June 18, 2021 | # Hazard Mitigation Plan





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RANCHO SIMI RECREATION AND PARK DISTRICT

Mountains Recreation & Conservation Authority

Credits

Q&A | ELEMENT A: PLANNING PROCESS | A1c.
Q: Does the plan identify who represented each jurisdiction? (At a minimum, it must identify the jurisdiction represented and the person's position or title and agency within the jurisdiction.) (Requirement §201.6(c)(1))
A: See **Hazard Mitigation Planning Team** below.

Hazard Mitigation Planning Team:

Name	*Department*	*Position*
MRCA		
Sally Garcia		Project Assistant
Rorie Skei		
Tim Miller		
Walt Young		
Ken Nelson		
Cara Meyer		Deputy Executive Director
Fernando Gomez		

Acknowledgements

Mountains Recreation & Conservation Authority Governing Board

- ✓ George Lange - Chair, Designee of Conejo Recreation and Park District
- ✓ jim Hasenauer - Vice-Chair, Member at Large
- ✓ Irma Muñoz - Designee of Santa Monica Mountains Conservancy
- ✓ Dan Paranick - District Manager, Rancho Simi Recreation and Park District

Point of Contact

To request information or provide comments regarding this mitigation plan, please contact:

Name & Position Title	Sally Garcia, Project Assistant
Email	sally.garcia@mrca.ca.gov
Mailing Address	570 W. Avenue 26, Suite 100 Los Angeles, CA 90065
Telephone Number	323-221-9944 ext. 191

Consulting Services

Emergency Planning Consultants

- ✓ Principal Planner: Carolyn J. Harshman, CEM, President
- ✓ Research Analyst: Megan R. Fritzler

3665 Ethan Allen Avenue
San Diego, California 92117
Phone: 858-483-4626
epc@pacbell.net
www.carolynharshman.com

Mapping

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

Mandated Content

In an effort to assist the readers and reviewers of this document, the jurisdiction has inserted "markers" emphasizing mandated content as identified in the Disaster Mitigation Act of 2000 (Public Law – 390). Following is a sample marker:

EXAMPLE

Q&A | ELEMENT A: PLANNING PROCESS | A1a.
Q Does the plan document the planning process, including how it was prepared (with a narrative description, meeting minutes, sign-in sheets, or another method)? (Requirement §201.6(c)(1)) **A:**

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Mountain Recreation and Conservation Authority
Hazard Mitigation Plan
Planning Team Meeting #4
January 19, 2021
(Note: Virtual meeting so initials entered electronically)

Name	Department
Sally Garcia	SG
Rorie Skei	RS
Tim Miller	TM
Cara Meyer	CM
Carolyn Harshman	CH

Emergency Planning Consultants

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Part I: PLANNING PROCESS

Introduction

Q&A | ELEMENT A: PLANNING PROCESS | A1b.
Q: Does the plan list the jurisdiction(s) participating in the plan that are seeking approval? (Requirement §201.6(c)(1)) **A:** See **Introduction** below.

The Hazard Mitigation Plan (Mitigation Plan) was prepared in response to the Disaster Mitigation Act of 2000 (DMA 2000). DMA 2000 (also known as Public Law 106-390) requires state and local governments (including special districts and joint powers authorities) to prepare mitigation plans to document their mitigation planning process, and identify hazards, potential losses, mitigation needs, goals, and strategies. This type of planning supplements Mountain Recreation and Conservation Authority's emergency management planning programs. This is the agency's first hazard mitigation plan.

Planning Approach

The four-step planning approach outlined in the FEMA publication, *Developing the Mitigation Plan: Identifying Mitigation Actions and Implementing Strategies* (FEMA 386-3) was used to develop this plan:

- ✓ **Develop mitigation goals and objectives -** The risk assessment (hazard characteristics, inventory, and findings), along with municipal policy documents, were utilized to develop mitigation goals and objectives.
- ✓ **Identify and prioritize mitigation actions -** Based on the risk assessment, goals and objectives, existing literature/resources, and input from participating entities, mitigation activities were identified for each hazard.
- ✓ **Prepare implementation strategy -** Generally, high priority activities are recommended for implementation first. However, based on organizational needs and goals, project costs, and available funding, some medium or low priority activities may be implemented before some high priority items.
- ✓ **Document mitigation planning process -** The mitigation planning process is documented throughout this plan.

Q&A | ELEMENT A: PLANNING PROCESS | A3
Q: Does the plan document how the public was involved in the planning process during the drafting stage? (Requirement §201.6(b)(1)) **A:** See **Stakeholders** below.

Stakeholders

The Hazard Mitigation Planning Team (Planning Team) consisting of MRCA staff worked with Emergency Planning Consultants to create the hazard mitigation plan. **The Planning Team served as the primary stakeholders throughout the planning process.**

As required by DMA 2000, the Planning Team involved "the public". The secondary stakeholders (general public and external agencies) were invited to contribute to the mitigation plan during the plan writing phase. Emails were distributed to external agencies on _______________ containing a link to the Second Draft Plan's web posting. The general public was informed of the Plan's writing through social media posts, announcements at the Santa Monica Mountains Conservancy (SMMC) Board meeting on February 22, 2021, and the MRCA Board meeting on February 3, 2021. The Second Draft Plan was posted on the MRCA website on ______________. The emails and public noticing established a due date of _____________________. See **Attachment: Secondary Stakeholder Input Solicitation** for the sample email and public notification.

The general public and external agencies served as secondary stakeholders with opportunity to contribute to the plan during the Plan Writing Phase of the planning process.

Q&A | ELEMENT C. MITIGATION STRATEGY | C2
Q: Does the plan address each jurisdiction's participation in the NFIP and continued compliance with NFIP requirements, as appropriate? (Requirement §201.6(c)(3)(ii)) **A:** See **NFIP Participation** below.

National Flood Insurance Program

Established in 1968, the NFIP provides federally backed flood insurance to homeowners, renters, and businesses in communities that adopt and enforce floodplain management ordinances to reduce future flood damage.

NFIP Participation

MRCA does not control land use development so is not eligible for participation in NFIP. See **Flood Hazard Section** for general information on flood hazards impacting the Authority.

Q&A | ELEMENT B: HAZARD IDENTIFICATION AND RISK ASSESSMENT | B4
Q: Does the Plan address NFIP insured structures within the jurisdiction that have been repetitively damaged by floods? (Requirement §201.6(c)(2)(ii)) **A:** See **Repetitive Loss Properties** below.

Repetitive Loss Properties

Repetitive Loss Properties (RLPs) are most susceptible to flood damages; therefore, they have been the focus of flood hazard mitigation programs. Unlike a Countywide program, the Floodplain Management Plan (FMP) for repetitive loss properties involves highly diversified property profiles, drainage issues, and property owner's interest. It also requires public involvement processes unique to each RLP area. The objective of an FMP is to provide specific potential mitigation measures and activities to best address the problems and needs of communities with repetitive loss properties. A repetitive loss property is one for which two or more claims of $1,000 or more have been paid by the National Flood Insurance Program (NFIP) within any given ten-year period. According to FEMA resources, none of the MRCA facility locations are designated as a Repetitive Loss Property (RLPs).

Planning Process

Throughout the project, the Planning Team served as the primary stakeholders while also making a concerted effort to gather information from the general public, external agencies (joint powers authority jurisdictions, utility providers, and special districts). In addition, the Planning Team solicited information from agencies and people with specific knowledge of hazards and past historical events, as well as building codes and facilities maintenance planning. The hazard mitigation strategies contained in this plan were developed through an extensive planning process involving MRCA staff, general public, and external agencies.

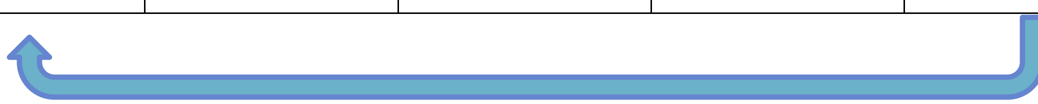
Following review and input by the Planning Team to the First Draft Plan, next (still during the Plan Writing Phase), the Second Draft Plan was shared with the general public and external agencies (joint powers authority jurisdictions, utility providers, special districts, etc.). The general public and external agencies served as the secondary stakeholders. Next, the comments gathered from the secondary stakeholders were incorporated into a Third Draft Plan which was submitted to Cal OES and FEMA along with a request for a determination of “approval pending adoption”.

Next, the Planning Team completed amendments to the Plan to reflect mandated input by Cal OES and FEMA. The Final Draft Plan was then posted in advance of MRCA’s Governing Board public meeting. Any comments gathered were included in the staff report to the MRCA Governing Board. Following adoption by the Board, proof of adoption was forwarded to FEMA with a request for approval. The FEMA Letter of Approval was included in the Final Plan. The planning process described above is portrayed below in a progression:

Q&A | ELEMENT A: PLANNING PROCESS | A1a.
Q: Does the plan document the planning process, including how it was prepared (with a narrative description, meeting minutes, sign-in sheets, or another method)? (Requirement §201.6(c)(1)) **A:** See **Plan Methodology and Planning Phases Progression** below.
Q&A | ELEMENT A: PLANNING PROCESS | A3
Q: Does the plan document how the public was involved in the planning process during the drafting stage? (Requirement §201.6(b)(1)) **A:** See **Planning Phases Progression** below.

Figure: Planning Phases Progression

PLANNING PHASES PROGRESSION				
Plan Writing Phase (First & Second Draft Plan)	**Plan Review Phase (Third Draft Plan)**	**Plan Adoption Phase (Final Draft Plan)**	**Plan Approval Phase (Final Plan)**	**Plan Implementation Phase**
• Planning Team input – research, meetings, writing, review of First Draft Plan • Incorporate input from the Planning Team into Second Draft Plan • Invite public and external agencies via email and web posting to provide input to the Second Draft Plan • Incorporate input into the Third Draft Plan	• Third Draft Plan sent to Cal OES and FEMA for approval pending adoption • Address any mandated revisions identified by Cal OES and FEMA into Final Draft Plan	• Post public notice of Governing Board meeting along with the Final Draft Plan • Final Draft Plan distributed to Board in advance of meeting • Present Final Draft Plan to the Board for adoption • Board adopts Plan	• Submit Proof of Adoption to FEMA with request for final approval • Receive FEMA Letter of Approval • Incorporate FEMA approval and Board's resolution into the Final Plan	• Conduct biannual Planning Team meetings • Integrate mitigation action items into budget and other funding and strategic documents



Q&A | ELEMENT E: PLAN ADOPTION | E1
Q: Does the plan include documentation that the plan has been formally adopted by the governing body of the jurisdiction requesting approval? (Requirement §201.6(c)(5))
A: See **Plan Adoption Process** below.

Plan Adoption Process

Adoption of the plan by the local governing body demonstrates MRCA's commitment to meeting mitigation goals and objectives. Governing body approval legitimizes the plan and authorizes responsible agencies to execute their responsibilities.

The Third Draft Plan was submitted to Cal OES and FEMA for review and approval. FEMA issued an Approval Pending Adoption on ____________ requiring the adoption of the Plan by the MRCA Governing Board. The adoption resolution was submitted to FEMA along with a request for a FEMA Letter of Approval.

In preparation for the public meeting with the Governing Board, the Planning Team prepared a Staff Report including an overview of the Planning Process, Risk Assessment, Mitigation Goals, and Mitigation Actions. The staff presentation concluded with a summary of the input received during the public review of the document. The meeting participants were encouraged to present their views and make suggestions on possible mitigation actions.

The Governing Board heard the item on ___________. The Board voted to adopt the hazard mitigation plan. The Resolution of adoption is located in the **Attachments: Governing Board Resolution**.

Plan Approval

FEMA approved the Plan on ____________________. A copy of the FEMA Letter of Approval is in the **Attachments: FEMA Letter of Approval**.

Plan Methodology

The Planning Team discussed knowledge of hazards and past historical events, as well as building codes and facilities maintenance plans.

The rest of this section describes the mitigation planning process including 1) Planning Team involvement, 2) general public and external agency involvement; and 3) integration of existing data and plans.

Q&A | ELEMENT A: PLANNING PROCESS | A1a.
Q: Does the plan document the planning process, including how it was prepared (with a narrative description, meeting minutes, sign-in sheets, or another method)? (Requirement §201.6(c)(1)) **A:** See **Planning Team Involvement** below.

Planning Team Involvement

The Planning Team consisted of representatives from different MRCA departments with a role in hazard mitigation processes. The Planning Team served as the primary stakeholders throughout the planning process. The general public and external agencies served as secondary stakeholders in the planning process. The Planning Team was responsible for the following tasks:

- ✓ Confirming planning goals
- ✓ Prepare timeline for plan update
- ✓ Ensure plan meets DMA 2000 requirements
- ✓ Organize and solicit involvement of public and external agencies
- ✓ Analyze existing data and reports
- ✓ Update hazard information
- ✓ Review HAZUS loss projection estimates
- ✓ Update status of Mitigation Action Items
- ✓ Develop new Mitigation Action Items
- ✓ Participate in Planning Team meetings and Governing Board public meeting
- ✓ Provide existing resources including maps and data

The Planning Team, with assistance from Emergency Planning Consultants, identified and profiled hazards; determined hazard rankings; estimated potential exposure or losses; evaluated development trends and specific risks; and developed mitigation goals and action items.

Table: Planning Team Level of Participation

Name	Risk Assessment	Plan Research and Writing	Planning Team Meeting 1: September 16, 2020	Planning Team Meeting 2: October 2, 2020	Planning Team Meeting 3: November 6, 2020	Planning Team Meeting 4: January 19, 2021	First Draft Plan to Planning Team	Community Input - Distribute Second Draft Plan to General Public and External Agencies	Incorporate input from Public, and External Agencies into the Third Draft Plan	Submit Third Draft Plan to Cal OES/FEMA for Approval Pending Adoption	Receive FEMA Approval Pending Adoption	Post Final Draft Plan in Advance of Governing Board meeting	Present Final Draft Plan to Board at Public Meeting for Plan Adoption	Submit Proof of Adoption to FEMA for Final Approval	Receive FEMA Final Approval and Incorporate FEMA Approval into Final Plan
Mountains Recreation and Conservation Authority															
Sally Garcia, Chair		X	X	X	X	X	X								
Rorie Skei		X	X	X	X	X	X								
Tim Miller		X	X	X	X	X	X								
Walt Young		X	X	X	X		X								
Fernando Gomez		X	X	X			X								
Ken Nelson		X	X	X	X		X								
Cara Meyer		X	X	X	X	X	X								
Emergency Planning Consultants															
Carolyn Harshman	X	X	X	X	X	X									
Megan Fritzler	X	X													

Table: Planning Team Timeline

Task	August 2020	September	October	November	December	January 2021	February	March	April	May	June	July	August	September
Risk Assessment	X	X												
Plan Research and Writing	X	X	X	X	X	X	X	X	X	X	X			
Planning Team Meetings		X	X	X		X								
First Draft Plan to Planning Team						X								
Community Input – Distribute Second Draft Plan to General Public and External Agencies							X							
Incorporate input from Second Draft Plan into Third Draft Plan								X						
Submit Third Draft Plan to Cal OES and FEMA for Approval Pending Adoption								X						
Receive FEMA Approval Pending Adoption													X	
Submit Final Draft Plan to Governing Board														X
Provide Proof of Adoption to FEMA														X
FEMA Issues Letter of Approval														X
FEMA Approval Incorporated into Final Plan														X

Q&A | ELEMENT C. MITIGATION STRATEGY | C1a.

