hydroelectric power plants; and about 701 miles of open canals and pipelines.

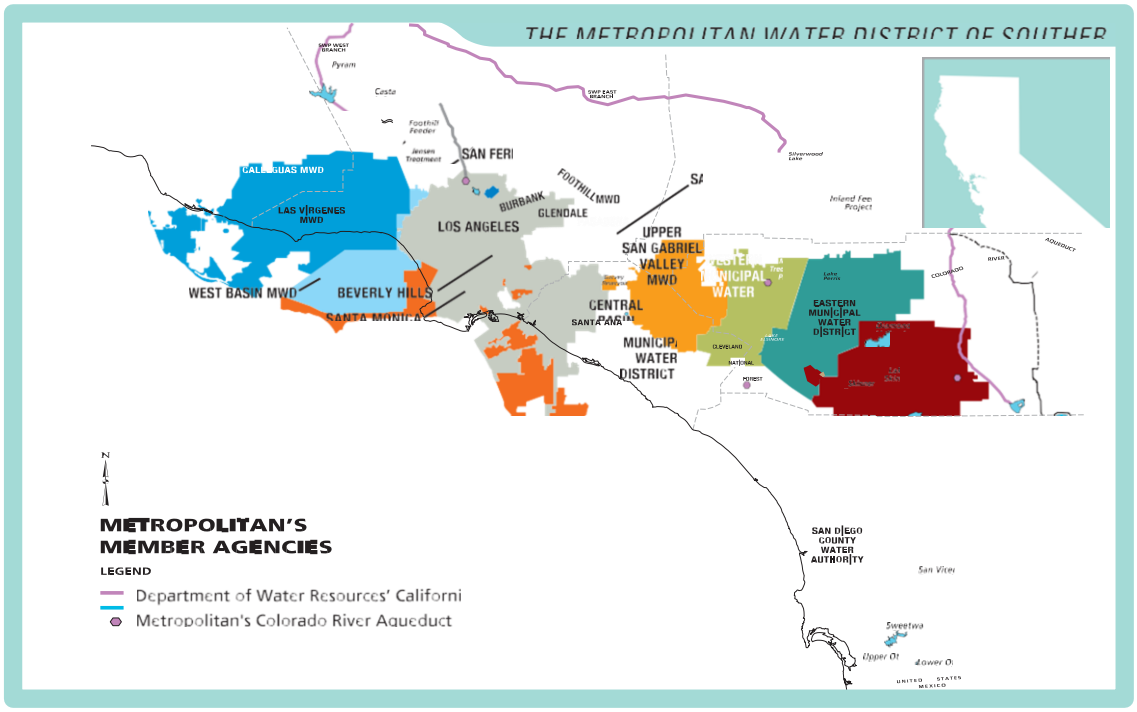
The State Water Project provides supplemental water to approximately 25 million Californians and about 750,000 acres of irrigated farmland.

FIGURE 5: CALIFORNIA STATE WATER PROJECT (SWP) FACILITIES



THE METROPOLITAN WATER DISTRICT OF SOUTHERN CALIFORNIA

FIGURE 6: METROPOLITAN MEMBER AGENCIES



The Metropolitan is the REGIONAL wholesaler that delivers water to 26 member public agencies – 14 cities, 11 municipal water districts, one county water authority which in turn provides water to more than 19 million people in Los Angeles, Orange, Riverside, San Bernardino, San Diego and Ventura Counties. Metropolitan is governed by a 37-member board of directors who represents their respective member agencies ensuring each member agency is part of the governance process.

To supply the more than 300 cities and unincorporated areas in Southern California with reliable and safe water, Metropolitan owns and operates an extensive water system including the Colorado River Aqueduct, 16 hydroelectric facilities, nine reservoirs, 819 miles of large-scale pipes and five water treatments plants. Four of these treatment plants are among the 10 largest plants in the world. In fact, Metropolitan is the largest distributor of treated drinking water in the U.S. The District imports water from the Feather River in Northern California and the Colorado River to supplement local supplies. It also helps its member agencies develop water recycling, storage and other local resource programs to provide additional supplies and conservation programs to reduce regional demands and help with the ongoing threat of drought.

Metropolitan currently delivers an average of 1.7 billion gallons of water per day to a 5,200-square mile service area.

MUNICIPAL WATER DISTRICT OF ORANGE COUNTY (MWDOC)

The Municipal Water District of Orange County (MWDOC) is a wholesale water supplier and resource planning agency. Their efforts focus on sound planning and appropriate investments in water supply development, water use efficiency, public information, legislative advocacy, water education, and emergency preparedness. MWDOC's service area covers all of Orange County, with the exception of the cities of Anaheim, Fullerton, and Santa Ana. They serve Orange County through 28 retail water agencies.



Local water supplies meet nearly half of Orange County's total water demand. To meet the remaining demand, MWDOC purchases imported water from Northern California and the Colorado River through the Metropolitan. MWDOC delivers this water to its 28 client agencies, which provide retail water services to the public.

MWDOC is governed by a seven-member Board of Directors. The MWDOC is the third largest Metropolitan member agency and holds key leadership positions on the Board of Directors that oversee policy development, strategy, and implementation.

ORANGE COUNTY WATER DISTRICT (OCWD)

OCWD was formed in 1933 by a special act of the California State Legislature to protect Orange County's rights to water in the Santa Ana River. OCWD's primary responsibility is managing the vast groundwater basin under northern and central Orange County that supplies water to more than 20 cities and water agencies, serving more than 2.3 million Orange County residents. Since 1933, OCWD has replenished and maintained the groundwater basin at safe levels while more than doubling the basin's annual yield. This important source of water provides local groundwater producers with a reliable supply of high-quality water.

OCWD primarily recharges the basin with water from the Santa Ana River and, to a lesser extent, with imported water purchased from the Metropolitan. OCWD currently holds rights to all Santa Ana River flows reaching Prado Dam. Water enters the groundwater basin via settling or percolation ponds in the cities of Anaheim and Orange. Behind Prado Dam (constructed and owned by the U.S. Army Corps of Engineers for flood prevention), OCWD owns 2,400 acres in Riverside County, which the District uses for water conservation, water quality improvement and environmental enhancement.

OCWD monitors the groundwater taken out each year to ensure that the basin is not overdrawn; refills the basin; and carries out an assessment program to pay for operating expenses and the

cost of imported replenishment water. The groundwater basin holds millions of acre-feet of water (an acre-foot satisfies the needs of two families for one year). The groundwater basin provides more than half of all water used within the District. Protection, safety and enhancement of groundwater are OCWD's highest priorities. With one of the most sophisticated groundwater protection programs in the country, OCWD uses more than 700 wells providing more than 1,400 sampling points—from which OCWD takes more than 18,000 water samples and conducts more than 350,000 analyses every year. OCWD's monitoring program looks for more than 330 contaminants—far more than the 122 required by the regulatory agencies.

OCWD is leading the way in purification of wastewater for reuse to provide a reliable, new, drought-proof high quality source of water. The Groundwater Replenishment System, a joint project of OCWD and the Orange County Sanitation District, went on-line in January 2008 and can produce enough near-distilled quality water for 500,000 people.

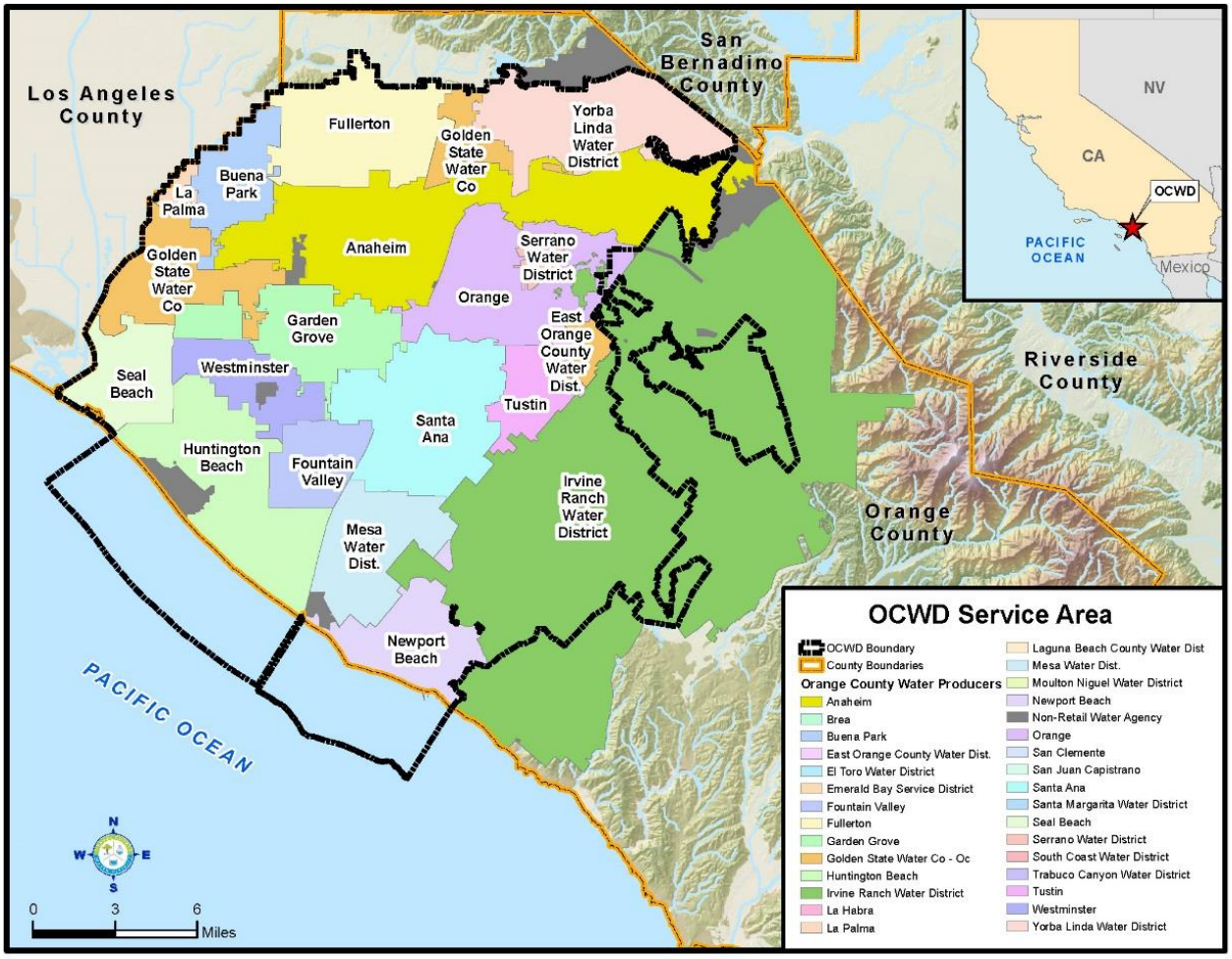
Additional efforts to increase local water supplies include expanding the capacity of the existing percolation facilities, treating poor quality water to make it useable, studying methods to extend the life of filtration membranes, improving advanced purification technologies, using bacteria to remove contaminants, and studying the quality of Santa Ana River water and other water-related issues. Other OCWD groundwater management and water quality activities focus on expanding the Prado wetlands, groundwater treatment at well heads, computer modeling of the groundwater basin and conservation of endangered or threatened species.

About Groundwater
Groundwater is the high-quality water that makes up more than half of all water used in Orange County. The groundwater basin began forming millions of years ago as mountains eroded and ocean sediments filled a deep valley, trapping Santa Ana River water between the layers of accumulated sand and gravel. The deepest aquifers of the groundwater basin still contain pristine water that fell to the earth thousands of years ago. The water Orange County drinks today may have entered the basin one year, 100 years or 1,000 years ago, depending on the location and depth of the well. The groundwater basin holds between 10 million and 40 million acre-feet of water, of which 1.25 million to 1.5 million acre-feet is usable.

Groundwater has always been vital to the lives and livelihoods of Orange County residents. In the 1800s and early 1900s, Orange County's growing agricultural industry thrived because of a reliable, easily obtainable supply of water pumped from the ground below. As farmers continued to pump groundwater and divert water from the Santa Ana River for irrigation, they noticed that groundwater levels were falling. Pumps had to be lowered deeper into the ground to pump out the same amount of water, requiring more energy. The question of seawater being drawn into the groundwater basin also was of serious concern.

Orange County's groundwater basin supplies up to 75% of the water needs for residents and businesses in Anaheim, Buena Park, Costa Mesa, Cypress, Fountain Valley, Fullerton, Garden Grove, Huntington Beach, Newport Beach, Irvine, La Palma, Los Alamitos, Orange, Placentia, Santa Ana, Seal Beach, Stanton, Tustin, Villa Park, Westminster and Yorba Linda. (This includes all RSCCD sites and facilities.)

FIGURE 7: ORANGE COUNTY WATER DISTRICT (OCWD) SERVICE AREA



VULNERABILITY ASSESSMENT

Drought produces a complex web of impacts that spans many sectors of the economy and reaches well beyond the area experiencing physical drought. This complexity exists because water is integral to our ability to produce goods and provide services.

Impacts are commonly referred to as direct or indirect. Reduced crop, rangeland, and forest productivity; increased fire hazard; reduced water levels; increased livestock and wildlife mortality rates; and damage to wildlife and fish habitat are a few examples of direct impacts. The consequences of these impacts illustrate indirect impacts. For example, a reduction in crop, rangeland, and forest productivity may result in reduced income for farmers and agribusiness, increased prices for food and timber, unemployment, reduced tax revenues because of reduced expenditures, increased crime, foreclosures on bank loans to farmers and businesses, migration, and disaster relief programs. Direct or primary impacts are usually biophysical. Conceptually speaking, the more removed the impact from the cause, the more complex the link to the cause. In fact, the web of impacts becomes so diffuse that it is very difficult to come up with financial estimates of damages. The impacts of drought can be categorized as economic, environmental, or social.

Many economic impacts occur in agriculture and related sectors, including forestry and fisheries, because of the reliance of these sectors on surface and subsurface water supplies. In addition to obvious losses in yields in both crop and livestock production, drought is associated with increases in insect infestations, plant disease, and wind erosion. Droughts also bring increased problems with insects and diseases to forests and reduce growth. The incidence of forest and range fires increases substantially during extended droughts, which in turn places both human and wildlife populations at higher levels of risk.

Income loss is another indicator used in assessing the impacts of drought because so many sectors are affected. Reduced income for farmers has a ripple effect. Retailers and others who provide goods and services to farmers face reduced business. This leads to unemployment, increased credit risk for financial institutions, capital shortfalls, and loss of tax revenue for local, state, and federal government. Less discretionary income affects the recreation and tourism industries. Prices for food, energy, and other products increase as supplies are reduced. In some cases, local shortages of certain goods result in the need to import these goods from outside the stricken region. Hydropower production may also be curtailed significantly. Income loss for water retail agencies often result in the need to increase water rates in order to cover fixed operational costs.

Environmental losses are the result of damages to plant and animal species, wildlife habitat, and air and water quality; forest and range fires; degradation of landscape quality; loss of biodiversity; and soil erosion. Some of the effects are short-term and conditions quickly return to normal following the end of the drought. Other environmental effects linger for some time or may even become permanent. Wildlife habitat, for example, may be degraded through the loss of wetlands, lakes, and vegetation. However, many species will eventually recover from this temporary aberration. The degradation of landscape quality, including increased soil erosion, may lead to a more permanent loss of biological productivity of the landscape. Although environmental losses are difficult to quantify, growing public awareness and concern for environmental quality has forced public officials to focus greater attention and resources on these effects.

TABLE 2: ORANGE COUNTY AGRICULTURE VALUES (2009)

Crop	Value
Animal Industry	$246,978
Field	$875,688
Nursery	$126,316,686
Tree Fruit & Berry Crops	$51,062,700
Vegetables	$13,598,272
Total	$192,100,324

Social impacts mainly involve public safety, health, conflicts between water users, reduced quality of life, and inequities in the distribution of impacts and disaster relief. Many of the impacts specified as economic and environmental have social components as well. Population out-migration is a significant problem in many countries, often stimulated by greater availability of food and water elsewhere. Migration is usually to urban areas within the stressed area or to regions outside the drought area; migration may even be to adjacent countries, creating refugee problems. However, when the drought has abated, these persons seldom return home, depriving rural areas of valuable human resources necessary for economic development. For the urban area to which they have immigrated, they place ever-increasing pressure on the social infrastructure, possibly leading to greater poverty and social unrest.

In terms of calculations of the replacement value of the potential loss of structures due to drought, additional analysis could not be made due to data limitations. Hazus does not have drought data. However, it is not thought that drought would seriously impact structures in the district. The table above shows the value of agriculture that is present in Orange County. The loss of agriculture would impact the RSCCD financially by the loss of tax dollars received by the district.

E. RSCCD AND DROUGHT

RSCCD has been proactive in the area of sustainability for the past several years. The RSCCD Board of Trustees has established policies for District sustainability that have been incorporated in both the District Educational and Facilities Master Plans. The District has been active in recycling efforts, encouraging public transit use for students, faculty, and staff, and implementing energy and water saving projects and efficient new construction of campus facilities. Students have also been very active in this area through various clubs and sustainability events. While the District has made significant progress on the path to sustainability, it is poised to accomplish much more with the implementation of the new Sustainability Plan.

RSCCD WATER SOURCES

RSCCD is dependent on the Cities of Santa Ana, Orange and Tustin for their water service who in turn are dependent on the State Water Project, Metropolitan, MWDOC, and OCWD for water supply.

Fortunately, these agencies have always provided adequate, reliable water supplies to serve the District's needs. The Metropolitan, MWDOC and OCWD and the cities of Santa Ana, Orange and Tustin project that the water supply will be adequate to meet essential water demands for the next 20 years. Of course a deepening and continuing drought and/or extensive population increases could impact those projections. Also continuing conservation measures such as hardware installation, the reduction of industrial consumption, and education programs in conservation have significantly assisted the reduction in water usage within the County and these and additional mitigation measures are necessary to provide a continued sufficient water supply to RSCDD.

The three water suppliers to RSCCD are: Cities of Santa Ana, Orange and Tustin.

CITY OF SANTA ANA WATER

RSCCD has four sites located in Santa Ana: (1) Santa Ana Community College, (2) District Operations Center, (2) Centennial Education Center and the (4) Digital Media Center.

The City of Santa Ana Public Works Department manages the water service for Santa Ana. It depends on two sources for the 12.5 billion gallons of water supplied to its residents each year, 72 percent is groundwater and 28 percent is imported water, purchased from the Metropolitan.

The groundwater accumulates and is stored beneath the surface of the earth and then pumped to the surface by 20 City-owned wells. Metropolitan brings Colorado River water from Lake Havasu and runoff from the snow pack in the Sierra Nevada Range in Northern California. The water is then treated at either the Diemer Filtration Plant in Yorba Linda or the Weymouth Filtration Plant in La Verne before it is delivered to Santa Ana college facilities. There are seven Metropolitan connections located in the city. Most of Santa Ana customers receive a blending of the two sources, groundwater and imported water.

CITY OF ORANGE WATER

RSCCD has two sites located in the City of Orange: (1) Santiago Canyon Community College and (2) Orange Education Center. The City of Oranges water supply comes from several sources: local groundwater basins, Northern California water via the State Water Project, the Colorado River, local watersheds, reclamation, and water reuse projects. The City is a member agency of MWDOC and Metropolitan. Metropolitan supplies imported water to six Southern California counties, including Orange County. As a MWDOC member, it represents the interests of its 29 member agencies at the Metropolitan.

The City of Orange is also a member of the OCWD who manages the vast groundwater basin under north and central Orange County. The Orange County Groundwater Basin is the main source of water supply for the City of Orange. The City obtains approximately 64 to 75 percent of its water from City-owned wells. The City purchases approximately 25 to 36 percent through the MWDOC. In addition, the City purchases approximately 3 to 5 percent from the Serrano Water District. The following four water districts serve the City of Orange:

- Irvine Ranch Water District
- Golden State Water Company
- Serrano Water District
- East Orange County Water District (EOCWD)

CITY OF TUSTIN WATER

RSCCD has one site located in Tustin, the Orange County Sheriff's Regional Training Academy. The City of Tustin's main sources of water supply are: groundwater from the Lower Santa Ana River Groundwater Basin and imported water from Metropolitan through MWDOC. The City relies on 85% groundwater and 15% imported water. It is projected that through 2035 the water supply will remain roughly the same. The City works together with three primary agencies: Metropolitan, MWDOC, and OCWD to insure a safe and high quality water supply. The sources of imported water supplies include the Colorado River and the State Water Project.

RSCCD DROUGHT/CLIMATE CHANGE MITIGATION EFFORTS

Both Santa Ana and Santiago Canyon Colleges have implemented water conservation strategies through various projects on their respective campuses. For example, Santiago Canyon College is currently working with the Irvine Ranch Water District (IRWD) to utilize reclaimed water to irrigate the athletic fields. Although the area is served by the IRWD, the recycled water is provided through a partnership from the City of Orange Water Department.

In addition, the new Humanities and Gymnasium buildings at Santiago Canyon College were designed with low-flush volume toilets with automatic operation resulting in reduced water usage. Low-flush urinals were also installed and plans have been made to install more when funding is available. Synthetic turf has also been installed on the softball field to reduce the need for water, fertilizer, and pesticides. Santa Ana College has installed new efficient, low-flow irrigation systems in all of its new perimeter landscaping as well as efficient irrigation valves to reduce its water use on campus. A new tournament quality artificial turf soccer field was recently installed to reduce the use of water, fertilizer, and pesticides, as well as GHG emissions related to lawn mowers. Finally, the District would like to explore the feasibility of greywater systems, which capture and repurpose used water for flushing toilets or irrigation. It will aim to pilot a greywater system at one of the campuses.

Various sustainable landscaping projects have been implemented on both campuses, such as the Campus Landscape Improvement Program at Santa Ana College and the Coastkeeper Garden at Santiago Canyon College (SCC). The Coastkeeper Garden is a project where Santiago Canyon College leases some of its property to the non-profit Orange County Coastkeepers, who have built a demonstration garden open to the public featuring sustainable landscape techniques. SCC has also undergone campus landscaping projects using native or adaptive plant materials to reduce or eliminate irrigation requirements. Highly water efficient irrigation equipment is employed where irrigation is required. Moving forward, the District will continue to landscape with native plants and employ water-wise landscaping practices. The District will explore the installation of water bottle refilling stations or enhance current water fountains to better accommodate bottle refills. This will encourage the use of reusable bottles, thereby reducing the amount of plastic water bottles purchased and thrown in the waste stream.

The Community College Academic Senate Curriculum Committee indicates that faculty members are currently integrating sustainability in the curriculum in three main ways: by adding a component to an existing course outline of record, creating a new course, or creating a new certificate or degree program. The District employs these strategies as described more fully below, and all strategies will require leadership from faculty for adoption.

Some examples of courses include:

Biology 170/ Environmental Studies 170 – Environmental Challenge of the 21st Century – Examines the environmental impacts of increased human population on food, water and energy resources. Land use policies and environmental effects of pollution will also be analyzed.

Engineering 203 – Sustainable Construction and Facilities Management
This course provides students the means to apply core sustainable principles to each step within the facilities planning, design and management process. It examines best practices for site and building: energy, conservation, reclamation, recycle-ability, air, water, waste, sound, ecological literacy, and management tools.

Environmental Studies 140/ Geology 140 – Environmental Geology – This course focuses on the study of urban geologic hazards: earthquakes, groundwater pollution, flood potential, landslides and creep, soil expansion, coastal erosion, and volcanic hazards.
Santiago Canyon College is the lead college for training field water utility employees throughout Orange County. In addition, the Community College Academic Senate Curriculum Committee is adding new certificate and degree programs on sustainability including:

Water Utility Science Degree & Certificate – The Water Utility Science program and certificate at Santiago Canyon offers a wide range of courses that directly apply to water distribution, treatment, and wastewater management. The program provides a great opportunity for students to be trained in a growing and important field centered on environmental sustainability. With completion of the program, students are prepared for entry-level jobs in the water distribution, treatment and water reclamation industries. The associate of science degree provides coursework and internship experience designed to provide an overview of a wide range of environmental career opportunities.

According to the Director of District Construction, the sites are independently following through on drought mitigation – albeit using similar approaches: signage, reduced irrigation. Where the district has coordinated more closely is through scheduled maintenance. There are projects proposed and approved in the Scheduled Maintenance Program that address irrigation control and replacement of turf with drought tolerant species. Additionally since Santa Ana College is undergoing a significant infrastructure project and hard/soft scape replacement that balances the landscape design in a way that meets water conservation mandates.

RSCCD has been extremely pro-active on water conservation. One of the projects being studied by the committee for the Santa Ana Community College is the feasibility of a rainwater harvesting system, which would use the upper deck of the parking structure as a collection area.

SUSTAINABLE RSCCD COMMITTEE (SRC)

Purpose
The Sustainable RSCCD Committee is a participatory governance committee, working with the campus committees, responsible for raising awareness within the district and making recommendations to the Chancellor concerning the conservation of energy and other resources and the implementation of sustainability practices that impact the district and community.

The District has established water conservation goals in their approved RSCCD Sustainability Plan. The District will perform water use benchmarking studies at both campuses and the District Office to better understand usage as compared to similar facilities and community college peers. Based on the results, the District will establish annual water use reduction goals and plan new appropriate measures to achieve goals.

Responsibilities
Promote and nurture new patterns of thinking about college and district operations, practices, learning programs, support services and the relation to the local community that include consideration of conservation of energy and sustainability.

Develop a comprehensive plan to achieve climate neutrality.

Create institutional structures and identify resources relating to conservation of energy and sustainability to guide and support the implementation of the comprehensive plan.
Complete an inventory of all greenhouse gas emissions and update that inventory at least once every two years.

Encourage the development of curriculum that raises awareness about climate neutrality and sustainability and that offers a career path to employment in "green" technologies.
Review the status of and develop objectives related to improving and maintaining the "green infrastructure" of the district and colleges.
Provide periodic progress reports on the accomplishments of the committee.

Sustainability Plan
The Sustainable RSCCD Committee finalized work on the Rancho Santiago Community College District Sustainability Plan in February 2015. The plan was approved by the Board of Trustees at its meeting of March 9, 2015, Rancho Santiago Community College District Sustainability Plan.

F. Probability of Future Occurrences

EXTENT/PROBABILITY OF OCCURRENCE AND MAGNITUDE

Of the many varied indexes used to measure drought, the "Palmer Drought Severity Index" (PDSI) is the most commonly used drought index in the United States. Developed by meteorologist Wayne Palmer, the PDSI is used to measure dryness based on recent temperature compared to the amount of precipitation. It utilizes a number range, 0 as normal, drought shown in terms of minus numbers, and wetness shown in positive numbers. The PDSI is most effective at analyzing long-range drought forecasts or predications. Thus, the PDSI is very effective at evaluation trends in the severity and frequency of prolonged periods of drought, and conversely wet weather. The National Oceanic and Atmospheric Administration (NOAA) publish weekly Palmer maps, which are also used by other scientists to analyze the long-term trends associated with global warming and how this has affected drought conditions.

The U.S. Drought Monitor is unique, blending numeric measures of drought and experts' best judgment into a single map every week. It started in 1999 as a federal, state, and academic partnership, growing out of a Western Governors' Association initiative to provide timely and understandable scientific information on water supply and drought for policymakers.

The Monitor is produced by a rotating group of authors from the U.S. Department of Agriculture, the National Oceanic and Atmospheric Administration, and the National Drought Mitigation Center. It incorporates review from a group of 250 climatologists, extension agents, and others across the nation. Each week the author revises the previous map based on rain, snow and other events, observers' reports of how drought is affecting crops, wildlife and other indicators. Authors balance conflicting data and reports to come up with a new map every Wednesday afternoon. It is released the following Thursday morning.

Highly Likely (every 1-10 years)

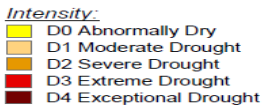
The University of Nebraska-Lincoln has published many of the Palmer Drought Index maps analyzing trends over the past one hundred years (National Drought Mitigation Center). In coastal Southern California, (Orange County is a coastal county) from 1895 to 1995, severe droughts occurred 10 to 15 percent of the time. From 1990 to 1995, severe droughts occurred 10 to 20 percent of the time and as recently as 1989, a severe drought was documented that lasted for six years. More recently, between 1999 and 2004, a six-year drought on the Colorado River basin has resulted in a drawdown of Colorado River water storage by more than 50%. The 2012-15 drought has been severe causing the Governor to declare a State of Emergency and require conservation measures of all Californians.

Based on these trends and *Climate Change*, severe droughts can readily occur in Southern California. According to the California Natural Resources Conservation Service (NRCS), the current and recent droughts in Southern California have caused extensive devastation to forests in the mountains of San Bernardino, San Jacinto and Palomar Mountains. Drought weakens trees which make them susceptible to infestation by bark-beetles. In turn dry vegetation and beetle infested trees are more susceptible to fire than healthy forests.

In addition, droughts are occurring much more often since the 1970's. Drinking water supply for Orange County is approximately 50% local supply and 50% imported supply. The RSCCD Hazard Mitigation Team has ranked droughts as **Highly Likely probability** to continue to impact the planning area in the future at a rate of every 1-10 years.

Drought Impact Types: Short Term droughts are typically less than 6 months with Long Term droughts typically greater than 6 months.

Drought Intensities are listed to the right. At the writing of this plan, October 2015, California is in level D4, Exceptional Drought emergency and the State of California is in a Drought State of Emergency.



The geographic area affected by a Drought and by Climate Change is s100% of the planning area or ***Extensive***. The Maximum Probable Extent of a drought is ***Moderate***. As of 2016, the Governor's California State of Emergency for Drought is still in place. This 5-year drought resulted in the district purchasing a new irrigation system, low flow toilets and investing in drought tolerant plants.

The Overall Significance of a Drought and/or Climate Change on the RSCCD is "***Medium***." It's going to happen but our excellent water management overcame one of nature's most powerful droughts in history. With increased planning and cooperation, the RSCCD can overcome most of these incidents.

G. CLIMATE CHANGE AND THE RSCCD

WHAT IS CLIMATE CHANGE?

Climate is usually defined as the "average weather" in a place. It includes patterns of temperature, precipitation (rain or snow), humidity, wind and seasons. Climate patterns play a fundamental role in shaping natural ecosystems, and the human economies and cultures that depend on them. But the climate we've come to expect is not what it used to be, because the past is no longer a reliable predictor of the future. Our climate is rapidly changing with disruptive impacts, and that change is progressing faster than any seen in the last 2,000 years.

According to the report, Preparing for a Changing Climate, rising levels of carbon dioxide and other heat-trapping gases in the atmosphere have warmed the Earth and are causing wide-ranging impacts, including rising sea levels; melting snow and ice; more extreme heat events, fires and drought; and more extreme storms, rainfall and floods. Scientists project that these trends will continue and in some cases accelerate, posing significant risks to human health, our forests, agriculture, freshwater supplies, coastlines, and other natural resources that are vital to the economy, environment, and our quality of life.

Because so many systems are tied to climate, a change in climate can affect many related aspects of where and how people, plants and animals live, such as food production, availability and use of water, and health risks. For example, a change in the usual timing of rains or temperatures can affect when plants bloom and set fruit, when insects hatch or when streams are their fullest. This can affect historically synchronized pollination of crops, food for migrating birds, spawning of fish, water supplies for drinking and irrigation, forest health, and more
.
Some short-term climate variation is normal, but with longer-term trends many scientists believe they indicate a changing climate.

Climate Change/Climate Adaptability
Climate scientists studying California find that drought conditions are likely to become more frequent and persistent over the 21st century due to *Climate Change*. The experiences of California during recent years underscore the need to examine more closely the state's water shortage, distribution management conservation and use policies.

The Climate Adaptation Strategy (CAS) stresses the need for public policy development addressing long-term *Climate Change* impacts on water supplies. The CAS notes that *Climate Change* is likely to significantly diminish California's future water supply, stating that:

"California must change its water management and uses because *Climate Change* will likely create greater competition for limited water supplies needed by the environment, agriculture and the cities." (State of California Multi-Hazard Mitigation Plan, 2013)

In February 2015, California passed SB 379 would, upon the next revision of a local hazard mitigation plan on or after January 1, 2017, or, if the local jurisdiction has not adopted a local hazard mitigation plan, beginning on or before January 1, 2022, require the safety element to be reviewed and updated as necessary to address climate adaptation and resiliency strategies

applicable to that city or county. The bill would require the update to include a set of goals, policies, and objectives based on a vulnerability assessment, identifying the risks that *Climate Change* poses to the local jurisdiction and the geographic areas at risk from *Climate Change* impacts, and specified information from federal, state, regional, and local agencies. Historical evidence and scientific studies have already uncovered distributing trends due to *Climate Change*s. By 2006, scientist projected a loss of at least 25% of the Sierra's snowpack, an important source of urban, agricultural and environmental water.

Weather patterns are becoming more variable, causing more severe winter and spring flooding and longer drier droughts.

Since 1950's, flood flows on many California rivers have been largest on record. Levees, dams, and flood by-passes are forced to manage flows for which they weren't designed.

In the past century, sea levels has risen over one-half foot at the Golden Gate. It is projected, continued sea level rises will threaten many coastal communities as well as the sustainability of the Sacramento – San Joaquin Delta which supplies 25 million Californians with drinking water.

Agencies that provide water to RSCCD (Municipal Water District of Orange County, Orange County Water District, City of Santa Ana, Orange's five water districts and City of Tustin) are monitoring and preparing for *Climate Change*. This has been made a priority for all California water departments.

Rising water temperatures and changes in runoff patterns may adversely impact salmon and other aquatic species.

Based on the *Climate Change* Impacts and Climate Predication Outlooks, the RSCCD Hazard Mitigation Team voted that it is ***Highly Likely***, that we will see additional Sever to Extremely Sever Droughts over the next 10-20 years due to Climate Change, requiring:

- Strategies to address impacts of *Climate Change*s
- Increase monitoring of climatological and water resources conditions.
- Improve flood forecasting abilities and *Climate Change*s models to assess future flood protection needs.
- Refined projections of *Climate Change*s consequences on water supply and reliability
- A need to conduct system re-operation studies to improve reliability and maintain sufficient flood reservations
- A need to assess *Climate Change* effects on hydropower production
- A need to reduce greenhouse gas emissions from water management activities
- Updated studies on the combined effects of increased atmospheric carbon dioxide and increased temperature on crop water needs, to predict future water needs
- Analyses on the effects of the sea level rise on the Delta salinity levels
- Adaption statewide of water management systems by incorporating more flexibility
- Improvements in the interaction and coordination with local, state, federal and academic researchers

Integrated Regional Water Management

Integrated regional water management plans are the primary strategy to achieve reliable, high quality water supplies and protect and enhance the environment. Cooperation among communities and stakeholders benefit by resolving conflicts, leveraging existing infrastructure,

and building a diversified portfolio of water supply alternatives. This approach will help regions find the best solutions to the effects of Climate Changes in local areas.

Orange County is ahead of the curve on this issue with the Metropolitan District of Southern California, Municipal District of Orange County and the Orange County Water District. Orange County has been working for decades with integrated regional water management plans and policies.

Groundwater and Surface Storage
Climate Change may cause core frequent and more severe winter storms, and longer drier periods of drought. New groundwater and surface and water storage, will ensure a reliable water supply for California's future and provide vital flood protection by managing more variable precipitation and runoff.

Again, Orange County has the Orange County Water District that regionally manages and shares in the ground water. They maintain the groundwater ensuring quality water for Orange County residents.

Water and Energy
Climate Change may reduce hydropower generation production. At the same time, energy use may increase because of higher temperature and greater water demands. These conditions may force greater reliability on fossil fuels that produce greenhouse gases. Future water management activities must consider strategies to conserve energy and reduce greenhouse gases emissions.