Q: Does the plan document each jurisdiction's existing authorities, policies, programs and resources? (Requirement §201.6(c)(3))

A: See **Capability Assessment – Existing Processes and Programs** below.

Capability Assessment – Existing Processes and Programs

MRCA will incorporate mitigation planning as an integral component of daily operations. This will be accomplished by the Planning Team working with their respective departments to integrate mitigation strategies into the planning documents and MRCA's operational guidelines. FEMA identifies four types of capabilities:

- ✓ Planning and Regulatory
- ✓ Administrative and Technical
- ✓ Financial
- ✓ Education and Outreach

The table below includes a broad range of capabilities within the Agency to successfully accomplish mitigation.

Table: Capability Assessment - Existing Processes and Programs
(Source: MRCA Website and Planning Team)

Type of Capability				Name of Capability	Capability Description and Ability to Support Mitigation
Planning & Regulatory	Administrative & Technical	Financial	Education & Outreach		
MRCA Departments					
X	X		X	Construction Division	The Construction Division is responsible for providing construction and building services in a variety of trades, for projects carried out by force account. The Construction team ensures that repairs, replacements, and new construction work is performed to proper code, contributing to safe, clean, well-maintained and functional park facilities for the public. Construction staff are "boots on the ground" who witness the results of deferred maintenance and hazard-related damages to buildings and infrastructure. This information is of great importance to any priority changes or updates to the HMP. Additionally, Construction staff have experience with a variety of MRCA facilities and frequently interface with the general public. This provides opportunities to demonstrate and explain activities and best practices that help to minimize threats associated with hazards.
X	X	X	X	Planning and Park Development Divisions	The Planning and Park Development Divisions are responsible for planning, managing and carrying out improvement capital improvement and land acquisition projects, and managing long-range planning efforts such as the HMP. Working closely with licensed consultants, these divisions develop detailed plans and specifications that meet regulatory requirements. Some mitigation action items from the HMP can be incorporated into existing capital projects. These staff also apply for competitive grants for new projects such as the mitigation action items. These staff can share new mitigation-related building standards with the HMP Planning Team for inclusion in future updates to the plan. Most projects incorporate community outreach and public awareness efforts, which can emphasize activities that help to minimize threats associated with hazards.
	X		X	Operations Division	The Operations Division of MRCA includes both maintenance personnel and Ranger Services, all dedicated to carrying out the mission of MRCA and providing public safety through law enforcement. The team provides safe, clean, well-maintained and functional park facilities for the public. Operations and Ranger staff are the "boots on the ground" who witness the results of deferred maintenance and hazard-related damages to the buildings and infrastructure. They also have experience as first responders. This information is of great importance to any priority changes or updates to the HMP. Additionally, Operations staff interface with each of the MRCA facilities and with that comes opportunity to "teach by

Type of Capability				Name of Capability	Capability Description and Ability to Support Mitigation
Planning & Regulatory	Administrative & Technical	Financial	Education & Outreach		
					showing" activities that help to minimize threats associated with hazards.
	X		X	Developed Resources Division	The Developed Resources Division of MRCA is responsible for the operations and maintenance of our largest and most developed parklands. This includes the majority of structures owned by the agency. Developed Resources provides safe, clean, well-maintained and functional park facilities for the public. Like Operations, the DR staff are the "boots on the ground" who witness the results of deferred maintenance and hazard-related damages to the buildings and infrastructure. This information is of great importance to any priority changes or updates to the HMP. Additionally, DR staff interface with the most frequently-visited MRCA facilities and have ample opportunities to demonstrate to the public activities that help to minimize threats associated with hazards.
X	X		X	Fire Division	The Fire Division will participate in HMP implementation by carrying out some of the mitigation action items in the plan. They also provide fire suppression/prevention services. Fire Division staff frequently interface with the general public and have the opportunity to demonstrate activities that help to minimize threats associated with hazards.
X	X		X	Legal Division	The Legal Division's responsibilities include risk management and the safety of employees and public visitors to MRCA parklands. Legal staff is an essential part of the MRCA team to identify and mitigate risks, recommending steps to eliminate the risk if possible or manage its effects. Legal staff also develop safety programming policies and procedures to minimize risk whenever or wherever possible, and are responsible for obtaining insurance to reduce the financial losses from claims that cannot be prevented. Their daily focus on these topics will be helpful to the Planning Team during HMP implementation.
	X	X		Finance Division	The purpose of MRCA's Finance Division is to provide the support and infrastructure needed to carry out MRCA's mission. Finance addresses a wide range of issues and long-term budget outlooks, and will be instrumental in monitoring availability of grants and other funding sources to help implement the HMP.
	X		X	Administration Division	Staff in the Administration Division include a social media coordinator and receptionists that frequently interface with the general public. These staff have frequent opportunities to explain ongoing hazard mitigations and activities that help to minimize threats associated with hazards. They also will support updates to the HMP.
X	X	X	X	Annual Budget	The Annual Budget and its associated review and approval process provides opportunities to explain tasks, priorities, and spending allocations for the projects, programs, and equipment supporting the

Type of Capability				Name of Capability	Capability Description and Ability to Support Mitigation
Planning & Regulatory	Administrative & Technical	Financial	Education & Outreach		
					efforts of MRCA. Some of the ongoing mitigation items in the plan are supported through the Annual Budget.
X	X	X	X	Capital Asset Maintenance Plan	The CAMP is a long-range planning effort to inventory MRCA's facilities and amenities and plan for replacements based on expected life cycles. Many of the mitigation action items in the plan will be added to the CAMP which will help to ensure the implementation of the HMP. (Note: Funding expected during 2021)
		X		Reserve Funds	Reserve Funds for Equipment Replacement, Capital Asset Improvements, Fire Prevention and Vegetation Management, and Capital Asset Deferred Maintenance provide opportunities to fund the projects, programs and equipment supporting the efforts of MRCA. Some of the mitigation items in the plan could be supported through Reserve Funds upon approval by the Governing Board. (Note: Funding expected during 2021)
External Agencies					
X	X		X	City and County Public Safety	Within the MRCA service area there are 2 layers of local governments providing law enforcement and fire suppression/prevention: cities and counties. Each of these agencies provide technical expertise in a variety of public safety subject areas along with knowledge of regulatory requirements. Also, each maintains robust capabilities for education and outreach through a variety of venues and mediums.
X	X	X	X	Santa Monica Mountains National Recreation Area partners	Lands within the Santa Monica Mountains National Recreation Area are jointly and cooperatively managed by MRCA, the Santa Monica Mountains Conservancy, National Park Service, and California State Parks. Each agency provides technical expertise in a variety of areas along with day-to-day operations of public lands. NPS and CSP maintain education and outreach capabilities. Some past projects and land acquisition have been jointly funded and this remains a possibility for future efforts.
			X	Community Nature Connection	This non-profit organization provides public interpretation and education programs in MRCA-managed parks.

Q&A | ELEMENT A: PLANNING PROCESS | A4
Q: Does the plan describe the review and incorporation of existing plans, studies, reports, and technical information? (Requirement §201.6(b)(3))   **A:** See **Use of Existing Data** below.

Use of Existing Data

The Planning Team gathered and reviewed existing data and plans during plan writing and specifically noted as "sources". Numerous electronic and hard copy documents were used to support the planning process:

MRCA Website
https://mrca.ca.gov/
Applicable Incorporation: Departments Information, Project Area Maps, Location and Environment

County of Los Angeles General Plan (2015)
http://planning.lacounty.gov/assets/upl/project/gp_final-general-plan.pdf
Applicable Incorporation: Information about the planning area and geography Maps

County of Los Angeles All-Hazards Mitigation Plan (2019)
http://file.lacounty.gov/SDSInter/lac/1062614_AHMPPublicDraft_Oct1.pdf
Applicable Incorporation: Information about hazards in the County contributed to the hazard-specific sections in the MRCA Hazard Mitigation Plan and Previous Occurrences.

Los Angeles County Repetitive Loss Area Analysis (2016)
https://dpw.lacounty.gov/WMD/NFIP/FMP/documents/Repetitive%20Loss%20Area%20Analysis.pdf
Applicable Incorporation: Repetitive Loss Information

Ventura County General Plan (2013)
https://vcrma.org/ventura-county-general-plan
Applicable Incorporation: Information about hazards in the County contributed to the hazard-specific sections in the MRCA Hazard Mitigation Plan and Previous Occurrences.

Ventura County Multi-Hazard Mitigation Plan (2015)
http://www.vcfloodinfo.com/pdf/2015%20Ventura%20County%20Multi-Hazard%20Mitigation%20Plan%20and%20Appendices.pdf
Applicable Incorporation: Information about hazards in the County contributed to the hazard-specific sections in the MRCA Hazard Mitigation Plan and Previous Occurrences.

Ventura County General Plan 2040
https://vc2040.org/review/documents
Applicable Incorporation: Information about hazards in the County contributed to the hazard-specific sections in the MRCA Hazard Mitigation Plan and Previous Occurrences

State of California Hazard Mitigation Plan (2018)
https://www.caloes.ca.gov/HazardMitigationSite/Documents/0022018%20SHMP_FINAL_ENTIRE%20PLAN.pdf
Applicable Incorporation: Used to identify hazards posing greatest threat to State.

HAZUS Maps and Reports
Created by Emergency Planning Consultants

Applicable Incorporation: Numerous HAZUS maps and reports have been included for Earthquakes to determine specific risks and impacts to the MRCA

FEMA "How To" Mitigation Series (386-1 to 386-9)
https://www.fema.gov/vi/media-library/collections/6
Applicable Incorporation: Mitigation Measures Categories and 4-Step Planning Process are quoted in the Executive Summary.

National Flood Insurance Program
www.fema.gov/national-flood-insurance-program
Applicable Incorporation: Repetitive Loss Information.

Local Flood Insurance Rate Maps
https://msc.fema.gov/portal/home
Applicable Incorporation: Provided by FEMA and included in Flood Hazard section.

California Department of Forestry and Fire Protection (CAL FIRE)
www.fire.ca.gov
Applicable Incorporation: Wildland fire hazard mapping.

California Department of Conservation
www.conservation.ca.gov/cgs
Applicable Incorporation: Seismic hazards mapping.

U.S. Geological Survey (USGS)
www.usgs.gov
Applicable Incorporation: Earthquake records and statistics.

Using HAZUS for Mitigation Planning (2018)
https://www.fema.gov/media-library-data/1540479624999-ab1eca852448e271f0de82cf2031a01b/Using_Hazus_in_Mitigation_Planning_20180820_Final_508_Compliant.pdf
Applicable Incorporation: HAZUS Information.

California's Fourth Climate Change Assessment: Los Angeles Region Report (2019)
https://www.energy.ca.gov/sites/default/files/2019-07/Reg%20Report-%20SUM-CCCA4-2018-007%20LosAngeles.pdf
Applicable Incorporation: Climate Information.

NOAA National Centers for Environmental Information, Climate at a Glance (2019)
https://www.ncdc.noaa.gov/cag/county/time-series
Applicable Incorporation: Data Image.

County of Los Angeles Public Health, Acute Communicable Disease Control (2019)
https://admin.publichealth.lacounty.gov/acd/WNVData.htm
Applicable Incorporation: Pandemic/Epidemic/Vector Borne Disease Information.

Projected Changes in Ventura County Climate
https://wrcc.dri.edu/Docs/VenturaClimate2019_lores.pdf
Applicable Incorporation: Climate Information

Part II: RISK ASSESSMENT

Project Area Profile

Q&A | ELEMENT B3:
Q: Is there a description of each identified hazard's impact on the community as well as an overall summary of the community's vulnerability for each jurisdiction? (Requirement §201.6(b)(3)) **A:** See **Location and the Environment** below.