The Delta
Rising sea levels will increase pressure on Delta levees, and force more salt water from the San Francisco Bay into the Delta. As currently managed, more fresh water will be needed to repel seawater and maintain water quality standards, especially during drier years. Compounding these impacts from sea level rise, shifting precipitation and runoff patterns will direct more water to the Delta during the dry summer months. Since 43% of Orange County's water is imported, it is critical that we pay close attention to issues such as the Delta.

Drought Mitigation Projects
We have identified the following Drought Mitigation issue that we are currently discussing or assessing the status of these issues to determine if we need to take action to mitigate the effects of the drought on Operational Area. We will be working with Local Water Purveyors, City, County, State and Federal partners to coordinate our response to these issues that have been identified.

Identified mitigation drought issues for future consideration include:

- Assess Vulnerability to Drought Risk
- Plan for Drought
- Monitor Drought Conditions
- Monitor Water Supply
- Require Water Conservation During Drought Conditions
- Retrofit Water Supply Systems
- Enhance Landscaping and Design Measures
- Educate Residents on Water Saving Techniques

The Sustainability RSCCD Committee is already taking the lead on drought issues and will continue to lead the district and its colleges on drought and *Climate Change*.

Orange County already has numerous groups working towards climate adaption. Felicity Figueroa of Orange County for Climate Action stated: “If we let the inevitable consequences of *climate change* proceed undeterred, no other issue will even matter.” Orange County for Climate Action (OCCA) is alliance of OC organizations to address the problem of climate change and how it affects individuals, organizations and our community. (occlimateaction.org).

H. Drought & Climate Change Mitigation Strategies

Hazard	**Drought Activity #1**
Action Item	**Develop a comprehensive approach to mitigating the hazard "Drought."**
Coordinating Organization	Chief Safety & Security and Sustainable RSCCD Committee
Ideas for Implementation	Work through the Sustainable RSCCD Committee (SRC) to do the following Introduce the Hazard Mitigation Plan to the RSCCD Sustainability Planning Committee so efforts can be coordinated by inviting them to the Hazard Mitigation Community Forum. Continue Drought awareness and education (Short Term Activity #2) Monitor and report drought conditions on a monthly basis and display this information on the district's website (Short Term Activity #3)
Time Line	Ongoing
Constraints	Pending Funding and Available Personnel
Funding Sources	General Fund
Cost Estimate	Staff Time
Benefits: Losses Avoided	Improved education and planning. Low cost item
Priority	Medium/High

	Plan Goals Addressed
X	**Promote Public/College Community Awareness**
X	**Create Partnerships and Implementation**
	Protect Life and Property
	Protect Natural Systems
X	**Strengthen Emergency Services**

Hazard	DROUGHT ACTIVITY #2
Action Item	**Increase Drought and Climate Change Risk Awareness and Education**
Coordinating Organization	Sustainable RSCCD Committee and Chief District Safety & Security
Ideas for Implementation	▪ Present the RSCCD Hazard Mitigation Drought/Climate Change Section to as many RSCCD staff, faculty, students and the public when possible ▪ Every occasion the districts emergency preparedness program is presented, include information on the RSCCD Hazard Mitigation Drought/Climate Change Section and ask for input into future projects. ▪ Present the U.S. Drought Monitor to RSCCD staff, faculty, students and public to ensure they understand that California is in the Exceptional Drought index and how severe the drought situation is in California. Even when the drought ends, drought education must continue. ▪ Include information on monitoring droughts, conservation actions the district is taking, emergency plans for severe droughts, and educating students, faculty, and staff on water saving techniques for work and home. ▪ Review the California "Local Government Drought Toolkit" to determine if further District actions are necessary. Go to: http://www.opr.ca.gov/docs/Local_Government_Drought_Toolkit_March_10_2014.pdf
Time Line	Ongoing
Constraints	Chief District Safety & Security can only offer the training; attendance is voluntary
Funding Sources	General Fund
Cost Estimate	Staff Time
Benefits: Losses Avoided	Sustained mitigation outreach programs have minimal cost and will help build and support district-wide capacity. This type of activity enables the district faculty, students and the public to better prepare for drought. .
Priority	Medium/High

Plan Goals Addressed	
X	Promote Public and College Community Awareness
X	Create Partnerships and Implementation
X	Protect Life and Property
	Protect Natural Systems
X	Strengthen Emergency Services

Hazard	

	DROUGHT ACTIVITY #3
Action Item	**Continue to develop a Drought Conservation Plan for the RSCCD (Implement Water Conservation Strategies SRC 4.7.2)**
Coordinating Organization	Sustainable RSCCD Committee (lead) Chief District Safety & Security will liaison with the committee on Drought
Ideas for Implementation	▪ Utilizing the Sustainable RSCCD Committee (SRC), make list of what conservation efforts that have been completed and are ongoing. ▪ List actions being considered (unfunded projects). The Hazard Mitigation Team Project Manager should work with the SRC providing a list of possible funding sources for these projects from the Hazard Mitigation Plan.
Time Line	5 years
Constraints	Pending Funding and Available Personnel
Funding Sources	General Fund
Cost Estimate	Staff Time
Benefits: Losses Avoided	Drought is a long term issue that must be managed every year, not just in drought years. Low cost item
Priority	Medium/High

Plan Goals Addressed	
X	Promote Public/College Community Awareness
X	Create Partnerships and Implementation
	Protect Life and Property
	Protect Natural Systems
X	Strengthen Emergency Services

Hazard	**DROUGHT ACTIVITY #4**
Action Item	**Retrofit Water Supply Systems.**
Coordinating Organization	Director of District Construction
Ideas for Implementation	Improve water supply and delivery systems to save water through actions such as: a. Designing water delivery systems to accommodate drought events b. Developing new or upgrading existing water delivery systems to eliminate breaks and leaks c. Repair all water leaks in a timely manner
Time Line	5 years
Constraints	Pending Funding and Available Personnel
Funding Sources	General Fund
Cost Estimate	$3 – 4 million
Benefits: Losses Avoided	Long term planning item that will result in long term benefits.
Priority	Medium/High

Plan Goals Addressed	
X	Promote Public/College Community Awareness
X	Create Partnerships and Implementation
	Protect Life and Property
	Protect Natural Systems
X	Strengthen Emergency Services

Notes: SAC has a soccer field with AstroTurf
Darryl Taylor is completing a Districtwide Water conservation Efforts Presentation to the Board

Hazard	**DROUGHT ACTIVITY #5**
Action Item	**Enhance Landscaping and Design Measures (Adopt Sustainable Landscaping Practices SRC 4.7.4)**
Coordinating Organization	Director of District Construction
Ideas for Implementation	All future landscaping on the seven RSCCD sites should take into consideration using drought-tolerant landscape design through measures such as: a. Incorporating drought tolerant practices to reduce dependence on irrigation b. Using permeable parking lots and surfaces to reduce runoff and promote groundwater recharge c. Consider synthetic turf in appropriate locations (Test case is the soccer field was converted to AstroTurf) d. SCC needs a reclaimed water system e. Research systems available for reuse of rain water f. Replace faucets, fixtures, toilets with low-flow and waterless fixtures (almost complete) g. Upgrade campus wide irrigation system to smart and water efficient systems. i.e. drip or other system
Time Line	5 years
Constraints	Pending Funding and Available Personnel
Funding Sources	General Fund
Cost Estimate	$2 million
Benefits: Losses Avoided	Long term planning item that will result in long term benefits.
Priority	Medium/High

Plan Goals Addressed	
X	Promote Public/College Community Awareness
X	Create Partnerships and Implementation
	Protect Life and Property
	Protect Natural Systems
X	Strengthen Emergency Services

Note: A districtwide water conservation efforts report will be presented to the Board in 2016.

Hazard	**CLIMATE CHANGE ACTIVITY #1**
Action Item	**Study the impacts of Climate Change on the RSCCD**
Coordinating Organization	Sustainability RSCCD Committee
Ideas for Implementation	a. Review updated state and county studies on Climate Change as they are released b. Make recommendations to the Board of Trustees on how RSCCD can be pro-active on climate adaption issues c. Take necessary actions d. Educate the students, faculty and staff on Climate Change and Climate Adaption issues
Time Line	5 years
Constraints	Pending Funding and Available Personnel
Funding Sources	General Fund
Cost Estimate	Staff Time
Benefits: Losses Avoided	Long term planning item that will result in long term pro-active actions.
Priority	Medium/High

Plan Goals Addressed	
X	Promote Public/College Community Awareness
X	Create Partnerships and Implementation
	Protect Life and Property
X	Protect Natural Systems
	Strengthen Emergency Services

Section IV-F – Severe Weather/Santa Ana Winds

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MITIGATION STRATEGIES 23

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A. California Vulnerability to Windstorms/Severe Weather

The State of California Multi-Hazard Mitigation Plan did not study windstorms, Santa Ana Wind or tornadoes. Santa Ana Wind is the primary concern and this weather condition only impacts Southern California. This study will combine the following issues to make up the Windstorms section:

- Windstorms or High Winds
- Santa Ana Wind Condition
- Tornadoes

B. Orange County Vulnerability to Windstorms/Severe Weather

Severe winds can occur alone, such as during straight-line wind events or it can accompany other natural hazards including hurricanes, and severe thunderstorms. Severe wind poses a threat to lives, property, and vital utilities primarily due to the effects of flying debris or downed trees and power lines. Severe wind will typically cause the greatest damage to structures of light construction, particularly manufactured homes as those used as portable classrooms.

Orange County is subject to high winds, Santa Ana Wind, and tornadoes. An example of a Santa Ana Wind incident that hit Orange County was in January 6, 2003 when the City of Orange was hit with severe Santa Ana Wind as seen on the left. This incident caused downed power and phone lines, closed streets in the City of Orange and required extensive cleanup of the impact area. No lives were lost and there were no serious injuries.



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



Santa Ana Wind conditions can result in two general disaster conditions. The most common is fire fanned by the high winds. This was the situation in 1993 in Laguna Beach when a massive fire destroyed a number of homes in the hills around Laguna Beach. Santa Ana Wind driven flames caused the destruction of more than 3,000 homes in Southern California in October, 2003. Other forms of disaster would be direct building damage, damage to utilities and infrastructure as a result of the high winds. This has occurred in the past few years in many southland communities including Santa Ana, Orange and Tustin where the RSCCD sites are located.

Santa Ana Winds commonly occur between October and February/March with December having the highest frequency of events. Summer events are rare. Wind speeds are typically north to east at 35 knots through and below passes and canyons with gusts to 50 knots. Stronger Santa Ana Wind can have gusts greater than 60 knots over widespread areas and gusts greater than 100 knots in certain areas. Frequently, the strongest winds in the basin occur during the night and morning hours due to the absence of a sea breeze. The sea breeze which typically blows onshore daily, can moderate the Santa Ana Wind during the late morning and afternoon hours. Santa Ana Wind are an important forecast challenge because of the high fire danger associated with them. Also, unusually high surf conditions on the northeast side of the Channel Islands normally accompany a Santa Ana Wind event. Other hazards include: wind damage to property, turbulence and low-level wind shear for aircraft, and high wind dangers for boaters.



WINDSTORM, SANTA ANA WIND AND TORNADO-LIKE EVENTS

Based on local history, most incidents of high wind in Orange County area are the result of the Santa Ana Wind conditions. While high impact wind incidents are not common to the area, significant Santa Ana Wind events and sporadic tornado activity have been known to negatively impact the local communities. (Actually, the wind miles per hour most often do not meet the legal definition of a tornado by the National Weather Service. However these incidents are always called tornados by the locals.)

WHAT ARE SANTA ANA WINDS?

Santa Ana Wind (sometimes referred to as “Santa Ana’s”) are warm, dry, gusty offshore winds that blow from the east or northeast and occur below the passes and canyons of the coastal ranges of Southern California and in the Los Angeles Basin. According to the National Weather Service, winds must blow at speeds greater than 25 knots to be called Santa Ana Wind. These winds accelerate to speeds of 35 knots as they move through canyons and passes, with gusts to 50 or even 60 knots.



Several meteorological conditions contribute to the phenomenon. The Bernoulli Effect accounts for increased speeds when the desert wind is pushed through narrow canyons. Bernoulli's Law mathematically describes the relationship between pressure and velocity in the horizontal flow of fluids. Although different scenarios may contribute to a Santa Ana Wind, the most common pattern involves a high-pressure region sitting over the Great Basin (the high plateau west of the Rockies and east of the Sierra Mountains).

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

In different regional areas, similar wind conditions exist and are named respectively. In the Pacific Northwest, the "Chinooks" are caused by a downhill flow very similar to the Santa Ana Wind. The Northern California version of this wind is sometimes referred to as the "Diablo."

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

The **Beaufort Wind Force Scale** is a measure that relates wind speed at sea or on land although it is a measure of wind speed and not of force in the scientific senses.

TABLE 1 - BEAUFORT WIND FORCE SCALE

BEAUFORT SCALE				
Beaufort Force	**Speed (mph)**	**Wind Description**	**State of Sea**	**Effects on Land**
0	**Less 1**	Calm	Mirror-like	Smoke rises vertically
1	**1-3**	Light Air	Ripples look like scales; No crests of foam	Smoke drift shows direction of wind, but wind vanes do not
2	**4-7**	Light Breeze	Small but pronounced wavelets; Crests do not break	Wind vanes move; Leaves rustle; You can feel wind on the face
3	**8-12**	Gentle Breeze	Large Wavelets; Crests break; Glassy foam; A few whitecaps	Leaves and small twigs move constantly; Small, light flags are extended
4	**13-18**	Moderate Breeze	Longer waves; Whitecaps	Wind lifts dust and loose paper, small branches
5	**19-24**	Fresh Breeze	Moderate, long waves; Many whitecaps; Some spray	Small trees with leaves begin to move
6	**25-31**	Strong Breeze	Some large waves; Crests of white foam; Spray	Large branches move; Telegraph wires whistle; Hard to hold umbrellas
7	**32-38**	Near Gale	White foam from breaking waves blows in streaks with the wind	Whole trees move; Resistance felt walking into wind
8	**39-46**	Gale	Waves high and moderately long; Crests break into spin drift, blowing foam in well marked streaks	Twigs and small branches break off trees; Difficult to walk
9	**47-54**	Strong Gale	High waves with wave crests that tumble; Dense streaks of foam in wind; Poor visibility from spray	Slight structural damage
10	**55-63**	Storm	Very high waves with long, curling crests; Sea surface appears white from blowing foam; Heavy tumbling of sea; Poor visibility	Trees broken or uprooted; Considerable structural damage
11	**64-73**	Violent Storm	Waves high enough to hide small and medium sized ships; Sea covered with patches of white foam; Wave crests blown into froth; Poor visibility	Seldom experienced inland; Considerable structural damage
12	**>74**	Hurricane	Sea white with spray. Foam and spray render visibility almost non-existent	Widespread damage. Very rarely experienced on land

Information taken from the following URL: http://www.compuweather.com/decoder-charts.html

WHAT ARE TORNADOES?

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

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

California does not have large destructive tornados like the mid-west. In fact, the National Weather Service reports that most Orange County events thought to be tornados actually do not meet the minimum wind speed of 73 miles per hour and are just wind storms. Often along the Pacific coast, there are water spouts that come on shore to create tornado-like incidents.



January 19, 2010 Huntington Beach

TABLE 2 - FUJITA TORNADO DAMAGE SCALE

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

Chart taken from the LA Times Weather Section at the following URL: http://weather.latimes.com/tornadoFAQ.asp

WHAT ARE HURRICANES?

Hurricanes are large, swirling storms. They produce winds of 74 mph or higher. That's faster than a cheetah, the fastest animal on land. Winds from a hurricane can damage buildings and trees. Hurricanes form over warm ocean waters.

The main reason why hurricanes do not hit California is because of cold sea surface temperatures off the California coastline and the California Current.

Hurricanes or tropical cyclones as they are often called, usually need sea surface temperatures above 26.5 °C (80 °F) with a depth of 50 meters (160 feet) to survive. But the waters off the California coast are too cold for tropical cyclones, even during the summer. Normally, the waters' temperatures do not get above 17 °C (70 °F), although El Nino effects may sometimes warm the waters a little bit.

Also the California Current moves down from the northwestern US coast to the southern tip of the Baja California peninsula, which is the opposite in which Northern Hemisphere tropical cyclones move. While a few tropical cyclones may hit the southern and central areas of the Baja California peninsula, they do not make landfall any farther north than that.

Southern California Hurricanes

July 18–20, 2015: The remnants of Hurricane Dolores brought scattered showers and thunderstorms throughout Southern California, breaking many rainfall records and causing flooding. One such flash flood caused a bridge to collapse which shut down Interstate 10 between Indio and Blythe, effectively shutting off the primary Phoenix-to-Los-Angeles route. The good news was that the rain helped firefighters contain the North Fire within 3 days.

September 12–15, 2015: The remnants of Hurricane Linda brought localized downpours from Santa Barbara to San Diego, California.[1] On September 15, Los Angeles received 2.39 inches of rain, making it one of the wettest September days since records dating back to 1877, second only to 1939

COMMUNITY WINDSTORM ISSUES; WHAT IS SUSCEPTIBLE TO WINDSTORMS?

LIFE AND PROPERTY

Based on the history of the region, windstorm events can be expected, perhaps annually, across widespread areas of the region. Obviously, the District and surrounding areas can be adversely impacted during a windstorm event.

Both residential and commercial structures with weak reinforcement are susceptible to damage. Wind pressure can create a direct and frontal assault on a structure, pushing walls, doors, and windows inward. Conversely, passing currents can create lift suction forces that pull building

components and surfaces outward. With extreme wind forces, the roof or entire building can fail, causing considerable damage.

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

UTILITIES

Historically, falling trees have been the major cause of power outages in the region. Windstorms such as strong microbursts and Santa Ana Wind conditions can cause flying debris and downed utility lines. For example, tree limbs breaking in winds of only 45 mph can be thrown over 75 feet. As such, overhead power lines can be damaged even in relatively minor windstorm events. Falling trees can bring electric power lines down to the pavement, creating the possibility of lethal electric shock. Rising population growth and new infrastructure in the region creates a higher probability for damage to occur from windstorms as more life and property are exposed to risk.

INFRASTRUCTURE

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

This photo and the photo on page 2 (taken January 6, 2003 in Orange), demonstrates the damage to infrastructure and utilities from a Santa Ana Wind condition. RSCCD has two sites in Orange.

Severe Winds/Santa Ana Wind can result in damaged buildings or blocked roads and bridges, damaged traffic signals, streetlights, and parks, among others. Roads blocked by fallen trees during a windstorm may have severe consequences to people who need access to 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 Windstorms/Severe Weather related to both physical damages and interrupted services.



INCREASED FIRE THREAT

Perhaps the greatest danger from windstorm activity in Southern California comes from the combination of the Santa Ana Wind with the major fires that occur every few years in the urban/wildland interface zones. With the Santa Ana Wind driving the flames, the speed and reach of the flames is even greater than in times of calm wind conditions. The higher fire hazard raised by a Santa Ana Wind condition requires that even more care and attention be paid to proper brush clearances on property in the wildland/urban interface areas.



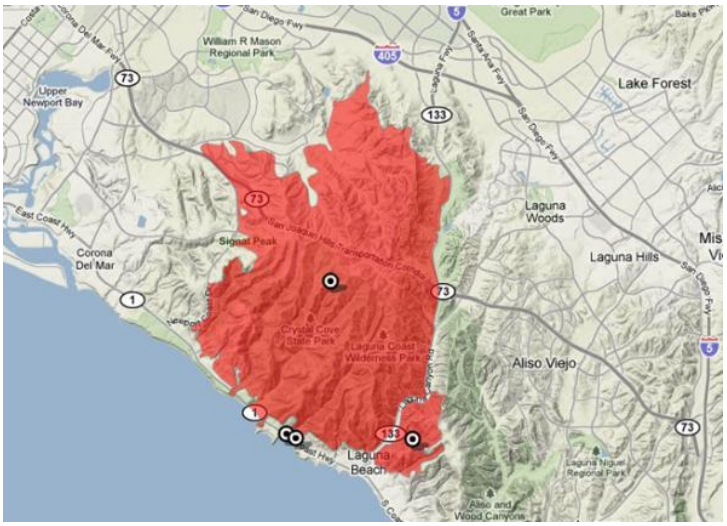
Laguna Beach Firestorm 1993

TRANSPORTATION

Windstorm activity can have an impact on local transportation in addition to the problems caused by downed trees and electrical wires blocking streets and highways. During periods of extremely strong Santa Ana Wind, major highways can be temporarily closed to truck and recreational vehicle traffic and accidents. The Metrolink has been shut down due to extreme high winds stranding commuters.

ORANGE COUNTY HISTORY OF WINDSTORM EVENTS

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



The following is a glimpse of some major Santa Ana Wind/windstorm events to hit the local area:

1993 LAGUNA BEACH FIRESTORM

The 1993 Laguna Beach Firestorm was one of the 20 Largest Fires Losses in U.S. History. The area burnt is shown to the left.

This is the worst case scenario, a Santa Ana Wind and fire combined.

A fire burned in Laguna Beach in 1993, consuming 16,000 acres and destroying or severely damaging over 400 homes and causing $528 million dollars in damage. The fire started on October 27, 1993 as a brush fire in Laguna Canyon. It spread when embers jumped a firebreak into Laguna Beach and Emerald Bay. The speed of the fire was phenomenal. The top half of Emerald Canyon burned at a rate of 100 acres per minute. Fire flashed across Laguna Canyon Road in six places, leaping up the slope with 200- feet flames. Fire burned 1.25 miles of brush in 17 minutes to reach Canyon Acres.



After destroying homes in Canyon Acres, the blaze ascended from the canyon floor to obliterate the Mystic Hills neighborhood. By 2 p.m. the fires reaches Emerald Bay and Boat Canyon, jumps Laguna Canyon Road reaching Canyon Acres about 3:30 p.m. The fire raced up the hillside to Skyline /Mystic Hills about 4 p.m. and by 5 p.m. had reached its farthest extremities, to El Morro and Temple Hills. About 10 p.m. the winds shifted and the fire was declared contained by midnight. Mutual aid from other communities included 345 fire engines, 17 dozers, 30 aircraft, 11 hand crews, and a total of 1,968 fire personnel.

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

January 6, 2003
OC Register
March 16, 2003"One of the strongest Santa Ana Windstorms in a decade toppled 26 power poles in Orange early today, blew over a mobile derrick in Placentia, crushing two vehicles, and delayed Metrolink rail service." This windstorm also knocked out power to thousands of people in northeastern Orange County.

January 8, 2003
CBSNEWS.com
"Santa Ana's roared into Southern California late Sunday, blowing over trees, trucks and power poles. Thousands of people lost power."

DailyBulletin.com
Fire Officials Brace for Santa Ana Wind
"The forest is now so dry and so many trees have died that fires, during relatively calm conditions, are running as fast and as far as they might during Santa Ana Wind. Now the Santa Ana season is here. Combine the literally tinder dry conditions with humidity in the single digits and 60-80 mph winds, and fire officials shudder."

Vicki Vargas
NBC LA
On February 27, 2010 at 3:20 PM we witnessed a waterspout from Pacific Coast Highway at the Santa Ana River Bridge south to the Newport Beach city limits. It was a tilted cone followed by a stretching and then it hit the water surface.

Earlier a waterspout, flooding and rain hit Huntington Beach. Bulldozers were building a berm on the Huntington Beach waterline. A waterspout came in from the ocean, crossed Pacific Coast Highway; it crossed a track of homes and a parking lot. It lifted a van and tossed it onto its side. Then it went into Huntington Harbour condominium complex and left a path of debris everywhere it went. It battered boats in the harbor and in Peters Landing.

The following is a list of tornado events to hit Orange County:

The following is a list of Major Windstorms and Santa Ana Wind Events in Orange County from 1961 to 2010.

TABLE 3 – ORANGE COUNTY MAJOR WINDSTORM/SANTA ANA WIND EVENTS AND DAMAGE EXTENT

MAJOR WINDSTORM/SANTA ANA WIND EVENTS ORANGE COUNTY AREA 1961- 2010		
DATE	**LOCATION**	**DAMAGE EXTENT**
November 5-6, 1961	Santa Ana Wind	Fire in Topanga Canyon
February 10-11, 1973	Strong storm winds. 57 mph at Riverside, 46 Newport Beach	Some 200 trees uprooted in Pacific Beach alone
October 26-27, 1993	Santa Ana Wind	Fire in Laguna Hills
October 14, 1997	Santa Ana Wind: gusts 87 mph in central Orange County	Large fire in Orange County
December 29, 1997	Gusts 60+ mph at Santa Ana	
March 28-29, 1998	Strong storm winds in Orange County: sustained 30-40 mph. Gust 70 mph at Newport Beach, gust 60 **Huntington Beach**	Trees down, power out, and damage across Orange and San Diego Counties. 1 person died.
September 2, 1998	Strong winds from thunderstorms in Orange County with gusts to 40 mph	Large fires in Orange County
December 6, 1998	Thunderstorm in Los Alamitos and Garden Grove: gust 50-60 mph called "almost a tornado"	
December 21-22, 1999	Santa Ana Wind: gust 68 mph at Campo, 53 **Huntington Beach**, 44 Orange	House and tree damage in Hemet.
March 5-6, 2000	Strong thunderstorm winds at the coast: gust 60 mph at **Huntington Beach**	Property damage and trees downed along the coast
April 1, 2000	Santa Ana Wind: gust 93 mph at Mission Viejo, 67 Anaheim Hills	
December 25-26, 2000	Santa Ana Wind: gust 87 mph at Fremont Canyon	Damage and injuries in Mira Loma, Orange and Riverside Counties
February 13, 2001	Thunderstorm gust to 89 mph in east Orange	
January 6, 2003	Santa Ana Wind storm in the City of Orange	-Toppled 26 power poles in Orange. -Blew over a mobile derrick in Placentia crushing 2 vehicles and delaying the Metrolink service -Knocked out power to thousands in North East Orange County
January 8, 2003	Santa Ana Windstorm	Blew over trees, trucks and power poles
March 16, 2003	Santa Ana Windstorms	80 mph winds and tinder dry conditions
March, 2005	Huntington Beach Water Spout	Huntington Beach closed down the pier and beach area

Information depicted on chart taken from http://www.wrh.noaa.gov/sandiego/research/Guide/weatherhistory.pdf

TABLE 4 - MAJOR TORNADO EVENTS

Major Tornado Events - Orange County Area 1958-2010		
DATE	**LOCATION**	**DAMAGE**
April 1, 1958	Tornado Laguna Beach	
February 19, 1962	Tornado **Irvine**	
April 8, 1965	Tornado **Costa Mesa**	
November 7, 1966	**Newport Beach** and **Costa Mesa**	Property Damage
March 16, 1977	Tornado skipped from Fullerton to Brea	Damage to 80 homes and injured four people
February 9, 1978	Tornado **Irvine**	Property damage and 6 injured
January 31, 1979	Tornado Santa Ana	Numerous power outages
November 9, 1982	Tornadoes in **Garden Grove** and Mission Viejo	Property damage
January 13, 1984	Tornado **Huntington Beach**	Property damage
March 16, 1986	Tornado Anaheim	Property damage
February 22-24, 1987	Tornadoes and waterspouts **Huntington Beach**	
January 18, 1988	Tornadoes Mission Viejo and San Clemente	Property damage
February 28, 1991	Tornado Tustin	
March 27, 1991	Tornado **Huntington Beach**	
December 7, 1992	Tornadoes Anaheim and **Westminster**	Property damage
January 18, 1993	Tornado **Orange County**	Property damage
February 8, 1993	Tornado Brea	Property damage
February 7, 1994	Tornado from **Newport Beach** to Tustin	Roof and window damage. Trees were also knocked down
December 13, 1994	Two waterspouts about 0.5 mile off **Newport Beach**	
December 13, 1995	Funnel cloud near Fullerton Airport	
March 13, 1996	Funnel cloud in **Irvine**	
November 10-11, 1997	Waterspout came ashore at **Newport Pier** on the 10th and dissipated over western **Costa Mesa.** Tornadoes in Irvine on the 11th and a funnel cloud developed.	10th: Winds estimated at 60-70 mph. 11th: Minor power outages occurred with little property damage. A fisherman was blown from one end of Newport Pier to the other. Property and vehicle damage in Irvine from flying debris. Ten cars were thrown a few feet.
December 21, 1997	Waterspout and tornado in **Huntington Beach**	Damage to boats, houses, and city property
February 24, 1998	Tornado in **Huntington Beach**	Property damage with a power outage, roof flew ¼ mile
March 13-14, 1998	Numerous waterspouts between Long Beach, **Huntington Beach**, and Catalina	
March 31-April 1, 1998	Numerous funnel clouds reported off Orange County coastline, two of which became waterspouts off Orange County. One waterspout briefly hit the coast off the **Huntington Beach** pier.	
June 6, 1998	Two funnel clouds off Dana Point	
December 31, 1998	Funnel clouds in Santa Ana. Waterspout off **Costa Mesa**	
February 21, 2000	Tornado Anaheim Hills	Property damage
October 28, 2000	Funnel clouds around **Newport Beach and Costa Mesa**	
January 10, 2001	Funnel cloud at Orange County airport and **Newport Beach**	
February 24, 2001	Tornado in Orange	Damage to warehouse, 6 structures, fences, and telephone wires.
March 2005	**Huntington Beach** Water Spout	Pier and beach closed by Marine Safety Officers
February 27, 2010	**Newport Beach** and **Huntington Beach**	Crossed PCH and went into Huntington Harbour; damaged boats and left a path of debris

Information depicted on chart taken from http://www.wrh.noaa.gov/sandiego/research/Guide/weatherhistory.pdf

C. THE RSCCD VULNERABILITY TO WINDSTORM/SEVERE WEATHER



A windstorm event in Orange County can range from tornado-like winds to Santa Ana Wind conditions. Windstorms in Orange County can cause extensive damage including damage to trees, road and highway infrastructure, and critical utility facilities, leaving the streets covered in debris.

FIGURE 1 - SANTA ANA WIND PATH MAP

The map shows clearly the direction of the Santa Ana Wind as they travel from the stable, high-pressure weather system called the Great Basin through the canyons and towards the low-pressure system off the Pacific. Clearly the coastal areas of Orange County and RSCCD are in the direct path of the ocean-bound Santa Ana Wind.

All facilities in the RSCCD are subject to Santa Ana Wind and the damage caused by these high winds.

A major concern is a fire during a Santa Ana Wind condition. This can result in a small fire spreading quickly to become a catastrophic fire.

RSCCD PREVIOUS OCCURRENCES OF WIND EVENTS

Although the RSCCD sites were impacted by many of the Orange County events listed on page 10, fortunately none of the incidents caused deaths, injuries or heavy financial damage to the RSCCD properties. The following is a list of wind related incidents experienced by the RSCCD. None of the incidents were severe. No deaths or injuries resulted from these incidents.

TABLE 5: RSCCD PREVIOUS OCCURRENCES

Date	Location	Type of Damage	Details (from insurance records)	Costs
1/1/2006	Santa Ana College	Weather/wind damage	Metal roof sheeting that covered the pole vault equipment had blown off completely. The roofs had been bolted down to the metal housing unit but due to the high winds, the bolts could not keep the metal sheets in place.	Unknown
10/20/2007	Santa Ana College	Wind damage	Replace the baseball field fence and awning damaged during a wind storm	$81,210
12/2014	Santiago Canyon	Wind damage	Soccer/Softball fencing	$38,080

RSCCD RISK ASSESSMENT OF SANTA ANA WINDS

Windstorms and especially the Santa Ana Winds pose several different types of threats to Orange County including:

Health Issues

- The winds pose a threat to the health of the people with allergies.
- Health risks relate primarily to breathing problems caused by the blowing dust and plant pollen.
- Individuals with serious respiratory problems may require paramedics, ambulances and hospital stays

The winds carry *Coccidioides immitis* and *Coccidioides posadasii* spores into nonendemic areas,a pathogenic fungus that causes Coccidioidomycosis ("Valley Fever"). Symptomatic infection (40 percent of cases) usually presents as an influenza-like illness with fever, cough, headaches, rash, and myalgia (muscle pain). Serious complications include severe pneumonia, lung nodules, and disseminated disease, where the fungus spreads throughout the body. The disseminated form of Coccidioidomycosis can devastate the body, causing skin ulcers, abscesses, bone lesions, severe joint pain, heart inflammation, urinary tract problems, meningitis, and often death.

There is some belief the winds also create positive ions, which are believed to affect mood negatively. Many believe this to be the cause for the statistical increase in the number of suicides

and homicides during these times.

Structural Damage Issues

- Structural issues relating to the winds range from roofs being blown off and building facades being destroyed
- Mobile homes and portable buildings can be blown over or damaged
- Trees may fall onto buildings or block roads and building exits
- Flag poles, light and power poles may be blown over causing injuries and traffic accidents
- Loose furniture and items such as bleachers, patio furniture, trash cans will be blown away and may cause injuries

Electrical Power Issues

- Santa Ana Winds cause power lines to arc, which increases the fire threat
- Santa Ana Winds can either cause trees to fall on power lines or power lines to break, causing power outages
- Power outages are common as the result of Santa Ana Winds
- Santa Ana College is in the process of placing utilities underground to prevent utility line damage and disruptions during a Santa Ana Wind condition

Fire Issues

- The winds increase the threat and/or severity of fires in the urban areas
- Wind-blown flames will spread more rapidly when pushed by high Santa Ana's
- Winds can turn a small fire into a fire conflagration
- Fires can be catastrophic when coupled with a Santa Ana Wind condition

Debris

Maintenance of trees and shrubbery, removing weak branches and eliminating trees that could fall on structures is a necessity prior to a windstorm. Falling trees and blowing debris in storms often cause fatalities and severe structural damage. Santa Ana Winds create havoc with tree branches, dirt and other items blowing and landing in streets, blocking storm drains, blocking doors, and possibly injuring individuals

EXISTING MITIGATION STRATEGIES

As stated, one of the most common problems associated with windstorms is power outage. High winds commonly occur during winter storms, and can cause trees to bend, sag, or fail (tree limbs or entire trees), coming into contact with nearby distribution power lines. Fallen trees can cause short-circuiting and conductor overloading. Wind-induced damage to the power system causes power outages to customers, incurs cost to make repairs, and in some cases can lead to ignitions that start wildland fires.

One of the strongest and most widespread existing mitigation strategies pertains to debris and tree clearance. Currently, California State Law requires utility companies to maintain specific clearances (depending on the type of voltage running through the line) between electric power lines and all vegetation.

Enforcement of the following California Public Resource Code Sections provides guidance on tree pruning regulations.

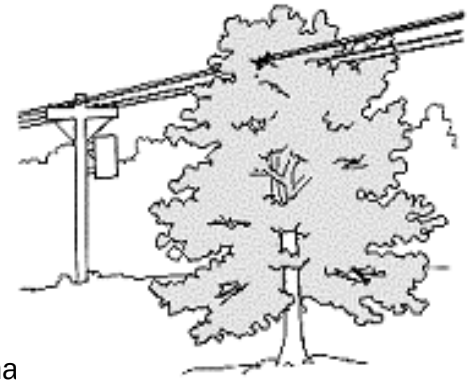
4293: Power Line Clearance Required
4292: Power Line Hazard Reduction
4291: Reduction of Fire Hazards Around Buildings
4171: Public Nuisances

The following pertain to tree pruning regulations and are taken from the California Code of Regulations:

Title 14: Minimum Clearance Provisions
Sections: 1250 – 1258
General Industry Safety Orders

Title 8: Group 3: Articles 12, 13, 36, 37 and 38

California Penal Code: Section 385



The following California Public Utilities commission section ha

California Public Utilities Commission
General Order 95: Rule 35

FIGURE 2: BASIC HUD WIND ZONE MAP FOR MANUFACTURED HOMES



Every school day, more than 5 million students in the United States attend lessons held in modular classrooms. RSCCD has hundreds of portables on their campuses.

All of California is in HUD Wind Zone 1. Each manufactured home must be designed according to the federal Manufactured Home Construction and Safety Standards at 24 CFR 3280, commonly called the HUD Code. The HUD Code stipulates, at §3280.305(c) (1) and §3280.305(c) (2), that the home shall be designed and constructed to conform to one of three wind load zones. The appropriate wind zone used in design is dependent on where the home will be initially installed. Homes designed and constructed to a higher Wind Zone can be installed in a lower Wind Zone (a Wind Zone III home can be installed in a Wind Zone I or II location). However, a Wind Zone I home cannot be installed in either a Wind Zone II or III area.

Wind Zone I, Wind Zone II and Wind Zone III are identified on the basic wind zone map above. The manufactured home producer designs the home to resist the wind load, which is measured in pounds per square foot. Wind Zone I equates to a 70-mph fastest-mile wind speed. Wind Zone II equates to a 100-mph fastest-mile wind speed. Wind Zone III equates to a 110-mph fastest-mile wind speed.

D. CALIFORNIA DSA-STRUCTURAL SAFETY (DSA-SS)

The RSCCD works with the DSA Structural Safety (DSA-SS) who adopts and amends Title 24 Building regulations applicable to California's K-12 public schools, Community Colleges and State Essential Services facilities. Refer to Sections 109.2 of Part 2, Title 24 for more information regarding the scope and application of DSA-SS adopted regulations.

The RSCCD also works closely with DSA on portable classrooms or "factory-built buildings for use as school buildings." All safety measures are determined as site specific requirements as determined by the DSA. The following is from the California Education Code in regards to factory-built buildings used as school buildings:

17351. Except as provided in Section 18930 of the Health and Safety Code, the Department of General Services shall adopt regulations for the safety of design and construction of factory-built buildings for use as school buildings, and shall prescribe procedures for the plans, specifications, methods of construction, and estimates of cost of a factory-built school building to be submitted to the department for approval as provided in Section 17352. Except as provided in Section 18930 of the Health and Safety Code, such regulations shall comply with but not be limited by the provisions of Article 2 (commencing with Section 17260) and Article 3 (commencing with Section 17280) of this chapter.

The Department of General Services shall adopt and submit building standards for approval pursuant to Chapter 4 (commencing with Section 18935) of Part 2.5 of Division 13 of the Health and Safety Code for the purposes described in this section.

17352. A manufacturer of factory-built buildings designed or intended for use as school buildings shall submit to the Department of General Services and the State Department of Education for approval, its plans, specifications, methods of construction, and estimates of cost of such buildings. At the same time the manufacturer shall pay to the Department of General Services a deposit to be applied toward the actual expenses in an amount as determined by the Department of General Services based on the estimated cost of such factory-built buildings, but not exceeding 0.5 percent of such estimated cost. The minimum deposit in any case shall be fifty dollars ($50). The manufacturer shall reimburse the Department of General Services and the State Department of Education for the actual expenses incurred by those departments in the review of such plans and specifications. All fees received by the Department of General Services pursuant to this article are subject to the provisions of Section 17301.

PROBABILITY OF FUTURE OCCURANCE

There was no HAZUS analysis of windstorm available. HAZUS does not have wind data. However, with an analysis of the high wind and tornado events depicted in the "Local History" section, we can deduce the common windstorm impact areas including impacts on life, property, utilities, infrastructure, and transportation. Santa Ana Wind incidents occur several times annually with severe cases 2-3 times per decade.

Using FEMA worksheet 5.1, the Hazard Mitigation Committee ranked the probability of a Santa Ana Wind as **"Highly Likely"** with the maximum probable extent or magnitude/strength based on historic events as **"Moderate"** resulting in some damage and loss of services.

E. WINDSTORM MITIGATION STRATEGIES

MITIGATION STRATEGIES

Hazard	**WINDSTORM ACTIVITY #1**
Action Item	**Maintenance & Operations personnel need to review and upgrade their annual Standard Maintenance Plan to include Santa Ana Wind mitigation activities.**
Coordinating Organization	VP of Administrative Services
Ideas for Implementation	Maintain trees and shrubbery, removing weak branches and eliminating trees that could fall on structures during a wind storm. Schedule tree cutting and maintenance for completion prior to/October each year prior to Santa Ana Wind season as part of the Districts scheduled maintenance. 1. Provide education to Maintenance & Operations employees to help them determine the steps needed to get and remain prepared including: 2. Include the comprehensive list in the Emergency Plan a. How employees will be warned of a Santa Ana Wind condition weather warning. b. Keep landscape pruned and remove dead branches regularly c. Cut all trees away from power lines d. Incorporate inspection of the drainage system into the maintenance process. e. Annually inspect all flag and utility poles, signs, antennas, etc. to ensure they are secure and not rotting and do not have the potential to be blown over during a wind incident. f. Secure free standings items such as outdoor furniture, bleachers, etc. g. Research and educate personnel on other methods to mitigate wind damage h. Survey experienced maintenance personnel to find out what issues they have experienced and add their suggestions to the list.
Time Line	Ongoing
Constraints	Time and personnel
Funding Sources	General Fund
Cost Estimate	Staff Time
Benefits: Losses Avoided	By educating Maintenance & Operations employees on mitigation of wind-related emergencies, they can take actions that will help lessen the chance of fatalities, injuries, accidents, debris cleanup time and costs. It will help the campus' remain operational during emergencies if they improve the district's day-to-day maintenance mission. Local, State and FEMA debris cleanup costs will be reduced.
Priority	Medium
Plan Goals Addressed	
	Promote Public Awareness
	Create Partnerships and Implementation
X	Protect Life and Property
	Protect Natural Systems
	Strengthen Emergency Services

Hazard	**WINDSTORM ACTIVITY #2**
Action Item	**Develop a Santa Ana Wind Plan including a list of actions to be taken when a warning is received.**
Coordinating Organization	VP Administrative Services
Ideas for Implementation	1. Maintenance and Operations should develop a comprehensive list of items that should be done when a Santa Ana Wind is predicted. This information is generally known and acted on by the experienced maintenance crews, but it would improve communications and education of newer employees if the list were in written form and emailed to all sites when a wind condition is predicted. 2. Assign a district position this duty and when the high wind prediction is received, the list should be disseminated to all maintenance personnel at each district sites
Time Line	Ongoing
Constraints	Time and personnel
Funding Sources	General Fund
Cost Estimate	Staff Time
Benefits: Losses Avoided	Helps eliminates deaths, injuries, damage, and costs to the district, State and Federal government.
Priority	Medium

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

Hazard	WINDSTORM ACTIVITY #3 – LONG TERM
Action Item	**Develop an Emergency Power Failure project to supply generators to every RSCCD site for Emergency Operations Centers (EOCs)**
Coordinating Organization	District Director of Maintenance and Operations
Ideas for Implementation	1. Using the Critical Facilities List determine if a generator exists for each site 2. Is the generator sufficient to power the site Emergency Operations Center for 72 hours and provide communications equipment and computers during an emergency? 3. What are the sites generator needs? Cost it out.
Time Line	5 Years
Constraints	Time, personnel and funds
Funding Sources	Hazard Mitigation Program
Cost Estimate	
Benefits: Losses Avoided	Helps eliminate deaths, injuries, damage, and costs to the district, State and Federal government because RSCCD Security and Management personnel will better be able to manage an emergency that impacts its sites and especially a district wide emergency.
Priority	High

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

TABLE 6: CRITICAL FACILITY GENERATORS NEEDED FOR DISASTER RESPONSE

Facility #	Facility Name	Building/ Room #	Description	Generators (Yes/No) Sufficient (Yes/No)
1	RSCCD District	▪ District EOC: Floor #1 Large Incident: Room 107 District Boardroom Small Incident: Chancellor's Conference Room ▪ IT: Floor #2	Used to manage emergencies for ***all*** RSCCD facilities District Information Technology	
2	Santa Ana College	▪ Campus EOC: -Large Incident: A-214 Caesar Chavez Bldg -Small Incident: X-101/ Campus Safety Office ▪ Student Health Center/ U-120 or #16 IT: A-117/Caesar Chavez Bldg.	Used to manage emergencies at Santa Ana College ▪ Used to Manage medical incidents	
3	Santiago Canyon College	▪ Campus EOC: Building A/01 ▪ Health Care Center: Building T/03 ▪ IT: Building 18, room 107	▪ Used to manage emergencies at Santiago Canyon College ▪ Used to manage medical incidents	
4	Centennial Education Center	▪ Campus EOC: Building A ▪ Large Incident: outside, back of Building E ▪ No Health Care Center	▪ Used to manage emergencies at Centennial Education Center	
5	Orange Education Center	▪ Campus EOC: Parking Lot ▪ No Health Care Center	▪ Used to manage emergencies at Orange Education Center	
7	Orange County Sheriff's Regional Training Academy	▪ Campus EOC: Main Conference Rm ▪ No Health Care Center	Used to manage emergencies at the OC Sheriff's Regional Training Academy	
8	Digital Media Center	▪ Campus EOC: Second Floor Administration	Used to manage emergencies at the Digital Media Center	

Part V - The Planning Process and Public Participation

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Part V - The Planning Process and Public Participation

A. State and Federal Planning Process Requirements

The Federal government requirements for approval of a Natural Hazard Mitigation Plan that discuss the planning process include:

- 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 and public input into the mitigation strategies
- Campus and community cooperation, with opportunity for other local government agencies, the business community, educational institutions, and non-profits to participate in the process
- Incorporation of local documents, including Cities and County General Plans, Safety Elements, Zoning Ordinances, Building and Fire Codes, Hazard Mitigation Plans and other pertinent documents

The following components must be part of the planning process:

- Complete documentation of the planning process
- A detailed risk assessment on hazard exposures in the community
- A comprehensive mitigation strategy, which describes the goals and objectives, including proposed strategies, programs and actions that can be implemented to reduce or minimize long-term vulnerabilities
- A plan maintenance process, which describes the method and schedule of monitoring, evaluating and updating the Plan and integration of the Hazard Mitigation Plan into other planning mechanisms
- Formal adoption by the RSCCD Board of Trustees
- Plan review by both State of California Office of Emergency Services (OES) and the Federal Emergency Management Agency (FEMA)

B. GRANT APPLICATION PROCESS

In 2010, the RSCCD learned of the FEMA Hazard Mitigation Grant opportunity. The Risk Manager brought the grant opportunity to management's attention. Development of a Hazard Mitigation Plan had been a long-term goal of the RSCCD Emergency Management Program; however, the district did not have sufficient personnel, time or subject matter expertise to complete the project.

Through the participation in the Orange County Emergency Management Organization (OCEMO), the Risk Manager met with the Coast Community College District who had an approved plan to learn more about the development of a Natural Hazard Mitigation Plan. The Risk Manager documented the requirements as well as the personnel time and costs needed to complete the project. Armed with this information, the RSCCD decided that the limited personnel at the district would make it necessary to hire an additional part time employee to work with the district on the planning process and the development of the plan. This grant provided the funding to hire an employee allowing the district the opportunity to develop the plan. The information was presented to management and when the project was agreed upon, it was presented for final approval of the District Chancellor who in 2011 approved the grant application process.

The Risk Manager completed the Hazard Mitigation planning grant application in August 2012. The grant was approved by FEMA and funded at the end of 2014. A Plan Writer that met the district's requirements was hired in February 2015 by the RSCCD. The District hired Glorria Morrison. who had experience in developing Hazard Mitigation Plans for both Orange County cities (Huntington Beach, Fountain Valley and Mission Viejo) and school districts (Huntington Beach City School District, Huntington Beach Union High School District, Ocean View School District, Fountain Valley School District and Coast Community College District) and had worked as a professional Emergency Manager within Orange County for 31 years as the City of Huntington Beach Emergency Manager.

The Risk Manager worked with State OES personnel and the on-line grant system completing all reports and reimbursement forms. This was supported by the RSCCD finance personnel and the Plan Writer ensuring all RSCCD and State OES financial requirements were met.

This grant is an example of a successful partnership between the Federal government (FEMA), State government (OES), and a local government agency (RSCCD). RSCCD appreciates the financial, professional and technical support provided by the Federal and State governments. Without this partnership, development of the RSCCD Natural Hazard Mitigation Plan would have been impossible.

See Grant Award Face Sheet – Figure 1.

FIGURE 1 – GRANT AWARD FACE SHEET – STATE OES 2-101

(Cal EMA Use Only)

Cal EMA # 01 FIPS# 059-91093 CFDA# _____ Grant # DR-1810

CALIFORNIA EMERGENCY MANAGEMENT AGENCY
GRANT AWARD FACE SHEET (Cal EMA 2-101)

The California Emergency Management Agency, hereafter designated Cal EMA, hereby makes a Grant Award of funds to the following:

1. **Grant Recipient:** Coast Community College District (CCCD)
in the amount and for the purpose and duration set forth in this Grant Award.
2. **Implementing Agency:** CCCD **2a. Congressional District:** 46
2b. State Senate District#: 35 **2c. State Assembly District#:** 68
2d. Location of Project: CCCD **2e. Congressional District(s):** 46
3. **Disaster/Program Title** DR-1810/Hazard Mitigation Grant Program **4. Performance Period** 08/26/2010 to 01/26/2013

Grant Year	Fund Source	A. State	B. Federal	C. Total	D. Cash Match	E. In-Kind Match	F. Total Match	G. Total Project Cost
2010	5. DR-1810		75,000				25,000	$100,000
Select	6. Select							$0
Select	7. Select							$0
Select	8. Select							$0
Select	9. Select							$0
	10. **TOTALS**	$0	$75,000	$75,000	$0	$0	$25,000	10G. Total Project Cost: $100,000

11. This Grant Award consists of this title page, the application for the grant, which is attached and made a part hereof, and the Assurances/Certifications which are being submitted. I hereby certify I am vested with the authority to enter into this Grant Award Agreement, and have the approval of the City/County Financial Officer, City Manager, County Administrator, Governing Board Chair, or Approving Body. The Grant Recipient certifies that all funds received pursuant to this agreement will be spent exclusively on the purposes specified in the Grant Award. The Grant Recipient signifies acceptance of this Grant Award and agrees to administer the grant project in accordance with the Grant Award as well as all applicable state and federal laws, audit requirements, federal program guidelines, and Cal EMA policy and program guidance. The Grant Recipient further agrees that the allocation of funds may be contingent on the enactment of the State Budget.

12. Federal DUNS Number 0676-7770 13. Federal Employer ID Number _____

14. Official Authorized to Sign for Applicant/Grant Recipient:

Name: _____ Title: _____

Telephone: _____ (area code) FAX: _____ (area code) Email: _____

Payment Mailing Address: _____ City: _____ Zip + 4: _____

Signature _____ Date: _____

[FOR Cal EMA USE ONLY]

I hereby certify upon my own personal knowledge that budgeted funds are available for the period and purposes of this expenditure stated above.

Cal EMA Fiscal Officer Date Cal EMA Secretary(or designee) Date

Grant Award Face Sheet – Cal EMA 2-101 (Revised 01/11)

C. Formation of a District Hazard Mitigation Team

The Risk Manager was named the Project Manager by the District. The Project Manager and the Plan Writer set up a series of meetings for 2015 and 2016 to guide the planning process. The District Hazard Mitigation Planning Team (Team) members were selected based on their positions and expertise. The Team was made up of representatives from the seven sites that make up the RSCCD. Outside Team members were from the cities of Orange and Santa Ana, Orange County, State OES, and volunteers who represented the general public were selected. Two student representatives were invited to participate. Representatives from two Chamber of Commerce's were invited to participate. A schedule of meetings was set up for the Team beginning with a kickoff meeting for everyone involved scheduled for April 2, 2015 at the district office at 2323 North Broadway in Santa Ana.

The following is a list of RSCCD Hazard Mitigation Team Members. Some personnel changed and additions were made but the majority remained on the team from the kick off meeting through to the Community Forums.

TABLE 1 – RSCCD HAZARD MITIGATION PLANNING TEAM

Team List with Titles Updated 2017

Rancho Santiago Community College District (RSCCD) Hazard Mitigation Planning Team

Name	Title	Email	Phone	Priorities
District Office 2323 North Broadway Santa Ana 92706-1640				
Adam O'Connor	Assistant Vice Chancellor Fiscal Services	OConnor_Adam@rsccd.edu	(714) 480-7320	Fiscal Support Planning
Darryl Taylor	Director of District Construction	Taylor_Darryl@rsccd.edu	(714) 480-7513	Mitigation Strategies
Don Maus	District Risk Manager and Project Manager for this project	Maus_Don@rsccd.edu	(714) 480-7330	Project Manager
Alistair Winter	Chief, District Safety & Security	Winter_Alistair@rsccd.edu	(714) 480-7333	Hazard Assessments
Hank Dang	Associated Student Government	HankDang@gmail.com	(714) 926-0702	Hazard Assessments
Skylar Bertram	Student Representative	ep5577@aol.com	(714) 658-4044	Hazard Assessments
Janneth Linniell	Ex. Director Child Dev. Services	Linniell_Janneth@rsccd.edu	(714) 480-7546	Mitigation Strategies
Glorria Morrison	Plan Writer	Morrison_Glorria@rsccd.edu	(714) 955-2504	Plan Writer
Santa Ana Community College 1530 West 217th Street Santa Ana 92706-3398				
Mike Colver	Lt., District Safety & Security	Colver_michael@sac.edu	(714) 564-6335	Hazard Assessments
Michael Collins	VP Administrative Services	Collins_michael@sac.edu		Fiscal Support Planning
Nilo Lipiz	Dean of Instruction Continuing Ed	Lipiz_Nilo@sac.edu		Mitigation Strategies
Mark Wheeler	Facilities Manager	Wheeler_Mark@sac.edu	(714) 241-5701	Mitigation Strategies
Ron Coopman	Assistant Dean, Criminal Justice Academies	Coopman_Ron@sac.edu	(714) 566-9201	Mitigation Strategies
Santiago Canyon Community College 8045 East Chapman Avenue Orange, CA 92869-4512				
Ken Gouldsmith	Lt., District Safety & Security	Gouldsmith_Ken@sccollege.edu	(714) 628-4989	Hazard Assessments
Arleen Satele	VP Administrative Services	Satele_Arleen@sccollege.edu	(714) 628-4717	Fiscal Support Planning
Jose Vargas	VP Continuing Education	Vargas_Jose@sccollege.edu	(714) 628-5910	Mitigation Strategies
Position Vacant	Facilities Manager			Mitigation Strategies
City of Santa Ana Representatives 20 Civic Center Plaza Santa Ana, CA, 92702 PO Box 1988 Ross Annex				
Randy Black	Orange County Fire Authority Fire Battalion Chief	randyblack@ocfa.org	(714) 292-8476	Hazard Assessments
Vince Fregoso	Acting Planning Director Building & Planning Department	vfregoso@santa-ana.org	(714) 667-2706	Mitigation Strategies
Steve Rymer	Emergency Manager	srhyner@santa-ana.org	(714) 647-5315	City Coordination
City of Orange Representatives 300 East Chapman Avenue in Orange, CA 92866				
Jennifer Amat	Sgt. Orange Police Dept. and Emergency Manager	JAmat@orangepd.org	(714) 744-7462 (714) 325-1423	City Coordination
Alan Velasco	Orange Fire Department Captain	AVelasco@cityoforange.org	(714) 288-2512	Hazard Assessments
Rick Otto	Asst. Executive Director	ROtto@cityoforange.org	(714) 744-2222	Mitigation Strategies
County of Orange Representative 2644 Santiago Canyon Rd, Silverado, CA 92676				
Bryan Hovde	OC Sheriff Department Emergency Mgmt. Bureau Senior Program Coordinator 2015 Administrative Manager 2016	Bryan Hovde bhovde@ocsd.org Ray Cheung rcheung@ocsd.org Vicki Osborn vosborn@ocsd.org	Vicki Osborn (714) 628-7019 (714) 448-1197 c (714) 628-7058	County Coordination

State of California Representative				
Jim Acosta, Region I, Los Alamitos Emergency Services Coordinator Victoria LaMar-Haas Sac, Tech Support Sr. Emergency Services Coordinator Andrew Rush, Sac Grant Coordinator Senior Emergency Services Coordinator Ricardo Castillo, Sac (New Grant Coordinator) Emergency Services Coordinator	State OES Los Alamitos, CA 9 and Sac.	LaMar-Haas, Victoria@CalOES Jim.Acosta@CALOES.ca.gov ricardo.castillo@caloes.ca.gov	(562) 795-2939 (916) 845-8275 (916) 845-8269 916.845.8158	State Coordination/ Grant Coordination
Other Representatives				
Debbie Graves	American Red Cross Regional Disaster Officer Santa Ana, CA 9	Debbie.Graves redcross.org	(714) 481-5348	Public Participation
Paula Garcia-Young	Santa Ana Chamber of Commerce, Chair	info@santaanachamber.com	(714) 953-4455	Business Interests
Charla Lenarth	Orange Chamber of Commerce, Chair	charla@orangechamber.com	(714) 536-3581	Business Interests
Linda Morin	Coast Community College District Emergency Manager	LMorin@mail.cccd.edu	(714) 475-9059 (714) 438-4753	Lessons Learned in Community College Hazard Mitigation Planning
Hope Seligson	MMI Engineering Engineer/Loss Estimation Consultant	HSeligson@MMIEnginering.com	Office (714) 465-1390 Cell (562) 688-6272	Hazard Maps HAZUS Building Damage Estimates

The Risk Manager was assigned as the Project Manager (from this point on will be called the Project Manager). A series of monthly meetings were scheduled to coordinate the team education, plan development and consensus building.

TABLE 2 – RSCCD HAZARD MITIGATION TEAM MEETING SCHEDULE

HAZARD MITIGATION PLAN SCHEDULE

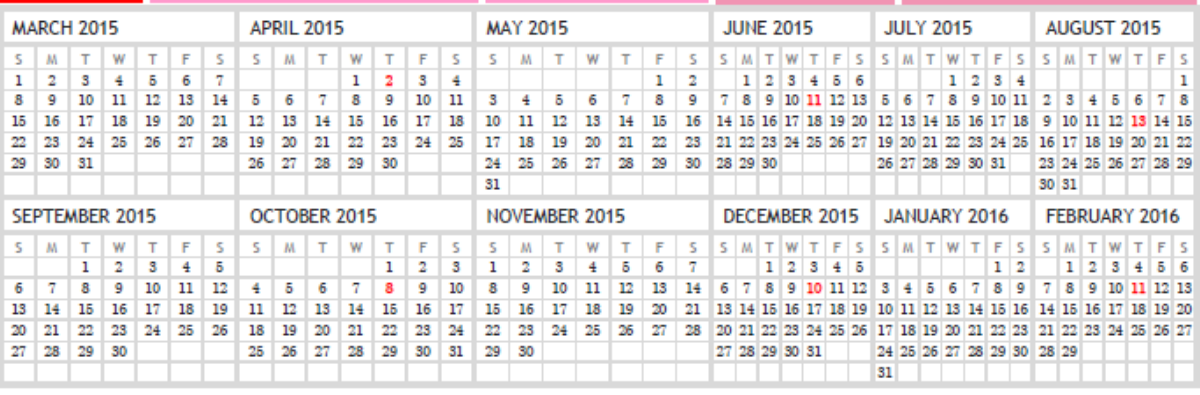
10/13/2015 Update

2323 North Broadway Santa Ana 92706-1640

PROJECT/EVENT	HAZARD MITIGATION PLAN
ORGANIZER	DON MAUS/GLORRIA MORRISON

The RSCCD has received a grant from the State Office of Emergency Services to develop a Hazard Mitigation Plan. The Planning Team will conduct a risk assessment of hazards that may impact the district and identify mitigation strategies. Meeting Information:
SECOND THURSDAY OF EACH MONTH 1:30 -3 PM AT THE DISTRICT OFFICE

MILESTONES	DESCRIPTION	DISTRIBUTION DATE	MEETING DATE	MEETING LOCATION 2323 NORTH BROADWAY
MILESTONE 1	FORM TEAM/INTRO & PROFILE	4.14.2015	4.2.2015	Third Floor, Room #340
MILESTONE 2	RISK ASSESSMT & MULTI-HAZARD	6.4.2015	6.11.2015	Third Floor, Room #340
MILESTONE 3	EARTHQUAKE	8.6.2015	8.13.2015	Board Room, First Floor, #107
MILESTONE 4	FLOOD/STORM & DAM FAILURE	10.1.2015	10.8.2015	Board Room, First Floor, #107
MILESTONE 5	WINDSTORM & DROUGHT	12.3.2015	12.10.2015	Third Floor, Room 340
MILESTONE 6	PROCESS & MAINTENANCE	2.4.2016	2.11.2016	Board Room, First Floor, #107
MILESTONE 7	COMMUNITY FORUMS	DISRICT OFFICE	APRIL 2016	Board Room, First Floor, #107



In addition to the meetings being held every other month, the Project Manager and the Plan Writer communicated daily. The Plan Writer worked in the Risk Management Office. Email was used to transfer completed sections of the plan. The Project Manager reviewed, changed and approved all sections of the plan; the Risk Management Office Administrative Clerk edited the plan; and then the sections were disseminated to the Team members for their comments. Special meetings were held as needed with Facilities, Maintenance and Operations, Security, City and County (Emergency Management, Planning, Police, Fire, City Planners and City Engineers), County, Water District, etc. as needed.

D. CAPABILITY ASSESSMENT PROCESS

What resources does the RSCCD have in place to develop a Natural Hazard Mitigation Plan? What reports, lists and studies can help us learn more about the threat to the district and what mitigation strategies were already in place? A lot of questions had to be answered before and at the Kick-Off Meeting.

Before even starting the Hazard Mitigation Plan, the Project Manager and the Plan Writer met to discuss the issues. Research was conducted to determine if any bonds had been passed to mitigate any hazards. What funding sources were being used to upgrade buildings? What insurance documents were available? The Project Manager managed the Risk Management Office and had insurance information listing each site's replacement value and content values. Community College Districts do not have General Plans or Master Plans. So all the information discussed in the meeting was requested from other RSCCD employees/Hazard Mitigation Planning Team Members.

A Capability Assessment was completed at the Kick-off Meeting to determine what expertise existed in the district and what documents should be reviewed. See the RSCCD Capability Assessment, section I. Introduction, Table 3, page 21.

Notably missing from a community college district that cities have is a City Engineer, engineering staff, and GIS capability. The district has a ***Director of District Construction*** that we recruited for the team.

HUMAN RESOURCE CAPABILITIES

The two key participants (Project Manager and Plan Writer) discussed what type of person would we want on the planning team? What types of specialties, experience, knowledge, education, interest and availability would be required? It was agreed that representatives from Safety & Security, Administrative Services and Facilities Managers for each of the seven sites would be invaluable. The Maintenance & Operations Directors would be important to have on the Team. Since the Team would be asked how to fund each recommended mitigation strategy, the Finance Managers would be included. The City and County Emergency Managers would need to answer questions from time to time and their input into the plan would be useful. We would like them to share their plans with the RSCCD. A City planner, police and fire rep from the two key cities were invited to participate. The District also needed the public represented. Who would volunteer from the public to provide input for the plan? The Team agreed on several volunteers that were invited to participate. The District wanted the business community represented so each of the Presidents of the Chamber of Commerce from the two cities with most of the facilities were invited to participate. So, all of these individuals were invited to participate on the Team and subsequently invited to the Kick-off meeting.

TECHNICAL RESOURCES

Many of the technical resources came from the County and the Cities. The Plan Writer communicated with the County and City Emergency Managers, City Planners, Police Reps and Fire Reps and asked for their assistance in completing the plan. As a past Emergency Manager in Orange County the Plan Writer knew many of these individuals personally and received full cooperation. Everyone agreed to provide documents and their expertise. Of course the Internet was invaluable. Dozens of government and private Internet sites were accessed as well as newspaper articles, technical documents, city General Plans, Safety Elements, maps, photos, historical documents, old insurance files, etc.

TABLE 3 - RSCCD CAPABILITY ASSESSMENT

District Departments	Policy or Plan	Ability to Support Mitigation
1. Risk Management	Hazard Mitigation Project Lead	▪ Tracks and maintains hazard mitigation plan ▪ Manages the districts insurance program ▪ Access to placing information on the website to ensure public participation ▪ Liaison to the two students on the committee ▪ Local champion for Hazard Mitigation education
2. District Safety and Security	Emergency Plan	▪ Provides disaster preparedness education to employees ▪ Develops the Districts Emergency Plans ▪ Liaison's with all Orange County cities, the county, Cal OES, and FEMA for preparedness, response and recovery ▪ Local champion for emergency preparedness
3. Director of District Construction	New Construction	▪ Manages new buildings and construction ▪ Works with bond issues ▪ Local champion for mitigation in new construction
4. Facilities Department	Facilities	▪ Manages all aspects of facilities planning and maintenance ▪ Manages some construction projects ▪ Works with Bond issues ▪ Local champion for mitigation in upgrading older facilities

5. MSI Engineering	Mapping	▪ Updates and maintains the maps for this plan ▪ Runs HAZUS Advanced Engineering Building Model software for risk assessment and vulnerability assessment
6. Orange County Fire Authority (OCFA) & Orange City Fire Department	Fire Codes	▪ Fire protection ▪ Rescue, Emergency medical and Hazardous materials control ▪ Fire ISO Rating ▪ Fire prevention and safety education ▪ Local champion for fire mitigation and prevention
7. Santa Ana and Orange PDs	Law Enforcement	Emergency response and preparedness; crime prevention
8. City/County Planner	Land use, Bldg., Codes, Flood	NFIP, CRS, Floodplain Ordinance, Building Codes, Storm Water

GIS MAPPING CAPABILITIES

It was determined that the district had layout maps of the large district sites. They were useful. But they did not have a GIS mapper or this capability. It was decided that an Engineering company would be needed for maps and Hazus studies.

HAZUS

Orange County completed a Hazus study in 2009 and the RSCCD was a participant in the school study. The study was requested from the County. It was utilized in this document. However, the data was, at this point 6 years old so the District hired MMI Engineering to conduct a new RSCCD Hazus study for Earthquake and Flood. No Hazus data is available at this time for other hazards.

MEETING SITES AND AUDIO VISUAL EQUIPMENT

The District Office hosted all the meetings. The Risk Management Administrative Clerk booked the Board Room and conference rooms with audio visual equipment.

HAZARD MITIGATION TEAM LIAISON

The Team agreed that the Plan Writer would liaison with the representatives from outside the RSCCD and the Project Manager would liaison with the internal District Team members and students who volunteered to participate. This worked well since the Project Manager knew the district employees and the Plan Writer knew many of the City and County representatives as well as the American Red Cross Representative.

Most of the County, City and District personnel attended the Kick-Off Meeting and the every other month formal planning meetings and were available to the RSCCD for consultation throughout the planning process.

E. Ability to Expand/Improve Existing Capabilities, Policies and Programs

There are several systems in place to expand or improve existing capabilities, policies and programs.

The RSCCD Annual Budget

A department manager would have to submit a request a resource or to expand a capability. For example, if the district needed to hire a contractor to survey buildings, the Director of District Construction would have to provide a budget request during the annual budget preparation which begins in the spring and is completed and approved by June 30 of each year. The request would be submitted formally in writing to his/her Department Manager.

F. Hazard Mitigation Team Planning Meetings

Invitations were developed and distributed to all potential Team members. A Team meeting schedule was agreed upon.

Rooms were booked at the district site for all meetings scheduled throughout 2015 and through April 2016. Participants were asked to identify other individuals within and outside the RSCCD who they recommended to participate on the Team. These individuals would be sent invitations to join the Team.

G. Team Invitations

Figure 2: Invitation letter sent to the Team Members listed in Table 1

To Whom It May Concern:

You are invited to participate in a Hazard Mitigation Planning Team.

Rancho Santiago Community College District (RSCCD) will be forming a Hazard Mitigation Team. The district has been awarded a Federal Emergency Management Agency (FEMA)/State Office of Emergency Services (OES) grant to complete a Hazard Mitigation study and plan. A Hazard Mitigation Plan needs to include participation from key District employees, cities where the colleges are located, Orange County and State officials, local stakeholders, students and the public.

Kickoff Meeting Specifics

Date: April 2, 2015

Time: 1:30 – 3 PM
Location: Rancho Santiago Community College District Office
2323 North Broadway Santa Ana, CA 92706
Third Floor Conference Room, Room #340

WHAT IS A HAZARD MITIGATION PLAN?

The Disaster Mitigation Act 2000 (44 Code of Federal Regulations 201.6) was passed to reduce risk of death, injuries, and property damage as the result of disasters. This is to reduce or eliminate long term risks from natural disasters. The Federal Emergency Management Agency (FEMA) four phases of a disaster are (1) mitigation/prevention, (2) preparedness, (3) response and (4) recovery. In the past, FEMA's emphasis has been on response and recovery from disasters and costs of disasters nation-wide have continued to escalate year after year. FEMA studies prove that for every dollar spent on a mitigation (lessening the impact of a disaster) and prevention saves $6 in response and recovery costs. We as a nation need to mitigate our hazards prior to emergencies therefore reducing death, injuries, and property damage, as well as response and cleanup costs. FEMA has allocated billions of dollars to assist public agencies to prepare Hazard Mitigation Plans and once the plan is complete and board approved, FEMA will support 75% of the cost of approved mitigation projects that will make the district office, colleges and satellite sites safer during disasters.

The DMA 2000 requires every State, County, and local government agency (City, Special District and School District) that want to be eligible for FEMA Hazard Mitigation project grants (pre-disaster and post-disaster grants), must first develop a Hazard Mitigation Plan. The plan must be developed under strict criteria and approved by the State OES and FEMA.

Please join us for our kick off meeting on April 2, 2015 at the district office at 2323 North Broadway in Santa Ana. ***All members of the public are welcome to attend and participate in this planning process.***

HAZARD MITIGATION PLAN

The Disaster Mitigation Act 2000 (44 Code of Federal Regulations 201.6) was passed to reduce risk of death, injuries, and property damage as the result of disasters. This is to reduce or eliminate long term risks from disasters. The FEMA four phases of a disaster are mitigation/prevention, preparedness, response and recovery. In the past, FEMA's emphasis has been on response and recovery from disasters and costs of disasters have continued to escalate year after year. FEMA studies prove that for every dollar spent on a mitigation project saves $6 in response and recovery costs. We as a nation need to mitigate our hazards prior to emergencies therefore reducing death, injuries, and property damage, as well as response and cleanup costs. FEMA allocated $1.06 billion for California in 2009 for plans and projects and that amount changes yearly.

The DMA 2000 requires every State, County, and local government agency (City, Special District and School District) that want to be eligible for FEMA Hazard Mitigation

project grants (pre-disaster and post-disaster grants), must first develop a Hazard Mitigation Plan. The plan must be developed under strict criteria and approved by FEMA.

PURPOSE OF THE PLAN

As the costs of damage from natural disasters continue to increase, the Federal and State governments and communities all around the U.S. have come to realize the importance of identifying effective ways to reduce their vulnerability to disasters. Local hazard mitigation plans assist communities in reducing their risk by identifying hazards and strategies for risk reduction. The plan will study the natural hazards that may impact the RSCCD and determine a set of actions that when implemented, can help reduce the risks.