Location and the Environment

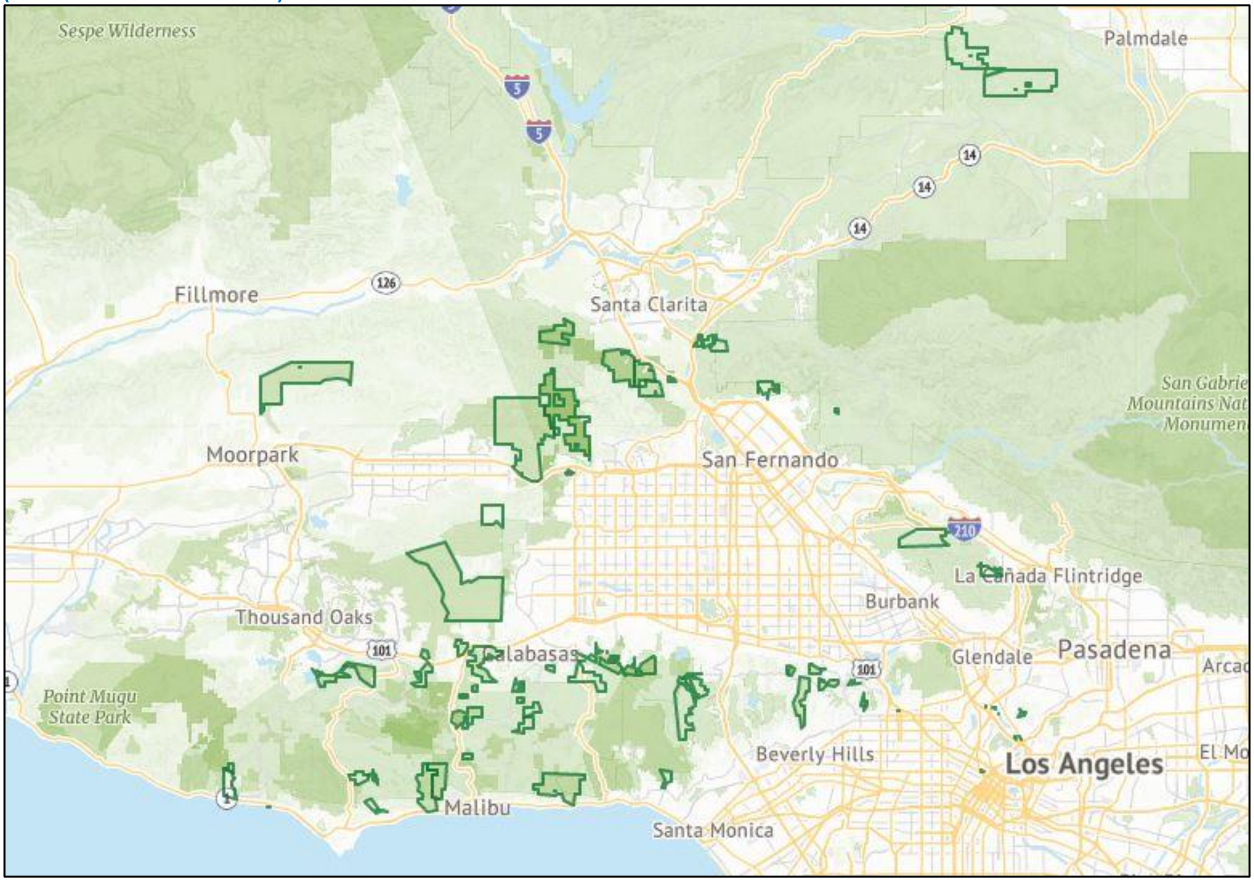
Photo: Wilacre Park
Source: MRCA Website

According to the MRCA website, the MRCA is a local government public entity established in 1985 pursuant to the Joint Powers Act. The MRCA is a partnership between the Santa Monica Mountains Conservancy, which is a state agency established by the Legislature, and the Conejo Recreation and Park District and the Rancho Simi Recreation and Park District both of which are local park agencies established by the vote of the people in those communities.

MRCA manages over 75,000 acres of public parkland and open space that it owns or that is owned by the Santa Monica Mountains Conservancy. The Santa Monica Mountains Conservancy zone covers an area from the edge of the Mojave Desert to the Pacific Ocean. The zone encompasses the whole of the Santa Monica Mountains, the Simi Hills, the Verdugo Mountains and significant portions of the Santa Susana and San Gabriel Mountains.

In addition, the Mountains Recreation and Conservation Authority also owns or manages thousands of acres in the Sierra Pelona Mountains and in the Whittier-Puente Hills. From north to south, these areas drain into the Santa Clara River, Calleguas Creek, numerous smaller coastal watersheds in the Santa Monica Mountains, and the Los Angeles River and Rio Hondo.

Map: MRCA - Managed Parkland
(Source: MRCA Website)



Climate

Los Angeles County

As discussed in the Los Angeles County General Plan 2015, the region is a land of beaches, valleys, mountains, and deserts. Overall, the climate can be characterized as "Mediterranean," with hot, dry summers and mild, wet winters. The diversity of the topography results in localized climate zones that are roughly divided by the Transverse Ranges (Santa Monica Mountains and San Gabriel Mountains). The climate zones are closely tied to geologic landforms and vary based on elevation changes and distance from the ocean. These climate zones can be grouped into three broad categories:

> **Coastal Plain:** The coastal plain includes the beaches, valleys, and canyons that occupy the Los Angeles Basin and terminate at the Transverse Ranges. During the dry season, the determining factor in coastal plain weather is the proximity to the Pacific Ocean and the resultant marine layer. The marine layer acts as a buffer, which is evidenced by relatively cool and constant temperatures, low clouds, fog, and haze. The marine layer settles over the Basin during the evening and early morning before being burned off by sunshine midday. Due to the dominance and stability of the high-pressure area in the Basin, precipitation is rare between May and November.

Mountain: Climates in the mountains are characterized by lower average temperatures and heavier rainfall than in the coastal plain. The Transverse Ranges are further removed from the climatic influences of marine wind patterns and experience the additional influence of altitude.

High Desert: The high desert includes the Antelope Valley, which is the westernmost portion of the Mojave Desert. The high desert is located more than 50 miles inland and is removed from marine influences and experiences a more extreme type of climate. The Transverse Ranges act as a barrier to rain bearing clouds moving inland. In addition, the Antelope Valley is home to several wildlife and wildflower sanctuaries that thrive in the often-inhospitable climate found in the high desert.

Ventura County

According to the Projected Changes in Ventura County Climate (2019), Ventura County features a Mediterranean climate with cool, dry summers at the coast and warm, dry summers inland. Winters are mild and wet; nearly all precipitation falls between October and April. The mountainous terrain is a major factor in the region's climate. Elevations range from sea level in the south to 8847 ft at the top of Mt. Pinos in the Transverse Ranges at the County's northern edge.

Coastal temperatures are moderated year-round by the Pacific Ocean and especially during summer as cold water upwelled near Pt. Conception and Pt. Arguello by prevailing northwesterly winds flows into the Santa Barbara Channel. Marine stratus, commonly referred to as "fog," also plays an important role in regulating temperatures and evaporative demand in the region. In Oxnard, three miles from the coast, temperatures are generally warmer during the winter and cooler during the summer than inland areas, such as Ojai, situated 13 miles inland from the coast.

Risk Assessment

What is a Risk Assessment?

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

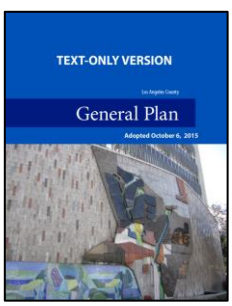
1. *Hazard Identification*
2. *Profiling Hazard Events*
3. *Vulnerability Assessment/Inventory of Existing Assets*
4. *Risk Analysis*
5. *Assessing Vulnerability/Analyzing Development Trends*

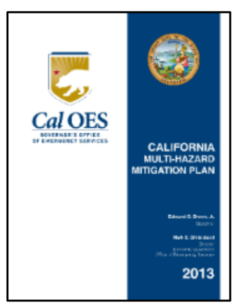
Q&A | ELEMENT B: HAZARD IDENTIFICATION AND RISK ASSESSMENT | B1a.
Q: Does the plan include a general **description** of all natural hazards that can affect each jurisdiction? (Requirement §201.6(c)(2)(i)) **A:** See **Hazard Identification** below.

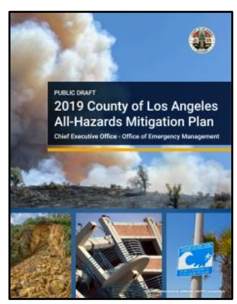
1) Hazard Identification

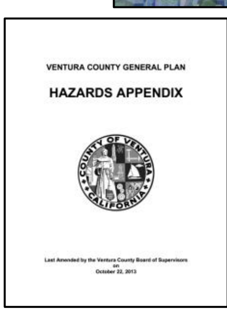
This section is the description of the geographic extent, potential intensity, and the probability of occurrence of a given hazard. Maps are used in this plan to display hazard identification data. ***The MRCA utilized the categorization of hazards as identified in California's State Hazard Mitigation Plan, including: Earthquakes, Floods, Levee Failures, Wildfires, Landslides and Earth Movements, Tsunami, Climate-Related Hazards, Volcanoes, and Other Hazards***.

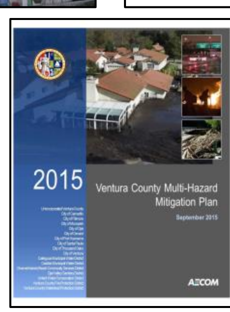
Next, the Planning Team reviewed existing documents to determine which of these hazards posed the most significant threat to the MRCA and its ability to deliver services. In other words, which hazard would likely result in a local declaration of emergency.

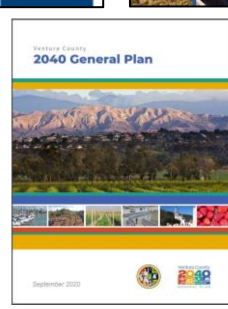


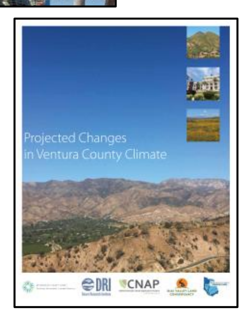












The geographic extent of each of the identified hazards was identified by the Planning Team utilizing maps and data contained on the MRCA website. In addition, numerous internet resources along with the County of Los Angeles General Plan (2015) and All-Hazards Mitigation Plan (2019) and the Ventura County General Plan (2013) and Multi-Hazard Mitigation Plan (2015) were valuable resources. Utilizing the Calculated Priority Risk Index (CPRI) ranking technique, the Planning Team concluded the hazards posing a significant threat against MRCA include: Earthquake, Flood, Wildfire, Extreme Weather, and Epidemic/Pandemic and Vector-Borne Diseases.

The hazard ranking system is described in **Table: Calculated Priority Risk Index**, while the actual ranking is shown in **Table: Calculated Priority Risk Index Ranking for the MRCA.**

Table: Calculated Priority Risk Index
(Source: Federal Emergency Management Agency)

CPRI Category	Degree of Risk			Assigned Weighting Factor
	Level ID	Description	Index Value	
Probability	Unlikely	Extremely rare with no documented history of occurrences or events. Annual probability of less than 1 in 1,000 years.	1	45%
	Possibly	Rare occurrences. Annual probability of between 1 in 100 years and 1 in 1,000 years.	2	
	Likely	Occasional occurrences with at least 2 or more documented historic events. Annual probability of between 1 in 10 years and 1 in 100 years.	3	
	Highly Likely	Frequent events with a well-documented history of occurrence. Annual probability of greater than 1 every year.	4	
Magnitude/ Severity	Negligible	Negligible property damages (less than 5% of critical and non-critical facilities and infrastructure. Injuries or illnesses are treatable with first aid and there are no deaths. Negligible loss of quality of life. Shut down of critical public facilities for less than 24 hours.	1	30%
	Limited	Slight property damage (greater than 5% and less than 25% of critical and non-critical facilities and infrastructure). Injuries or illnesses do not result in permanent disability, and there are no deaths. Moderate loss of quality of life. Shut down of critical public facilities for more than 1 day and less than 1 week.	2	
	Critical	Moderate property damage (greater than 25% and less than 50% of critical and non-critical facilities and infrastructure). Injuries or illnesses result in permanent disability and at least 1 death. Shut down of critical public facilities for more than 1 week and less than 1 month.	3	
	Catastrophic	Severe property damage (greater than 50% of critical and non-critical facilities and infrastructure). Injuries and illnesses result in permanent disability and multiple deaths. Shut down of critical public facilities for more than 1 month.	4	
Warning Time	> 24 hours	Population will receive greater than 24 hours of warning.	1	15%
	12–24 hours	Population will receive between 12-24 hours of warning.	2	
	6-12 hours	Population will receive between 6-12 hours of warning.	3	

	< 6 hours	Population will receive less than 6 hours of warning.	4	
Duration	< 6 hours	Disaster event will last less than 6 hours	1	10%
	< 24 hours	Disaster event will last less than 6-24 hours	2	
	< 1 week	Disaster event will last between 24 hours and 1 week.	3	
	> 1 week	Disaster event will last more than 1 week	4	

Table: Calculated Priority Risk Index Ranking for the MRCA
(Source: Emergency Planning Consultants)

Hazard	Probability	Weighted 45% (x.45)	Magnitude Severity	Weighted 30% (x.3)	Warning Time	Weighted 15% (x.15)	Duration	Weighted 10% (x.1)	CPRI Total
Wildfire	4	1.8	4	1.2	4	0.6	2	0.2	**3.80**
EQ –San Andreas M 7.8	3	1.35	3	0.9	4	0.6	4	0.4	**3.25**
EQ –Sierra Madre 7.2	3	1.35	3	0.9	4	0.6	4	0.4	**3.25**
EQ –Newport-Inglewood 7.2	3	1.35	3	0.9	4	0.6	4	0.4	**3.25**
EQ –Oak Ridge 7.2	3	1.35	3	0.9	4	0.6	4	0.4	**3.25**
Epidemic/Pandemic and Vector-Borne Diseases	3	1.35	4	1.2	1	0.15	4	0.4	**3.10**
Flood	3	1.35	2	0.6	1	0.15	1	0.1	**2.20**
Extreme Weather	3	1.35	1	0.3	1	0.15	1	0.1	**1.90**

2) Profiling Hazard Events

This process describes the causes and characteristics of each hazard and what part of the MRCA facilities, infrastructure, and environment may be vulnerable to each specific hazard. A profile of each hazard discussed in this plan is provided in the MRCA Specific Hazard Analysis. **Table: Vulnerability: Location, Extent, and Probability for the MRCA** indicates a generalized perspective of the community's vulnerability of the various hazards according to extent (or degree), location, and probability.

Q&A | ELEMENT B: HAZARD IDENTIFICATION AND RISK ASSESSMENT | B1b.
Q: Does the plan provide rationale for the omission of any natural hazards that are commonly recognized to affect the jurisdiction(s) in the planning area? (Requirement §201.6(c)(2)(i)) **A:** See **Table: Vulnerability: Location, Extent, and Probability for the MRCA** below.
Q&A | ELEMENT B: HAZARD IDENTIFICATION AND RISK ASSESSMENT | B1c.
Q: Does the plan include a description of the **location** for all natural hazards that can affect each jurisdiction? (Requirement §201.6(c)(2)(i)) **A:** See **Table: Vulnerability: Location, Extent, and Probability for the MRCA** below.
Q&A | ELEMENT B: HAZARD IDENTIFICATION AND RISK ASSESSMENT | B1d.
Q: Does the plan include a description of the **extent** for all natural hazards that can affect each jurisdiction? (Requirement §201.6(c)(2)(i)) **A:** See **Table: Vulnerability: Location, Extent, and Probability for the MRCA** below.
Q&A | ELEMENT B: HAZARD IDENTIFICATION AND RISK ASSESSMENT | B2a.
Q: Does the plan include information on **previous occurrences** of hazard events for each jurisdiction? (Requirement §201.6(c)(2)(i)) **A:** See **Table: Vulnerability: Location, Extent, and Probability for the MRCA** below.
Q&A | ELEMENT B: HAZARD IDENTIFICATION AND RISK ASSESSMENT | B2b.
Q: Does the plan include information on the **probability** of future hazard events for each jurisdiction? (Requirement §201.6(c)(2)(i)) **A:** See **Table: Vulnerability: Location, Extent, and Probability for the MRCA** below.

Table: Vulnerability: Location, Extent, and Probability for the MRCA

Hazard	Location (Where)	Extent (How Big an Event)	Probability (How Often) *	Previous Occurrences
Earthquake	Entire Project Area	The Southern California Earthquake Center (SCEC) in 2007 concluded that there is a 99.7 % probability that an earthquake of M6.7 or greater will hit California within 30 years.[1]	Likely	Los Angeles County: La Habra earthquake on March 28, 2014. Ventura County: Northridge earthquake on January 17, 1994.
Wildfire	Entire Project Area	The project area is susceptible to High or Very High Wildfire Hazard Severity Zone ratings.	Likely	Los Angeles County: Tick Fire in October 2019. Ventura County: Maria Fire in October 2019.
Flood	Entire Project Area to varying degrees	Flood Zone areas subject to inundation, flooding, and flash flooding.	Likely	Los Angeles County: Flash flooding from Winter storms in January 2017. Ventura County: Flash flooding on February 21, 2005.
Extreme Weather	Entire Project Area	Excessive heat and winter storms could lead to severe property damage and interruption to Project Area facilities.	Likely	Los Angeles County: Temperature increases over the past century. Ventura County: Presidential Disaster Declaration for freezing and winter storms in 2007.
Epidemic/Pandemic and Vector-Borne Diseases	Entire Project Area	Impacts would range from mild to severe throughout the Project Area.	Possibly	Los Angeles County and Ventura County: Coronavirus 2020.
* Probability is defined as: Unlikely = 1:1,000 years, Possibly = 1:100-1:1,000 years, Likely = 1:10-1:100 years, Highly Likely = 1:1 year				
[1] Uniform California Earthquake Rupture Forecast				

HAZUS-MH

The hazard maps in the Mitigation Plan were generated by Emergency Planning Consultants using FEMA's Hazards United States – Multi Hazard (HAZUS-MH) software program. Please see **Attachments – HAZUS** for complete reports. Once the location and size of a hypothetical earthquake are identified, HAZUS-MH estimates the intensity of the ground shaking, the number of buildings damaged, the number of casualties, the amount of damage to transportation systems and utilities, the number of people displaced from their homes, and the estimated cost of repair and clean up. It's important to note that the "project are" is based on Census Tracts not jurisdictional boundaries.

As per FEMA's HAZUS Guidebook, HAZUS is a GIS-based software that can be used to estimate potential damage, economic loss, and social impacts from earthquake, flood, tsunami and hurricane wind hazards. The HAZUS software includes nationwide general GIS datasets, and a model for the four natural disasters below. The model results can support the risk assessment piece of mitigation planning.

Graphic: Model Results to Support Risk Assessment for Mitigation Planning
(Source: Using HAZUS for Mitigation Planning, Federal Emergency Management Agency, 2018)

Earthquake model	Estimates damages and losses to buildings, essential facilities, transportation, and utility lifelines from a single scenario or probabilistic earthquake analysis. There are also tools that allow the user to integrate earthquake hazard data generated outside of Hazus into the earthquake model. This model estimates debris generation, shelter requirements, casualties, and fire following an earthquake disaster.
Flood model	Generates flood hazard data using nationwide hydrological datasets. There are also tools that allow the user to integrate flood hazard data generated outside of Hazus software into the flood model. This model estimates the expected levels of damage to infrastructure and buildings. Debris generation and shelter requirements, as well as agricultural losses, can be calculated with this model.
Tsunami model	Can produce analyses that have several pre-tsunami and/or post-tsunami applications. Use of the methodology will generate an estimate of the consequences to a county or region of a "scenario tsunami," i.e., a tsunami with a specified inundation depth, velocity, and location. The resulting "loss estimate" generally will describe the scale and extent of damage and disruption that may result from the scenario tsunami.
Hurricane wind model	Can create the wind hazard data from a historical or real-time event, probabilistic event, or from a user-defined scenario. Estimates of potential damage and economic loss to buildings can then be calculated. The storm surge analysis combines the wind and coastal flood model to simulate storm surge for historical, and manual hurricanes. The model combines the wind and flood losses.

HAZUS is packaged with datasets that include building inventories and infrastructure for the entire United States. Because HAZUS is currently built on GIS technology, the inventory and infrastructure datasets can be mapped and intersected with the hazard information created from the four models.

Following the intersection, HAZUS determines the effects of wind, ground shaking, and water depths on buildings and infrastructure to calculate losses and damages. The outputs and estimates can be used in hazard mitigation planning, emergency response, and planning for recovery and reconstruction.

Losses estimated in HAZUS are based on the accuracy of input data. Basic analysis can be developed using the default data and parameter data provided within HAZUS. Users can conduct more advanced analysis using more accurate data that is specific to the region, hazard, population, etc. User-supplied data improves the accuracy of inventories and/or parameters.

Advanced-level analyses may also incorporate data from third-party studies. The user must determine the appropriate level of analysis to meet the user's needs and resources.

HAZUS analysis can be performed at three different levels:

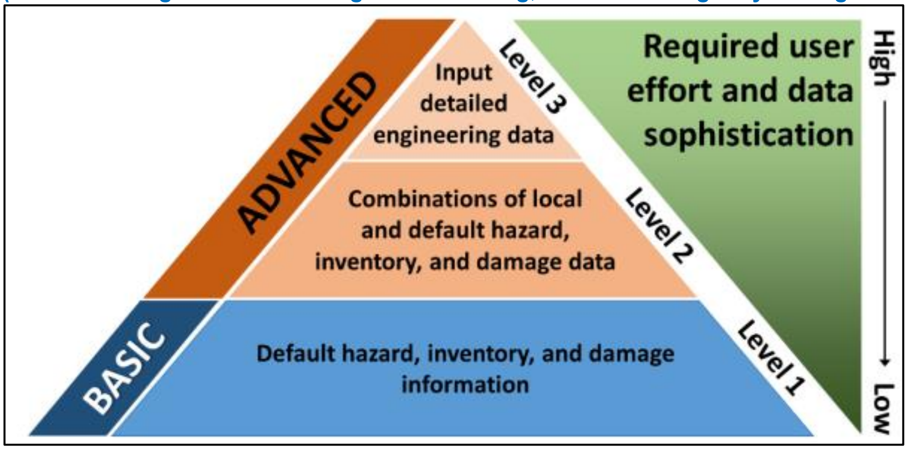
- A Level 1 basic analysis can be performed simply using the default data provided. This level of analysis is very coarse, and because the results will be subject to a much higher level of uncertainty, this should serve primarily as a baseline for further study. The user will still be able to produce basic maps and results. Limited additional data will be required to complete the flood analysis. Site specific input data produces more accuracy in vulnerability identification and loss estimation amounts. If the data is available, it is highly recommended that a user integrate site specific data to reduce uncertainty associated with the results of default data. Using a user defined depth grid, in the flood model, against default state data is classified as a level 1 analysis and is the recommendation of HAZUS Program.

- A Level 2 advanced analysis increases the accuracy and precision of an analysis by incorporating user-supplied data relevant to a given hazard. While the data included with the HAZUS software can be utilized to run a basic level one analysis, level two inputs are supplied by local sources and contain a higher level of detail. This can include datasets that model the hazards in more detail, or datasets that increase the accuracy of the inventory information. Incorporating more detailed data will improve the quality of the results. Level 2 is broadly defined as the incorporation of user-defined hazard and updated GBS or site-specific data.

- A Level 3 advanced analysis achieves the highest degree of precision and involves modifying or substituting the model parameters and/or equations, relevant to a given hazard. Users can modify inputs depending on the time and resources available. Keeping track of the data used is suggested so that any relationships between input and results is documented. It is usually done by advanced users experienced with both the hazard and the HAZUS software.

FEMA's Natural Hazard Risk Assessment Program (NHRAP) encourages users to conduct Level 2 or 3 analyses to improve the accuracy of results and recommends the use of user defined data (e.g., depth grids for all flood analysis) for mitigation planning.

Graphic: HAZUS Analysis Levels
(Source: Using HAZUS for Mitigation Planning, Federal Emergency Management Agency, 2018)



HAZUS creates credible estimates for losses and damages; datasets created on the local level typically provide greater detail than the datasets that are packaged with HAZUS (Level 1). Incorporating local datasets into the analysis will improve the results.

HAZUS Outputs

The user plays a major role in selecting the scope and nature of the output of a HAZUS analysis. A variety of maps can be generated for visualizing the extent of the losses. Numerical results may be examined at the level of the census block or tract or may be aggregated by county or region. There are three main categories of HAZUS outputs: direct physical damage, induced damage, and direct losses. Direct physical damage includes general building stock (GBS), essential facilities, high potential loss facilities, transportation systems, utility systems, and user defined facilities. Induced damage includes building debris, tree debris generation and fire following disaster occurrence. Direct losses include losses for buildings, contents, inventory, income, crop damage, vehicle loss, injuries, casualties, sheltering needs and displaced households.

Graphic: HAZUS Outputs
(Source: Using HAZUS for Mitigation Planning, Federal Emergency Management Agency, 2018)

Hazus Capabilities	Earthquake Ground Shaking Ground Failure	Flood Frequency | Depth Riverine | Coastal Surge	Hurricane Wind | Surge	Tsunami Depth | Momentum Flux | Runup | Velocity
Inputs				
Historic	✓		✓	
Deterministic	✓	✓	✓	✓
Probabilistic	✓	✓	✓	
User-supplied	✓	✓	✓	✓
Other supported inputs	Real-time & scenario USGS ShakeMaps	Risk MAP, User-supplied depth grids (ArcGRID, GeoTIFF, IMAGINE), HEC-RAS (.FLT)	Hurrevac, User-supplied wind files (.dat)	NOAA PMEL SIFT, State models
Direct Damage				
General Building Stock	✓	✓	✓	✓
Essential Facilities	✓	✓	✓	
Transportation Systems	✓	✓		
Utility Systems	✓	✓		
User-Defined Facilities	✓	✓	✓	✓
Induced Damage				
Fire Following	✓			
Debris Generation	✓	✓	✓	
Direct Losses				
Cost of Repair	✓	✓	✓	✓
Income Loss	✓	✓	✓	✓
Agricultural		✓		
Casualties	✓			✓
Shelter and/or Evacuation Needs	✓	✓	✓	✓
Average Annualized Loss (AAL)	✓	✓	✓	

3) Vulnerability Assessment/Inventory of Existing Assets

A Vulnerability Assessment in its simplest form is a simultaneous look at the geographical location of hazards and an inventory of the underlying land uses (populations, structures, etc.). Facilities that provide critical and essential services following a major emergency are of particular concern because these locations house staff and equipment necessary to provide important public safety, emergency response, and/or disaster recovery functions.

Q&A | ELEMENT B: HAZARD IDENTIFICATION AND RISK ASSESSMENT | B3b.
Q: Is there a description of each identified hazard's overall **vulnerability** (structures, systems, populations, or other community assets defined by the community that are identified as being susceptible to damage and loss from hazard events) for each jurisdiction? (Requirement §201.6(c)(2)(ii)) **A:** See **Critical Facilities** below.

Critical Facilities

FEMA separates critical buildings and facilities into the five categories shown below based on their loss potential. All of the following elements are considered critical facilities:

Essential Facilities are essential to the health and welfare of the whole population and are especially important following hazard events. Essential facilities include hospitals and other medical facilities, police and fire stations, emergency operations centers and evacuation shelters, and schools.

Transportation Systems include airways – airports, heliports; highways – bridges, tunnels, roadbeds, overpasses, transfer centers; railways – trackage, tunnels, bridges, rail yards, depots; and waterways – canals, locks, seaports, ferries, harbors, drydocks, piers.

Lifeline Utility Systems such as potable water, wastewater, oil, natural gas, electric power and communication systems.

High Potential Loss Facilities are facilities that would have a high loss associated with them, such as nuclear power plants, dams, and military installations.

Hazardous Material Facilities include facilities housing industrial/hazardous materials, such as corrosives, explosives, flammable materials, radioactive materials, and toxins.

Table: Critical Facilities Vulnerable to Hazards below illustrates the hazards with potential to impact critical facilities owned by or providing services to the MRCA.

Table: Critical Facilities Vulnerable to Hazards
(Source: MRCA Planning Team)

MRCA Assets	Earthquakes	Flood	Wildfire	Extreme Weather	Epidemic/Pandemic and Vector Borne
King Gillette Ranch 26800 West Mulholland Highway, Calabasas	X	X	X	X	X
Los Angeles River Center and Gardens 570 W Avenue 26, Los Angeles	X	X			X
Franklin Canyon Park 2600 Franklin Canyon Drive, Beverly Hills	X		X		X
Temescal Gateway Park 156001 Sunset Boulevard, Pacific Palisades	X	X	X		X
Ramirez Canyon Park 5750 Ramirez Canyon Road, Malibu	X	X	X		X
Upper Las Virgenes Canyon Open Space Preserve Western end of Victory Boulevard, Woodland Hills	X		X	X	X
Ed Davis Park in Towsley Canyon 24335 The Old Road, Newhall	X	X	X	X	X
Mentryville 27201 Pico Canyon Road, Stevenson Ranch	X	X	X		X
Vista Hermosa Natural Park 100 N. Toluca Street, Los Angeles	X				X
San Vicente Mountain Park 17500 Mulholland Drive, Encino	X		X	X	X
Lewis MacAdams Riverfront Park 2999 Rosanna Street, Los Angeles	X	X	X		X
Sage Ranch Park 1 Black Canyon Road, Simi Valley	X		X	X	X
Red Rock Canyon Park 23601 W. Red Rock Road, Old Topanga	X	X	X		X

Earthquake Hazards

Hazard Definition

Photo: Soft Story Building Collapse at Northridge, California, Source: FEMA Photo Library

An earthquake is a sudden motion or trembling that is caused by a release of strain accumulated within or along the edge of the Earth's tectonic plates. The effects of an earthquake can be felt far beyond the site of its occurrence. They usually occur without warning and, after just a few seconds, can cause massive damage and extensive casualties. Common effects of earthquakes are ground motion and shaking, surface fault ruptures, and ground failure.