EXAMPLES OF MITIGATION PROJECTS:

- Had New Orleans rebuilt their levees prior to Hurricane Katrina, the US would have saved hundreds of billions of tax dollars
- The County of Orange, Orange County Cities along the Santa Ana River, the State of California and FEMA mitigated the Santa Ana River (Main Stem Project) working together for a decade and now Orange County has considerably less flooding from the Santa Ana River
- Huntington Beach City received $4 million to complete a seismic retrofit of their city hall
- Huntington Beach City School District and the Huntington Beach Union High School District received over a hundred thousand dollars each to complete the Non-Structural Hazard Mitigation Project to secure items at their schools and district sites

HAZARD MITIGATION PLAN OUTLINE

- Introduction – Describes the background and purpose of the plan
- District Profile – Presents the history, geography, demographics and socioeconomics of the district
- Hazard Identification, Vulnerability Assessment and Mitigation Strategies – Summarizes the research on the identified hazards, the RSCCD vulnerability of their facilities and lists mitigation strategies to prevent or mitigate the hazards
- Planning Process and Public Participation – The plan development process and public participating in developing the plan is documented in this section
- Plan Maintenance – Establishes procedures for Plan implementation, monitoring and evaluation
- Plan Adoption – Once State OES and FEMA review and approve the plan, the RSCCD Board of Trustees will review and adopt the plan

TEAM AND PUBLIC PARTICIPATION REQUIREMENTS

The Team includes representatives from the district, the colleges, other RSCCD sites, cities, county, Chamber of Commerce, volunteer/non-profits, students and the public. They will meet six times to develop the plan and present the plan to the public at a RSCCD Community Forum. Other individual meetings with the Plan Writer were scheduled throughout the planning process as needed. Each member of the Team will review sections of the plan prior to the next planning meeting. For example, meeting were held with the Director of District Construction throughout the 16 months to discuss strategies, Bond measures, future facility plans and priorities. ***The Team voted on such things as: list of natural hazards, mitigation strategies, mitigation priorities, how to best to involve the public in the plan, etc. Every team member was asked to invite guests/the public to the meetings***. Each member was asked to provide information on the district owned facilities, budgeting and facility funding processes, future facility planning, insurance data, etc.

The Team met on the following dates (second Thursday of every other month) at the RSCCD offices on seven occasions. The Project Manager ran the meetings and the Plan Writer presented the plan and updates. The Engineering Company was present to answer any technical questions.

H. KICK-OFF MEETING

The *Initial Hazard Mitigation Kick-Off Meeting* was held on April 2, 2015 at 1:30 PM at the District Office. The meeting was opened with self-introductions followed by a Power Point presentation which discussed the plan purpose, overview of the Disaster Mitigation Act of 2000, grant requirements, information about the FEMA Crosswalk and an overview of the proposed planning process. The plans goals were discussed and a Capability Assessment was completed. ***All team members were asked to invite guests/the public to the open meetings. The Plan Writer informed the group as to the importance of public participation in the planning process.***

The Plan Writer presented a brief history of Orange County's proclaimed disasters and discussed which of these incidents impacted the RSCCD service area. A methodical presentation was used by the Plan Writer on the natural hazards that could impact the RSCCD service area. The engineering company hired to assist with the plan (MMI Engineering) was introduced and they discussed what their role was in the planning process and what Hazus is.

TABLE 4 - HAZARDS CONSIDERED FOR THE RSCCD HAZARD MITIGATION PLAN

The following is a list of hazards considered for the RSCCD Hazard Mitigation Plan:

Hazard	Natural or Human-Caused	Preliminary Disposition	To Be Researched for This Plan
Agricultural Pests	Natural	Not Applicable. The RSCCD does not have any agriculture industry and would not warrant consideration of agricultural pest strategies.	No
Avalanche	Natural	Not Applicable. Avalanches are not possible given the location and geographical features of the RSCCD.	No
Coastal Erosion	Natural	Not Applicable. There is only one coastal site and the Team determined that the site is not capable of nor does it have the threat of coastal erosion.	No
Coastal Storm	Natural	Yes - The Team agreed to add the concern for coastal storm with the flood hazard profile.	Yes - Combine with Flood/Storm
Dam Failure	Natural	Yes - The Team agreed this hazard warranted mitigation strategies. It was acknowledged that there was one incident of seepage, but the dam has been raised and holds more water. (Good news/bad news)	Yes
Earthquake	Natural	Yes – The Team agreed that in addition to the earthquake hazard, mitigation strategies for fires that occur as a result of earthquakes are needed. Earthquakes are especially dangerous to the RSCCD area and facilities due to the possibility of liquefaction.	Yes
Epidemic/ Pandemic	Natural	The Team agreed this concern is addressed adequately through the Orange County's public health efforts.	No
Extreme Heat	Natural	Not Applicable. Extreme heat is not a concern given the location and geographical features of coastal OC.	No
Flood	Natural	The Team agreed to research flood in combination with storms and consider this hazard for mitigation strategies	Yes - Combine with Flood/Storm

Hazard	Natural or Human-Caused	Preliminary Disposition	To Be Researched for This Plan
Hurricane	Natural	Not Applicable. Hurricanes are not a concern given the location and geographical features of the RSCCD.	No
Land Subsidence	Natural	Not Applicable. The Team agreed that land subsidence is not a concern given the location and geographical features of the RSCCD area.	No
Landslide and Mudslide	Natural	Not Applicable. The Team agreed that landslides and mudflow are not a concern given the location and geographical features of the RSCCD area.	No
Santa Ana Winds	Natural	Yes – The Team was informed of the incidents that have occurred in Orange County and want this hazard studied.	Yes – Combine with Severe Weather/ Windstorm
Severe Winter Storms	Natural	Severe Winter Storms are not a concern given the location and geographical features of the RSCCD.	Yes - Combine with Flood/Storm
Terrorism	Human-Caused Review in 2016	Not a natural hazard. Add human-caused disasters in the first update of the plan scheduled for 2016.	No
Tornado	Natural	The Team acknowledged past incidents of high winds but they rarely reached tornado wind speeds (per the National Weather Service). The Team agreed to combine tornados with Windstorms and Waterspouts.	Yes – Combine with Windstorm
Tsunami	Natural	The Team agreed to consider this hazard for mitigation strategies. The District has two Newport Beach sites that may or may not be impacted.	Yes
Urban Fire	Natural or Human-Caused	Yes – The Team wanted this hazard researched and mitigation strategies developed.	Yes – Combine all Fire types
Volcano	Natural	Not Applicable. Volcano eruptions are not a concern given the location and geographical features of the RSCCD.	No

Hazard	Natural or Human-Caused	Preliminary Disposition	To Be Researched for This Plan
Waterspouts	Natural	The Team agreed to consider this hazard for mitigation strategies. It will be combined with tornados and Santa Ana Winds into a category called Windstorms	Yes – Combine with Windstorm
Wildland Fire	Natural	Not applicable – The Team agreed that wildland fires are not a concern given the location and geographical features of the RSCCD.	No
Wildland/Urban Interface	Natural	Yes – The Team wanted this hazard researched and mitigation strategies developed if any of the sites were threatened. This will be combined with Urban Fire.	Yes – Combine all Fire
Windstorm	Natural	Yes – Windstorm will consist of tornado, Santa Ana Winds, and Waterspouts which are all rare but possible.	Yes

The Project Manager and the Plan Writer facilitated an in depth discussion with the team on which hazards would be included in the plan. The Team was certain that flood/storm, earthquake and dam failure should be included. The discussions came about when the entire Team agreed that tornado-like events hit Orange County. High winds including Santa Ana Winds caused the exact same type of threat and damage. The only difference was the warning systems. However, in Orange County both hazard warnings were received through the same County system. Waterspouts also came in off the ocean to the coastal areas and became tornado-like. The National Weather Service often reminded Orange County Emergency Managers that the tornado-like events did not reach the National Weather Service definition of a tornado. The Team agreed to combine these wind-related hazards into “Windstorms”.

After considerable dialogue, the Team agreed unanimously that the following five natural hazards should be included in the MMI Engineering ***preliminary*** study:

1. Flood/Storm
2. Earthquake
3. Fire
4. Dam Failure
5. Windstorms (Tornados, High Wind, Santa Ana Winds and Waterspouts)

Once the hazards were identified, discussed and agreed upon, a schedule was set up and the research began.

The Project Manager worked with the district staff to compile lists of the district facilities, addresses, photos, and to get insurance information on the RSCCD facilities. The Plan Writer also needed to know which facilities were owned and which were leased by the RSCCD.

An engineering company was contracted to conduct a study using Hazus and other data. After the MMI Engineering hazard summary data was received, the Team discussed the need to study *Fire*. No RSCCD facilities were in the Fire Severity Zone. One facility was close. In fact, the American Red Cross Orange County Chapter has requested the district provide this site as a shelter during wildfire incidents because it was *outside* the Fire Severity Zone. At the August 13, 2015 meeting the Fire Severity Maps were provided to the Team. As the Team studied the maps, it was agreed that *Fire* would not need to be included in the plan. However, the Team unanimously agreed that since we were in a four-year drought that the plan should include a section on *Drought*.

California passed SB 379 in February 2015. This bill would according to State OES, upon the next revision of a local hazard mitigation plan on or after January 1, 2017**,** or, if the local jurisdiction has not adopted a local hazard mitigation plan, beginning on or before January 1, 2022, require the safety element to be reviewed and updated as necessary to address climate adaptation and resiliency strategies applicable to that city or county. The bill would require the update to include a set of goals, policies, and objectives based on a vulnerability assessment, identifying the risks that climate change poses to the local jurisdiction and the geographic areas at risk from climate change impacts, and specified information from federal, state, regional, and local agencies.

This plan combined Drought and Climate Change into one section. There should be more data available by 2021 which will help RSCCD improve on this section and hopefully, FEMA will provide additional data through Hazus. RSCCD is in a coastal county but has no coastal facilities and the lowest elevation of its facilities is 57 feet above sea level. That facility, the Orange County Sheriff's Regional Training Academy, is located in the inland City of Tustin so sea change will not impact any RSCCD sites but drought will.

I. THE TEAM'S ROLE

The Hazard Mitigation Planning Team convened every other month to guide the development of the Hazard Mitigation Plan. The Plan Writer provided drafts of the sections of the plan one week prior to each meeting for the Team members to review. A Power Point was presented at each meeting to educate the Team on the risk and the vulnerability of the RSCCD sites. The Plan Writer recommended mitigation strategies and the Team discussed each strategy and made additional recommendations. The

strategies were prioritized for each hazard. The Team members were given their assignment on what information was needed for the plans development. The comments of the Team were incorporated into the plan and the final plans were presented to the Team for approval.

The Team learned to work together in an effective manner. A consensus was reached on many different topics including strategies and priorities. When prioritizing the strategies, the list of Critical Facilities was used to ensure that these facilities became priorities. The group reviewed the strategies provided by the Plan Writer and Project Manager, added their own ideas, and then came to a consensus on the priorities. There were no disagreements on priorities. Everyone had input and then the group came to a consensus.

All meetings were advertised on the website prior to the meetings. The public was invited to and encouraged to attend every single meeting. The meetings were open to public comments and full public participation. Student representatives participated in each meeting.

J. THE TEAM'S ROLE IN PRIORITIZING THE MITIGATION STRATEGIES

The Plan Writer and Project Manager provided drafts of the plan sections at least one week prior to each meeting for the Team members via email. They included the Plan Writer and Project Manager recommended mitigation strategies. This gave Team members time to research and add their own strategies which they brought to the meetings to discuss. A Power Point was presented at each meeting on the risk assessment and vulnerability of each RSCCD site to educate the Team. Maps and Hazus data was presented. The MMI Engineering attended the meetings. Many of the strategies were recommended by the Facilities and site Directors of Maintenance & Operations. Then all strategies were prioritized by the Team for each hazard. This was done with discussion and recommendations by members (particularly Directors of Maintenance & Operations). On each of the hazards the priorities were discussed intensely which included everyone in attendances. The issues that were discussed included:

- How many people will benefit from the action?
- How many sites were impacted?
- Are the sites designated as RSCCD Critical Facilities?

The Team was provided the ***List of Critical Facilities*** which was previously agreed upon and listed in the Risk Analysis Section. The ***List of Facilities*** from the District Profile section, which included the site populations, was also provided to the Team. These lists along with the maps from the risk assessment and vulnerability assessments were all utilized to help set the mitigation strategy priorities. In each of these meetings the Team came to a consensus on the priorities. During the initial Hazard Mitigation meetings, the Team members were educated on mitigation strategies.

Each Maintenance & Operations Director agreed to review existing campus projects to see if any correlated cost estimates from existing reports and projects could be located for the list of strategies. Once the projects were reviewed, it was found that no cost estimates were available at this time for any projects listed. The Director of District Construction took the lead on determining project costs. In the future, more detailed cost estimates will be developed and a cost-benefit analysis will be conducted for key projects. The Team agreed this could *not* be done, at this time, as part of the Hazard Mitigation planning process due to staff time and budget constraints.

FEMA requires local governments to analyze the benefits and costs of a range of mitigation actions that can reduce the effects of each hazard. Cost-benefit analysis is used in hazard mitigation to show if the benefits to life and property protected through mitigation efforts exceed the cost of the mitigation activity. Conducting cost-benefit analysis for a mitigation activity can assist the district in determining whether a project is worth undertaking now, in order to avoid disaster related damages later. The analysis is based on calculating the frequency and severity of a hazard, avoided future damages, and risk.

A hazard mitigation plan must demonstrate that a process was employed that emphasized a review of benefits and costs when prioritizing the mitigation actions. The cost-benefit review must be comprehensive to the extent that it can evaluate the monetary as well as the non-monetary benefits and costs associated with each action. This planning Team agreed the District did not have the personnel available to do this at this time. If the District waited until a cost benefit analysis was done on each project or even major projects, the plan would never get completed.

Developing this Hazard Mitigation Plan was the first introduction for RSCCD employees to the concepts of mitigation. Since the concepts are new, the district believed it needed the five years before the plan update to work through strategy costs and cost-benefit analysts. That will be one of the priorities of the plan and a Multi-Hazard Strategy was added to do this plan, Multi-Hazard Strategy #1. The RSCCD will have to decide if someone will have to be hired to do this or can it be done internally.

Pending State funding for educational entities during fiscal years 2015-2017, the District will begin their cost estimates on the listed strategies.

On January 7, 2016, the Project Manager, Plan Writer, Chief of Safety and Security, and Director of District Construction met to develop cost estimates for each project. The FEMA Local Mitigation Planning Handbook dated March 2013 was distributed and the process agreed on. At that meeting the sub-Team added the following criteria to each strategy:

- Cost Estimate
- Benefits: Losses Avoided
- Priority

The Director of District Construction took the lead on cost estimates. The four Team members worked together on Benefits: Losses Avoided and Priority. The FEMA Local Mitigation Planning Handbook was used along with Worksheet 6.1.

The Districts Sub-Team ranked each action item by priority (low, medium, medium/high, or high) using the FEMA Worksheet 6.1, Mitigation Action Evaluation Worksheet. (STAPLE/E system). The system includes the following issues:

Life safety - How effectively will the action protect lives and prevent injuries?

Property protection - How significant will the action be at eliminating or reducing damage to structures and infrastructure?

Technical - Is the mitigation action technically feasible? Is it a long-term solution? Eliminate actions that, from a technical standpoint, will not meet the goals.

Political - Does the public support the mitigation action? Is there the political will to support the action item?

Legal - Does the community have the authority to implement the action?

Environmental - What are the potential environmental impacts of the action? Will it comply with environmental regulations?

Social - Will the proposed action adversely affect one segment of the population? Will the action disrupt established neighborhoods, break up voting districts, or cause the relocation of lower income people?

Administrative - Does the community have the personnel and administrative capabilities to implement the action and maintain it, or will outside help be necessary?

L**ocal champion** - Is there a strong advocate for the action or project among local departments and agencies who will support the action's implementation? This, when all is said and done, is who usually gets the strategy completed.

Other community objectives - Does the action advance other community objectives, such as capital improvements, economic development, environmental quality, or open space preservation? Does it support the policies of the comprehensive plan?

Rankings Using STAPLE/E:

Ranking	Points
Low	1 - 3 points (all low priority strategies were removed from the plan)
Medium	4 - 5 points
Medium/High	6 - 7 points
High	8 - 9 points

The Team worked together and came to a consensus on prioritizing the action item priorities. These updates are located in each mitigation action item table.

K. EXISTING AUTHORITIES, POLICIES AND PROGRAMS

The RSCCD gets its building and facility authorities from the following:

State of California
Department of General Services
Division of the State Architect

The Division of the State Architect (DSA) provides design and construction oversight for K–12 schools, community colleges, and various other state-owned and leased facilities. The Division also develops accessibility, structural safety, fire and life safety, and historical building codes and standards utilized in various public and private buildings throughout the State of California.

The following entity governs the RSCCD and makes all local decisions on buildings and facilities as well as setting all RSCCD policies and approval of programs:

Rancho Santiago Community College District
Board of Trustees

Education Code Sections 72023, 72103, 72104 govern the Rancho Community College District Board of Trustees which shall consist of five members elected by the qualified voters of the District. Members shall be elected at large as outlined in Board Policy. These five individuals are the local legal governing body of Rancho Santiago Community College District and therefore approve all policies and direction of programs.

RSCCD can expand on and improve their existing policies and programs by:

- Again participating in the County of Orange HAZUS study during its next update
- Working at the State level with the Fusion Team, expand Fusion to include disaster replacement cost estimates
- Consider future project funding through local Bond Measures. Review existing Bond Measures to determine if any of this funding can be utilized for the listed mitigation strategies

TABLE 5 – OVERVIEW OF TEAM MEETINGS AND THE PLANNING PROCESS

Planning Meetings	Date	Meeting Topics
Kick-off Meeting **Planning Meeting #1** **04/02/2015** **1:30-3:30 PM** **District Office**		**Hazard Mitigation Kick-off Meeting - Introduction and District Profile** This was the initial planning meeting with all Team members including: District, District/Student volunteers, Cities, County, State, non-profit organizations, business representatives and the general public. The meeting was advertised by the RSCCD Director of Public Affairs & Publications and placed on the District's website. The public was invited. Each of the District owned properties were reviewed. It was determined that the Regional Fire Training Center, Site 6, that the land was not owned by RSCCD; the lease was being terminated in May of 2015; and the district was selling the portables on the site. So this site would not be included in the study. An overview was given of the plan's goals, the grant, the planning process, a capability assessment was conducted, the Disaster Mitigation Act 2000 was reviewed and the recommended schedule of meetings was agreed upon. The Team was educated on what hazard mitigation was and its benefits. This educational process was conducted throughout the entire planning process at every meeting since Hazard Mitigation is a new concept to community colleges. The Team was asked if other district personnel or organizations should be included on the Team to insure all stakeholders were included in the process. The Team discussed how to get the public more involved in the planning process and everyone agreed that the District's Website reached tens of thousands of students, faculty, staff and the general public. Team members also agreed that they would spread the word and invite others to the meetings through meetings, classes and professional organizations. The first order of business was to determine which hazards could impact the District which would be studied for the plan. The Plan Writer gave a short presentation on Orange County disaster history. A list of known Orange County hazards was presented. The Team voted on the natural hazards they believed posed the greatest threat. The bulk of the meeting was spent on this subject. A long discussion was held on natural vs. human caused hazards. The team was informed that the human caused hazards would be studied in the future. Assignments were made to Team members asking for lists of district sites and facilities, facility plans, bond measures, funding sources as well as insurance information for the Plan Writer. At each meeting a list of information needed for the plan was assigned to Team members. A discussion was held on the District's capabilities to develop a plan. Developing a plan for a community college district is different from a City which has many additional resources that a college district does not have. A Capability Assessment was conducted and everyone participated and offered whatever resources they had. The Team agreed this project is invaluable and everyone and agreed to provide full cooperation to the project. Everyone agreed the District has the oldest college in Orange County and will benefit greatly from this project. Because of the limited resources of the community college regarding GIS mapping and

	engineering staff, MMI Engineering was hired to supplement those areas of expertise. Representative Hope Seligson was introduced at the meeting. She gave an overview of what Hazus is and what information and maps the Team could expect from the engineering company. The Plan Introduction and District Profile were presented and changes were made.
Planning Meeting #2 **06/11/2015** **1:30–3:30 PM** **District Office**	**III. Risk Assessment** **IV-A. Multi-Hazard Strategies** The Project Manager and Team recommended the following goals which the Team approved: 2016 – Develop the Initial Natural Hazard Mitigation Plan and provide education on hazard mitigation to the Team 2021 – Develop a Natural & Human-Caused HM Plan which later the team agreed would also include a Climate Change/Climate Adaption section. Also in 2021 plan, attempt to get improved GIS maps for hazards not covered by Hazus. A request was made to Orange County for any GIS maps for hazards not covered by Hazus. The Plan Writer presented **Risk Assessment** and **Multi-Hazard Strategies.** Additional education on Hazard Mitigation was conducted. A Power Point with MMI Engineering Hazards Summary was presented to the Team along with impact maps and a discussion was held on the hazard "Fire". None of the RSCCD sites are located in the Fire Hazard Severity Zone. The Team replaced the hazard "Fire" with "Drought" since California was in the fourth year of a drought and in a Drought "State of Emergency." The Project Manager explained the plan review process. Each Team member is to review every section of the plan and send their recommended changes to the Project Manager. The Project Manager will review the recommended changes, additions, corrections, etc. for accuracy and send the appropriate changes to the Plan Writer. The Plan Writer will then send the Project Manager the finalized sections of the plan to be reviewed and approved. Each Team member was given until the next meeting to make revisions or approve the sections provided. A draft list of Critical Facilities, site Emergency Operations Centers (EOCs) and critical facilities that would be needed to manage an emergency was presented. Additional assignments were made at Meeting #2 which included additional information on these Critical Sites, where site EOCs were located, IT sites, communications issues, generator issues, and additional insurance, facility and maintenance information. The Director of District Construction reviewed the Facilities Master Plan, Approved Bond Measure Studies and was the expert on the Division of the State Architect. He presented his findings in relation to the RSCCD Hazard Mitigation Plan to the team at this meeting. He discussed which sites were already financed by the Bond Measures and other financial means and which sites still needed funding. The Facilities Manager discussed "Fusion", the Community College statewide Facilities Utilization Space Inventory On-line System.

Planning Meeting #3 **08/13/2015** **1:30-3:30 PM** **District Office**	**IV-B. Earthquake** The Plan Writer and Project Manager worked together all month updating and improving the critical facilities list that would be required to manage and respond to a disaster at the RSCCD. The site list was documented and presented again to the Team at Meeting #3. The Team provided input on the critical facilities lists. The Plan Writer presented the first draft of the Earthquake section IV-B. The RSCCD is impacted by five earthquake faults. Each fault was presented using the 2009 Orange County HAZUS study, information from the California HM Plan, USGS, MMI Engineering Hazus Study and numerous other studies. Hazus data was presented by MMI Engineering and they were present for the discussion on Earthquake. After presenting the cost impacts for two of the faults, the five faults were prioritized by worst impact to least impact. The Team agreed on the priorities. The Director of District Construction discussed projects planned for the future and Bond Measure E plans were discussed. Many of the identified facilities (by MMI Engineering) were already scheduled for demolition, mostly on Santa Ana College. The recommended mitigation strategies were presented by the Plan Writer. Each was discussed in depth and then the members and public were invited to present their ideas. Their ideas were incorporated into the second draft of the Earthquake section. The Director of District Construction was invaluable during this process. He manages the Facilities Master Plan which he presented. It became an important central document utilized throughout this plan. The FEMA booklet Mitigation Ideas, January 2013 was used throughout this plan for mitigation ideas.
Planning Meeting #4 **10/08/2015** **1:30-3:30 PM** **District Office**	**IV-C. Flood/Storm** **IIV-D. Dam Failure** The Flood/Storm and Dam Failure draft reports were emailed to all Team members one week prior to the fourth meeting. The fourth meeting was a full meeting with two hazards being presented. The OC Hazus information was utilized again for the Flood/Storm. Numerous other studies on Prado Dam and other Orange County dams were utilized. State OES provided a CD with dams and inundation maps. They were in most cases unreadable and it was difficult to impossible to determine which RSCCD sites were in which inundation zones. Vicki Osborn, Orange County assisted with better maps and dam failure information and the Project Manager and Plan Writer reviewed each map individually and documented which sites would be impacted by which dams. Again, it was impossible to provide quality results without having the inundation maps integrated with GIS showing the exact location of each of the sites. The contractor studied the National Flood Insurance Program (NFIP) and ensured that all cities the RSCCD sites were located in were participants in the NFIP. She also discussed the Orange County Flood Control Projects Seven-Year Plan and how it related to the district. A Power Point presentation was used to present the risk and vulnerability of each RSCCD site to the different flood scenarios, dam failure from Prado Dam and other three dams that threatened RSCCD sites. Flood/Storm is the most common disaster in Orange County. The Prado Dam inundation map shocked the Team. Most sites in the district could be impacted. The Team found the information surprising, most of them knowing nothing about Prado Dam

	and the other dams. The mitigation strategies were presented by the Plan Writer. Each was discussed and then the members and public presented their ideas. Their ideas were incorporated into the second draft of the Sections. Assignments were made to the Team to determine future development trends of the district and ways in which to fund the strategies.
Planning Meeting #5 **12/10/2015**	**IV-E. Drought** **IV-F. Windstorms** The Windstorm and Drought draft reports were emailed to all Team members one week prior to the fifth meeting. The Team was working well together and understood their role in the project. They provided needed information on the district and the process was a success. It was discovered that the district had already taken steps to mitigate drought. The District has formed a RSCCD Sustainable Committee (RSC) that is responsible for raising awareness within the district and making recommendations to the Chancellor concerning the conservation of energy, water and other resources and the implementation of sustainability practices that impact the district and community. Their recently approved plan and goals were reviewed and data was included in this plan. Representatives from the Sustainable RSCCD Committee were invited to the meeting. The Plan Writer presented the Windstorm and Drought reports on a Power Point slide show. Individuals were surprised at the seriousness of a droughts. The Plan Writer made recommendations and mitigation strategies were presented. The Team members each presented their own ideas on strategies plus added additional strategies to the reports. Each strategy was discussed in detail. The Team was given their assignments. The Team considered and provided their ideas for how to maintain the plan and how to keep the subject of hazard mitigation as a priority topic for the district. Again the Team was asked how to get more public involvement in the planning process and how to get the public to attend a future Community Forum.
Planning Meeting #6 **2/11/2016**	**V. The Planning Process and Public Participation** **VI. Plan Maintenance** **IV Part E. Drought and Climate Change** The Plan Writer documented the RSCCD Hazard Mitigation Team Planning Process and developed the first draft of the Planning Process and Public Participation Plan and the Plan Maintenance Sections. The drafts of the sections V and VI were emailed to the Team one week prior to Meeting 6. At the meeting a Power Point slide show was presented describing these two sections of the plan. Changes and Team member's thoughts were incorporated into the second drafts of these plans. The Facilities Manager reviewed the District's Maintenance Plans and Landscape Plans to determine if there were opportunities for mitigation projects for drought and/or climate change. He also discussed the District's Sustainable RSCCD Committee Plan and most participants had never heard of the committee or the good work they were doing on drought education.

	Climate Change had been added to the Drought Plan to make the Drought and Climate Change plan, Section IV, Part E. The State OES provided the wording for Climate Change which was added and personalized to the District. Information was added about the RSCCD Sustainability Committee and their responsibilities. The remainder of the meeting was utilized to review the hazard mitigation strategies and ensure that everyone's thoughts and ideas were incorporated into these sections of the plan. A 2016 Mitigation Strategies Tracking Form was presented with all strategies from all hazards. The list was previously presented to the Director of District Construction who placed them in his recommended order and provided cost estimates. The Team then went through the list and reprioritized them after in-depth discussions. Each Team member and the public who were present had the opportunity to participate in the discussions. The Team came to a consensus on each of the priorities.
Community Forum **Meeting #7**	April 25, 2016 from 3-4 PM (Just prior to the RSCCD Board of Trustee Meeting), a Power Point was presented to the attendees which included the city/county/state/non-profit, district personnel, student representatives, and the public. The Power Point was an overview of the entire plan and included the 2016 Mitigation Strategies Tracking Form and a Public Comment Form. Each attendee was asked for their input into the plan using these two documents. Most comments were general comments such as: "good job," "we need this plan" and "very important plan." These comments were not included in the plan. Only specific comments on either existing strategies or new ideas were included in the Planning Process and Public Participation section of the plan.
Final Team Meeting #8 and plan approval	All comments on the plan were documented. The comments were discussed at the final meeting. The grant paperwork was completed and submitted to State OES. The final plan was reviewed, the crosswalk was completed and discussed. The plan was copied and two copies were submitted to State OES. The grant paperwork was finalized and submitted. The Hazard Mitigation Plan went through the approval process of OES, FEMA and the RSCCD Board of Trustees. ***And now the important work begins…***

The public was invited to every meeting by the website, many of the meetings through press releases to local newspapers, and through educational booths held at the colleges. The RSCCD employee representatives included: 7 site directors, facilities and construction personnel, finance personnel, Security Chief and emergency preparedness personnel at the 2 large colleges and 2 student representatives. Invited from the city/county/state were all Emergency Managers, all City Planners, and police and fire reps from the cities that had fire and police and the County Fire Department, To expand our outreach, we had the American Red Cross who attended most meetings and the Chamber of Commerce representatives to bring businesses into the planning meetings. Our goal was to reach as many individuals, internal and external to the district as possible. We included all public entities who represented their cities, county and State OES.

In addition, there were personal interviews, phone interviews and email interviews. For example: the City of Anaheim Building Official discussed a closed dam that was in Anaheim but impacted Orange. The Army Corps of Engineers was asked numerous questions about Prado Dam. The Orange County Water District emergency planner responded to dozens of questions about drought and water sources. County Emergency Management Bureau provided additional dam inundation maps and responded to a dozen question throughout the process. The cities of Santa Ana and Orange where 6 of the 7 sites are located provided maps, their General Plans, the Seismic Safety Elements, their Emergency Plans and their websites provided dozens of additional reports that were accessed.

State OES assisted us by providing a CD of dam inundation maps, answered dozens of questions on Climate Change requirements, grant information, grant reports, and many technical questions.

FEMA provided the booklets on hazard mitigation. They were used extensively for ideas on which mitigation projects especially for drought which was new to the plan writer. They were used for the FEMA recommended process for prioritizing the mitigation strategies.

At every meeting the attendees (including the public) were asked for their input into the plan. They were given a contact person, phone number and email address to send comments on the plan to. We stressed at each meeting that we really ***wanted*** their input!

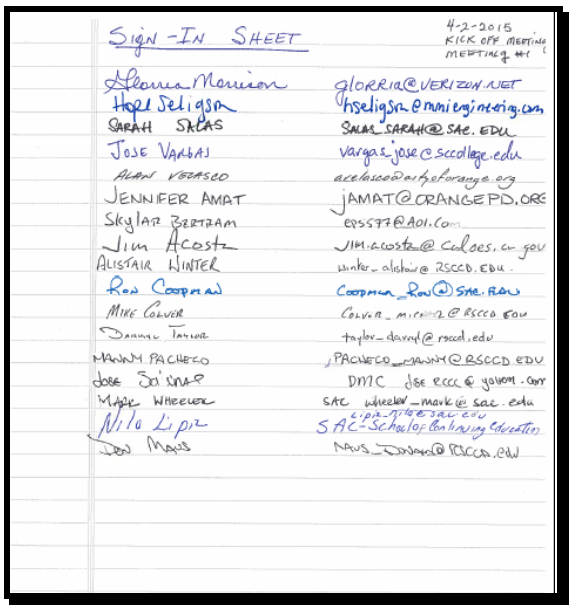
For the community forum, everyone that participated in the plan was invited and the general public through the website, local newspapers, press releases, notices to the Board of Trustees, etc. At the community forum, formal comment sheets were handed out to all attendees who were told that we wanted their input, comments, and ideas for additional projects. All employees, students and the public comments were reviewed by the Hazard Mitigation Team to determine if they should be incorporated into the plan.

Most attendees just made comments on, “Great job, good plan, important to follow through with, etc.”

Every effort was made to get employees, faculty, students, cities, county, state, public safety, businesses and business representatives, non-profit, and the general public involved in the planning process.

Meeting Sign-In Sheets

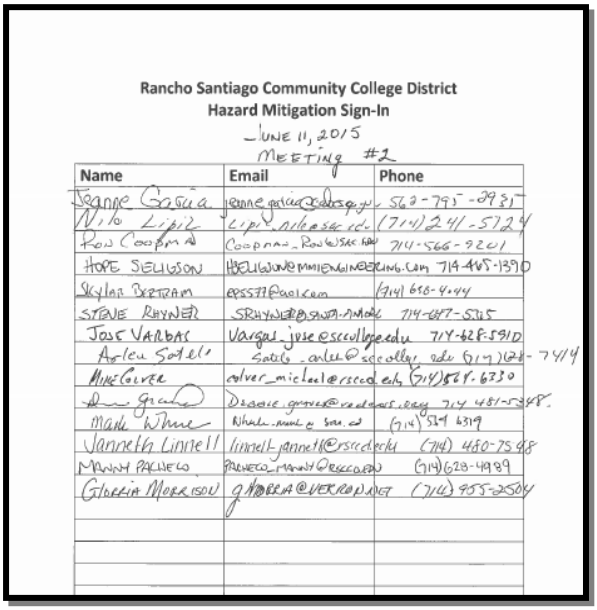
April 2, 2015 Kick Off Meeting



Sign-In Sheet — 4-2-2015 Kick Off Meeting #1

Gloria Morrison	GLORRIA@VERIZON.NET
Hope Seligson	hseligson@mmiengineering.com
Sarah Salas	SALAS_SARAH@SAC.EDU
Jose Vargas	vargas_jose@sccollege.edu
Arlen Vizcasco	arelasco@ci.peforange.org
Jennifer Amat	JAMAT@ORANGEPD.ORG
Skylar Bertram	epss77@aol.com
Jim Acosta	JIM.Acosta@calOES.ca.gov
Alistair Winter	winter_alistair@RSCCD.EDU
Ron Coopman	Coopman_Ron@SAC.RAN
Mike Colver	Colver_michael@rsccd.edu
Danny Taylor	taylor_danny@rsccd.edu
Manny Pacheco	PACHECO_MANNY@RSCCD.EDU
Jose Solano	DMC jose.rccc@yahoo.com
Mark Wheeler	SAC wheeler_mark@sac.edu
Nilo Lipiz	SAC-School of Continuing Education
Don Mans	MANS_DONALD@RSCCD.EDU

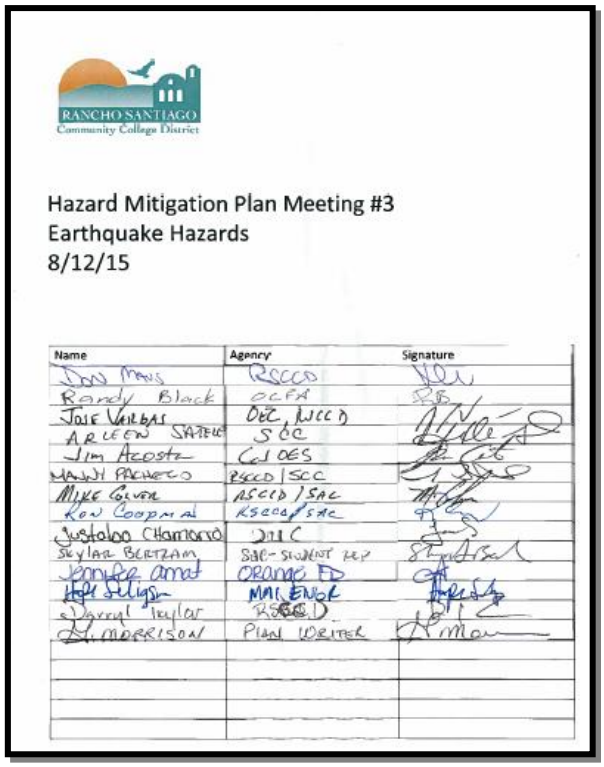
June 11, 2015 Meeting #2



Rancho Santiago Community College District
Hazard Mitigation Sign-In
June 11, 2015
Meeting #2

Name	Email	Phone
Jeanne Garcia	jeanne.garcia@ocfa.org	562-795-2937
Nilo Lipiz	Lipi...@rsccd.edu	(714)241-5724
Ron Coopman	Coopman_Ron@SAC.RAN	714-566-9261
Hope Seligson	HSELIGSON@MMIENGINEERING.com	714-445-1390
Skylar Bertram	epss77@aol.com	(916) 658-4444
Steve Rhynes	SRHYNES@SANTA-ANA.ORG	714-647-5245
Jose Vargas	Vargas_jose@sccollege.edu	714-628-5910
Arlen Satelo	Satelo_arlen@sccolleg.edu	(714)628-7414
Mike Colver	colver_michael@rsccd.edu	(714)558-6730
Debbie Graves	Deabie.graves@redlands.org	714 481-5348
Mark Wheeler	Wheeler_mark@sac.edu	(916)514 6319
Jannath Linnell	linnell-jannath@rsccd.edu	(714) 450-7548
Manny Pacheco	PACHECO_MANNY@RSCCD.EDU	(714)628-4989
Gloria Morrison	GMORRA@VERIZON.NET	(714) 955-2504

August 12, 2015 Meeting #3

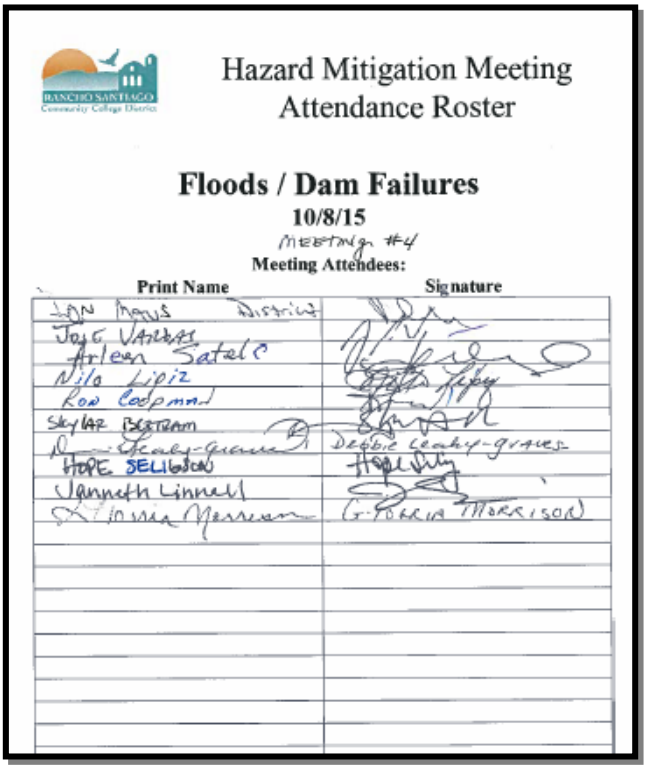


RANCHO SANTIAGO Community College District

Hazard Mitigation Plan Meeting #3
Earthquake Hazards
8/12/15

Name	Agency	Signature
Don Mans	RSCCD	
Randy Black	OCFA	
Jose Vargas	OEC, RSCCD	
Arleen Satelo	SCC	
Jim Acosta	Cal OES	
Manny Pacheco	RSCCD / SCC	
Mike Colver	RSCCD / SAC	
Ron Coopman	RSCCD / SAC	
Justaloo Chamorro	DMC	
Skylar Bertram	SAC-Student Help	
Jennifer Amat	Orange PD	
Hope Seligson	MMI Engr	
Danny Taylor	RSCCD	
G. Morrison	Plan Writer	

December 10, 2015 Meeting #5



RANCHO SANTIAGO Community College District

Hazard Mitigation Meeting
Attendance Roster

Floods / Dam Failures
10/8/15
Meeting #4
Meeting Attendees:

Print Name	Signature
Don Mans District	
Jose Vargas	
Arlen Satelo	
Nilo Lipiz	
Ron Coopman	
Skylar Bertram	
Debbie Leahy-Graves	Debbie Leahy-graves
Hope Seligson	
Jannath Linnell	
Jessica Morrison	G. Morrison

Rancho Santiago Community College District
Hazard Mitigation Sign-In
Meeting #5 December 10, 2015

Name	Email	Phone
Sylvia Bertram	epss79@aol.com	(714) 658-4044
Gloria Morrison	gloriar@verizon.net	714-955-2504
Don Maus	Maus_Don@ccsd	714 480 7330
Mike Colver	colver_michael@rsccd.edu	714-564-6530
Ron Cooprman	Cooprman_Ron@sac.edu	714-556-5201
Jose Vargas	Vargas_jose@sccollege	714-628-5910
Jose Salvia		(714) 910 36 49
Arlea Satele	satele_arlea@sccolleg.edu	
Milo Lipiz	Lipiz_milo@sac.edu	714-628-8477
Darryl Taylor	taylor_darryl@rsccd.edu	(714) 615-9414
		714 480 7513

February 11, 2016 Meeting #6

MEETING #6 SIGN-IN SHEET FEB. 11, 2016

1. Gloria Morrison, Peer Writer
2. Mike Colver, SAC Safety + Security
3. Debbie Graves, Red Cross
4. Steve Rhyner City of Santa Ana
5. Ron Cooprman SAC CTA
6. Alistair Winter RSCCD
7. Jim Acosta, Cal OES
8. Jose Salvias DMC
9. Don Maus
10. Arlea Satele, SCC
11. Darryl Taylor
12. Jose Vargas

L. EXAMPLES OF MEETING NOTICES

FIGURE 3: WEBSITE NOTICE OF PUBLIC HEARING ON HAZARD MITIGATION PLAN APRIL 2015



FIGURE 4: WEBSITE NOTICE OF HAZARD MITIGATION KICK-OFF MEETING APRIL 2, 2015

Website notices were placed on the RSCCD website for every Hazard Mitigation meeting. This was determined to be the best source of information for students, faculty, staff and the general public for issues related to the RSCCD.

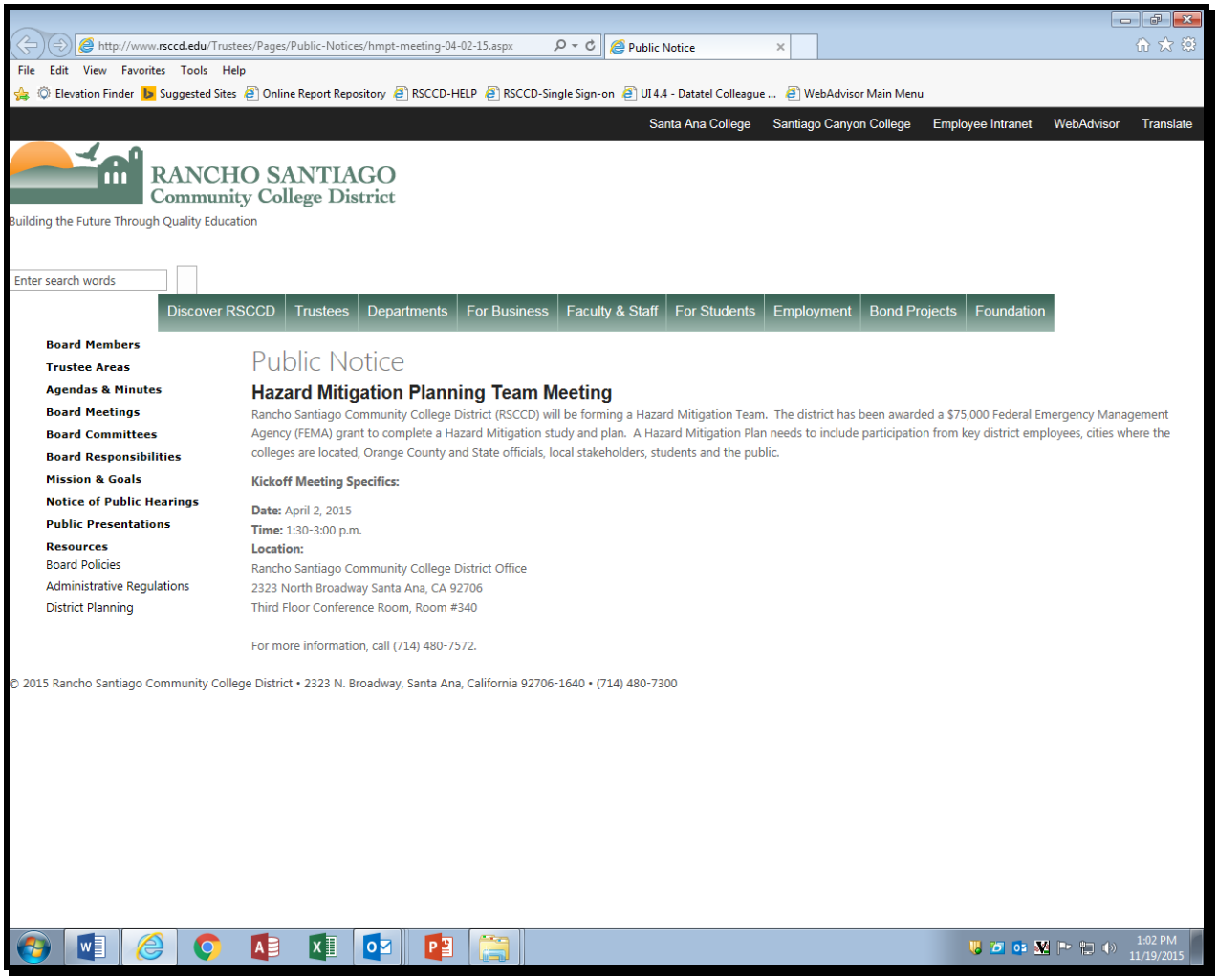


FIGURE 5: SAMPLE NEWS RELEASE FOR HAZARD MITIGATION MEETINGS

RANCHO SANTIAGO Community College District

NEWS RELEASE

Contact: Judy Iannaccone
Director, Public Affairs
Phone: (714) 480-7503
E-mail: iannaccone_judy@rscd.edu

August 5, 2015
FOR IMMEDIATE RELEASE

Rancho Santiago Community College District Holds Public Meeting to Review Hazard Mitigation Earthquake Plan on August 13

(Santa Ana, CA)— A public meeting will be held to review the Rancho Santiago Community College District Hazard Mitigation Plan, earthquake section. The meeting will be held on Thursday, August 13 at 1:30 p.m. at the District Office, located at 2323 N. Broadway, Santa Ana, in the first Floor Board Room (Room 107).

RSCCD has received a $75,000 grant from FEMA to guide the development of a Hazard Mitigation Plan. The goal of this grant program is to provide safer, stronger, protected communities and institutions and to take actions to reduce or eliminate long-term risk to people and property from natural hazards.

In the coming year, the college district will consider hazard mitigation measures for earthquakes, floods, dam failure, Santa Ana winds, and drought. The first phase of this hazard mitigation plan is the earthquake section, which will be presented to the public at this meeting.

Although community college facilities must meet Field Act standards at the time of construction, the hazard mitigation plan will recommend additional structural improvements that could further mitigate earthquake hazards. The plan will also offer non-structural improvements that could augment safety. Furthermore, suggestions will include training for district staff to prepare them to conduct initial damage assessments following an earthquake. Once approved by the RSCCD Board of Trustees and FEMA, the plan will offer a list of mitigation measures to make the college district facilities safer following earthquakes.

The public is invited to provide feedback on the plan and the list of mitigation measures that the district plans to take to lessen the impact of earthquakes on its facilities. For more information, contact RSCCD Risk Management at (714) 480-7330 or www.rsccd.edu.

About Rancho Santiago Community College District
Santa Ana College and Santiago Canyon College are public community colleges of the Rancho Santiago Community College District, which serves the residents of Anaheim Hills, Orange, Santa Ana, Villa Park, and portions of Anaheim, Costa Mesa, Irvine, Fountain Valley, Garden Grove, and Tustin.. Both colleges provide education for academic transfer and careers, courses for personal and professional development, and customized training for business and industry.

# # #

District Office
2323 North Broadway
Santa Ana, CA 92706 - 1640
(714) 480-7500 Tel (714) 796-3900 Fax

Santa Ana College Santiago Canyon College

FIGURE 6: PUBLIC EDUCATION BOOTH ON DISASTER PREPAREDNESS BEFORE MEETING #3



The RSCCD Safety & Security personnel set up a public education booth to educate students, faculty, staff and the general public about the earthquake threats to the District's sites.

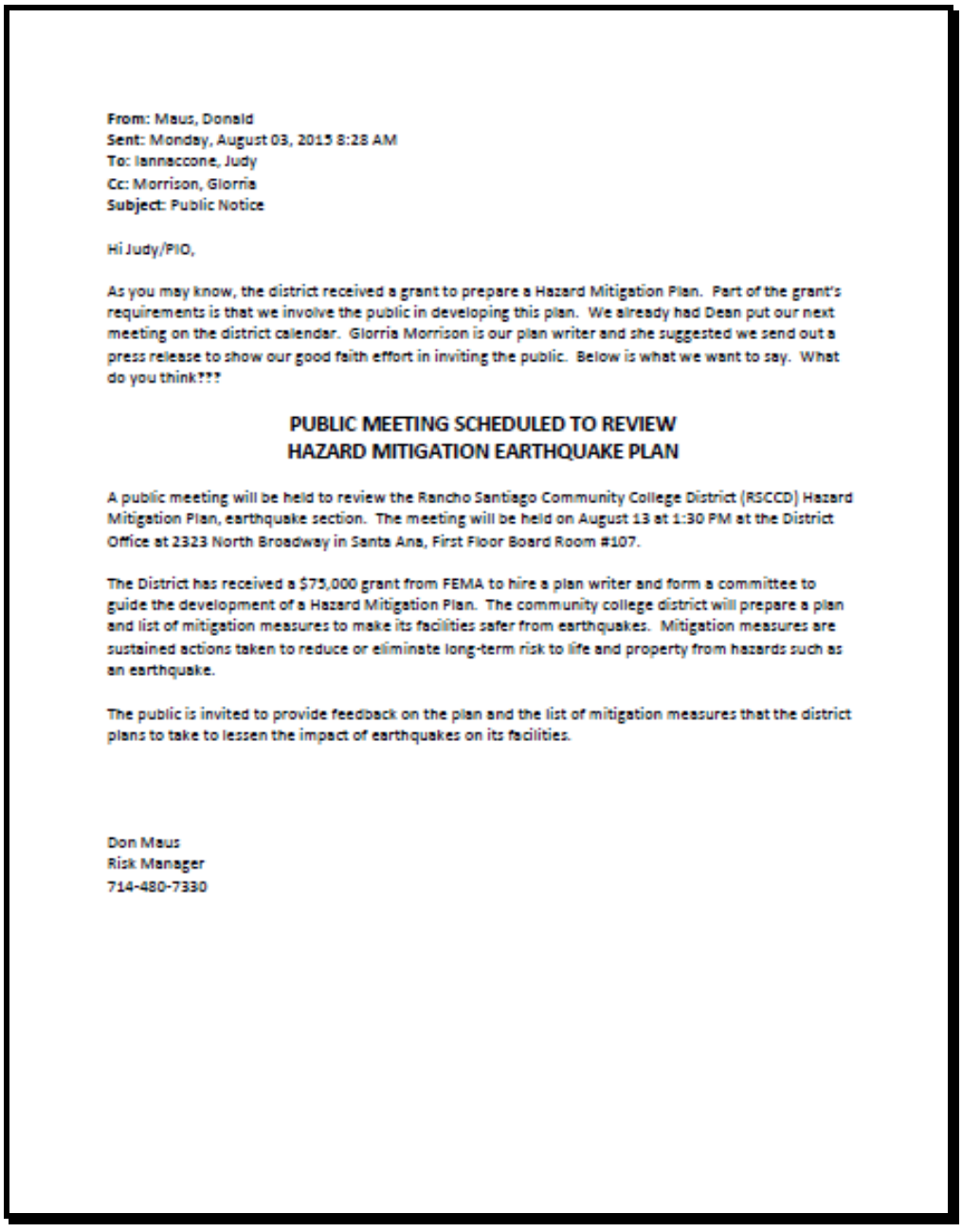
The maps that were to be used for the Hazard Mitigation Meeting #3 and the Community Forums were used to draw the public into the booth, and when they came to the booth the sign on the table was pointed out and participants were personally invited to the Hazard Mitigation Meeting #4 on Earthquakes.



Earthquake is the most popular issue in the plan and RSCCD personnel and visitors were more likely to attend that meeting than others. Because of this, the Public Affairs as

well as the Security & Safety personnel made great effort to bring in the students, faculty, staff and the general public.

FIGURE 7: SAMPLE NEWS RELEASE BY THE DIRECTOR OF PUBLIC AFFAIRS & PUBLICATIONS



From: Maus, Donald
Sent: Monday, August 03, 2015 8:28 AM
To: Iannaccone, Judy
Cc: Morrison, Glorria
Subject: Public Notice

Hi Judy/PIO,

As you may know, the district received a grant to prepare a Hazard Mitigation Plan. Part of the grant's requirements is that we involve the public in developing this plan. We already had Dean put our next meeting on the district calendar. Glorria Morrison is our plan writer and she suggested we send out a press release to show our good faith effort in inviting the public. Below is what we want to say. What do you think???

PUBLIC MEETING SCHEDULED TO REVIEW HAZARD MITIGATION EARTHQUAKE PLAN

A public meeting will be held to review the Rancho Santiago Community College District (RSCCD) Hazard Mitigation Plan, earthquake section. The meeting will be held on August 13 at 1:30 PM at the District Office at 2323 North Broadway in Santa Ana, First Floor Board Room #107.

The District has received a $75,000 grant from FEMA to hire a plan writer and form a committee to guide the development of a Hazard Mitigation Plan. The community college district will prepare a plan and list of mitigation measures to make its facilities safer from earthquakes. Mitigation measures are sustained actions taken to reduce or eliminate long-term risk to life and property from hazards such as an earthquake.

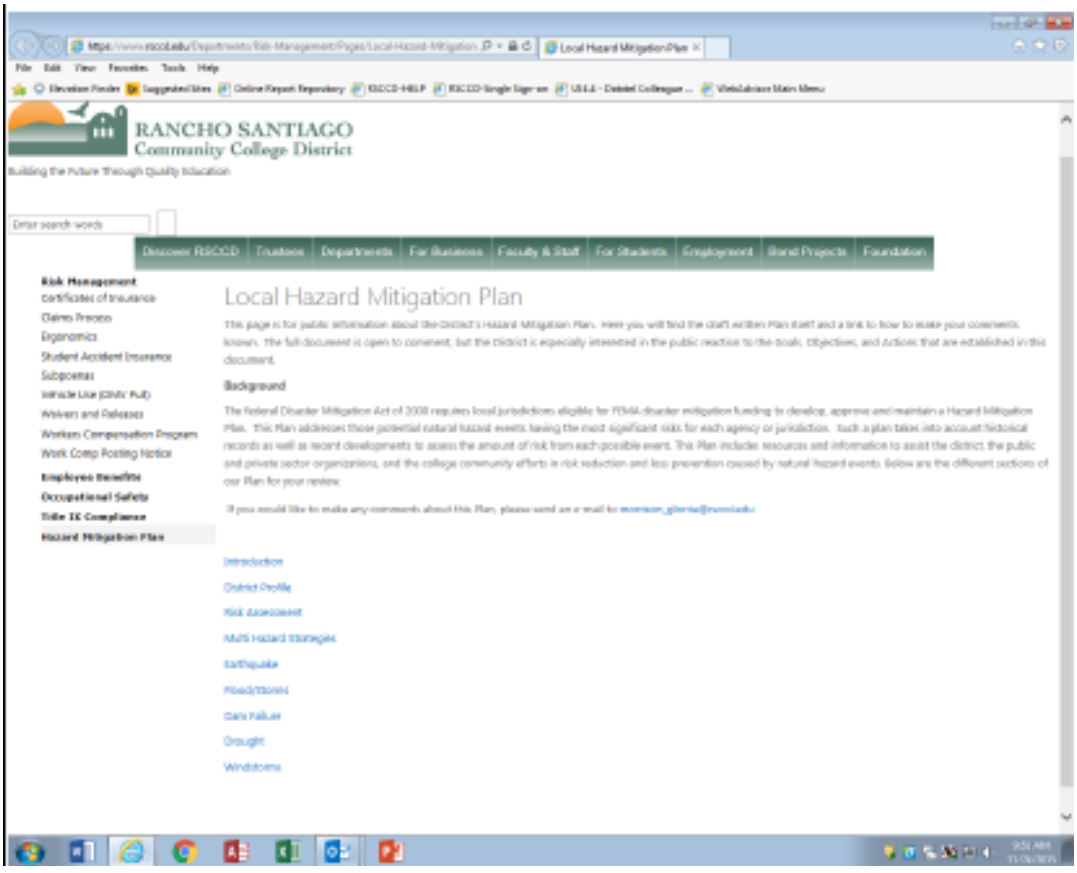
The public is invited to provide feedback on the plan and the list of mitigation measures that the district plans to take to lessen the impact of earthquakes on its facilities.

Don Maus
Risk Manager
714-480-7330

FIGURE 8: SAMPLE DISTRICT OFFICE MEETING NOTICE TO EMPLOYEES



FIGURE 9: HAZARD MITIGATION PLAN ON THE WEBSITE REQUESTING PUBLIC COMMENTS



M. Review of Existing Documents, Studies, and Technical Info

Throughout the planning process, the Team members, Project Manager and the Plan Writer had to determine what existing documents needed to be reviewed. Community College Districts do not have a General Plan like cities and counties do. They do, however, have Facilities Master Plans, Insurance Reports, websites with critical information, photos of facilities, Bond Measures and Studies, Budgets, etc. The cities, county and state representatives on the team were the best sources of local zoning and planning ordinances. City Planners were invited to participate on the team. The Division of the State Architect's (DSA) Office was the best source of public school construction codes and information. The Director of District Construction was the liaison to the DSA throughout this plan. The best and most valuable information came directly from the RSCCD employees. Their knowledge was essential in developing this plan. Dozens of documents were reviewed and the following documents were most beneficial:

- State of California Multi-Hazard Mitigation Plan - This plan helped identify hazard history for the entire state.
- County of Orange and Orange County Fire Authority Hazard Mitigation Plan – This plan helped identify O.C. hazard history and had information on the existing dams.
- Fullerton, Riverside, Huntington Beach and Newport Beach Hazard Mitigation Plans – These plans were reviewed for mitigation strategies.
- City General Plans and Safety Elements for Orange County, Santa Ana, Tustin and Orange City – These plans were used for their hazard profiles, i.e. the City of Orange had the best dam inundation map found during the research phase.
- City/County Safety Elements for Orange County, Santa Ana, Tustin, Orange City
- Division State Architects Website and documents – These plans were studied for maps, history and other technical data related to hazards.
- Emergency Operations Plan – More maps were discovered in these plans.
- OC Water District, Municipal Water District of OC, and Southern California Metropolitan Water District water planning and distribution documents – These plans and websites were used especially for drought data and water distribution.
- California Climatic Change and Washington Planning for a Changing Climate – These planning documents were used for information and data on climate change.
- National Flood Insurance Program website and information – used for flood data.
- Orange County Flood Control Project Seven-Year Plan – used to discuss flood channels and system in areas where RSCCD sites were located.
- Hazus Study - Orange County dated April 23, 2009 – Used for hazards study.
- State OES Dam Inundation CD – Used for dam failure maps, data, and to identify which dams would inundate each RSCCD site
- Orange County Dam Failure Inundation Maps. Used for dam failure inundation.

- Fusion - the Community College statewide Facilities Utilization Space Inventory On-line system. Used by MMI Engineering for site specific information.
- RSCCD 5-Year Facility Master Plan – Studied to find which sites have been already been identified and which sites have already been funded.
- RSCCD Maintenance Plans – Studied for drought strategies.
- RSCCD Landscape Plans – Studied for drought strategies.
- Sustainable RSCCD Committee Plan – Studied for drought and climate change strategies and to determine which were already in place and which were still needed.
- RSCCD Bond Measure E/Bond Oversight Committee and Annual Reports – Studied to determine which buildings have already been studied and which buildings have been funded.
- RSCCD Bond Measure Q/Bond Oversight Committee and Annual Reports - Studied to determine which buildings have already been studied and funded.
- Department of Water Resources Climate Action Plan – Used for climate change basic information and data.
- Preparing for Climate Change – Used for climate change data.

Each of these plans above was reviewed and assessed to determine what elements related to the RSCCD Hazard Mitigation Planning process. They were discussed at the meetings and incorporated into the RSCCD Hazard Mitigation Plan.

The leads for reviewing documents, discussing them with the Hazard Mitigation Team and incorporating them into the plan include:

Contractor Review
The contractor reviewed and incorporated the State, County, and other Orange County Cities Hazard Mitigation Pans; Orange County Emergency Operations Plan and numerous Orange County hazard specific plans, i.e. dam failure; National Flood Insurance Program, City General Plans and Safety Elements as well as the Orange County HAZUS Study 2009. All hazard-specific technical studies relating to Orange County were reviewed and discussed while trying to decide which hazards the district would study for the plan. These plans were discussed at meeting #1 (4/2/2015) and throughout the planning meetings and key data was incorporated into this plan.

Director of District Construction Review
The Director of District Construction reviewed all Bond Measures to see which sites have already been funded and which were not. He manages the Facilities Master Plan and was asked to incorporate information from that plan into this plan as well as incorporating sections of the RSCCD Hazard Mitigation Plan, i.e. mitigation project lists, MMI Engineering Studies done for this plan. The Director of District Construction discussed with the team all his findings at meeting #2 (6/11/2015) and throughout the remainder of the meetings.

He explained "Fusion," the Community College statewide Facilities Utilization Space Inventory On-line system to the Hazard Mitigation Team at meeting #2 (6/11/2015) and throughout the planning process. He shared it with the Hazard Mitigation Team and worked closely with MMI Engineering. He assisted the consultant in incorporating significant data from the bonds, studies and reports into the Hazard Mitigation Plan.

Facilities Manager
The Facilities Manager took the lead in reviewing the RSCCD Maintenance Plans and RSCCD Landscape Plans to determine if there were opportunities for mitigation projects for drought or climate change. The Facilities Manager and the Contractor reviewed the Sustainable RSCCD Committee Plan and presented the findings during the Drought and Climate Change meetings #6 (2/11/2016). This committee was a delightful find. Significant data was incorporated into this plan about what they had already accomplished.

Risk Manager Review
The Risk Manager (Project Manager) was intimately familiar with all insurance data and provided it to the committee at meeting #2 (6/11/2015). He provided electronic data to MMI Engineering who used the data (along with FUSION data) to run HAZUS to determine which facilities would need, for example, further seismic evaluations and flood evaluations. MMI Engineering ran several different earthquake and flood scenarios using this data and FEMA's HAZUS software program. This data was discussed at the meetings and incorporated into the plan where appropriate.

N. Implementation through Existing Programs

The RSCCD, unlike a City/County does not address community planning goals and legislative requirements through a General Plan or Building and Safety Codes. Instead, the RSCCD must operate under the Division of the State Architect (DSA) using their Facilities Master Plan. The RSCCD Board approves all changes to the Facilities Master Plan. The Hazard Mitigation Plan provides a series of recommendations, many of which are closely related to the goals and objectives of the DSA. Other goals support County and City planning and hazard mitigation goals. For example, the RSCCD supports the Orange County 7-Year Flood Plan which heavily impacts the district's facilities.

The RSCCD is attempting to implement the mitigation strategies through their own systems and processes such as:

- The Facilities Master Plan
- Annual budget
- Standard Maintenance Plan
- Local Bonds
- CA Community College *Scheduled Maintenance Program*

- CA Community College *Deferred Maintenance* (requires matching funds)
- CA Community College *State Capital Outlay Fund Program*
- Local bonds and private donations

The following are the main processes used to get facilities projects completed. The Hazard Mitigation Plan will be integrated into each of these planning mechanisms to create a comprehensive facilities program:

1. **Facility Planning, District Construction and Support Services**
   The Facility Planning, District Construction and Support Services Department coordinates the construction and implementation of major construction and renovation projects throughout the District and acts as the liaison in the planning and development of facilities with various state and local government agencies. They work with contractors, inspectors, architects and engineering firms to upgrade and improve district facilities
2. **Facilities Master Plan**
   The Facilities Master Plan shows the big picture with photos and drawings of the future of each RSCCD College or site.
3. **State Community College Capital Improvement Plans**
   This is a state process where the district submits projects for modernization, growth and campus completion projects. It is a complete list of future facility projects, priorities and cost estimates. Annually the district submits requests funding to the state for specific projects.
4. **District Capital Outlay**
   These projects will be completed annually, internally, through the district's annual budget process
5. **Bonds**
   These are funds voted on by the public for very specific facilities projects. The district is currently working to complete the requirements from Measure Q and Measure E.

Assignment of Responsibility and Process for Integration

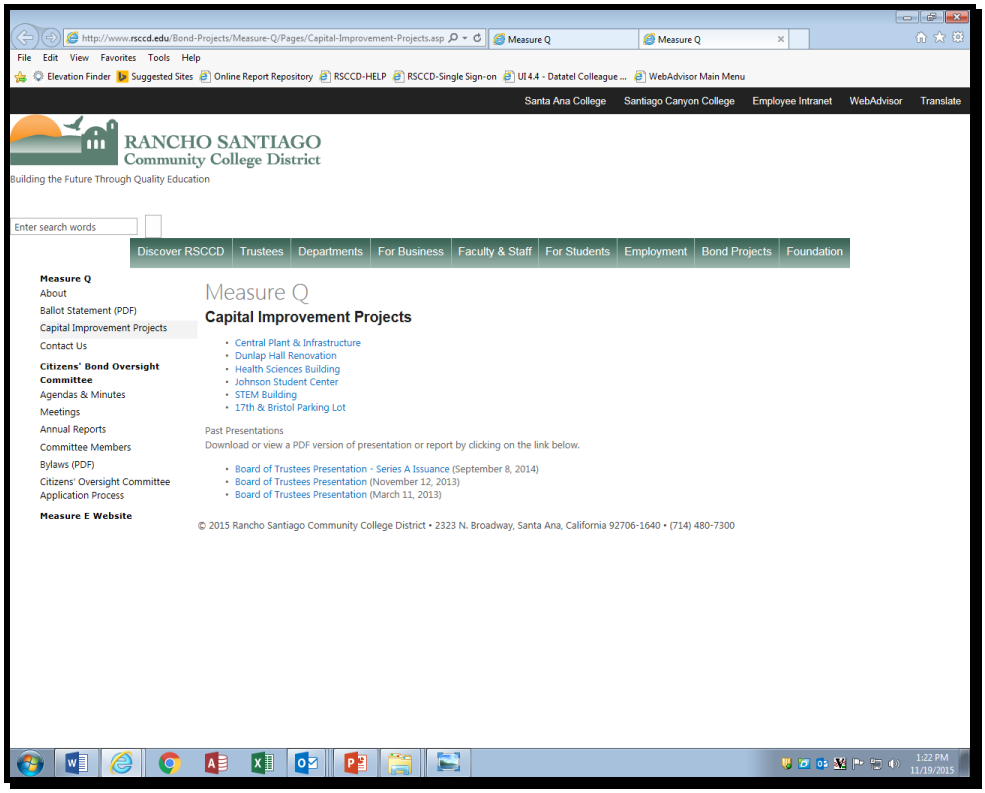
The Director of District Construction has full responsibility to integrate the District's Local Hazard Mitigation Plan into the above listed documents and to update the Local Hazard Mitigation Plan when facility conditions change. As each document is reviewed annually, he/she will add or update the progress of the facilities listed in the mitigation strategies section of the plan. This individual was the most knowledgeable and most active person on the Hazard Mitigation Planning Team. He is up-to-date and intimately familiar with all aspects of the districts construction and future construction planning.

Additional recommendations include:

- Assigning the Director of District Construction the responsibility for communicating to the Board of Trustees the need for Bonds and Measures to implement the recommended hazard mitigation strategies as a result of the Hazard Mitigation Committee's recommendations (Measure E is ending and Measure Q is the more recently passed bond)
- Assigning the Risk Manager and Director of District Construction responsible for planning and implementing projects out of the Capital Improvements Project budget for implementing the strategies
- Assigning the Risk Manager as the liaison to FEMA who will notify committee participants when FEMA Hazard Mitigation Project Grants become available. (This was done this week (2016) when FEMA announced $199,000,000 available for projects. It was disbursed to the team members who all responded that they wished we were already eligible for projects!)
- Assigning the Director of District Construction to be responsible for reviewing the State Funds including but not limited to:
    - CA Community College Scheduled Maintenance Program
    - CA Community College Deferred Maintenance (requires matching funds)
    - CA Community College State Capital Outlay Fund Program

The following figures show facility projects already planned for and funded by local bonds. The district has been aggressively upgrading/replacing the older facilities.

Figure 10: List of Measure E Capital Improvement Projects


http://www.rsccd.edu/Bond-Projects/Measure-Q/Pages/Capital-Improvement-Projects.asp
Measure Q
Measure Q
File Edit View Favorites Tools Help
Elevation Finder Suggested Sites Online Report Repository RSCCD-HELP RSCCD-Single Sign-on UI 4.4 - Datatel Colleague ... WebAdvisor Main Menu
Santa Ana College Santiago Canyon College Employee Intranet WebAdvisor Translate
RANCHO SANTIAGO Community College District
Building the Future Through Quality Education
Enter search words
Discover RSCCD Trustees Departments For Business Faculty & Staff For Students Employment Bond Projects Foundation
Measure Q
About
Ballot Statement (PDF)
Capital Improvement Projects
Contact Us
Citizens' Bond Oversight Committee
Agendas & Minutes
Meetings
Annual Reports
Committee Members
Bylaws (PDF)
Citizens' Oversight Committee Application Process
Measure E Website
Measure Q
Capital Improvement Projects
Central Plant & Infrastructure
Dunlap Hall Renovation
Health Sciences Building
Johnson Student Center
STEM Building
17th & Bristol Parking Lot
Past Presentations
Download or view a PDF version of presentation or report by clicking on the link below.
Board of Trustees Presentation - Series A Issuance (September 8, 2014)
Board of Trustees Presentation (November 12, 2013)
Board of Trustees Presentation (March 11, 2013)
© 2015 Rancho Santiago Community College District • 2323 N. Broadway, Santa Ana, California 92706-1640 • (714) 480-7300
1:22 PM
11/19/2015

Santiago Canyon College Projects



LIBRARY/LEARNING RESOURCE CENTER: Dedicated in Fall 2006, the Santiago Canyon College Library/Learning Resource Center is the third permanent building constructed for the college with Measure E funds.

- College Infrastructure
- Humanities Building, Athletics & Aquatics Complex, Parking Lot
- Library/Learning Resource Center
- Orange Education Center
- Science Center
- Student Services & Instruction Building

- Measure E Milestones (PDF)

Figure 11: Measure Q Projects



O. PLANNING CONSTRAINTS

The Cities of Santa Ana, Orange and Tustin do not have Hazard Mitigation Plans, a constraint in development of the college district plan.

The City of Tustin had no one available to participate on the Hazard Mitigation Team. In the 5-Year Update of the plan, this will be rectified.

The district could not get quality maps of dam inundation zones. The district received a CD from State OES and some improved maps from the Orange County Emergency Management Bureau but none of these maps were in GIS format and the quality of all maps were insufficient to properly evaluate their impact on the district facilities. This issue was made a Hazard Mitigation Strategy to attempt to resolve this problem before the 5-Year Update.

P. COMMUNITY PARTICIPATION/RSCCD TEAM RECRUITMENT

It was a main goal of the RSCCD and the RSCCD Hazard Mitigation Planning Team to provide as many opportunities for the community, the faculty, students and staff; public agencies within the RSCCD area; local businesses; academia; nonprofits; the general public; and other interested parties to be involved in the planning process. The plan was announced with invitations to key district and public agency personnel; disaster preparedness meetings and trainings; management meetings; Board of Trustee Meetings where the grant was introduced and approved; Orange County Emergency Management Organization (OCEMO) Meetings; as well as emergency management professional meetings.