Photo: Portable Seismic Station
Source: USGS

One tool used to describe earthquake intensity is the Magnitude Scale. The Magnitude Scale is sometimes referred to as the Richter Scale. The two are similar but not exactly the same. The Magnitude Scale was devised as a means of rating earthquake strength and is an indirect measure of seismic energy released. The Scale is logarithmic with each one-point increase corresponding to a 10-fold increase in the amplitude of the seismic shock waves generated by the earthquake. In terms of actual energy released, however, each one-point increase on the Richter scale corresponds to about a 32-fold increase in energy released. Therefore, a Magnitude 7 (M7) earthquake is 100 times (10 X 10) more powerful than a M5 earthquake and releases 1,024 times (32 X 32) the energy.

Q&A | ELEMENT B: HAZARD IDENTIFICATION AND RISK ASSESSMENT | B2a.
Q: Does the plan include information on **previous occurrences** of hazard events for each jurisdiction? (Requirement §201.6(c)(2)(i))
A: See **Previous Occurrences of Earthquakes in MRCA** below.

Previous Occurrences of Earthquakes in MRCA

The most recent significant earthquake to impact MRCA was the La Habra earthquake on March 28, 2014. The earthquake hit 1 mile east of La Habra at 9:09pm with a depth of 4.6 miles. It resulted in isolated power outages and $10 million in damages. According to the County of Los Angeles All-Hazards Mitigation Plan (2019), significant earthquakes in the county over the past 50 years include the following:

Table: Earthquakes Impacting MRCA in Los Angeles County
(Source: County of Los Angeles All-Hazards Mitigation Plan, 2019)

Date	Location	Impact
March 28, 2014	La Habra (M 5.1)	few injuries and $10 million dollars in damages
July 29, 2008	Chino Hills (M 5.5)	8 injuries and limited damages
January 17, 1994	Northridge (M 6.7)	57 deaths, 8,700 injuries and up to $40 billion dollars in damages
June 28, 1991	Sierra Madre (M 5.6)	1 death, 100+ injuries and up to $40 million dollars in damages
February 28, 1990	Upland (M 5.7)	30 injuries and $12.7 million dollars in damages
October 1, 1987	Whitter (M 5.9)	8 deaths, 200 injuries and $358 million in damages
February 9, 1971	San Fernando (M 6.6)	58 – 65 deaths, 200 – 2,000 injuries and up to $553 million in damages

The most recent significant earthquake to affect MRCA in Ventura County was the Northridge earthquake on January 17, 1994. This blind thrust earthquake occurred along the Northridge thrust fault. It was the strongest earthquake instrumentally recorded in an urban setting in North America and caused parking structures, apartments, office buildings, and sections of freeways to collapse. Approximately 25,000 dwellings were rendered uninhabitable. Total damage exceeded $44 billion. The incident resulted in 51 deaths. According to the Ventura County Multi-Hazard Mitigation Plan (2015), damaging earthquakes occurred in the County in 1950 (north of Ojai), 1957 (Hueneme), 1963 (Camarillo), and 1973 (Point Mugu). The three most recent events in the table below:

Table: Earthquakes Impacting MRCA in Ventura County
(Source: County of Los Angeles All-Hazards Mitigation Plan, 2019)

Date	Location	Impact
January 17, 1994	Northridge (M 6.7)	51 deaths and total damage exceeded $44 billion
February 21, 1973	Point Mugu (M5.3)	5 injuries and more than $1 million damage in the Point Mugu–Oxnard area
February 9, 1971	San Fernando (M 6.6)	58 – 65 deaths, 200 – 2,000 injuries and up to $553 million in damages

Photo: Northern end of rupture resulting from the M7.1 Searles Valley quake
Source: Ryan Gold, USGS

Q&A | ELEMENT B: HAZARD IDENTIFICATION AND RISK ASSESSMENT | B1a.
Q: Does the plan include a general **description** of all natural hazards that can affect each jurisdiction? (Requirement §201.6(c)(2)(i)) **A:** See **Regional Conditions** below.
Q&A | ELEMENT B: HAZARD IDENTIFICATION AND RISK ASSESSMENT | B3b.
Q: Is there a description of each identified hazard's overall **vulnerability** (structures, systems, populations, or other community assets defined by the community that are identified as being susceptible to damage and loss from hazard events) for each jurisdiction? (Requirement §201.6(c)(2)(ii)) **A:** See **Regional Conditions** below.

Regional Conditions

According to the County of Los Angeles All-Hazards Mitigation Plan (2019), the county is susceptible to 3,041.91 (63.90%) square miles with violent low frequency shaking potential; and 711.01 square miles (14.93%) with extreme low frequency shaking potential. In unincorporated areas of Los Angeles County, there are 1,783.57 (58.65%) square miles with violent low frequency shaking potential; and 527.60 square miles (17.35%) with extreme low frequency shaking potential.

Violent perceived shaking can produce the potential for heavy damage. According to the USGS, this could mean that well-designed framed structures could be thrown out of plumb and substantial buildings could experience partial building collapse. In extreme shaking, the USGS notes that some well-built wooden structures could be destroyed, and most masonry and frame structures with foundations could be destroyed.

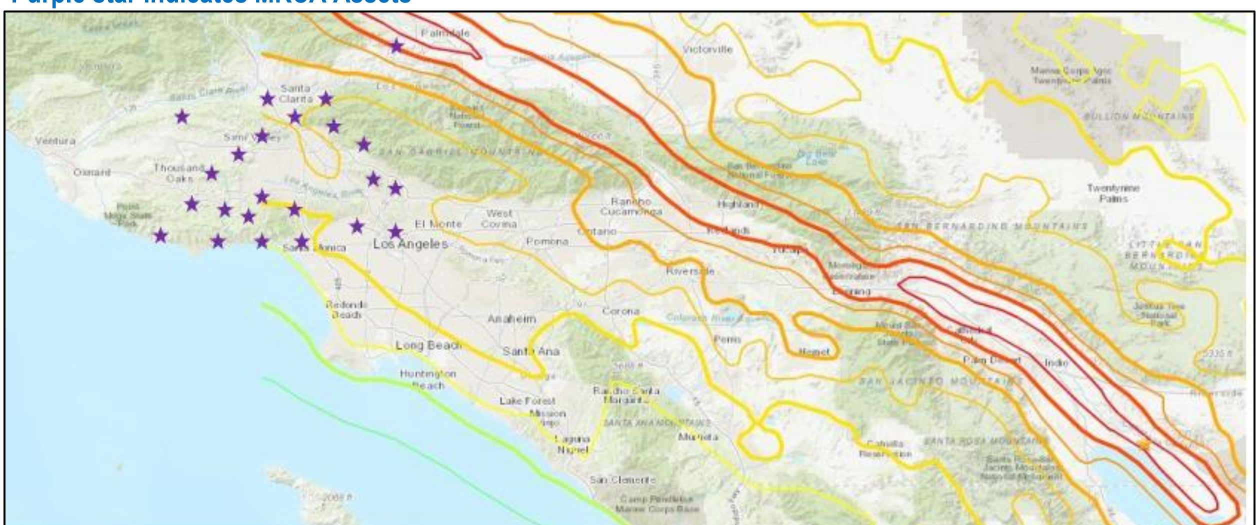
According to the Ventura County Multi-Hazard Mitigation Plan (2015), recent reports from scientists of the U.S. Geological Survey and the Southern California Earthquake Center say that the Los Angeles Area could expect one earthquake every year of magnitude 5.0 or more for the foreseeable future. A major earthquake occurring in or near this jurisdiction may cause many deaths and casualties, extensive property damage, fires and hazardous material spills and other ensuing hazards. The effects could be aggravated by aftershocks and by the secondary affects of fire, hazardous material/chemical accidents and possible failure of the waterways and dams.

The time of day and season of the year would have a profound effect on the number of dead and injured and the amount of property damage sustained. Such an earthquake would be catastrophic in its affect upon the population and could exceed the response capabilities of the individual cities, Los Angeles County Operational Area and the State of California Emergency Services. Damage control and disaster relief support would be required from other local governmental and private organizations, and from the state and federal governments.

San Andreas Fault Zone

The San Andreas Fault Zone potentially has a strong effect on the Project Area. This fault zone extends from the Gulf of California northward to the Cape Mendocino area where it continues northward along the ocean floor. The total length of the San Andreas Fault Zone is approximately 750 miles. The activity of the fault has been recorded during historic events, including the 1906 (M8.0) event in San Francisco and the 1857 (M7.9) event between Cholame and San Bernardino, where at least 250 miles of surface rupture occurred. These seismic events are among the most significant earthquakes in California history. Geologic evidence suggests that the San Andreas Fault has a 50 percent chance of producing a magnitude 7.5 to 8.5 quake (comparable to the great San Francisco earthquake of 1906) within the next 30 years.

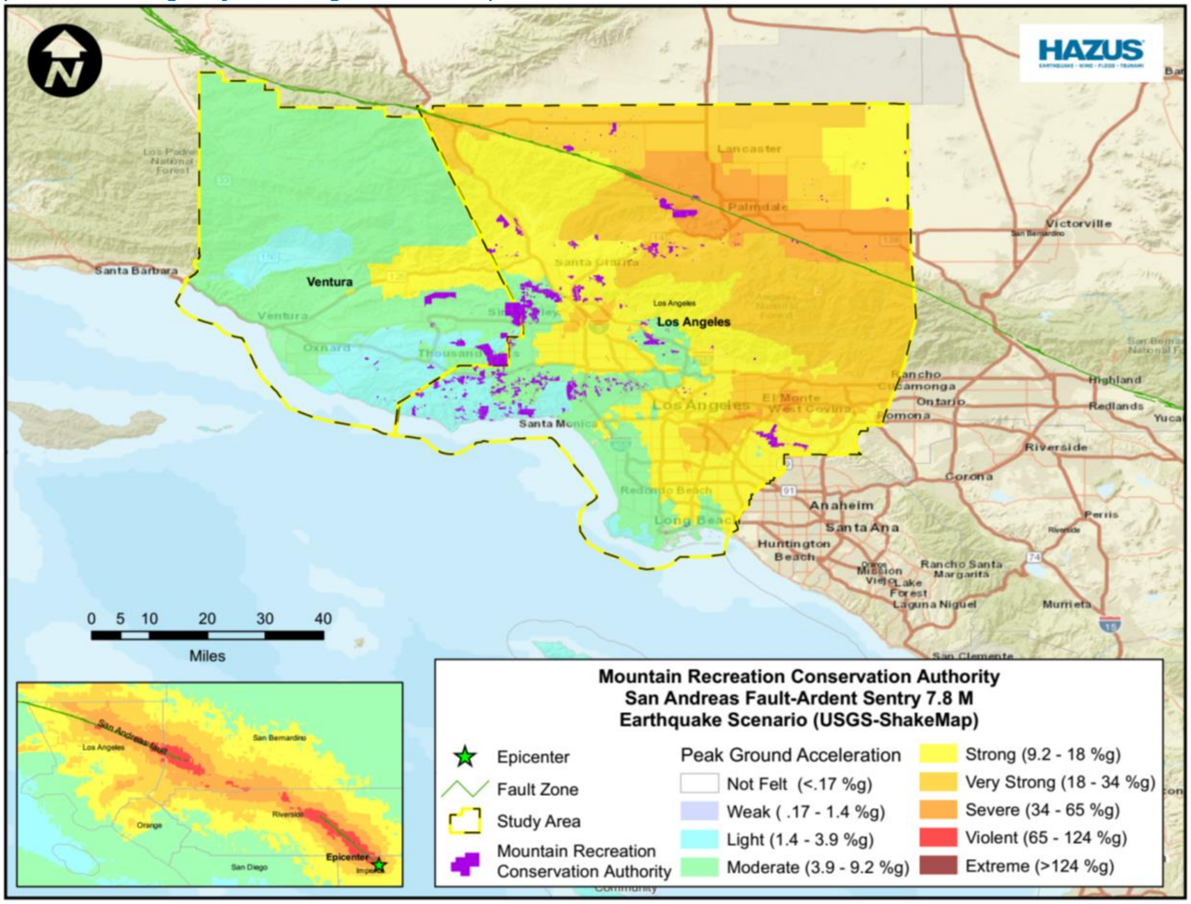
Map: Shake Intensity Map – San Andreas M7.8
(Source: USGS)
***Purple star indicates MRCA Assets**



PERCEIVED SHAKING	Not felt	Weak	Light	Moderate	Strong	Very strong	Severe	Violent	Extreme
POTENTIAL DAMAGE	none	none	none	Very light	Light	Moderate	Mod./Heavy	Heavy	Very Heavy
PEAK ACC.(%g)	<0.05	0.3	2.8	6.2	12	22	40	75	>139
PEAK VEL.(cm/s)	<0.02	0.1	1.4	4.7	9.6	20	41	86	>178
INSTRUMENTAL INTENSITY	I	II–III	IV	V	VI	VII	VIII	IX	X+

Scale based upon Worden et al. (2012)

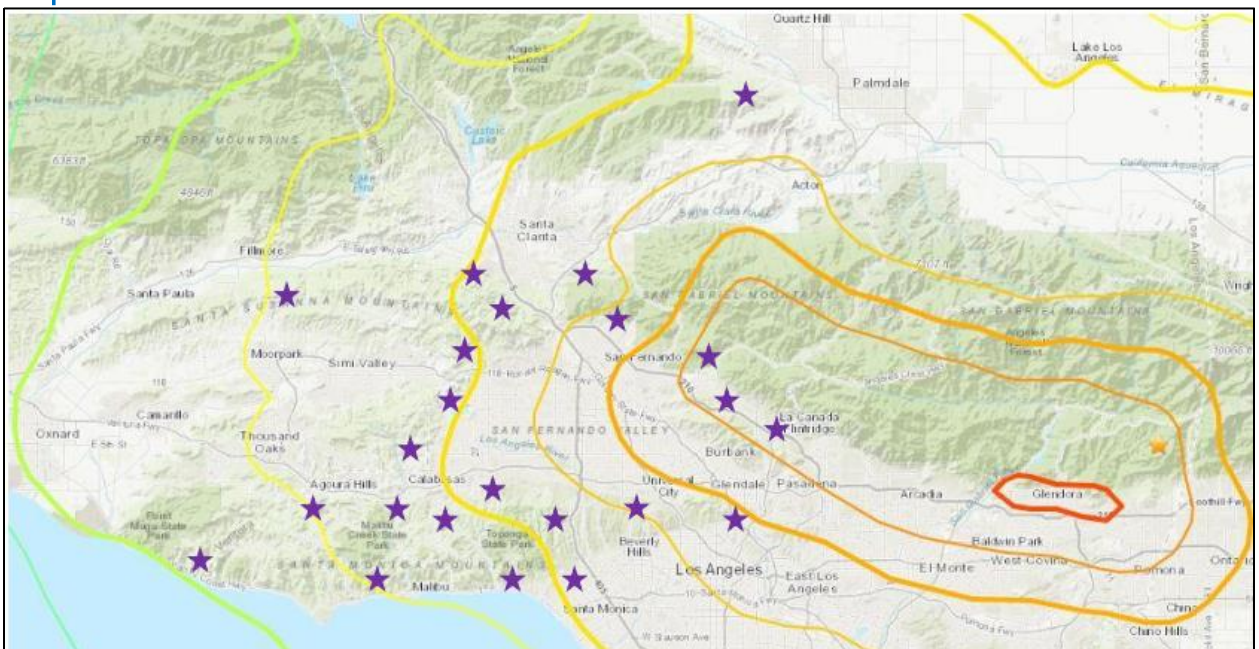
Map: HAZUS – San Andreas M7.8
(Source: Emergency Planning Consultants)