Press Releases were sent to The Orange County Register who reach all 34 cities within Orange County including all cities that the RSCCD serves. They also have contracts with the smaller local newspapers such as The Independent, The View, and The Daily Pilot and other local papers.

The RSCCD Hazard Mitigation Committee was announced in as many places as the Project Manager and Plan Writer could think of to invite the public to the planning meetings. Some examples of announcements made by the Plan Writer include:

- Orange County Emergency Management Organization (OCEMO)
  - Target Audiences
    - Orange County Local Emergency Managers
    - Orange County Colleges and Universities
    - Orange County K-12 School Districts
    - Orange County Non-Profits

- OCEMO College Committee Chair
  - Target Audiences
    - Orange County Community Colleges
    - Orange County Universities (public and private)
- Orange County Disaster Preparedness Academy
  - Target Audiences
    - Orange County public interested in disaster preparedness
    - Orange County CERT Teams
    - Orange County K-12 Personnel
    - Orange County College Personnel
    - Orange County Emergency Management professionals
    - Orange County Businesses
    - The General Public
- In addition, the public was invited by the RSCCD Board of Trustees at meetings where the grant was approved
  - Target Audiences
    - RSCCD Board Members
    - The General Public
    - RSCCD Managers and Budget Personnel
    - RSCCD Students
    - RSCCD Faculty
- RSCCD Website where all meetings were announced and the public was invited as well as the draft plans were placed on the website as each section was completed
  - Target Audiences
    - RSCCD Students (The RSCCD website was proven to be the best avenue to reach students)
    - RSCCD Faculty
    - RSCCD Staff
    - The General Public
    - RSCCD Sustainable Committee
    -
- The Orange County Register Newspaper
  - Target Audiences
    - The General Public

A special thanks to the RSCCD Public Affairs & Publications Director for developing monthly notices and newspaper press releases announcing the Hazard Mitigation Team Meetings. Ms. Judy Iannaccone, Public Affairs & Publications, who was previously with the American Red Cross communicated the importance of hazard mitigation and need for public participation in all communications.

These individuals were targeted again and again throughout the planning process along with targeting the general public on every occasion possible.

Q. COMMUNITY FORUM

The Project Manager, the Team and the Plan Writer agreed the most effective way to conduct a Community Forum was to hold it directly prior to the Board of Trustees meeting. The plan was placed on the RSCCD website with invitations for the public to participate in the process. Memos were sent to the Board of Trustees, all Hazard Mitigation Team members, all RSCCD managers, Maintenance & Operations managers, Security supervisors, the public, local emergency managers and police and fire departments in the three cities the district is located in (Santa Ana, Orange and Tustin), water agencies, County of Orange Emergency Management Bureau personnel as well as State Office of Emergency Services and the American Red Cross.

The Team wanted to make it convenient for the Board of Trustees to attend so the policy makers could be educated on the Hazard Mitigation Plan, its goals, the district's vulnerabilities, and the recommended strategies. This would allow the policy makers an opportunity to comment on the plan and its strategies.

Copies of each section of the plan were made available for the Community Forum attendees on the website. A Power Point presentation was presented by the Plan Writer. The Power Point is available through the Project Manager. It included maps, vulnerability assessments, community issues, strategies and strategy priorities.

The presentation was followed at each forum by a questions and answers section and there were always questions and comments. All comments were positive. See the memos, signs, notices, website announcements and emails announcing the Community Forum. (below) All plan comments are included in this section.

All plan comments were reviewed by the RSCCD Hazard Mitigation Planning Team at the final meeting. Changes recommended by the Team were made by the Plan Writer.

FIGURE 12: INVITATION POSTCARD TO THE HAZARD MITIGATION TEAM TO THE COMMUNITY FORUM



FIGURE 13: INVITATION TO THE RSCCD BOARD OF TRUSTEES TO THE COMMUNITY FORUM

To: RSCCD Board of Trustees
From: Don Maus, Risk Manager

The Board is invited to participate in the Hazard Mitigation Community Forum on April 25, 2016 from 3-4 PM at the District Office Board Room, just prior to the scheduled Board Meeting.

The district received a $75,000 grant from the State Office of Emergency Services (OES) and Federal Emergency Management Agency (FEMA) to develop a Hazard Mitigation Plan which will make the district eligible for FEMA grants to mitigate district facilities from natural hazards. A planning team was formed to develop the plan. It included the hiring of an experienced part time employee to write the plan and hiring an engineering firm to complete an analysis of all our facilities and to map the hazards.

The plan identifies our natural hazards which include: Earthquake, Flood/Storm, Dam Failure, Drought/Climate Change and Santa Ana Winds. A vulnerability assessment was conducted looking at each of the 7 district sites and all the buildings on those sites. The hazard mapping shows which facilities are threatened by earthquakes, floods and dam failures. The Community Forum will review the highlights of the planning results.

Once the Board, the State and FEMA approve the plan, the district will be eligible for FEMA Hazard Mitigation grants where FEMA pays 75% and the district would cover 25% of the costs to evaluate or improve the facilities. This year alone, FEMA announced they will provide $289 million to local communities for these pre-disaster grants. Also, following a disaster, the district will now be eligible for grants to help rebuild damaged facilities.

FIGURE 14: INVITATION TO RSCCD MANAGERS TO THE COMMUNITY FORUM

Last year we received a $75,000 grant to prepare a Hazard Mitigation Plan for the district, which describes the risks and vulnerabilities to district sites associated with natural disasters and identifies long-term strategies for protecting people and property from future hazard events such as these. We hired a consultant with past experience writing these plans and put together a committee with representatives from each of our sites and community partners such as the Red Cross, the City of Orange, the City of Santa Ana, the Orange County Fire Authority, and the Orange County Emergency Management Bureau. The committee spent the last year hiring an engineering firm and reviewing each of the natural hazards that might affect the district.

The Plan is now complete and we would like to invite you to provide feedback on the Plan at a one hour presentation on the impact of earthquakes, floods, dam failure, drought, climate change, and Santa Ana Winds on the RSCCD sites and facilities. The meeting will be held on April 25, 2016 from 3:00pm-4:00pm at the District Office in the Boardroom. Feel free to invite members of the safety committees, Building Captain/Floor Warden programs or others who might be interested in hearing about our Plan.

Hazard mitigation saves lives, preserves property, and protects the environment during times of disaster. Once our Plan is approved, we then become eligible for mitigation projects, which are funded at 75% by FEMA. This year alone FEMA provided $190 million to public agencies for mitigation projects.

If you have any questions, please give me a call.

Thanks.

FIGURE 15: RSCCD PRESS RELEASE FOR THE APRIL 25 COMMUNITY FORUM

PUBLIC MEETING SCHEDULED TO REVIEW
DISTRICT HAZARD MITIGATION PLAN

The Rancho Santiago Community College District (RSCCD) received a grant to prepare a Hazard Mitigation Plan, which describes the risks and vulnerabilities to the District associated with natural disasters, and identifies long-term strategies for protecting people and property from future hazard events such as these.

The Plan is complete and we would like to invite the public to provide feedback on the plan at a one hour presentation on the impact of earthquakes, floods, dam failure, drought, climate change, and Santa Ana Winds on the RSCCD sites and facilities. The meeting will be held on April 25, 2016 from 3:00pm-4:00pm at the RSCCD Board Room, 2323 N. Broadway in Santa Ana. Hazard mitigation saves lives, preserves property, and protects the environment during times of disaster.

FIGURE 16: RSCCD SECOND PRESS RELEASE FOR THE APRIL 25 COMMUNITY FORUM

RANCHO SANTIAGO Community College District

NEWS RELEASE

Contact: July Iannaccone
Director, Public Affairs
Phone: (714) 480-7503
E-mail: iannaccone_july@rscod.edu

April 18, 2016
FOR IMMEDIATE RELEASE

Rancho Santiago Community College District Holds Public Meeting to Review Hazard Mitigation Earthquake Plan on April 25

(Santa Ana, CA)— A public meeting will be held to present the Rancho Santiago Community College District Hazard Mitigation Plan and to solicit feedback. The meeting will be held on Monday, August 25 from 3:00 p.m.-4:00 p.m. at the District Office, located at 2323 N. Broadway, Santa Ana, in the first Floor Board Room (Room 107).

The RSCCD Hazard Mitigation Plan was prepared thanks to a $75,000 grant from FEMA. The plan describes the college district's risks and vulnerabilities in association with natural disasters including earthquakes, floods, dam failures, drought, climate change and severe weather including Santa Ana winds. Glorria Morrison, retired emergency manager for the City of Huntington Beach who consulted in the development of this plan, will present the various impacts and associated mitigation strategies described in the plan. Morrison has over 30 years of experience in emergency planning.

According to Morrison, the two natural disasters with the highest potential impact on the college district would be an earthquake along the San Joaquin Hills Fault or a failure of the Prado Dam.

Once the public has had an opportunity to provide feedback, the following steps will be undertaken:

- The plan will be submitted to the State Office of Emergency Services and to FEMA for review and approval.
- Then the plan will be submitted to the RSCCD Board of Trustees for approval.
- With those approvals, RSCCD will be eligible to apply for additional FEMA funds to help underwrite mitigation strategies. If FEMA approves any project, it will pay 75 percent of its cost.

The public is invited to provide feedback on the plan and encouraged to attend this presentation. For more information, contact RSCCD Risk Management at (714) 480-7570 or www.rsccd.edu.

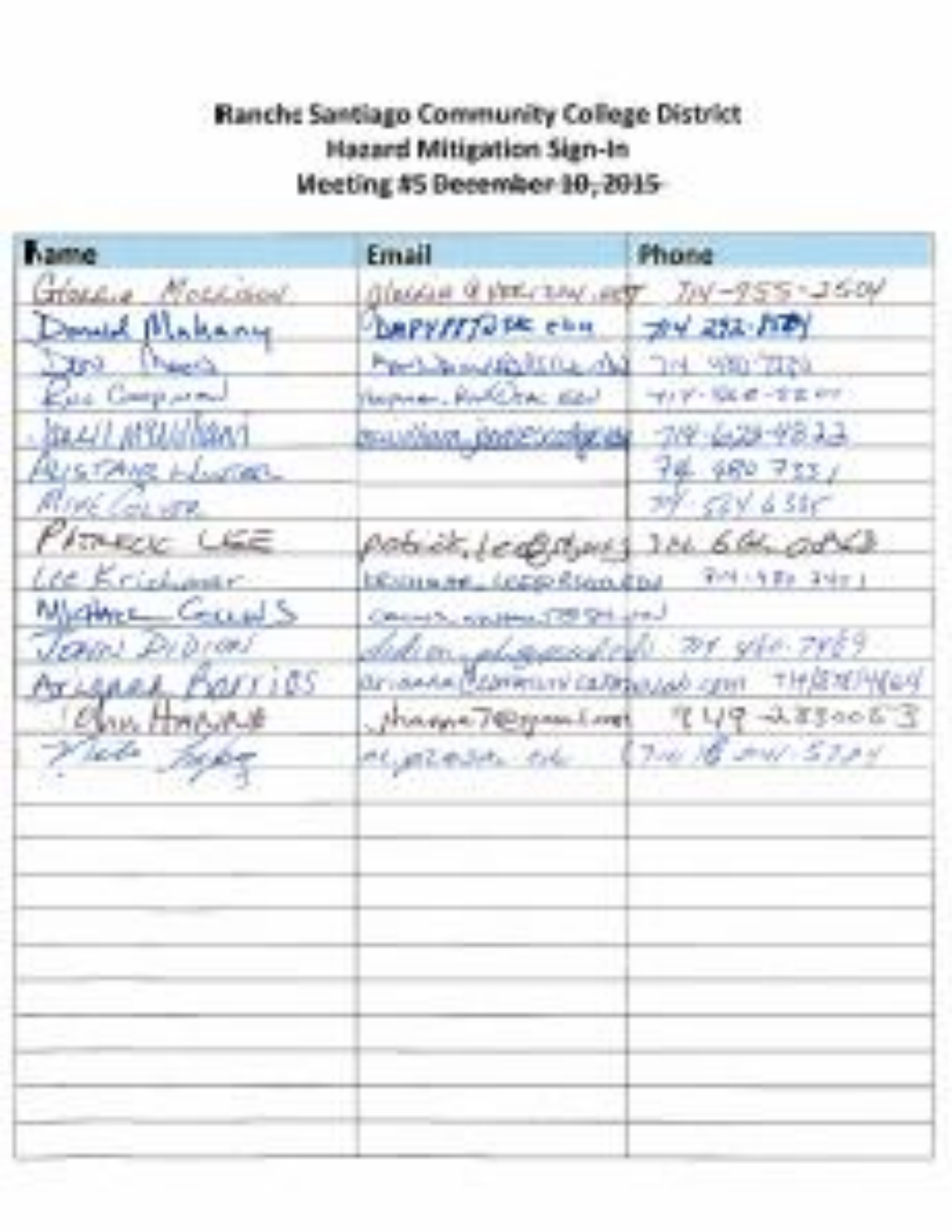
About Rancho Santiago Community College District
Santa Ana College and Santiago Canyon College are public community colleges of the Rancho Santiago Community College District, which serves the residents of Anaheim Hills, Orange, Santa Ana, Villa Park, and portions of Anaheim, Costa Mesa, Irvine, Fountain Valley, Garden Grove, and Tustin. Both colleges provide education for academic transfer and careers, courses for personal and professional development, and customized training for business and industry.

# # #

Santa Ana College Santiago Canyon College

District Office
2323 North Broadway
Santa Ana, CA 92706 - 1640
(714) 480-7500 Tel (714) 796-3900 Fax

FIGURE 17: COMMUNITY FORUM SIGN-IN SHEETS



Rancho Santiago Community College District
Hazard Mitigation Sign-In
Meeting #5 December 10, 2015

Name	Email	Phone
Donald Mahany		
Patrick Lee		
Jessica Adams		
Adriana Barrios		

FIGURE 18: COMMUNITY FORUM COMMENTS

Comment	Mitigation Project	Responses/ Issue Covered in Plan
Santa Ana Winds coupled with fire is a recipe for disaster at the Santiago Canyon College (SCC).	IV-F	VI. Plan Maintenance, page 10 recommends in the 5-Year Review that the hazard "Fire" be reviewed. IV-F pages 12 and 19 discuss the severe threat of a Santa Ana Wind condition coupled with fire. ---No additional action required
Santa Ana College (SAC) is an old campus with buildings that were built before the 1960s. The student population has been increasing every year. If earthquakes caused damage to Prado Dam it could result in severe damage to all of Orange County.	IV-D	IV-D Dam Failure - discusses the impact of Prado Dam on RSCCD. A map on page 46 shows the Prado Dam failure flood impact on the RSCCD's 7 sites. Flood Mitigation Activity #1 identifies at-risk buildings on the 7 sites that would be impacted by a 100 and 500 year flood and a strategy to deal the threat. ---No additional action required
Santa Ana College (SAC) is within ½ mile of the Santa Ana River. When the Santa Ana River overflows it banks, there would be no stopping the water.	IV-C	IV-C Flood, page 53 shows a map of SAC and the 100 year flood. SAC is located in Zone X, "Protected by an Accredited Levee for 100-year flood." Flood Mitigation Activity #1 identifies at-risk buildings on the 7 sites that would be impacted by a 100 and 500 year flood and a strategy to deal the threat. ---No additional action required
If a dam breaks during the El Nino, there would be no way to protect Santa Ana College. The houses in North Santa Ana will not survive.	IV-D	IV-C Flood - page 53 shows a map of SAC and the 100 year flood. SAC is located in Zone X, "Protected by an Accredited Levee for 100-year flood." ---No additional action required
We need to learn more about the drought. The Bark Beetle is killing trees due to the drought conditions. Electrical costs are going up due to the dry climate.	IV-E	IV-E Drought – pages 1 – 28 According to Orange County Emergency Management Bureau, there are no Bark Beetle issues in Orange County, CA only in the inland counties of San Bernardino and Riverside. ---No additional action required

Santa Ana College is in the process of placing utilities underground.	IV-F	IV-F Windstorms, page 19 describes how the burying of these utilities may lessen the damage, fires and disruption of electrical power during a windstorm. Also a plus for earthquakes. ---No additional action required
Not clear on how you deal with problems while area near zones creates hazard with no funds available for repairs.	IV-B	VI – Plan Maintenance, page 10 states the importance of monitoring State OES and FEMA emails announcing funds available and project grant opening and closing dates so the RSCCD can apply for Pre-Disaster Mitigation Grants. ---No additional action required
Current visuals and analysis – poor SAC	IV-C	IV-C Flood, pages 51-73 is the study by MMI Engineering showing the impact of the 100 and 500 year floods on district sites. ---No additional action required
How does global warming impact this issue? How are facilities to be constructed differently?	IV-E	IV-E Drought/Climate Change, page 28 – The State is now requiring that Climate Change be added to all Hazard Mitigation Plans, SB 379. The five drought/climate change mitigation projects include: public education, conservation, retrofitting water systems, improving landscape design and further research. No facility changes. ---No additional action required
How does disaster elsewhere impact us? What about Delta Levee Failure? Would like possible solutions.	None	This issue would be covered in the RSCCD Emergency Operations Plan. If Orange County were to have a severe water shortage due to damage to the water system from Northern California, the OC Water District would plan for and lead a response to such an event. ---No additional action required

All comments from the April 25, 2016 Community Forum were reviewed and approved by the Hazard Mitigation Planning Team on 4/28/2016.

R. PARTNERSHIPS

ORANGE COUNTY OPERATIONAL AREA AND OCEMO

The Orange County Emergency Managers Organization (OCEMO) meets monthly to prepare Orange County public agencies for disasters. OCEMO is comprised of representatives from all public jurisdictions in Orange County. These representatives include: County Agencies, Cities, Special Districts, School Districts, and the American Red Cross and other members of OCEMO. Developing a Natural Hazards Mitigation Plan is a major concern of all agencies. Orange County, many of the cities and a few school districts had developed plans. These jurisdictions were consulted on the process, asked to share their plans, and helped throughout 18 months in answering questions.

CALIFORNIA OFFICE OF EMERGENCY SERVICES (OES)

The California OES was helpful in each step during the Hazard Mitigation plan writing process. State OES provided Hazard Mitigation Workshop Power Points, documents, the California Hazard Mitigation Plan, and links to federal documents that were helpful. They provided us with dam inundation maps and worked with us on grant paperwork

FEDERAL EMERGENCY MANAGEMENT AGENCY (FEMA)

FEMA was also helpful in the hazard mitigation planning process. FEMA announced it was accepting applications for the Hazard Mitigation planning grants. This grant was a competitive grant written to help jurisdictions develop Hazard Mitigation Plans. The RSCCD applied through State OES for the FEMA grant. FEMA also provided training documents that were priceless.

FEMA published and provided at no cost the Hazard Mitigation 386 Series. The RSCCD utilized the books throughout the process. The 386 Series was very helpful and utilized on a daily basis. The 386 Series is a “how to guide” for writing Hazard Mitigation Plans. The Plan Writer and Project Manager referred to the 386 Series often. ***The Hazard Mitigation Plan could not have been written without the guidance provided from the 386 Series.***

FEMA published and provided at no cost the Hazard Mitigation 386 Series. The RSCCD utilized the books throughout the process. The 386 Series was very helpful and utilized on a daily basis. The 386 Series is a “how to guide” for writing Hazard Mitigation Plans. The Plan Writer and Project Manager referred to the 386 Series often. ***The Hazard Mitigation Plan could not have been written without the guidance provided from the 386 Series.***

S. AUTHORITIES, POLICIES AND PROGRAMS

TABLE 6: REVIEWED AUTHORITIES, POLICIES AND PROGRAMS

Agency Name (Mission and Function)	Programs, Plans, Policies, Regulations	Point of Contact	Comments
State of California	California Code of Regulations (CCR), Title 24, also known as the California Building Standards Code. Assembly Bill (AB) 1402 (which has been codified as Education Code Section 17250.10 et seq.), effective January 1, 2002, authorizes school districts to enter into design-build contracts for projects with design and construction costs exceeding $10 million. AB 1402 also required the California Department of Education (CDE) to develop guidelines for implementing design-build projects in consultation with the Office of the Secretary for Education; Department of General Services; Energy Resources, Conservation, and Development Commission; Seismic Safety Commission; school district representatives; and industry representatives.	State of California California Building Standards Commission	California Building Standards Code, is a compilation of three types of building criteria from three different origins: ▪ Building standards that have been adopted by state agencies without change from building standards contained in national model codes; ▪ Building standards that have been adopted and adapted from the national model code standards to meet California conditions; and ▪ Building standards, authorized by the California legislature, that constitute extensive additions not covered by the model codes that have been adopted to address particular California concerns

Division of the State Architect (DSA)	Division of the State Architect (DSA) provides design and construction oversight for K–12 schools, community colleges, and various other state-owned and leased facilities	Division of the State Architect (DSA) http://www.dgs.ca.gov/dsa/home.aspx Chester A. Widom, FAIA State Architect 1102 Q Street, Suite 5100, Sacramento, California 95811 916.445.8100	The Division of State Architect (DSA) provides for submittal of plans, review of plans, oversight of construction and certification upon completion of projects.
Orange County	Codified Ordinances	Orange County Clerk of the Board, Darlene Bloom 10 Civic Center Plaza, Room 465 Post Office Box 687 Santa Ana, CA 92702 www.ocgov.com	Ordinances dedicated to Public Facilities; Public Morals, Safety and Welfare; Property Maintenance; Health and Sanitation and Animal Regulations; Business and Special Licenses, Regulations; Highways, Bridges, Rights-of-Way, Vehicles; Land Use and Building Regulations; Fees; Water Quality—Orange County Flood Control; Stormwater Management and Urban Runoff.
Orange County Fire Authority (OCFA) Mission: To serve the changing needs of the community by providing the highest quality regional emergency, safety and support services, including protecting lives, property, and the environment with compassion, vigilance and dedication to excellence	Orange County Hazardous Materials Area Plan (November, 1999) California Fire Code 2001 California Public Resources Code, Division 4.	Emergency Planning & Coordination Section, OCFA (714-573-6000)	Addresses the storage, use and emergency planning for hazardous materials The purpose of the Code is to prescribe regulations governing conditions hazardous to life and property from fire or explosion. Section 27, Appendix 2-A-1, Article 11, Section 1103.2.4 The purpose is to prescribe regulations governing forests, forestry and fire issues.

Agency Name (Mission and Function)	Programs, Plans, Policies, Regulations, Funding, or Practices	Point of Contact	Comments
City of Santa Ana	Local Zoning Ordinances	City Engineer/Building and Planning Departments City of Santa Ana	City General Plan Zoning & Subdivisions Ordinance
City of Orange	Local Zoning Ordinances	City Engineer/Building and Planning Departments City of Orange	City General Plan Zoning & Subdivisions Ordinance
City of Tustin	Local Zoning Ordinances	City Engineer/Building and Planning Departments City of Tustin	City General Plan Zoning & Subdivisions Ordinance
RSCCD Board of Trustees	California Code of Regulations (CCR), Title 24, also known as the California Building Standards Code Assembly Bill (AB) 1402 (which has been codified as Education Code Section 17250.10 et seq.), effective January 1, 2002, authorizes school districts to enter into design-build contracts for projects with design and construction costs exceeding $10 million.	RSCCD Clerk of the Board RSCCD 2323 North Broadway Santa Ana, CA 92706	Community College Districts do not have building or fire codes. They operate under the State of California Building Standards Code and AB 1402 (Education Code Section 1i7250.10. However, they have legal authority to make all decisions about facilities in the district through the Facilities Master Plan. The Board makes the decisions and then they work with the DSA to make facility changes and additions.

Part V - Plan Maintenance

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Plan Maintenance

A. Plan Maintenance

The plan maintenance section of this document details the formal process that will ensure that this RSCCD 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 RSCCD will integrate public participation throughout the plan maintenance process. Finally, this section includes an explanation of how the RSCCD intends to incorporate the mitigation strategies outlined in this plan into existing planning and budget mechanisms.

B. Monitoring and Implementing the Plan

PLAN ADOPTION

RSCCD Board of Trustees is responsible for adopting the Hazard Mitigation Plan. This governing body has the authority to promote sound public policy regarding natural hazard mitigation on RSCCD campuses. Once the plan is adopted, the District's Risk Manager will be responsible for submitting the plan to the State Hazard Mitigation Officer at OES. OES 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 201.6(d)(3). Upon acceptance by FEMA, the RSCCD will gain eligibility for Hazard Mitigation Grant Program funds. Following OES and FEMA approval of the plan, the RSCCD will review and determine if the plan will be adopted.

C. Coordinating Body

The RSCCD Hazard Mitigation Committee will be responsible for coordinating implementation of the plan's mitigation strategies and undertaking the formal review process. At this time, the Hazard Mitigation Committee consists of representatives from the district, each of the eight campuses and city, county, state, non-profit, business, student body and the general public.

The Committee is supported by a larger body of technical advisors representing the cities and county in which the RSCCD facilities are located. The Cities have a vested interest in reducing the natural hazards to facilities within their cities and county. The entire Committee has responsibility for reviewing the plan and providing input on the mitigation strategies proposed and their prioritization.

In order to make this committee as broad and useful as possible, the Risk Manager, or designee, may engage other relevant organizations and agencies in the review and update of the plan.

Table 1 - Hazard Mitigation Committee

Rancho Santiago Community College District (RSCCD)
Hazard Mitigation Planning Team

1/14/2016 Update

Name	Title	Email	Phone	Priorities
District Office 2323 North Broadway Santa Ana 92706-1640				
Adam O'Connor	Assistant Vice Chancellor Fiscal Services	OConnor_Adam@rsccd.edu	(714) 480-7320	Fiscal Support Planning
Darryl Taylor	Director of District Construction	Taylor_Darryl@rsccd.edu	(714) 480-7513	Mitigation Strategies
Don Maus	Risk Manager	Maus_Don@rsccd.edu	(714) 480-7330	Project Manager
Alistair Winter	Chief, District Safety & Security	Winter_Alistair@rsccd.edu	(714) 480-7333	Hazard Assessments
Hank Dang	Associated Student Government	HankDang@gmail.com	(714) 926-0702	Hazard Assessments
Skylar Bertram	Student Representative	ep5577@aol.com	(714) 658-4044	Hazard Assessments
Janneth Linniell	Ex. Director Child Dev. Services	Linniell_Janneth@rsccd.edu	(714) 480-7546	Mitigation Strategies
Gloria Morrison	Plan Writer	Morrison_Gloria@rsccd.edu	(714) 955-2504	Plan Writer
Santa Ana Community College 1530 West 17th Street Santa Ana 92706-3398				
Mike Colver	Lt., District Safety & Security	Colver_michael@sac.edu	(714) 564-6335	Hazard Assessments
Michael Collins	VP Administrative Services	Collins_michael@sac.edu		Fiscal Support Planning
Nilo Lipiz	Dean of Instruction Continuing Ed	Lipiz_Nilo@sac.edu		Mitigation Strategies
Mark Wheeler	Facilities Manager	Wheeler_Mark@sac.edu	(714) 241-5701	Mitigation Strategies
Ron Coopman	Assistant Dean, Criminal Justice Academies	Coopman_Ron@sac.edu	(714) 566-9201	Mitigation Strategies
Santiago Canyon Community College 8045 East Chapman Avenue Orange, CA 92869-4512				
Ken Gouldsmith	Lt., District Safety & Security	Gouldsmith_Ken@sccollege.edu	(714) 628-4989	Hazard Assessments
Arleen Satele	VP Administrative Services	Satele_Arleen@sccollege.edu	(714) 628-4717	Fiscal Support Planning
Jose Vargas	VP Continuing Education	Vargas_Jose@sccollege.edu	(714) 628-5910	Mitigation Strategies
Position Vacant	Facilities Manager			Mitigation Strategies
City of Santa Ana Representatives 20 Civic Center Plaza Santa Ana, CA, 92702 PO Box 1988 Ross Annex				
Randy Black	Orange County Fire Authority	randyblack@ocfa.org	(714) 292-8476	Hazard Assessments
Vince Fregoso	City Planner	vfregoso@santa-ana.org	(714) 667-2706	Mitigation Strategies
Steve Rymer	Emergency Manager	srhymer@santa-ana.org	(714) 647-5315	City Coordination
City of Orange Representatives 300 East Chapman Avenue In Orange, CA 92866				
Jennifer Amat	Sgt. Orange Police Dept./ Emergency Manager	JAmat@orangepd.org	(714) 744-7462 (714) 325-1423	City Coordination
Alan Velasco	Orange Fire Dept.	AVelasco@cityoforange.org	(714) 288-2512	Hazard Assessments
Rick Otto	City Planner	ROtto@cityoforange.org	(714) 647-5804	Mitigation Strategies
County of Orange Representative 2644 Santiago Canyon Rd, Silverado, CA 92676				
Bryan Hovde, Primary Ray Cheung Vicki Osborn	OC Sheriff Department Emergency Mgmt. Bureau	Bryan Hovde bhovde@ocsd.org Ray Cheung rcheung@ocsd.org Vicki Osborn vosborn@ocsd.org	Vicki Osborn (714) 628-7019 (714) 448-1197 c Ray Cheung (714) 628-7058	County Coordination

State of California Representative				
Jim Acosta, Region I, Los Alamitos Victoria LaMar-Haas Sac, Tech Support ~~Andrew Rush, Sac Grant Coordinator~~ ~~Ricardo Castillo, Sac New Grant Coordinator~~ ~~As of 10/22/2015 Linda Ortiz (916) 845-8152~~ As of 1/14/2016 Drew Hammond ESC, CA OES Pre-Disaster and Flood Mitigation Division (916) 845-8158 drew.hammond@caloes.ca.gov	State OES Los Alamitos, CA 9 and Sac. New State Rep	Jim.Acosta@CALOES.ca.gov LaMar-Haas, Victoria@CalOES Linda.Ortiz@caloes.ca.gov	(562) 795-2939 (916) 845-8275 (916) 845-8269 916.845.8158 916-845-8152	State Coordination/ Grant Coordination Grant Coordinator
Other Representatives				
Debbie Graves	American Red Cross Santa Ana, CA 9	Debbie.Graves redcross.org	(714) 481-5348	Public Participation
Paula Garcia-Young	Santa Ana Chamber of Commerce, Chair	Info@santaanachamber.com	(714) 953-4455	Business Interests
Charla Lenarth	Orange Chamber of Commerce	charla@orangechamber.com	(714) 536-3581	Business Interests
Linda Morin	Coast Community College District	LMorin@mail.cccd.edu	(714) 475-9059 (714) 438-4753	Lessons Learned in Community College Hazard Mitigation Planning
Hope Sellgson	MMI Engineering	HSellgson@MMIEngineering.com	Office (714) 465-1390 Cell (562) 688-6272	Hazard Maps HAZUS Building Damage Estimates

Additional resources at the state and federal levels, who were advisors on the plan will be invited to participate in RSCCD's Natural Hazards Mitigation program, including the following agencies:

- American Red Cross Orange County Chapter
- Orange County Emergency Management Organization (OCEMO)
- California Office of Emergency Services (OES)
- Federal Emergency Management Agency (FEMA)

The Hazard Mitigation Committee will meet no less than annually. Meeting dates will be scheduled once the final plan has been adopted by the Board of Trustees and approved by the appropriate FEMA office. These meetings will provide an opportunity to discuss the progress of the mitigation strategies and maintain the partnerships that are essential for the sustainability of the Hazard Mitigation Plan.

D. THE CONVENER – *WHO* WILL LEAD THE ANNUAL REVIEW OF THE PLAN?

The Board of Trustees will adopt RSCCD's Hazard Mitigation Plan, and the Hazard Mitigation Committee will take responsibility for plan implementation. RSCCD Risk Manager will serve as a convener to facilitate the meetings of the Hazard Mitigation Committee, and will assign tasks such as updating and presenting the plan to the members of the committee. He/She will ensure the updates are complete and that all documentation is kept on the progress of the mitigation strategies. He/she will work with other departments to help them strategize on how to best complete their projects. (Note: This same individual was the Project Manager developing this plan and managing the Hazard Mitigation grant process.) Plan implementation and evaluation will be a shared responsibility among all of the Hazard Mitigation Committee members. Future updates of the plan will require participation of the entire Committee under the direction of and with full documentation by the Risk Manager.

***How* will the Committee provide the annual review of the plan?**

- Review the goals and objectives of the plan
- Review the nature, magnitude and/or type of risks that have changed including any new research, reports or any major emergencies within the Orange County area and their potential impact to the RSCCD. For example: if a new earthquake fault or new information on an existing fault is discovered, add that data to the plan.
- Review the current resources (both human resources and financial resources) to determine if they are adequate for implementing the plan. For example: if a new Emergency Manager is hired by the district, he/she will now take the lead on projects x, y, z.
- Determine if there are implementation problems, such as technical, political, legal, financial or coordination issues with partner agencies
- Review the progress to determine if the outcomes have occurred as expected and report the progress in an annual report
- Determine if the County and Cities in which the RSCCD facilities are located are still willing, planning partners as originally proposed. (Santa Ana, Orange and Tustin)

- ***How often will the plan be reviewed? Annually***. The Risk Manager will document progress related to implementation of the strategies annually and present a written summary to the Committee. That report will become part of the Plan, Section VI.

E. Economic Analysis of Mitigation Projects

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

For funding of the RSCCD Hazard Mitigation Plan must look to:

- General Fund - RSCCD Yearly Budget used for such things as Capital Improvement Projects (CIP does not create new buildings but upgrades existing facilities)
- FEMA Hazard Mitigation Project Grants (75% FEMA/25% RSCCD)
- Bond Funds (like Measure Q and E)
- California Community College State Capital Outlay Fund Program
- California Community College Scheduled Maintenance Program
- Private grants and donations

F. Evaluating and Updating the Plan

FORMAL REVIEW PROCESS

The RSCCD Hazard Mitigation Plan will be evaluated on an annual basis to determine the effectiveness of programs, and to reflect changes that may affect mitigation priorities. This meeting will be held just prior to district budget preparations. It is recommended that the month of February each year that the committee be reconvened and the strategies be reviewed.

Why February? The districts Fiscal year starts July 1 and ends June 30. The months of March, April and May are the months when departments prepare budgets for the next fiscal year. Departments' should review the mitigation strategies right before each budget preparation season so they can include mitigation strategies into their next year's budgets.

Review Dates:

- February 2018
- February 2019
- February 2020
- February 2021
- February 2022 (5-Year Review of plan should be scheduled)

The Risk Manager is responsible for ***monitoring, evaluating and updating*** the plan. He/she will bring the team together to evaluate the plan each February, prior to preparing the next year's district budget. This way, departments can budget for and research other finance options for each strategy that will be completed in the next fiscal year. The Risk Manager will call for the annual meeting, work with the team to evaluate which strategies will be completed in the next fiscal year, and update the plan to reflect these goals and the past year's accomplishments.

The evaluation process includes a firm schedule and time line, and identifies the local agencies and organizations participating in plan evaluation. The convener, or designee, will be responsible for contacting the Hazard Mitigation 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 mitigation strategies to determine their relevance to changing situations at the RSCCD, 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 new available data. The coordinating organizations responsible for the various strategies 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.

It is critical that the Risk Manager monitor State Office of Emergency Services (OES) emails and forward these emails to the proper RSCCD authorities. For example, On February 19, 2016 Julie Norris, Chief Pre-Disaster and Flood Mitigation Division, California Governor's Office of Emergency Services sent out an email stating that $90,000,000 nationwide was just made available for the FEMA Pre-Disaster Mitigation Program. These announcements state opening and closing dates of grant periods and other important information.

The convener, the Risk Manager, will assign the duty of updating the plan to Committee members. The designated committee members will be provided sufficient time to make appropriate changes to the plan before submitting them to the Risk Manager who will in turn submit them to Hazard Mitigation Committee members. The Hazard Mitigation Committee will also notify all holders of the RSCCD Plan when changes have been made. Every five years the updated plan will be submitted to the State Hazard Mitigation Officer and the FEMA for review.