Sierra Madre Fault Zone

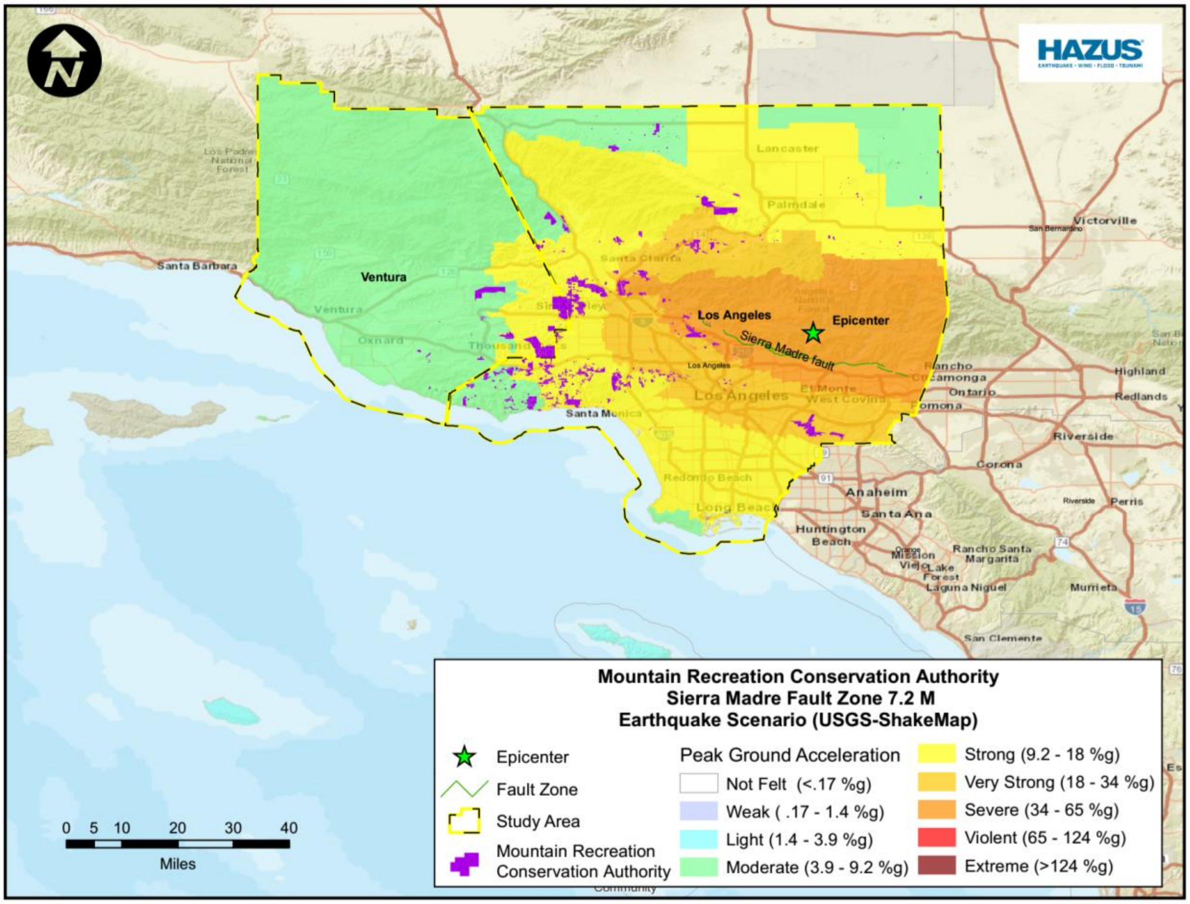
The Sierra Madre fault zone is a series of moderate angle, north-dipping, reverse faults (thrust faults). Movement along these frontal faults has resulted in the uplift of the San Gabriel Mountains. According to the Southern California Earthquake Data Center, rupture on the Sierra Madre fault zone (theoretically) could be limited to one segment at a time, it has recently been suggested that a large event on the San Andreas fault to the north (like that of 1857) could cause simultaneous rupture on reverse faults south of the San Gabriel Mountains – the Sierra Madre fault zone being a prime example of such. Whether this could rupture multiple Sierra Madre fault zone segments simultaneously is unknown. Seismic activity on the Sierra Madre Fault is expected to have a maximum magnitude of 7.2.

Map: Shake Intensity Map – Sierra Madre M7.2
(Source: USGS)
***Purple star indicates MRCA Assets**



PERCEIVED SHAKING	Not felt	Weak	Light	Moderate	Strong	Very strong	Severe	Violent	Extreme
POTENTIAL DAMAGE	none	none	none	Very light	Light	Moderate	Mod./Heavy	Heavy	Very Heavy
PEAK ACC.(%g)	<0.05	0.3	2.8	6.2	12	22	40	75	>139
PEAK VEL.(cm/s)	<0.02	0.1	1.4	4.7	9.6	20	41	86	>178
INSTRUMENTAL INTENSITY	I	II–III	IV	V	VI	VII	VIII	IX	X+

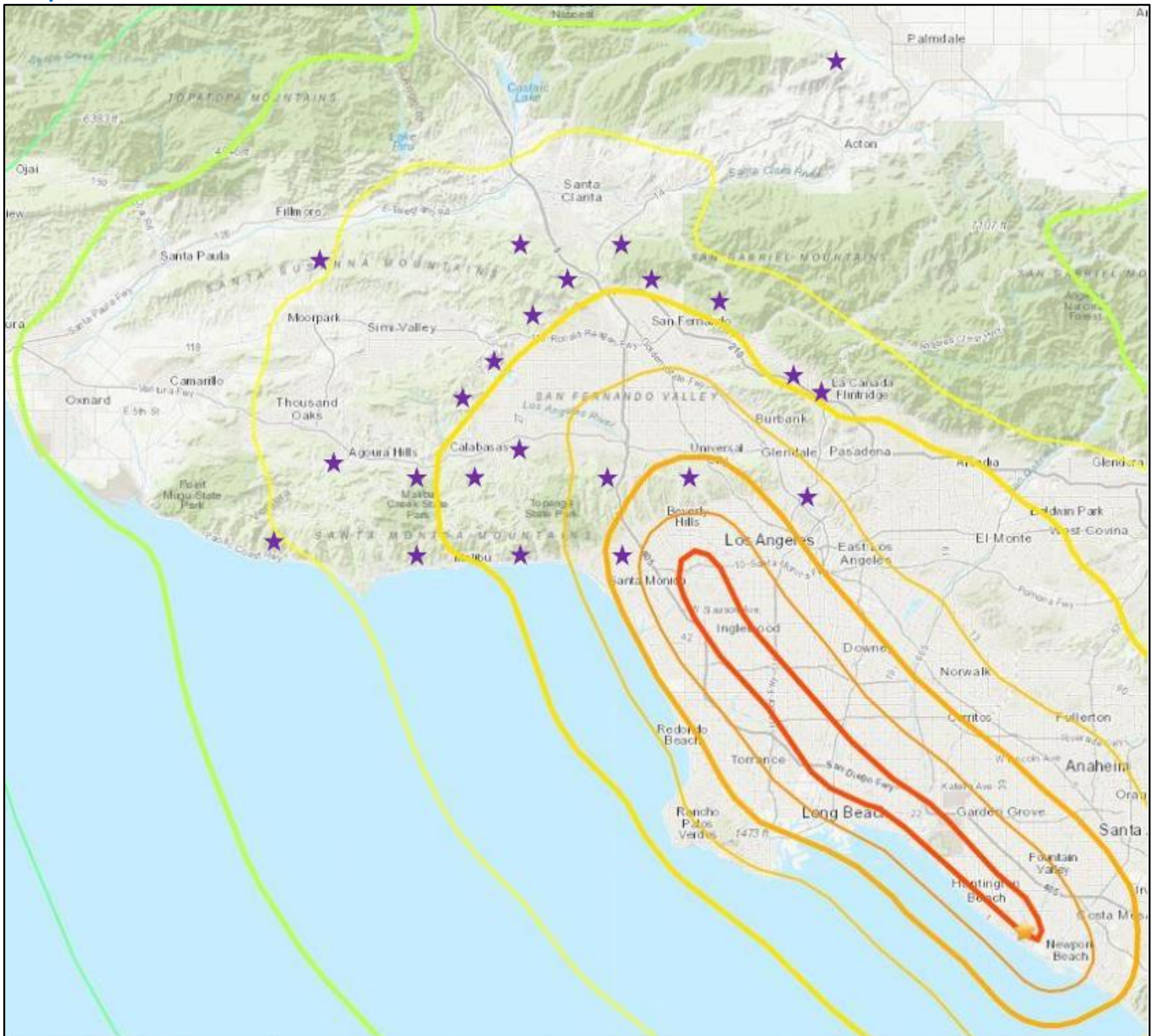
Map: HAZUS – Sierra Madre M7.2
(Source: Emergency Planning Consultants)



Newport-Inglewood Fault

The Newport-Inglewood Fault is a right-lateral fault with a length of 75 km in the Los Angeles Basin. The fault zone can easily be noted by the existence of a chain of low hills extending from Culver City to Signal Hill. South of Signal Hill, it roughly parallels the coastline until just south of Newport Bay, where it heads offshore, and becomes the Newport-Inglewood – Rose Canyon fault zone. The most recent rupture was on March 10, 1993 (M6.4) but was not a surface rupture.

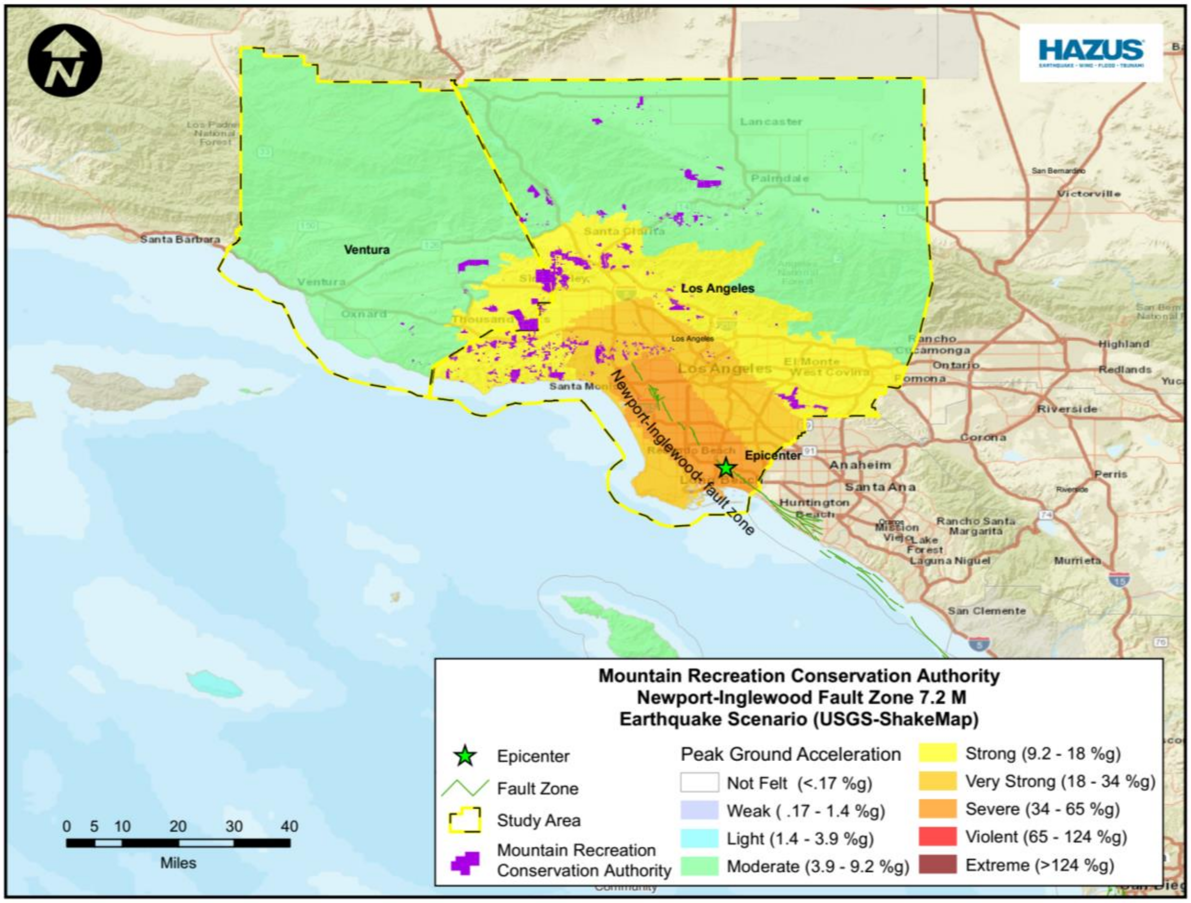
Map: Shake Intensity Map – Newport-Inglewood M7.2
(Source: USGS)
***Purple star indicates MRCA Assets**



PERCEIVED SHAKING	Not felt	Weak	Light	Moderate	Strong	Very strong	Severe	Violent	Extreme
POTENTIAL DAMAGE	none	none	none	Very light	Light	Moderate	Mod./Heavy	Heavy	Very Heavy
PEAK ACC.(%g)	<0.05	0.3	2.8	6.2	12	22	40	75	>139
PEAK VEL.(cm/s)	<0.02	0.1	1.4	4.7	9.6	20	41	86	>178
INSTRUMENTAL INTENSITY	I	II–III	IV	V	VI	VII	VIII	IX	X+

Scale based upon Worden et al. (2012)