G. 5-YEAR AND 10-YEAR GOALS

This is the first RSCCD Hazard Mitigation Plan. It researches natural hazards only. The following is the 5-Year and 10-Year goals of this plan:

- **2022 - Update the 2016 Natural Hazard Mitigation Plan**
  - Improved Dam Inundation Maps (GIS) and district vulnerability analysis on dams
  - Add more detail on Climate Change/Climate Adaption and it becomes available
  - Review fire and landslide data once again to determine if these hazards should be added to the plan (one facility, SCC, was just outside the Fire Severity Zone)
  - Receive additional participation from the City of Tustin (one site is located in Tustin) who had no one available to participate on the planning team
  - Add information in the Earthquake Section on the Rose Canyon/Newport-Inglewood Fault
  - Update the progress on all strategies but particularly the SAC earthquake facility demolition, rebuild and structural upgrades list.
  - Include additional contacts with the media about the plan, progress, and the public's participation opportunities
- **2027 – Update the Plan and Add Human-Caused Hazards to the Plan**

H. CONTINUED PUBLIC INVOLVEMENT

The RSCCD is dedicated to involving the public directly in review and updates of the Hazard Mitigation Plan. The Hazard Mitigation Committee members are responsible for the annual review and update of the plan initiated by the district's Risk Manager.

The public will also have every opportunity to provide feedback on the plan. Copies of the plan will be available on the RSCCD website, the Risk Management Office, and with the Clerk of the Board of Trustees. The plan will be downloadable for anyone interested. This site will list an e-mail address and phone number to which people can direct their comments and concerns. The convener or Risk Manager will act as the liaison to the public for this plan.

A public meeting will also be held on the third year annual review or when deemed necessary by the Hazard Mitigation Committee. The meeting will be advertised on outlets that include the district's website and local newspapers. The meetings will provide the public with a forum where they can express their concerns, opinions, or ideas about the plan. The District's Public Affairs Officer will be responsible for using District resources to publicize public meetings and maintain public involvement through the District's website. The Project Manager/Risk Manager will initiate this process. However, the public can comment on the plan at any time and these comments will be taken into consideration at the next annual Hazard Mitigation Plan review.

The two student representatives on the planning team may have graduated from the district before the review so two additional student representatives will be recruited for the Team. Some city/county and district representatives may have retired or left the employment of their jurisdiction so their replacements will be recruited to participate in the annual reviews.

Every opportunity will be given to the public to provide input into this plan. The public is both invited and welcomed to comment at any time. The public's comments are invaluable to the hazard mitigation planning process.

I. RSCCD Future Development Trends

Table 2: Facilities Recommended for Engineering Evaluation (2016 RSCCD Update)

This table was updated by Darryl Taylor, RSCCD Director of District Construction on February 2016. The table represents the RSCCD future hazard mitigation priority facilities.

High Priority **Moderate Priority** **Planned for future demolition**

Building Site/ Building Name	Occupancy	Non-Zero Injury Rate 3 Eq Scenarios	Non-Zero Fatality Rates 3 Eq Scenarios	Moderate Bldg. Codes/ Year Built
District Office - Admin Building/District EOC	399	YES		YES 1970
SAC – Bldg 01 Administration Building	231	YES		YES 1972 Upgraded 2009
SAC – Bldg 02 Cesar Chavez Building	1,236	YES	YES	NO
SAC – Bldg 03 Fine Arts Building	414	YES		YES 1972
SAC – Bldg 04 Music Building	179	YES		YES 1970
SAC – Bldg 05 Theater Building	575	YES		YES 1955
SAC – Bldg 06 Dunlap Hall Building ($15 million upgrade & additions complete) *REMOVE FROM HIGH PRIORITY LIST/Darryl Taylor*	1,636	YES	YES	YES 1973
SAC – Bldg 07 Planetarium Building	127	YES		YES 1967 Renovation 2015
SAC – Bldg 08 Library Building Facilities Master Plan - To be demolished in the future - *REMOVE FROM HIGH PRIORITY LIST/D. Taylor*	958	YES	YES	YES 1956
SAC – Bldg 09 Russell Hall Building Facilities Master Plan - *Remove from high priority list/D .Taylor*	1,293	YES	YES	YES 1967 Significant Structural Upgrade 2014
SAC – Bldg 10 Hammond Hall Building Facilities Master Plan -*Remove from high prioritiy list/D .Taylor*	452	YES	YES	YES 1954
SAC – Bldg 11 Technical Arts Building	254	YES		YES 1970
SAC – Bldg 12 Exercise Science	227	YES		YES 1972 Retrofitted
SAC – Bldg 13 Gymnasium Building (*Some upgrades in 2010. No future plans at this time)/D. Taylor*	2,535	YES	YES	YES 1954
SAC – Bldg 14 Locker Building	136	YES		NO 2009 Rebuilt
SAC – Bldg 15 Fitness Center	84	YES		YES 1972
SAC – Bldg 16 Johnson Center Building/ U Building Johnson	727	YES	YES	Scheduled for demolition in 2016
SAC – Bldg 18 Auto Shop Building	159	YES		YES 1958 Retrofitted

SAC – Bldg 19 Maintenance & Publication	159	YES		YES 1950
SAC – Bldg 20 Campus Vehicles Bldg	10			YES 1950
SAC – Bldg 21 Welding/Maintenance	112	YES		YES 1958
SAC – Bldg 23 Classroom Building I	725	YES	YES	NO
SAC – Bldg 25 Maintenance & Storage	10			YES 1950
SAC – Bldg 26 Mechanical Pool Building	1			YES 1947
SAC – Bldg 28 Office/Storage	10			YES 1947
SAC – Bldg 32 Pool Equipment	1			YES 1947
SAC – Bldg 31 Middle School Bldg	480	YES		NO
SAC –Bldg 100 Child Development	126	YES		NO
SAC – Bldg 300 Child Development	96	YES		NO
SAC – Bldg 400 Child Development	96	YES		NO
CEC - Admin/Classroom Building A Wing	265	YES		NO
CEC - Classroom Building B Wing	200	YES		NO
CEC - Child Development Building C Win	223	YES		NO
CEC - Art Building D Wing	316	YES		NO
CEC - TV Studio/Classroom Building E W	189	YES		NO
CEC - Classroom Building F Wing	261	YES		NO
CEC – Portable Classroom	92	YES		NO
Digital Media Center	283	YES		NO
Orange Education Center	1,600	YES	YES	NO
SCC – Classroom Building B	529	YES		NO
SCC – Lecture Hall/Classroom Building	999	YES		NO
SCC – Admin/Office/Classroom Building	675	YES		NO
SCC – Library	661	YES		NO
SCC – Science Center	918	YES		NO
SCC - Physical Education Building	2,438	YES		NO
SCC – Humanities Building	1,560	YES		NO
OCSRT - Sheriff Administration/Training Academy	304	YES		NO

High Priority/Highlighted in Yellow

- Yes to non-zero injury, Yes to non-zero fatality, and Yes to moderate building codes

Moderate Priority/Highlighted in Green

- Yes to non-zero injury, Yes to non-zero fatality and No to Moderate Code as well as any with Yes and Moderate Code

Planned for future Demolition in the RSCCD Facilities Master Plan

Table 3: Buildings Predicted by HAZUS to Suffer Damage in 100 & 500-Year Floods

Building Name	Damaged in the 1% Annual Chance Flood[1]	Damaged in the 0.2% Annual Chance Flood[1]
District Office – Admin Building		☑
SAC – Exercise Science - Building-W	☑	
SAC – Baseball Office/Restroom Building		☑
SAC - Classroom Building-I	☑	
SAC - Weight Pavilion	☑	☑
SAC - Mechanical Pool Building	☑	
SAC - PE Offices – Building-F	☑	☑
SAC - Storage Building (Old Soccer Scoreboard)	☑	☑
SAC - Maintenance and Operation Buildings	☑	☑
SAC - Pool Equipment Storage Building	☑	☑
SAC - Village Classroom Rm 301	☑	
SAC - Village Classroom Rm 302	☑	
SAC - Village Classroom Rm 303	☑	
SAC - Village Classroom Rm 304	☑	
SAC - Village Classroom Rm 305	☑	
SAC - Village Classroom Rm 306	☑	
CEC - Building A	☑	☑
CEC - Building B	☑	☑
CEC - Child Development Center Building C	☑	☑
CEC - Building D	☑	☑
CEC - Building E	☑	☑
CEC - Building F	☑	☑
CEC - Portable Classroom D107 D106	☑	☑
CEC - Portable Classroom D108	☑	☑
CEC - Portable Classroom D109	☑	☑
CEC - Portable Classroom 110	☑	☑
CEC - Portable Classroom D111	☑	☑
CEC - Portable Classroom D112	☑	☑
CEC –Child Development Center C-110	☑	
CEC - Child Development Center C-111	☑	☑
CEC – F-115/F-1116	☑	

MMI ENGINEERING

Notes: 1) The results presented here are the product of a default Hazus flood analysis conducted using best-available data; damage in an actual flood event will be different. The results of this Hazus analysis are intended to be used for relative-risk assessment and screening for further study. Lack of damage in the modeled events should not be taken to mean the facility will not experience some flood damage during its useful lifetime.
2) Some building names have been updated from the original insurance report, as of 9/17/2015

Table 4: 2016 Mitigation Action Items Tracking Form

This form will be used annually to document progress of the RSCCD Hazard Mitigation Plan.

Item #	Page	Coordinating Organization	Description	Priority	Cost Estimate	Annual Updates
	Part A – Multi Hazard Strategies					
1	7	Assistant Vice Chancellor of Fiscal Services	Identify and pursue funding opportunities to develop and implement cost benefit analysis and mitigation activities	High #4	Staff Time	
2	8	Assistant Vice Chancellor of Fiscal Services	Create additional funding mechanisms for Hazard Mitigation	High #5	Staff Time	
3	9	Chief, District Safety & Security	Develop and conduct educational programs to educate staff, faculty, students and the public on the hazards and risk-reduction plans outlined in the Hazard Mitigation Plan	Medium #6	To Fund a District Emergency Services Coordinator $40,000-$80,000	
4	11	Chief, District Safety & Security	Strengthen emergency preparedness and response by linking emergency services with hazard mitigation programs	Medium #7	To Fund a District Emergency Services Coordinator $40,000-$80,000	
5	77	Chief, District Safety & Security and Risk Manager	Update the District Emergency Operations Plan and site emergency plans. Ensure plans are “all-hazards.” Include critical information and maps from the Hazard Mitigation Plan	High #1	$30,000	
3	30	Chief, Safety & Security	Develop a “District Warning Plan” to improve monitoring and dissemination of all hazardous conditions. Develop a list of RSCCD key personnel who should receive the early warnings. (i.e., flood warnings, dam failure, Santa Ana wind warnings, etc.)	Extremely High #2	To Fund a District Emergency Services Coordinator $40,000-$80,000	
6	12	Chief, District Safety & Security	Develop and Conduct Life Saving and Disaster Management Educational Programs for RSCCD (CERT, NIMS, SEMS, ICS, EOC and Campus EOC)	High #3	To Fund a District Emergency Services Coordinator $40,000-$80,000	
7	13	Risk Manager	Conduct annual meeting reviews of the Hazard Mitigation Plan and document all progress, continually advancing the plan’s strategies.	High #8	Risk Manager	

Item #	Page	Coordinating Organization	Description	Priority	Cost Estimate	Annual Updates
Part B - Earthquake						
1	71	Facilities Managers and Director of District Construction	Identify and mitigate potentially vulnerable non-structural components and systems	Extremely High #3	$21 million	
2	72	Director of District Construction	Conduct a structural engineering evaluation of RSCCD facilities to determine if they meet today's building codes and if structural retrofits are needed in older facilities.	Extremely High #1	$5-7 million	
3	77	Chief, District Safety & Security	Increase earthquake risk awareness	Medium/ High #5	To Fund a District Emergency Services Coordinator $40,000-$80,000	
4	79	Chief, District Safety & Security	Prepare to conduct post-earthquake inspections	High #4	To Fund a District Emergency Services Coordinator $40,000-$80,000	
5	80	Assistant Vice Chancellor of Facilities Planning	Seismically strengthen RSCCD facilities determined by the evaluation	Extremely High #2	Dependent on evaluation results	

Item #	Page	Coordinating Organization	Description	Priority	Cost Estimate	Annual Updates
Part C - Flood/Storm						
1	74	Facilities Managers and Director of District Construction	Identify and mitigate potentially vulnerable non-structural components and systems from flooding as well as conducting a structural engineering evaluation to determine if facilities meet today's flood building codes. (Phase 1)	Extremely High #1	$7-8 million	
2	76	Chief, District Safety & Security	Increase flood risk awareness and education	Medium/ High #3	To Fund a District Emergency Services Coordinator $40,000 - $80,000	
3	77	Vice Chancellor of Administrative Services and Facility Director	Conduct the flood-proofing measures to vulnerable facilities starting with critical facilities (Phase 2)	Extremely High #2	Dependent on evaluation results	
Part D - Dam Failure						
1	58	Chief, Safety & Security	The District needs up-to-date GIS Dam Failure Inundation maps for all dams that impact the District	Extremely High #1	Unknown	
2	59	Chief, Safety & Security	Consider writing Dam Failure Evacuation Plans for each dam that impacts the 7 RSCCD sites.	Extremely High #2	To Fund a District Emergency Services Coordinator $40,000 - $80,000	
3	60	Chief, District Safety & Security	Conduct a Dam Failure Education Campaign for Campus Facility Captains, EOC personnel and key management staff members at each site	Medium/ High #4	To Fund a District Emergency Services Coordinator $40,000 - $80,000	
4	61	Chief, District Safety & Security	Participate in the County of Orange and the Army Corps of Engineers dam safety planning, trainings, and exercises for Prado Dam and other orange County dams.	High #3	Staff Time	

Item #	Page	Coordinating Organization	Description	Priority	Cost Estimate	Annual Updates
Part E – Drought/Climate Change						
1	28	Chief, Safety & Security and the Sustainable RSCCD Committee	Develop a comprehensive approach to mitigation the hazard "drought"	Medium /High #3	Staff Time	
2	29	Chief, Safety & Security and the Sustainable RSCCD Committee	Increase "Drought" risk awareness and education	Medium/ High #5	To Fund a District Emergency Services Coordinator $40,000 - $80,000	
3	31	Sustainable RSCCD Committee and Chief, District Safety & Security	Continue to develop a Drought Conservation Plan for the RSCCD	Medium/ High #4	Staff Time	
4	32	Director of District Construction	Retrofit Water Supply Systems	Medium/ High #2	$3 – 4 million	
5	33	Director of District Construction	Enhance Landscaping and design measures to reduce water consumption	High #1	$2 million	
Part F - Severe Weather/Santa Ana Winds						
1	23	VP Administrative Services	Facilities and maintenance personnel need to review and upgrade their annual Standard Maintenance Plan to include Santa Ana Wind mitigation activities	Medium	Staff Time	
2	24	VP Administrative Services	Develop a Santa Ana Wind Plan including a list of actions to be taken.	High	To Fund a District Emergency Services Coordinator $40,000 - $80,000	
3	25	VP Administrative Services	Develop an Emergency Power Failure project to supply generators to each RSCCD site to run its Emergency Operations Centers (EOC)	Extremely High		

VII. Appendices and References

List of Appendices

The following Appendices are included in the Rancho Santiago Community College District (RSCCD) plan to assist the reader in understanding the details of the plan. Every 5 years this plan will be updated if RSCCD wishes to remain eligible for State and Federal hazard mitigation grants. It is also necessary to document the details and track changes to understand the progress the District makes from one year to the next and one planning cycle (5 years) to the next. The Glossary and Acronyms will assist the reader in understanding terms and agencies discussed in the plan

The References provide supporting data like Insurance Reports, Hazus studies the plan is based on. They include contributory facts, specialized data and important information needed to fully understand this plan. These References may be accessed at the RSCCD Risk Manager Office.

Appendix A – Glossary

Appendix B - Acronyms

Appendix C – Economic Analysis of Mitigation Strategies

Appendix D - California Disasters

Appendix E - Resources

List of References on File with RSCCD Risk Management Office

References are kept in the RSCCD Risk Managers office an available upon request.

Reference A – RSCCD 2015 Insurance Property Evaluation Report (completed every 5 years)

Reference B – RSCCD Earthquake Hazus Study by MMI Engineering

Reference C – RSCCD Flood Hazus Study by MMI Engineering

Reference D – RSCCD Facilities Master Plan

APPENDIX A: GLOSSARY

Acceleration	The rate of change of velocity with respect to time. Acceleration due to gravity at the earth's surface is 9.8 meters per second squared. That means that every second that something falls toward the surface of earth its velocity increases by 9.8 meters per second.
Asset	Any manmade or natural feature that has value, including, but not limited to people; buildings; infrastructure like bridges, roads, and sewer and water systems; lifelines like electricity and communication resources; or environmental, cultural, or recreational features like parks, dunes, wetlands, or landmarks.
Base Flood	Flood that has a 1 percent probability of being equaled or exceeded in any given year. Also known as the 100-year flood.
Base Flood Elevation (BFE)	Elevation of the base flood in relation to a specified datum, such as the National Geodetic Vertical Datum of 1929. The Base Flood Elevation is used as the standard for the National Flood Insurance Program.
Bedrock	The solid rock that underlies loose material, such as soil, sand, clay, or gravel.
Building	A structure that is walled and roofed, principally above ground and permanently affixed to a site. The term includes a manufactured home on a permanent foundation on which the wheels and axles carry no weight.
Coastal High Hazard Area	Area, usually along an open coast, bay, or inlet, that is subject to inundation by storm surge and, in some instances, wave action caused by storms or seismic sources.
Coastal Zones	The area along the shore where the ocean meets the land as the surface of the land rises above the ocean. This land/water interface includes barrier islands, estuaries, beaches, coastal wetlands, and land areas having direct drainage to the ocean.
Community Rating System (CRS)	An NFIP program that provides incentives for NFIP communities to complete activities that reduce flood hazard risk. When the community completes specified activities, the insurance premiums of policyholders in these communities are reduced.
Computer-Aided Design And Drafting (CADD)	A computerized system enabling quick and accurate electronic 2-D and 3-D drawings, topographic mapping, site plans, and profile/cross-section drawings.
Contour	A line of equal ground elevation on a topographic (contour) map.

Critical Facility	Facilities that are critical to the health and welfare of the population and that are especially important following hazard events. Critical facilities include, but are not limited to, shelters, police and fire stations, and hospitals.
Debris	The scattered remains of assets broken or destroyed in a hazard event. Debris caused by a wind or water hazard event can cause additional damage to other assets.
Digitize	To convert electronically points, lines, and area boundaries shown on maps into x, y coordinates (e.g., latitude and longitude, universal transverse Mercator (UTM), or table coordinates) for use in computer applications.
Displacement Time	The average time (in days) which the building's occupants typically must operate from a temporary location while repairs are made to the original building due to damages resulting from a hazard event.
Duration	How long a hazard event lasts.
Earthquake	A sudden motion or trembling that is caused by a release of strain accumulated within or along the edge of earth's tectonic plates.
Erosion	Wearing away of the land surface by detachment and movement of soil and rock fragments, during a flood or storm or over a period of years, through the action of wind, water, or other geologic processes.
Erosion Hazard Area	Area anticipated to be lost to shoreline retreat over a given period of time. The projected inland extent of the area is measured by multiplying the average annual long-term recession rate by the number of years desired.
Essential Facility	Elements that are important to ensure a full recovery of a community or state following a hazard event. These would include: government functions, major employers, banks, schools, and certain commercial establishments, such as grocery stores, hardware stores, and gas stations.
Extent	The size of an area affected by a hazard or hazard event.
Extra tropical 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 FEMA 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 exceed 50 percent of the market value of the structure before the damage.
Super Typhoon	A typhoon with maximum sustained winds of 150 mph or more.
Surface Faulting	The differential movement of two sides of a fracture – in other words, the location where the ground breaks apart. The length, width, and displacement of the ground characterize surface faults.
Tectonic Plate	Torsionally rigid, thin segments of the earth's lithosphere that may be assumed to move horizontally and adjoin other plates. It is the friction between plate boundaries that cause seismic activity.
Topographic	Characterizes maps that show natural features and indicate the physical shape of the land using contour lines. These maps may also include manmade features.

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

APPENDIX B: ACRONYMS

A. Federal Acronyms

AASHTO	American Association of State Highway and Transportation Officials
ATC	Applied Technology Council
B/CA	Benefit/Cost Analysis
BFE	Base Flood Elevation
BLM	Bureau of Land Management
BSSC	Building Seismic Safety Council
CDBG	Community Development Block Grant
CFR	Code of Federal Regulations
CRS	Community Rating System
EDA	Economic Development Administration
EPA	Environmental Protection Agency
ER	Emergency Relief
EWP	Emergency Watershed Protection (NRCS Program)
FAS	Federal Aid System
FEMA	Federal Emergency Management Agency
FIRM	Flood Insurance Rate Map
FMA	Flood Mitigation Assistance (FEMA Program)
FTE	Full Time Equivalent
GIS	Geographic Information System
GNS	Institute of Geological and Nuclear Sciences (International)
GSA	General Services Administration
HAZUS	Hazards U.S.
HMGP	Hazard Mitigation Grant Program
HMST	Hazard Mitigation Survey Team
HUD	Housing and Urban Development (United States, Department of)
IBHS	Institute for Business and Home Safety
ICC	Increased Cost of Compliance
IHMT	Interagency Hazard Mitigation Team
NCDC	National Climate Data Center
NFIP	National Flood Insurance Program
NFPA	National Fire Protection Association

NHMP	Natural Hazard Mitigation Plan (also known as "409 Plan")
NIBS	National Institute of Building Sciences
NIFC	National Interagency Fire Center
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NPS	National Park Service
NRCS	Natural Resources Conservation Service
NWS	National Weather Service
SBA	Small Business Administration
SEAO	Structural Engineers Association of Oregon
SHMO	State Hazard Mitigation Officer
TOR	Transfer of Development Rights
UGB	Urban Growth Boundary
URM	Unreinforced Masonry
USACE	United States Army Corps of Engineers
USBR	United States Bureau of Reclamation
USDA	United States Department of Agriculture
USFA	United States Fire Administration
USFS	United States Forest Service
USGS	United States Geological Survey
WSSPC	Western States Seismic Policy Council

B. 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
Cal ARP	California Accidental Release Prevention
Cal BO	California Building Officials
CAL FIRE	California Department of Forestry and Fire Protection
Ca lEPA	California Environmental Protection Agency
Ca lOES	California Office of Emergency Services
Cal REP	California Radiological Emergency Plan
CAL STARS	California State Accounting Reporting System

Cal TRANS	California Department of Transportation
CGS	California Geological Survey
CBO	Community Based Organization
CD	Civil Defense
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 (Cal OES)
DFO	Disaster Field Office
DGS	California Department of General Services
DHSRHB	California Dept. of Health Services, Radiological Health Branch
DO	Duty Officer
DOC	Department Operations Center
DOE	Department of Energy (U.S.)
DOF	California Department of Finance
DOJ	California Department of Justice
DPA	California Department of Personnel Administration
DPIG	Disaster Preparedness Improvement Grant
DR	Disaster Response
DSA	Division of the State Architect
DSR	Damage Survey Report
DSW	Disaster Service Worker
DWR	California Department of Water Resources
EAS	Emergency Alerting System
EDIS	Emergency Digital Information System
EERI	Earthquake Engineering Research Institute
EMA	Emergency Management Assistance
EMI	Emergency Management Institute
EMMA	Emergency Managers Mutual Aid
EMS	Emergency Medical Services
EOC	Emergency Operations Center
EOP	Emergency Operations Plan
EPA	Environmental Protection Agency (U.S.)
EPEDAT	Early Post Earthquake Damage Assessment Tool
EPI	Emergency Public Information
EPIC	Emergency Public Information Council
ESC	Emergency Services Coordinator

FAY	Federal Award Year
FDAA	Federal Disaster Assistance Administration
FEAT	Governor's Flood Emergency Action Team
FEMA	Federal Emergency Management Agency
FFY	Federal Fiscal Year
FIR	Final Inspection Reports
FIRESCOPE	Firefighting Resources of Southern California Organized for Potential Emergencies
FMA	Flood Management Assistance
FSR	Feasibility Study Report
FY	Fiscal Year
GIS	Geographical Information System
HAZMAT	Hazardous Materials
HAZMIT	Hazardous Mitigation
HAZUS	Hazards United States (a 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 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
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 C - ECONOMIC ANALYSIS OF MITIGATION STRATEGIES

The following criteria were used by the Hazard Mitigation Committee to select and prioritize proposed mitigation measures:

STAPLE/E

Social - Does the measure treat people fairly? (different groups, different generations)

Technical - Will it work? (Does it solve the problem? Is it feasible?)

Administrative - Do you have the capacity to implement and manage project?

Political - Who are the stakeholders? Did they get to participate? Is there public support? Is political leadership willing to support?

Legal - Does your organization have the authority to implement? Is it legal? Are there liability implications?

Economic - Is it cost-beneficial? Is there funding? Does it contribute to the local economy or economic development?

Environmental - Does it comply with environmental regulations?

Rankings for STAPLE/E:

Low	1-3 points (all low priority items were not included in the plan)
Medium	4-5 points
Medium/High	6 points
High	7-9 points

ECONOMIC ANALYSIS OF MITIGATION PROJECTS

Benefit/cost analysis is a key mechanism used by the state Office of Emergency Services (OES), the Federal Emergency Management Agency (FEMA), 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.

A. Cost Benefit Analysis Constraints

The City of Mission Viejo does not have the local expertise or the funds to hire a contractor to conduct benefit/cost analysis or cost-effectiveness analysis for this plan. This will be done on a project-by-project basis as the City moves forward on each project.

B. Mitigation Strategy Analysis

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.

C. 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.

D. 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.

E. 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 nonmarket benefits.

Investing in private sector mitigation activities:

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

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

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

F. How Economic Analysis are 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:

G. 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.

H. 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.

I. Consider Costs and Benefits to Society and 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.

J. 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?

A. 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.

B. 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.

C. 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.

D. 2016 RSCCD Plan

Due to District constraints: insufficient personnel local expertise as well as lack of funding to hire a contractor to conduct benefit-cost analysis and cost-effectiveness analysis, these processes will not take place during the development of this plan. Instead, benefit-cost analysis and/or cost-effectiveness analysis will be done prior to applying for any federal grants.

APPENDIX D: CALIFORNIA DISASTERS SINCE 1950

Hazard Type	Disaster Name	Disaster #	Year	Counties and Cities Declared	State Declaration	Federal Declaration	# of Deaths	# of Injuries	Cost of Damage
Flood	Floods	OCD 50-01	1950	Statewide	11/21/50	Not declared	9		$32,183,000
Flood	Fire, Flood, and Erosion	DR-28	1954	Los Angeles, San Bernardino	2/5/54	2/5/54			Not Avail
Flood	Floods	DR-47	1955	Statewide	12/22/55	12/23/55	74		$200,000,000
Fire	Fires	DR-65	1956	Los Angeles (Malibu area), Ventura		12/29/56	1	Several hundred	$70,000,000
Severe Storm, Economic	Unseasonal and Heavy Rainfall	N/A	1957	Cherry producing areas of Northern California	5/20/57	Not declared		2	$6,000,000
Fire	Fires	CDO 58-01	1958	Los Angeles	1/3/58	Not declared	1	23	Not available
Tsunami	High Tides	CDO 58-02	1958	City of Imperial Beach, San Diego County	1/31/58	Not declared			Not available
Flood	Storm & Flood Damage	CDO 58-03	1958	Northern California (Southern boundaries of Santa Cruz, Santa Clara, Stanislaus, Tuolumne, Alpine counties to the Oregon border)	2/26/58	Not declared			Not available
Flood	Storm & Flood Damage	N/A	1958	Statewide	4/2/58	82	13		$24,000,000
Flood, Landslide	Potential Flood Damage and Landsides as a Result of Fires	CDO 59-01	1959	Los Angeles	1/8/59	Not declared			Not applicable
Severe Storm	Unseasonal and Heavy Rainfall	N/A	1959	Tokay grape producing areas of Northern California	9/17/59	Not declared	2		$100,000
Fire	Major and Widespread Fires	N/A	1960	Los Angeles, San Bernardino	7/21-22/60	Not declared		12	$10,000,000
Fire	Major and Widespread Fires	N/A	1960	Lassen Plumas, Shasta, Sierra, Tehama	8/16/60	Not declared			$3,075,000
Fire	Bel Air Fires	DR-119	1961	Los Angeles		11/16/61		103	Between $50,000,000 - $100,000,000
Fire	Widespread Fires	N/A	1961	Amador, Butte, El Dorado, Napa, Nevada, Placer, San Diego, Sonoma, Tehama	9/8/61	Not declared			$5,696,813
Flood	High Tides and Waves Caused By Storms At Sea	N/A	1961	Ventura	1/16/61	Not declared			Not available
Flood	Flood and Rainstorm	DR-122	1962	Los Angeles, Ventura	2/16/62 & 2/23/62	3/6/62			Not available
Fire	Fires and Explosions	N/A	1962	Alameda	9/14/62	Not declared	1	12	$500,000
Flood	Flood and Rainstorm		1962	Alameda, Butte, Contra Costa, Modoc, Napa San Mateo, Sierra, Sutter, Yuba, Placer, Trinity, Lassen	10/17/62, 10/25/62, 10/30,62, & 11/4/62	138 (10/24/62)			$4,000,000

Hazard Type	Disaster Name	Disaster #	Year	Counties and Cities Declared	State Declaration	Federal Declaration	# of Deaths	# of Injuries	Cost of Damage
Flood	Baldwin Hills Dam Failure	DR-161	1963	Los Angeles	12/16/63	12/21/63			$5,233,203
Flood	High Tides and Heavy Surf	N/A	1963	Orange, City of Redondo Beach		Not declared	5		$500,000
Severe Storm, Flood	Abnormally Heavy and Continuous Rainfall	N/A	1963	Northern California (boundaries of San Luis Obispo, Ventura, Los Angeles, and San Bernardino counties to the Oregon State Line	2/14/64	Not declared			Not Available
Flood	Flood and Rainstorm	Unknown	1963	Alpine, Nevada, Placer, Plumas, Sierra, Amador, Colusa, El Dorado, Glenn, Lake, Lassen, Tehama, Santa Clara, Santa Cruz, Siskiyou, Yolo, Tulare, Mono, Trinity, Yuba	2/7/63, 2/26/63, 2/29/63, & 4/22/63	145 (2/25/63)			Not available
Fire	Major Widespread Fires (Weldon Fire)	N/A	1964	Los Angeles	3/16/64	Not declared			$2,000,000
Fire, Windstorm	Major and Widespread Fires and Excessively High Winds	N/A	1964	Napa, Sonoma, Santa Barbara	9/22/64, 9/23/64, & 9/25/64	Not declared			$16,500,000
Flood	Storms	N/A	1964	Los Angeles	4/3/64	Not declared			1,610,300
Severe Storm, Flood	Abnormally Heavy and Continuous Rainfall	N/A	1964	Humboldt	2/10/64	Not declared			$1,407,000
Tsunami	Tsunami Caused by 1964 Earthquake in Alaska	N/A	1964	Marin	9/15/64	Not declared			Not applicable
Flood	1964 Late Winter Storms	Unknown	1964	Del Norte, Humboldt, Shasta, Mendocino, Colusa, Glenn, Lassen, Plumas, Sierra, Siskiyou, Sonoma, Sutter, Tehama, Trinity, Amador, Butte, El Dorado, Modoc, Nevada, Placer, Yuba, Alpine, Lake, Sacramento, Yolo, Marin	12/22/64, 12/23/64, 12/28/64, 1/5/65, & 1/1/65	12/29/64			$213,149,000
Tsunami	Tsunami Caused by Alaska Earthquake	Unknown	1964	Del Norte	3/28/64	169 (4/1/64)	12		$10,000,000
Civil Unrest	Riots	N/A	1965	Los Angeles	8/14/65	Not declared	32	874	$44,991,000
Fire	Major and Widespread Fires	N/A	1965	Marin, Napa, Placer, Solano, Sonoma	9/18/65	Not declared			Not available
Flood, Landslide	Flooding and Hill Slides Caused by Heavy Rains	N/A	1965	City of Burbank, Los Angeles	1/5/65	Not declared			Not Available
Landslide	Slide Damage	N/A	1965	City of Los Angeles	6/21/65	Not declared			$6,488,600
Flood, Severe Storm	1965 Heavy Rainfall		1965	Riverside, San Bernardino, Ventura, San Diego	11/24/65, 11/26/65, 12/23/65	12/7/65			$21,843,739
Flood	Continuous Rainfall	DR-211	1966	Humboldt	1/14/66	212 (1/22/66)			$6,918,000.00
Civil Unrest	Riots	N/A	1966	San Francisco	9/27/66	Not declared		42	Not available
Landslide	Earth slides	N/A	1966	Redwood City	12/16/66	Not declared			$100,000

Hazard Type	Disaster Name	Disaster #	Year	Counties and Cities Declared	State Declaration	Federal Declaration	# of Deaths	# of Injuries	Cost of Damage
Flood	1966 Winter Storms	Unknown	1966	Kern, Riverside, Tulare, San Bernardino, San Luis Obispo, Monterey, City of Escondido, Inyo	12/9/66, 12/13/66, 12/16/66, 12/16/66, & 12/23/66	1/2/67			$28,761,041.00
Fire	Major and Widespread Fires	N/A	1967	Los Angeles, Orange, San Diego, Ventura	1/7/67	Not declared			$11,345,000
Civil Unrest	Riots and Other Conditions	N/A	1968	City of Richmond	8/2/68	Not declared			Not applicable
Civil Unrest	Riots	N/A	1969	City of Berkeley	2/5/69	Not declared	0	20	Not available
Freeze	Extremely Severe Weather; Freezing	N/A	1969	San Diego	2/5/69	Not declared			$10,000,000
HazMat	Major Oil Spill	N/A	1969	Coastal Areas of Southern California		Not declared			Not available
Flood	1969 Storms	Unknown	1969	Los Angeles, San Luis Obispo, Fresno, Inyo, Riverside, San Bernardino, Santa Barbara, Tulare, Ventura, Amador, El Dorado, Kern, Kings, Madera, Modoc, Mono, Monterey, Orange, Placer, Sacramento, San Joaquin, Shasta, Solano, Stanislaus, Tuolumne, Mariposa, Merced, Calaveras, San Benito, Sierra, Contra Costa, Humboldt, Mendocino, Sonoma, Plumas, Tehama, Yuba, Butte, Marin, Yolo	1/23/69, 1/25,69, 1/28/69, 1/29/69, 2/8/69, 2/10/69, 2/16/69, 3/12/69	1/26/69	47	161	$300,000,000
Flood	Heavy Snow Runoff		1969	Kings	1/28/96	8/15/69			$2,812,500.00
Civil Unrest	Riots and Disorders	N/A	1970	Santa Barbara	2/26/70	Not declared		12+	$300,000
Fire	Large Fire	N/A	1970	City of Sonora, Tuolumne	2/26/70	Not declared			$2,300,000
Fire	Widespread Fires	N/A	1970	Riverside	12/22/70	Not declared			$3,200,000
Flood	Storms and Floods	N/A	1970	Contra Costa	4/10/70	Not declared			Not available
Freeze	Freezing Conditions	N/A	1970	Napa, Sonoma, Mendocino, San Joaquin, Lake	5/1/70, 5/19/70, 6/8/70, 6/10/70, 7/24/70	Not declared			$19,749,200
Landslide	Slide Damage Caused by Heavy Rains and Storms	N/A	1970	City of Oakland	2/10/70	Not declared			$11,500,000
Landslide	Slide Damage Caused by Heavy Rains and Storms	N/A	1970	City of Los Angeles	3/10/70	Not declared			$8,500,000
Flood	Northern California Flooding	Unknown	1970	Butte, Colusa, Glenn, Lake, Lassen, Marin, Modoc, Plumas, Shasta, Siskiyou, Tehama, Trinity, Sutter, Yuba, Del Norte, Alameda, El Dorado, Mendocino	1/26/60, 2/3/60, 2/10/60, 3/2/60	2/16/70			$27,657,478