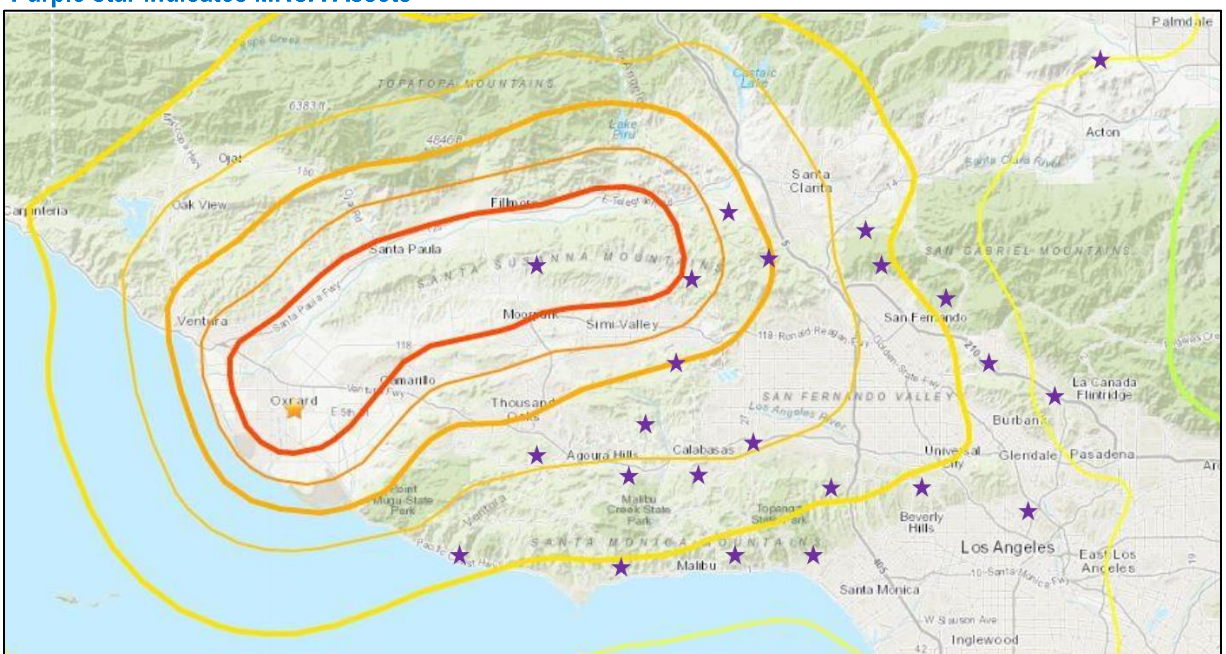
Map: HAZUS – Newport-Inglewood M7.2
(Source: Emergency Planning Consultants)



Oak Ridge Fault

The Oak Ridge Fault is a thrust fault with a length of 90km. The fault drops south at an angle less than 45 degrees, meaning the epicenter of an earthquake on this fault could appear distant from the surface trace. The surface trace of the Oak Ridge thrust forms a ridge to the south of its trace and is roughly paralleled by both the Santa Clara River and California State Highway 126, from the town of Piru to the coast, just southeast of Ventura. The Oak Ridge thrust continues offshore, out to a point about 20 kilometers due south of Santa Barbara. The offshore segment is associated with a definite zone of active seismicity, though the only known Holocene surface rupture is found well onshore, between the towns of Bardsdale and Fillmore. At its eastern end, the Oak Ridge thrust becomes progressively more difficult to trace, and appears to be overthrust by the Santa Susana fault, thus becoming a blind thrust fault. Indeed, the fault associated with the 1994 Northridge earthquake is probably part of the Oak Ridge fault system, as it shares many of the characteristics of this fault. This blind thrust fault is known either as the Pico Thrust, named for the Pico Anticline (a geologic fold it is creating), or as the Northridge Thrust, for more obvious reasons. The fault has probable magnitudes between 6.5-7.5.

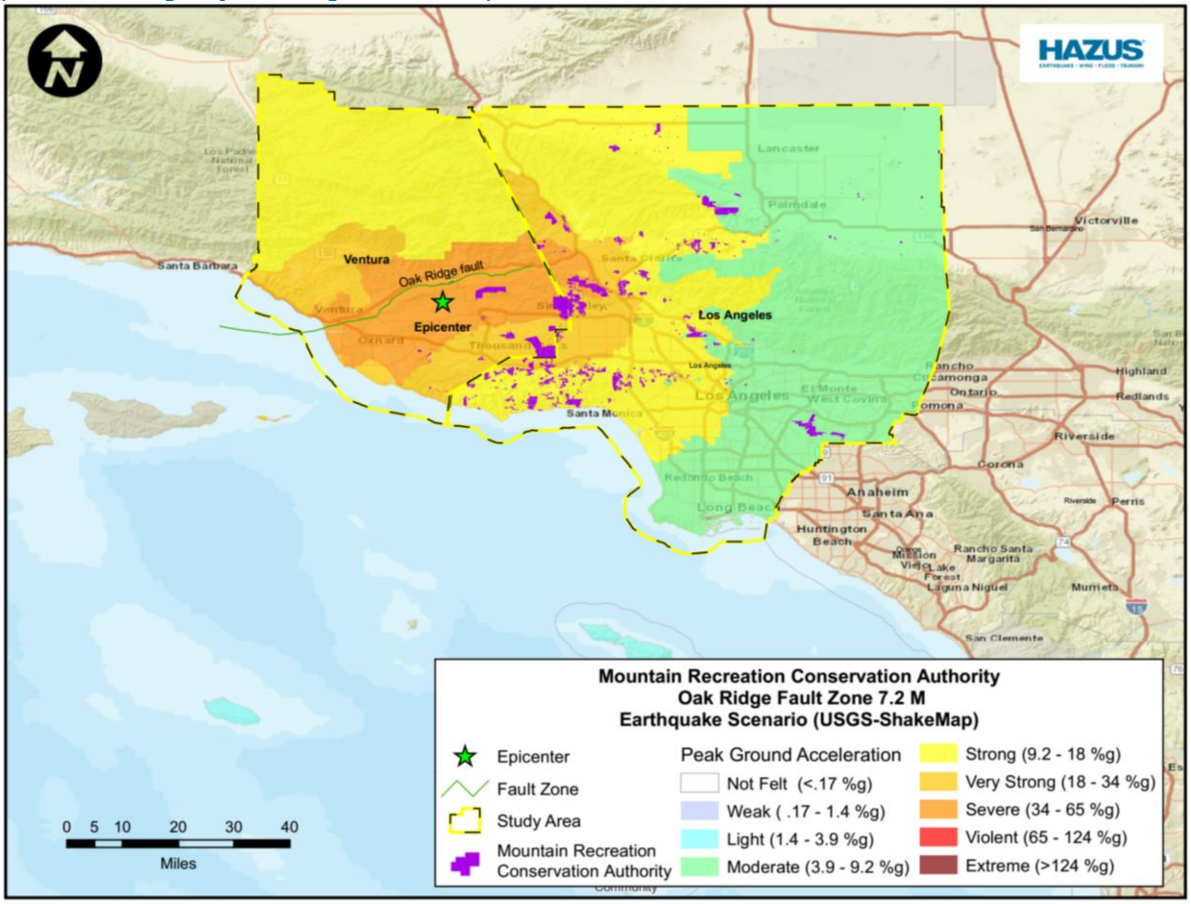
Map: Shake Intensity Map – Oak Ridge M7.2
(Source: USGS)
***Purple star indicates MRCA Assets**



PERCEIVED SHAKING	Not felt	Weak	Light	Moderate	Strong	Very strong	Severe	Violent	Extreme
POTENTIAL DAMAGE	none	none	none	Very light	Light	Moderate	Mod./Heavy	Heavy	Very Heavy
PEAK ACC.(%g)	<0.05	0.3	2.8	6.2	12	22	40	75	>139
PEAK VEL.(cm/s)	<0.02	0.1	1.4	4.7	9.6	20	41	86	>178
INSTRUMENTAL INTENSITY	I	II–III	IV	V	VI	VII	VIII	IX	X+

Scale based upon Worden et al. (2012)

Map: HAZUS – Oak Ridge M7.2
(Source: Emergency Planning Consultants)



Earthquake Related Hazards

Ground shaking, landslides, 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.

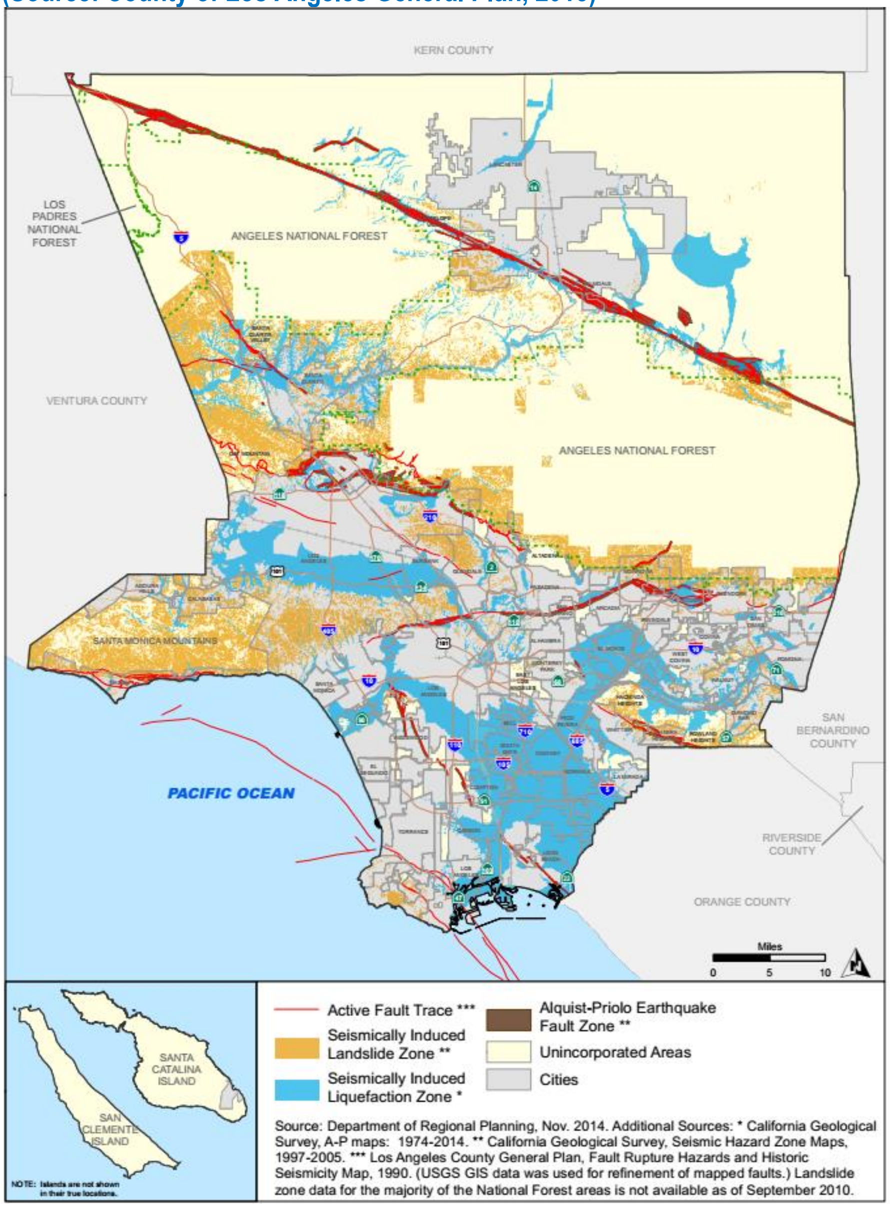
Rock falls may happen suddenly and without warning but are more likely to occur in response to earthquake induced ground shaking, during periods of intense rainfall, or as a result of human activities, such as grading and blasting. Ground acceleration of at least 0.10g in steep terrain is necessary to induce earthquake-related rock falls.

Photo: Landslide in Southern California
Source: Jim Bowers, USGS

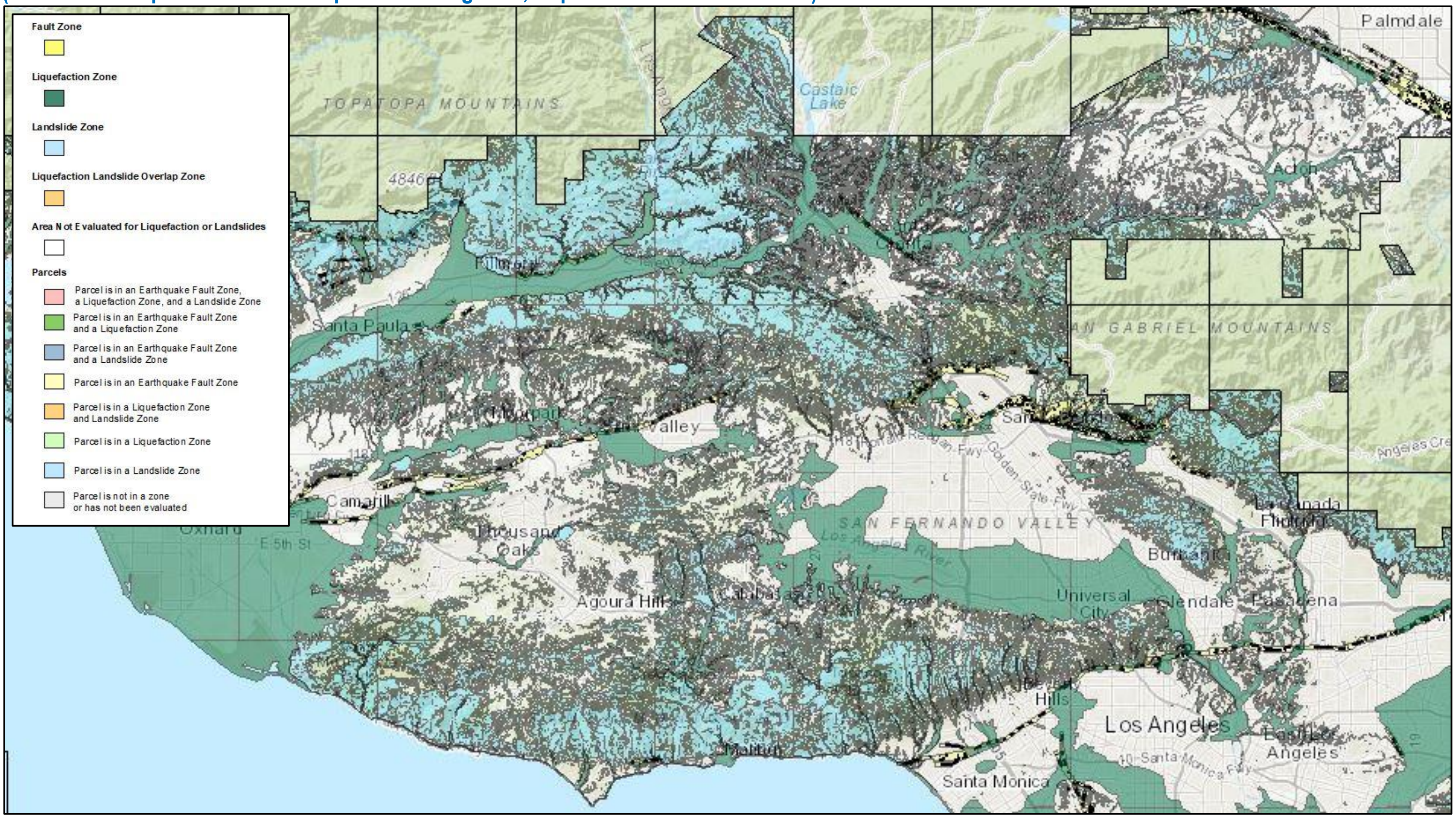
Liquefaction

Liquefaction is a phenomenon in which the strength and stiffness of a soil is reduced by earthquake shaking or other events. Liquefaction occurs in saturated soils, which are soils in which the space between individual soil particles is completely filled with water. This water exerts a pressure on the soil particles that influences how tightly the particles themselves are pressed together. Prior to an earthquake, the water pressure is relatively low. However, earthquake shaking can cause the water pressure to increase to the point where the soil particles can readily move with respect to each other. Because liquefaction only occurs in saturated soil, its effects are most commonly observed in low lying areas. Typically, liquefaction is associated with shallow groundwater, which is less than 50 feet beneath the earth's surface.