Hazard Type	Disaster Name	Disaster #	Year	Counties and Cities Declared	State Declaration	Federal Declaration	# of Deaths	# of Injuries	Cost of Damage
Fire	Statewide Fires		1970	City of Oakland, Los Angeles, Ventura, San Diego, Kern, San Bernardino, Monterey, Riverside	9/24/70, 9/28/70, 10/1/70, 10/2/70, 10/20/70, 11/14/70	9/29/70	19		$223,611,000
Earthquake	San Fernando Earthquake	DR-299	1971	Los Angeles	2/9/71	2/9/71	58	2,000	$483,957,000
Fire	Widespread Fires	N/A	1971	Santa Barbara	10/13/71	Not declared	4		$9,000,000
Flood	High Ocean Tides and Wind-driven Waves	N/A	1971	Ventura	5/19/71	Not declared			$250,000
Flood	1972 Storms	DR-316	1972	Santa Barbara	1/3/72	2/11/72			$2,660,000
Flood	Andrus island Levee Break	DR-342	1972	Sacramento	6/21/72	6/27/72			$23,681,630
Agricultural	Exotic Newcastle Disease Epidemic	N/A	1972	Los Angeles, Orange, Riverside, San Bernardino, San Diego, Ventura, Santa Barbara	4/10/72, 5/22/72	Not declared			$10,000,000
Drought	Drought Conditions	N/A	1972	Glenn, San Benito, Santa Clara	7//73	Not declared			$8,000,000
Flood	Heavy Rains and Mud Slides	N/A	1972	Monterey	10/24/72	Not declared			$720,000
Severe Storm	Severe Weather Conditions	N/A	1972	Sutter	9/3/72	Not declared			$2,004,300
Severe Storm, Freeze	Freeze and Severe Weather Conditions	N/A	1972	Fresno, Kings, Tulare, Merced, Kern, Madera, San Benito, Stanislaus, El Dorado, Tehama, Placer, Nevada, San Joaquin, Colusa, Siskiyou, Modoc, Santa Clara	4/17/72, 5/22/72, 5/22/72, 5/31/72	Not declared			$111,517,260
Flood	1972 Continuing Storms		1972	Del Norte, Humboldt	2/28/72	4/5/72			$6,817,618
Flood	Coastal Flooding	DR-364	1973	Marin, San Luis Obispo, City of South San Francisco, Santa Barbara, Solano, Ventura	1/23/73, 1/30/73, 2/8/73, 2/28/73	2/3/73			$17,998,250
Fire	Southern Pacific Railroad Fires and Explosions (Roseville)	N/A	1973	Sacramento, placer	4/30/73	Not declared	0	37	$2,925,000
Fire	Boulder Fire	N/A	1973	San Diego	12/12/73	Not declared	0		$215,700
Flood	High Ocean Tides and Wind-driven Waves	N/A	1973	Ventura	2/1/73	Not declared			$1,027,000
Flood	Storms and Floods	N/A	1973	Colusa, Glenn, Napa, Placer, Sutter, Yuba	2/28/73	Not declared			$1,864,000
Flood	Storms and Floods	N/A	1973	Mendocino	3/15/73	Not declared			$1,523,200
Flood	Storms and Floods	N/A	1973	City of Pacifica	4/11/73	Not declared			$700,000
Freeze	Freeze	N/A	1973	Butte	2/28/73	Not declared			$300,000
Freeze, Economic	Eucalyptus Tree Freeze	Unknown	1973	Alameda, Contra Costa	4/4/73	5/25/73			$8,000,000 to $10,000,000

Hazard Type	Disaster Name	Disaster #	Year	Counties and Cities Declared	State Declaration	Federal Declaration	# of Deaths	# of Injuries	Cost of Damage
Fire	Fires	N/A	1973	Los Angeles	7/16/73	Not declared			$1,300,000
Flood	Storms	DR-412	1974	Humboldt, Shasta, Siskiyou, Trinity, Glenn, Mendocino, Tehama	1/17/74, 1/18/74	1/25/74			$35,192,500
Flood	Storms	DR-432	1974	Mendocino	4/23/74	5/7/74			$4,475,900
Economic	Gasoline Purchasing Problems	N/A	1974	Alameda, Contra Costa, Los Angeles, Orange, Riverside, San Mateo, Solano, Santa Clara, Ventura	2/28/74, 3/4/74, 3/10/74	Not declared			
Flood	Storms	N/A	1974	Santa Cruz	2/28/74	Not declared			$763,267
Fire	Fires	N/A	1975	Los Angeles	11/24/75	Not declared			$19,486,960
Drought	Drought	N/A	1976	Alpine, Calaveras, Colusa, Fresno, Glenn, Madera, Merced, San Diego, San Joaquin, Solano, Stanislaus, Sutter, Tuolumne, Alameda, Butte, Contra Costa, Kings, Los Angeles, Riverside, San Luis Obispo, Tulare, Yolo, Amador, Monterey, Napa, Nevada, San Benito, San Bernardino, Tehama, San Mateo, Marin	2/9/76, 2/13,76, 2/24/76, 3/26/76, 7/6/76	Not declared			$2,664,000,000
Severe Storm	1976 High Winds and Flooding	DR-521	1976	Imperial, Riverside, San Bernardino, San Diego	9/13/76, 9/22/76	9/21/76			$120,132,771
Fire	Sycamore Fire	N/A	1977	Santa Barbara	7/27/77	Not declared	0		$25,540,755
Flood	Imperial County Flooding	N/A	1977	Imperial	8/23/77	Not declared			$28,498,469
Flood, Landslide	Threat of Floods/Mud Slides	N/A	1977	Monterey, Riverside	9/8/77	Not declared			$6,110,000
Severe Storm	Storms	N/A	1977	San Diego, Kern, Humboldt, City of Arvin	1/10/78, 12/23/77, 1/22/77, 12/21/77	Not declared			$38,009,035
Landslide	Laguna Landslide	DR-566	1978	City of Laguna Beach	10/5/78	10/9/78			$16,595,000
Fire	1978 Los Angeles Fire	EM-3067	1978	Los Angeles	10/24/78	10/29/78	1		$61,279,374
Earthquake	Santa Barbara Earthquake	N/A	1978	Santa Barbara	8/15/78	Not declared	0	65	$12,987,000
Miscellaneous	PSA Air Crash	N/A	1978	City of San Diego	1/15/79	Not declared	150		
Severe Storm	Storms	N/A	1978	Humboldt, Mendocino, Santa Cruz	1/27/78, 1/20/78	Not declared			$6,126,409
Severe Storm	Storms	Unknown	1978	Inyo, Mono, San Diego, San Luis Obispo, Kings, Monterey, Kern, Los Angeles, Orange, Riverside, San Bernardino, Santa Barbara, Tulare, Ventura	3/9/78, 2/27,78, 2/13/78	2/15/78	14	21	$117,802,785
Severe Storm	Severe Storms	DR-594	1979	Riverside	7/26/80	7/27/79			$25,867,100

Hazard Type	Disaster Name	Disaster #	Year	Counties and Cities Declared	State Declaration	Federal Declaration	# of Deaths	# of Injuries	Cost of Damage
Earthquake	Imperial Earthquake	DR-609	1979	Imperial	10/16/79	10/16/79	0	91	$21,197,250
Economic	Gasoline Shortage Emergency	N/A	1979	Alameda, Contra Costa, Los Angeles, Marin, Monterey, Orange, Riverside, San Francisco, San Diego, Santa Clara, Santa Cruz, San Mateo, Ventura, San Bernardino, Sonoma, Contra Costa, Los Angeles, Orange, Santa Clara	5/8/79 - 11/13/79	Not declared			
Fire	Fires	N/A	1979	Santa Barbara, Ventura, Los Angeles, El Dorado	9/28/79, 9/21/79, 9/20/79	Not declared			$9,970,119
Flood	1980 Winter Storms	DR-615	1980	Santa Barbara, Los Angeles, Orange, Riverside, Ventura, San Bernardino, San Diego	2/21/80, 2/7/80	2/21/80			
Flood	Jones Tract Levee Break	DR-633	1980	San Joaquin	9/30/80	9/30/80			$21,510,956
Fire	Southern California Fires	DR-635	1980	San Bernardino, Los Angeles, Orange, Riverside	11/18/80	11/18/80			$64,795,200
Flood	Delta Levee Break	EM-3078	1980	Contra Costa, Sacramento, San Joaquin	1/23/80	1/23/80			$17,388,013
Earthquake	Owens Valley Earthquake	N/A	1980	Mono	5/28/80	Not declared	0	9	$2,000,000
Flood	Storms	N/A	1980	Stanislaus, Monterey, Solano, Santa Cruz	3/5/80	Not declared			$316,640,817
Economic	Mediterranean Fruit Fly Infestation	N/A	1981	Contra Costa, Los Angeles, San Benito, Stanislaus, Santa Cruz, San Mateo	8/8/81 - 9/25/81	Not declared			$22,000,000
Fire	Atlas Peak Fire	N/A	1981	Napa	6/24/81	Not declared	0		$31,000,000
Flood	1982 Winter Storms	DR-651	1982	Alameda, Santa Clara, Solano, San Joaquin, Contra Costa, Humboldt, Marin, San Mateo, Santa Cruz, Sonoma	1/5/82 - 1/9/82	1/7/82	33	481	$273,850,000
Fire	Orange Fire	DR-657	1982	Orange, City of Redondo Beach	4/21/82	4/21/82			$50,877,040
Flood	McDonald Island Levee Break	DR-669	1982	MacDonald Island	8/24/82	8/24/82			$11,561,870
Flood, Severe Storm	1982-83 Winter Storms	DR-677	1982	Contra Costa, San Joaquin, Sacramento, Marin, San Mateo, Los Angeles, San Diego, Alameda, Orange, San Benito, Santa Barbara, Santa Clara, Santa Cruz, Shasta, Sonoma, Ventura, Trinity, Colusa, Lake, Mendocino, Monterey, San Luis Obispo, Solano, Yolo, Butte, Glenn, Kern, Kings, San Bernardino, Sutter, Tehama, Merced, Del Norte, Fresno, madera, Napa, Placer, Riverside, Stanislaus, Tulare,	1982, 1983	2/9/83	0	0	$523,617,032

Hazard Type	Disaster Name	Disaster #	Year	Counties and Cities Declared	State Declaration	Federal Declaration	# of Deaths	# of Injuries	Cost of Damage
				Humboldt, Mariposa, Nevada, Yuba					
Agricultural	Rains Causing Agricultural Losses	N/A	1982	Fresno, Madera, Merced, Monterey, kenr Tulare, Sacramento, San Joaquin, Solano, Stanislaus, Yolo	10/26/82	Not declared			$345,195,974
Fire	Dayton Hills Fire	N/A	1982	Los Angeles, Orange, Ventura	10/10/82	Not declared	0		$19,277,102
Flood, Windstorm	High Tides, Strong Winds, and Rains	N/A	1982	Contra Costa, Sacramento, San Joaquin	12/8/82	Not declared			$6,964,998
Severe Storm, Flood	Heavy Rains/ Flooding	N/A	1982	Inyo	9/27/82	Not declared			$6,161,320
Flood	Winter Storms	Unknown	1982	Contra Costa, San Joaquin, Sacramento, Marin, San Mateo, Los Angeles, San Diego, Alameda, orange, San Benito, Santa Barbara, Santa Clara, Santa Cruz, Shasta, Sonoma, Ventura, Trinity, Colusa, Lake Mendocino, Monterey, San Luis Obispo, Solano, Yolo, Butte, Glenn, Kern, Kings, San Bernardino, Sutter, Tehama, Merced, Del Norte, Fresno, Madera, Napa, Placer, Riverside, Stanislaus, Tulare, Humboldt, Mariposa, Nevada, Yuba	12/8/82-3/21/83	2/9/83			$523,617,032
Earthquake	Coalinga Earthquake	DR-682	1983	Fresno	5/2/83	5/3/83	0	47	$31,076,300
Flood	Colorado River Flooding	DR-682	1983	Riverside, San Bernardino, Imperial	6/23/83, 6/28/83	7/1/83			$4,640,315
Flood	1983 Summer Storms	DR-690	1983	Inyo, Riverside, San Bernardino	8/29/83	8/29/83	3		$34,689,155
Economic	Mexican Fruit Fly	N/A	1983	Los Angeles	11/4/83	Not declared			
Severe Storm, Flood	Levee Failure, High Winds, High Tides, Floods, Storms, Wind Driven Water	N/A	1983	Contra Costa, Alameda	12/9/83, 1/18/84	Not declared			$10,909,785
Earthquake	Morgan Hill Earthquake	EM-4043	1984	Santa Clara		4/25/84	0	27	$7,265,000
Severe Storm	Storms	N/A	1984	Kern, Riverside, Tulare, San Bernardino, San Luis Obispo, Monterey, City of Escondido, Inyo		Not declared			$1,600,000
Fire	Statewide Fires	DR-739	1985	San Diego, City of Lost Angeles, San Luis Obispo, Monterey, Santa Clara, Santa Cruz, Ventura	7/1/85 - 7/11/85	4/25/84	3	470	$64,845,864
Fire	Wheeler Fire	N/A	1985	Ventura	10/14/85	Not declared	1	2	
Miscellaneous	Hydrilla Proliferation	N/A	1985	Shasta	9/13/85	Not declared			

Hazard Type	Disaster Name	Disaster #	Year	Counties and Cities Declared	State Declaration	Federal Declaration	# of Deaths	# of Injuries	Cost of Damage
Severe Storm	Storms	DR-758	1986	Humboldt, Napa, Sonoma, Glenn, Lake, Marin, Modoc, Sacramento, Santa Clara, Santa Cruz, Solano, Yuba, Alpine, Amador, Butte, Calaveras, Colusa, El Dorado, Lassen, Mendocino, Nevada, Placer, Plumas, San Joaquin, Sierra, Sutter, Tehama, Tuolumne, Yolo, Fresno, Madera, San Mateo, Alameda, Contra Costa, Del Norte, Trinity, Mono, San Benito, Shasta	2/18-86 - 3/12/86	2/18/86	13		$407,538,904
Flood	Heavy Rains	N/A	1986	Monterey, Siskyou	3/26/86	Not declared			$400,000
Miscellaneous	Plane Crash	N/A	1986	City of Cerritos	8/31/86	Not declared	67	2	
Earthquake	Whittier Earthquake	DR-799	1987	Monterey park, City of Whittier, Los Angeles, Orange	10/2/87 - 10/5/87	10/7/87	9	200	$358,052,144
Earthquake	Imperial County Earthquake	N/A	1987	Imperial	11/23/87	Not declared	0	94	$2,638,833
Economic	Mediterranean Fruit Fly	N/A	1987	Los Angeles	8/25/87	Not declared			
Fire	Forest Fire - Del Norte Fire, Pebble Beach	N/A	1987	Monterey		Not declared	0	8	$15,000,000
Fire	Acorn Fire	N/A	1987	Alpine	8/3/87	Not declared	0	3	$8,500,000
Fire	Wildland Fires	N/A	1987	Colusa, Del Norte, Butte, Fresno, Humboldt, Inyo, Kern, Lake, Lassen, Mariposa, Mendocino, Modoc, Mono, Nevada, Placer, Plumas, Riverside, San Bernardino, Shasta, Sierra, Siskiyou, Trinity, Tulare, Tuolumne	9/10/87, 9/3/87	Not declared	3	76	$18,000,000
Fire	Wildfires/ Flooding/ Mud Slides	N/A	1987	San Diego	11/19/87	Not declared			$5,371,150
Severe Storm	Coastal Storms	DR-812	1988	Los Angeles, Orange, San Diego	1/21/88	2/5/88	0		
Fire	Fires - 49er, Miller, and Fern	DR-815	1988	Shasta, Solano, Yuba, Nevada	9/11/88-9/20/88	9/13/88	0		$31,247,534
Economic	Mediterranean Fruit Fly	N/A	1988	Los Angeles	7/21/88	Not declared			
Fire	Wildland Fires	N/A	1988	Calaveras	7/21/88	Not declared			
Fire, Windstorm	Fire and Wind Driven Waves	N/A	1988	City of Redondo Beach	6/15/88	Not declared	0		$25,000,000
Fire, Windstorm	Fires/ High Winds	N/A	1988	Los Angeles	12/9/88	Not declared	0	2	$12,400,000
Severe Storm	Storms	N/A	1988	Santa Barbara, City of San Buenaventura	1/26/88	Not declared			$49,416,200
Earthquake	Loma Prieta Earthquake	DR-845	1989	Alameda, Monterey, San Benito, San Mateo, Santa Clara, Santa Cruz, San Francisco, Contra Costa, Marin, City of Isleton, City of Tracy, Solano	10/18/89 - 10/30/89	10/18/89	63	3,757	$5,900,000,000
Economic	Mediterranean Fruit Fly	N/A	1989	Los Angeles	8/9/89	Not declared			

Hazard Type	Disaster Name	Disaster #	Year	Counties and Cities Declared	State Declaration	Federal Declaration	# of Deaths	# of Injuries	Cost of Damage
Economic	Mediterranean Fruit Fly	N/A	1989	Santa Clara	9/6/89	Not declared			
Economic	Mediterranean Fruit Fly	N/A	1989	San Bernardino	10/3/89	Not declared			
Economic	Mediterranean Fruit Fly	N/A	1989	Orange	11/20/89	Not declared			
Fire	Santa Barbara Fires	DR-872	1990	Los Angeles, Santa Barbara, Riverside, San Bernardino	6/28/90, 6/29/90	6/30/90	3	89	$300,000,000
Freeze	Freeze	DR-894	1990	Santa Cruz, Fresno, Glenn, imperial, Kern, Mendocino, Monterey, Riverside, San Benito, San Bernardino, San Diego, San Mateo, Santa Barbara, Santa Clara, Solano, Sonoma, Tulare, Ventura, Alameda, Butte, Colusa, Los Angeles, Madera, Marin, Merced, Napa, San Joaquin, San Luis Obispo, Sutter, Yolo, Yuba, Stanislaus, Tehama	12/19/90-1/18/91	2/11/91			$856,329,675
Drought	Drought	N/A	1990	City of Santa Barbara	7/17/90	Not declared			
Drought	Drought	N/A	1990	Santa Barbara	11/13/90	Not declared			
Earthquake	Upland Earthquake	N/A	1990	Los Angeles, San Bernardino	3/9/90, 3/13/90	Not declared	0	38	$12,034,150
Economic	Mediterranean Fruit Fly	N/A	1990	Riverside	4/18/90	Not declared			
Economic	Mexican Fruit Fly	N/A	1990	Los Angeles, San Diego	5/14/90	Not declared			
Fire	Finley Fire/ Yosemite Fire	N/A	1990	Mariposa, Kern, Tehama	8/13/90, 8/14/90	Not declared	1	84	$548,000,000
Severe Storm	Severe Storms	N/A	1990	Butte, Nevada	2/22/90	Not declared	1	17	$11,500,000
Fire	East Bay Hills Fire	DR-919	1991	Alameda County	10/20/91	10/22/91	25	150	$1,700,000,000
Economic	Sweet potato Whitefly	N/A	1991	Imperial, Riverside		Not declared			$120,567,949
HazMat	Cantara Spill	N/A	1991	Shasta, Siskyou				300	$38,000,000
Severe Storm	1992 Winter Storms	DR-935	1992	Los Angeles, Ventura, City of Los Angeles, kern, orange, San Bernardino	2/12/92, 2/19/92	2/25/92	5		$123,240,531
Civil Unrest	Los Angeles Civil Disorder	DR-942	1992	Los Angeles	4/29/92	5/22/92	53	2,383	$800,000,000
Earthquake	Cape Mendocino Earthquakes	DR-943	1992	Humboldt	4/25/92	5/5/92	0	356	$48,271,137
Earthquake	Big Bear - Landers Earthquakes	DR-947	1992	Riverside, San Bernardino	6/28/92	6/28/92	1	$402	$91,079,376
Fire	Shasta/Calaveras Fire	DR-958	1992	Calaveras, Shasta	8/21/92	8/29/92	0	$8	$54,108,500
Flood	1992 Late Winter Storms	DR-979	1992	Alpine, Los Angeles, Humboldt, Napa, Santa Barbara, Culver City, City of Los Angeles, Contra Costa, Mendocino, Sonoma, Fresno, imperial, Madera, Monterey, San Bernardino, Sierra, Tehama, Trinity, Tulare, Modoc, Orange, Riverside,	1/7/93 - 2/19/93	1/15/93	20	10	$600,000,000

Hazard Type	Disaster Name	Disaster #	Year	Counties and Cities Declared	State Declaration	Federal Declaration	# of Deaths	# of Injuries	Cost of Damage
				Lassen, Siskiyou, Plumas, San Diego					
HazMat	Sewage Spill	N/A	1992	San Diego, City of Chula Vista, City of Coronado, San Diego	2/6/92, 2/7/92	Not declared			
Fire	Southern California Firestorms	DR-1005	1993	Los Angeles, Ventura, San Diego, Orange, Riverside, San Bernardino	10/27/93, 10/28/93	10/28/93	4	162	$1,000,000,000
Economic	Mediterranean Fruit Fly	N/A	1993	Riverside	5/21/94	Not declared			
HazMat	Tijuana River Pollution	N/A	1993	San Diego	9/10/93	Not declared			
HazMat	New River Pollution	N/A	1993	Imperial	10/6/93	Not declared			
Earthquake	Northridge Earthquake	DR-1008	1994	Los Angeles, Ventura, Orange	1/17/94, 1/24/94	1/17/94	57	11,846	$40,000,000,000
Economic	Salmon fisheries	DR-1038	1994	Del Norte, Humboldt, Mendocino, Sonoma	5/20/94	9/20/94			$28,300,000
Earthquake	Humboldt Earthquake	N/A	1994	Humboldt	12/29/94	Not declared			$1,300,000
Economic	Mediterranean Fruit Fly	N/A	1994	Ventura	10/7/94	Not declared			
Fire	San Luis Obispo Fire - Hwy 41	N/A	1994	San Luis Obispo	8/24/94	Not declared		12	$6,382,235
Severe Storm	Severe Winter Storms	DR-1044	1995	Los Angeles, Orange, Humboldt, Lake , Sonoma, Butte, Colusa, Contra Costa, Del Norte, Glenn, Kern, Lassen, Mendocino, Modoc, Monterey, Napa, placer, Plumas, San Luis Obispo, Santa Barbara, Santa Clara, Santa Cruz, Tehama, Ventura, Yolo, Yuba, Alpine, Amador, Nevada, Riverside, Sacramento, San Bernardino, San Mateo, Shasta, Sutter, Trinity, San Diego, Alameda, Marin, Fresno, Kings, El Dorado, Madera, Solano, Siskiyou	1/6/95 - 3/14/95	1/13/95	11		$741,400,000
Severe Storm, Flood	Late Winter Storms	DR-1046	1995	All counties except Del Norte		1/10/95	17		$1,100,000,000
Fire	Southern California Firestorms	EM-3120	1996	Los Angeles, Orange, San Diego	10/1/96			5	$40,000,000
Flood	January 1997 Floods		1997	Alpine, Amador, Butte, Colusa, Del Norte, El Dorado, Glenn, Humboldt, Lake, Lassen, Modoc, Napa, Nevada, Plumas, Sacrament, San Joaquin, Sierra, Siskiyou, Solano, Sonoma, Sutter, Tehama, Trinity, Yuba, Calaveras, Madera, Mono, Monterey, Placer, San Benito, San Luis Obispo, San Mateo, Santa Cruz, Shasta, Stanislaus, Tuolumne, Yolo, Contra Costa, Fresno, Marin, Tulare,	1/2/97 - 1/31/97		8		$1,800,000,000

Hazard Type	Disaster Name	Disaster #	Year	Counties and Cities Declared	State Declaration	Federal Declaration	# of Deaths	# of Injuries	Cost of Damage
				Mariposa, Merced, Santa Clara, Alameda, San Francisco, Kings,					
Flood	El Nino		1998	Alameda, Amador, Butte, Calaveras, Colusa, Contra Costa, Fresno, Glenn Humboldt, Kern, Kings, Lake, Los Angeles, Marin, Mendocino, Merced, Monterey, Napa, Orange, Riverside, Sacramento, San Benito, San Bernardino, San Diego, San Francisco, San Joaquin, San Luis Obispo, San Mateo, Santa Barbara, Santa Clara, Santa Cruz, Siskiyou, Solano, Sonoma, Stanislaus, Sutter, Tehama, Trinity, Tulare, Ventura, Yolo, Yuba			17		$550,000,000
Freeze	Freeze		1998	Fresno, Kern, Kings, Madera, Merced, Monterey, Tulare, Ventura	2/9/99				
Fire	Fire		1999	Various Counties	8/26/99				
	Road Damage		1999	Sonoma	3/29/99				
Earthquake	Earthquake		2000	Napa	9/6/00				
Drought	Water Shortage		2001	City of Rio Dell	3/16/01				
Fire	California Wildfires	DR-1498	2003	Ventura, LA, San Bernardino, Riverside, San Diego		DR1498			
Earthquake	Sierra Madre Earthquake	N/A	2003	Los Angeles	7/5/91	Not declared	1	30	$33,500,000
Fire	Widespread Fires	N/A	2003	Madera		Not declared	2		Not available
Severe Storm, Freeze	Freeze and Snow Conditions	N/A	2003	Lake	7/13/72	Not declared			$357,000
Drought	Drought		2003	Modoc, Siskiyou	5/4/01				
Economic	Exotic Newcastle Disease Epidemic		2003	15 Northern Counties	2/21/03				
Economic	Bark Beetle Infestation		2003	San Bernardino, San Diego, Riverside	3/7/03				
Fire	Wildfire		2003	Calaveras	9/10/01				
Fire	Southern California Wildfires	DR-1498	2003	Ventura, Los Angeles, San Bernardino, Riverside, San Diego	10/24-26/03	10/27/03			
Earthquake	San Simeon Earthquake	DR-1505	2003	San Luis Obispo, Santa Barbara	12/23/03	1/13/04			Estimated $55 million
Flood	Levee Break	DR-1529	2004	San Joaquin	6./4/04	6/30/04			$53,000,000
Landslide	La Conchita Mudslide		2005	La Conchita, Ventura County	1/12/05	Not Declared	10	22	

Hazard Type	Disaster Name	Disaster #	Year	Counties and Cities Declared	State Declaration	Federal Declaration	# of Deaths	# of Injuries	Cost of Damage
Severe Storm, Flood, Debris Flow, Mudslide	Southern CA Severe Storm	DR-1577	2005	Kern, LA, Orange, Riverside, San Bernardino, San Diego, Santa Barbara, Ventura	1/6/05	2/4/05	22		
Severe Storm, Flood, Debris Flow, Landslide, Mudslide	Southern CA Severe Storm	DR-1585	2005	Kern, San Bernardino and San Diego	1/15/05	2/22/05			
Flooding, Debris and Mud Flows	California Winter Storms, Flooding and Debris and Mud Flows	DR-1952	2011	Orange County, California	12/17/10	12/17/10			

APPENDIX E: 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 these organizations on the following pages for resources and technical assistance. The Resource Directory provides a foundation for potential partners in action item implementation.

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

American Public Works Association	
Level: National	Hazard: Multi
2345 Grand Boulevard, Suite 500	www.apwa.net
Kansas City, MO 64108-2641	816-472-6100
Army Corps of Engineers, Los Angeles Division	
Level: Federal	Hazard:
P.O. Box 532711	www.spl.usace.army.mil/
Los Angeles CA 90053- 2325	213-452- 3921
Association of State Floodplain Managers	
Level: Federal	Hazard: Flood
2809 Fish Hatchery Road	www.floods.org
Madison, WI 53713	608-274-0123
Building Seismic Safety Council (BSSC)	
Level: National	Hazard: Earthquake
1090 Vermont Ave., NW, Suite 700	www.bssconline.org
Washington, DC 20005	202-289-7800

California Department of Conservation: Southern Regional Office	
Level: State	Hazard: Multi
655 S. Hope Street, #700	www.consrv.ca.gov
Los Angeles, CA 90017-2321	213-239-0878
California Department of Transportation (Caltrans)	
Level: State	Hazard: Multi
120 S. Spring Street	www.dot.ca.gov/
Los Angeles, CA 90012	213-897-3656
California Department of Water Resources (DWR)	
Level: State	Hazard: Flood
1416 9th Street	www.water.ca.gov/
Sacramento, CA 95814	916-653-6192
CAL FIRE	
Level: State	Hazard: Multi
PO Box 944246	www.fire.ca.gov/
Sacramento California 94244-2460	916-653-5123
California Division of Mines and Geology (DMG)	
Level: State	Hazard: Multi
801 K Street, MS 12-30	www.consrv.ca.gov/cgs/index.htm
Sacramento, CA 95814	916-445-1825
California Environmental Resources Evaluation System (CERES)	
Level: State	Hazard: Multi
900 N St., Suite 250	www.ceres.ca.gov/
Sacramento, Ca. 95814	916-653-2238
California Natural Resources Agency	
Level: State	Hazard: Multi
1416 Ninth Street, Suite 1311	www.resources.ca.gov/
Sacramento, CA 95814	916-653-5656

California Office of Emergency Services (OES)	
Level: County	Hazard: Multi
P.O. Box 419047	www.calema.ca.gov/
Rancho Cordova, CA 95741-9047	916-845-8910 and 11
City of San Dimas	
Level: Regional	Hazard: Windstorm Table
245 East Bonita Avenue	www.cityofsandimas.com/
San Dimas, CA 91773	909-394-6200
County of Orange County Sheriff Emergency Management Bureau	
Level: County	Hazard: multi
2644 Santiago Canyon Road	www.ocsd.org/
Silverado, CA 92676	714-628-7019
County of Orange Public Works	
Level: County	Hazard: Multiple
300 North Flower Street	www.ocpublicworks.com/
Santa Ana, CA 92703	714-834-2300
EPA, Region 9	
Level: Regional	Hazard: Multi
75 Hawthorne Street	www.epa.gov/region09
San Francisco, CA 94105	415-947-8000
Federal Emergency Management Agency, Region IX	
Level: Federal	Hazard: Multi
1111 Broadway, Suite 1200	www.fema.gov
Oakland, CA 94607	510-627-7100
Federal Emergency Management Agency, Mitigation Division	
Level: Federal	Hazard: Multi
500 C Street, S.W.	www.fema.gov/fima/planhowto.shtm
Washington, D.C. 20472	202-566-1600

Floodplain Management Association	
Level: Federal	Hazard: Flood
P.O. Box 50891	www.floodplain.org
Sparks, NV 89435-0891	775-626-6389
International Society of Arboriculture	
Level: International	Hazard: Severe Weather
P.O. Box 3129	www.isa-arbor.com
Champaign, IL 61826-3129	217-355-9411
Landslide Hazards Program, USGS	
Level: Federal	Hazard: Landslide
12201 Sunrise Valley Drive, MS 906	www.landslides.usgs.gov/index
Reston, VA 20192	703-648- 4000
National Fire Protection Association (NFPA)	
Level: National	Hazard: Wildfire
P.O. Box 9101	www.nfpa.org
Quincy, MA 02269-9101	617-770-3000
National Flood Insurance Program (NFIP)	
Level: Federal	Hazard: Flood
500 C Street, S.W.	www.fema.gov/nfip/
Washington, D.C. 20472	202-566-1600
National Flood Insurance Program (NFIP) Community Rating System (CRS)	
Level: Federal	Hazard: Flood
500 C Street, S.W.	www.fema.gov/nfip/crs.shtm
Washington, D.C. 20472	202-566-1600
National Interagency Fire Center (NIFC)	
Level: Federal	Hazard: Wildfire
3833 S. Development Ave.	www.nifc.gov
Boise, Idaho 83705-5354	208-387-5512
National Landslide Information Center, US Geological Survey	

Level: Federal	Hazard: Landslide
345 Middlefield Road	www.landslides.usgs.gov/nlic/
Menlo Park, CA 94025	650-853-8300

National Oceanic /Atmospheric Administration	
Level: Federal	Hazard: Multi
14th Street & Constitution Ave NW, Room 6013	www.noaa.gov
Washington, DC 20230	202-482-6090
National Resources Conservation Service	
Level: Federal	Hazard: Multi
14th and Independence Ave., SW Room, 5105-A	www.nrcs.usda.gov/
Washington, DC 20250	202-720-7246

National Weather Service, Oxnard, CA	
Level: Federal	Hazard: Multi
520 North Elevar Street	www.nws.noaa.gov/
Oxnard, CA 93030	805-988- 6615
National Weather Service, Office of Hydrologic Development	
Level: Federal	Hazard: Flood
1325 East West Highway, SSMC2	www.nws.noaa.gov/
Silver Spring, MD 20910	301-713-1658
National Wildland/Urban Interface Fire Program	
Level: Federal	Hazard: Wildfire
1 Batterymarch Park	www.firewise.org/
Quincy, MA 02169-7471	617-770-3000

Office of the State Fire Marshal (SFM)	
Level: State	Hazard: Wildfire
1131 "S" Street	www.osfm.fire.ca.gov
Sacramento, CA 95814	916-445-8200
Orange County Fire Authority Headquarters (OCFA)	
Level: County	Hazard: All
One Authority Road	www.ocfa.org
Irvine, CA	949-881-2411
Orange County Sanitation District	
Level: County	Hazard: All
10844 Ellis Avenue	www.ocsd.com/
Fountain Valley, CA 92708	714-962-2411
South Coast Air Quality Management District (AQMD)	
Level: Regional	Hazard: Multi
21865 E. Copley Drive	www.aqmd.gov
Diamond Bar, CA 91765	800-CUT-SMOG
Southern California Association of Governments (SCAG)	
Level: Regional	Hazard: Multi
818 W. Seventh Street, 12th Floor	www.scag.ca.gov
Los Angeles, CA 90017	213-236-1800
Southern California Earthquake Center (SCEC)	
Level: Regional | Hazard: Earthquake	www.scec.org
3651 Trousdale Parkway	Suite 169
Los Angeles, CA 90089-0742	213-740-5843
US Army Corps of Engineers	
Level: Federal	Hazard: Multi
P.O. Box 532711	www.usace.army.mil
Los Angeles CA 90053- 2325	213-452- 3921

USDA Forest Service	
Level: Federal	Hazard: Wildfire
1400 Independence Ave. SW	www.fs.fed.us
Washington, D.C. 20250-0002	202-205-8333

US Department of the Interior, Bureau of Reclamation	
Level: Federal	Hazard: Multi
2800 Cottage Way	www.usbr.gov/
Sacramento CA 95825-1898	916- 978-5000 or 5599
US Fire Administration (USFA) (an entity of FEMA)	
Level: Federal	Hazard: Multi
16825 South Seton Avenue	www.usfa.fema.gov/
Emmitsburg, MD 21727	301-447-1000
United States Geological Survey	
Level: Federal	Hazard: Multi
345 Middlefield Road	www.usgs.gov/
Menlo Park, CA 94025	650-853-8300
USGS Water Resources	
Level: Federal	Hazard: Multi
6000 J Street, Placer Hall	www.water.usgs.gov
Sacramento, CA 95819-6129	916-278-3000
University of Nebraska-Lincoln/U.S. Drought Monitor	
Level: National	Hazard: Drought
3310 Holdrege Street	www.droughtmonitor.uni.edu
Lincoln, Nebraska	(402) 472–6707

List of References on File with RSCCD Risk Management Office

Reference A – RSCCD 2015 Insurance Property Evaluation Report (completed every 5 years)

Reference B – RSCCD Earthquake Hazus Study by MMI Engineering

Reference C – RSCCD Flood Hazus Study by MMI Engineering

Reference D – RSCCD Facilities Master Plan