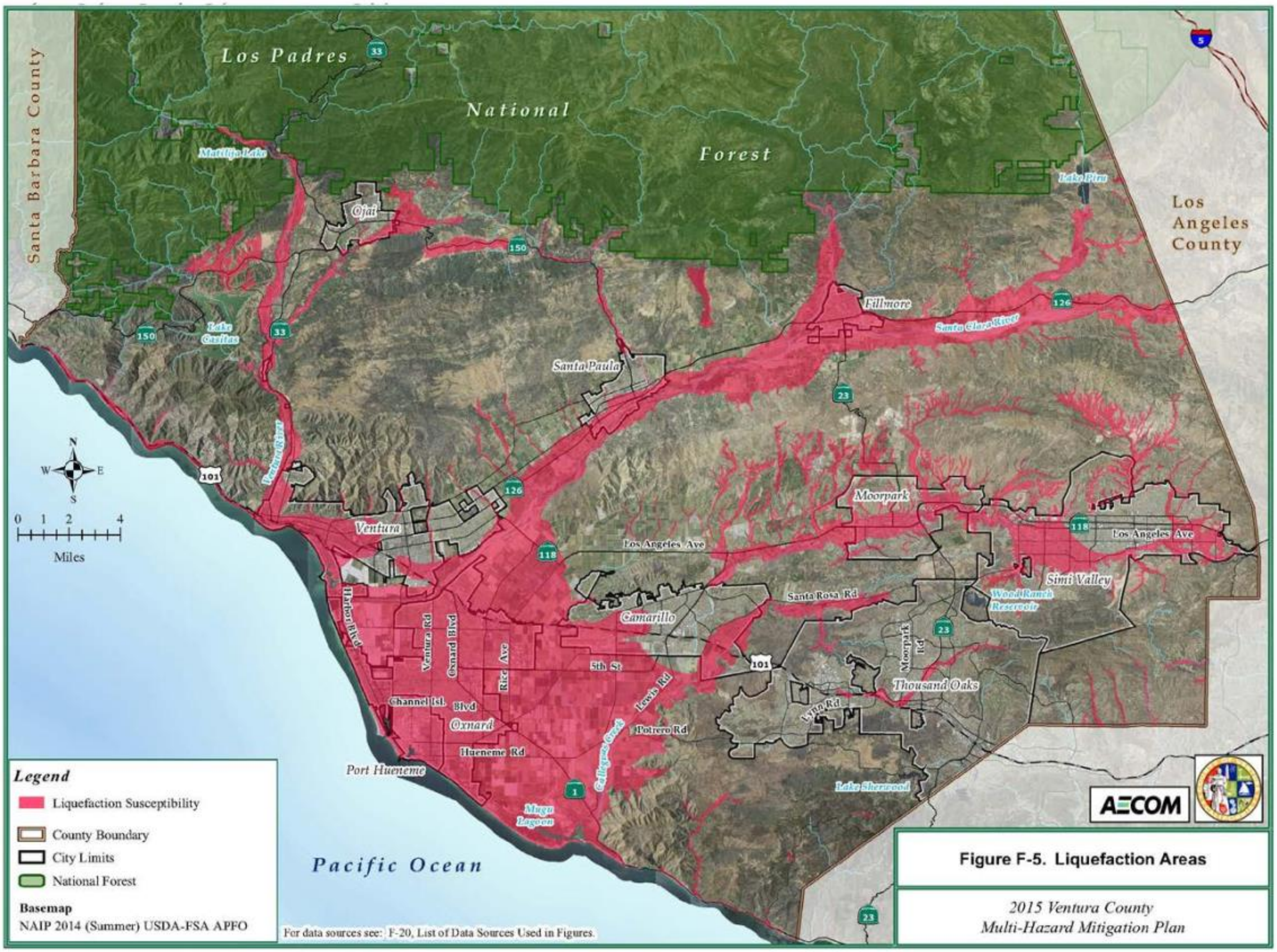
Map: Seismic and Geotechnical Hazard Zones – Los Angeles County
(Source: County of Los Angeles General Plan, 2015)



Map: Liquefaction Areas – Los Angeles County and Ventura County
(Source: Earthquake Zones of Required Investigation, Department of Conservation)



Map: Liquefaction Areas – Ventura County
(Source: Ventura County Multi-Hazard Mitigation Plan, 2015)



Q&A | ELEMENT B: HAZARD IDENTIFICATION AND RISK ASSESSMENT | B3a.
Q: Is there a description of each hazard's **impacts** on each jurisdiction (what happens to structures, infrastructure, people, environment, etc.)? (Requirement §201.6(c)(2)(ii)) **A:** See **Impact of Earthquakes in MRCA** below.

Impact of Earthquakes in MRCA

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

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

Impacts of Climate Change on Earthquakes

The impacts of global climate change on earthquake probability are unknown. Some scientists say melting glaciers could induce tectonic activity. As ice melts and waters runs off, tremendous amounts of weight are lifted off the Earth's crust. As the newly freed crust settles back to its original, pre-glacier shape, it could cause seismic plates to slip and stimulate volcanic activity, according to research into prehistoric earthquakes and volcanic activity. NASA and USGS scientists found that retreating glaciers in southern Alaska may be opening the way for future earthquakes (NASA, 2004).

The secondary impacts of earthquakes could be magnified by climate change. Soils saturated by repetitive storms could fail prematurely during seismic activity due to the increased saturation. Dams storing increased volumes of water due to changes in the hydrograph could fail during seismic events. Wildfire risks associated with earthquakes could be significantly enhanced by drought conditions triggered by climate change. There are currently no models available to estimate these impacts.

Wildfire Hazards

Hazard Definition

Photo: Modoc July Complex Fire
Source: CAL OES

A wildfire is an uncontrolled fire spreading through vegetative fuels and exposing or possibly consuming structures. They often begin unnoticed and spread quickly. Naturally occurring and non-native species of grasses, brush, and trees fuel wildfires. A wildland fire is a wildfire in an area in which development is essentially nonexistent, except for roads, railroads, power lines and similar facilities. A wildland/urban interface fire is a wildfire in a geographical area where structures and other human development meet or intermingle with wildland or vegetative fuels.

Photo: Modoc July Complex Fire
Source: CAL OES

Wildfire Characteristics

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

Q&A | ELEMENT B: HAZARD IDENTIFICATION AND RISK ASSESSMENT | B2a.
Q: Does the plan include information on **previous occurrences** of hazard events for each jurisdiction? (Requirement §201.6(c)(2)(i))
A: See **Previous Occurrences of Wildfire in MRCA** below.

Previous Occurrences of Wildfire in MRCA

The most recent significant wildfire event to impact the MRCA Project Area in Los Angeles County was the Tick Fire in October 2019. The fire burned 4,615 acres in the Canyon County area. The combination of warm and dry Santa Ana winds and critically dry vegetation allowed for significant fire growth. The fire destroyed 23 homes and damaged 40 other residences. During the incident, four firefighter injuries were reported.

The most recent significant wildfire to impact Ventura County was the Maria Fire in October 2019. The fire started in late October across the valleys of Ventura county, near the community of Santa Paula and burned into early November. Due to warm and dry Santa Ana winds as well as critically dry vegetation, the fire continued to burn into early November, eventually burning 9,999 acres. Fortunately, no significant damages or injuries were reported.

According to the NOAA Storm Events Database, some of the counties' most destructive fires have occurred since 2015, including:

Table: Wildfires Impacting the Counties of Los Angeles and Ventura, 2015-2020 (Source: NOAA Storm Events Database)

County	Date	Fire	Damage
County of Ventura	6/10/2020	The Lime Fire	The Lime Fire scorched 803 acres near the Lake Piru area in Ventura county.
County of Ventura	10/31/2019	The Maria Fire	Burned 9,999 acres. Fortunately, no significant damages or injuries were reported.
County of Ventura	10/30/2019	The Easy Fire	Burned 1806 acres across the coastal valleys of Ventura county, near the community of Simi Valley. Three firefighters were injured.
County of Los Angeles	10/28/2019	The Getty Fire	Burned 745 acres. The fire destroyed 10 residences and damaged 15 other residences.
County of Los Angeles	10/24/2019	The Tick Fire	Burned 4,615 acres in the Canyon County area of Los Angeles county. The fire destroyed 23 homes and damaged 40 other residences. During the incident, four firefighter injuries were reported.
County of Los Angeles	10/10/2019	The Saddle Ridge Fire	Burned 8,799 acres across the foothills of the San Fernando Valley as well as the Santa Clarita Valley and the Los Angeles county mountains. The fire destroyed 19 residences and damaged 88 additional residences. One civilian death was reported (due to cardiac arrest) and eight firefighters were injured.
County of Los Angeles	11/8/2018	The Woolsey Fire	Burned a total of 96,949 acres in Los Angeles and Ventura counties including Thousand Oaks, Agoura Hills, Calabasas, the Santa Monica Mountains, Malibu, and West Hills. A total of 1,643 structures were destroyed and 3 people were killed.
County of Ventura	11/8/2018	The Woolsey Fire	Burned 96,949 across in Ventura and Los Angeles county. In total, the Woolsey Fire destroyed 1,643 structures (including 400 homes) and damaged an additional 364 structures. Three deaths were attributed to the fire. Two deaths occurred when an SUV was overrun by flames and the third death occurred in a destroyed home.
County of Ventura	11/8/2018	The Hill Fire	Burned 4,531 acres in Ventura county, near the community of Camarillo. During the fire, four structures were destroyed.
County of Los Angeles	6/4/2018	The Stone Fire	Burned 1,352 acres in the mountains of Los Angeles county.

County of Ventura	12/4/2017	The Thomas Fire	Burned 281,893 acres, making it the largest recorded fire in the state of California. During the height of the fire, one firefighter died when he was burned over.
County of Los Angeles	9/1/2017	The La Tuna Fire	Burned 7,194 acres in the San Fernando Valley. The fire destroyed five homes in the area.
County of Los Angeles	7/9/2016	The Sage Fire	Burned 41,432 acres in the mountains of Los Angeles county, just above the Santa Clarita Valley.
County of Ventura	6/30/2016	The Pine Fire	Burned 2,304 acres in the mountains of Ventura county.
County of Los Angeles	6/20/2016	The San Gabriel Complex	Burned 5,399 acres in the mountains of Los Angeles county.

Q&A | ELEMENT B: HAZARD IDENTIFICATION AND RISK ASSESSMENT | B1a.
Q: Does the plan include a general **description** of all natural hazards that can affect each jurisdiction? (Requirement §201.6(c)(2)(i)) **A:** See **Regional Conditions** below.
Q&A | ELEMENT B: HAZARD IDENTIFICATION AND RISK ASSESSMENT | B3b.
Q: Is there a description of each identified hazard's overall **vulnerability** (structures, systems, populations, or other community assets defined by the community that are identified as being susceptible to damage and loss from hazard events) for each jurisdiction? (Requirement §201.6(c)(2)(ii)) **A:** See **Regional Conditions** below.

Regional Conditions

According to the MRCA website, fire prevention and protection is a year-round activity for the Mountains Recreation and Conservation Authority (MRCA) Fire Division. Extremely low moisture in the vegetation of hillsides and mountain areas poses a dangerous and volatile fire risk. The MRCA Fire Division protects the array of resources on MRCA-managed properties, and works together with local fire departments, State and federal agencies, and the public to prevent wildfires, and—if necessary—to defend against them. The MRCA Project Area sits on High or Very High Wildfire Hazard Severity Zones.

According to the County of Los Angeles All-Hazards Mitigation Plan (2019) and the Ventura County Multi-Hazard Mitigation Plan (2015), the climate of both counties is characterized as Mediterranean, featuring cool, wet winters and warm, dry summers. High moisture levels during the winter rainy season significantly increase the growth of plants. However, the vegetation is dried during the long, hot summers, decreasing plant moisture content, and increasing the ratio of dead fuel to living fuel. As a result, fire susceptibility increases dramatically, particularly in late summer and early autumn. In addition, the presence of chaparral, a drought-resistant variety of vegetation that is dependent on occasional wildfires, is expected in Mediterranean dry-summer climates.

A local meteorological phenomenon, known as the Santa Ana winds, contributes to the high incidence of wildfires in each county. These winds originate during the autumn months in the hot, dry interior deserts to the north and east of Los Angeles County. They often sweep west into the county, bringing extremely dry air and high wind speeds that further desiccate plant communities during the period of the year when the constituent species have extremely low moisture content. The effect of these winds on existing fires is particularly dangerous; the winds can greatly increase the rate at which fires spread.

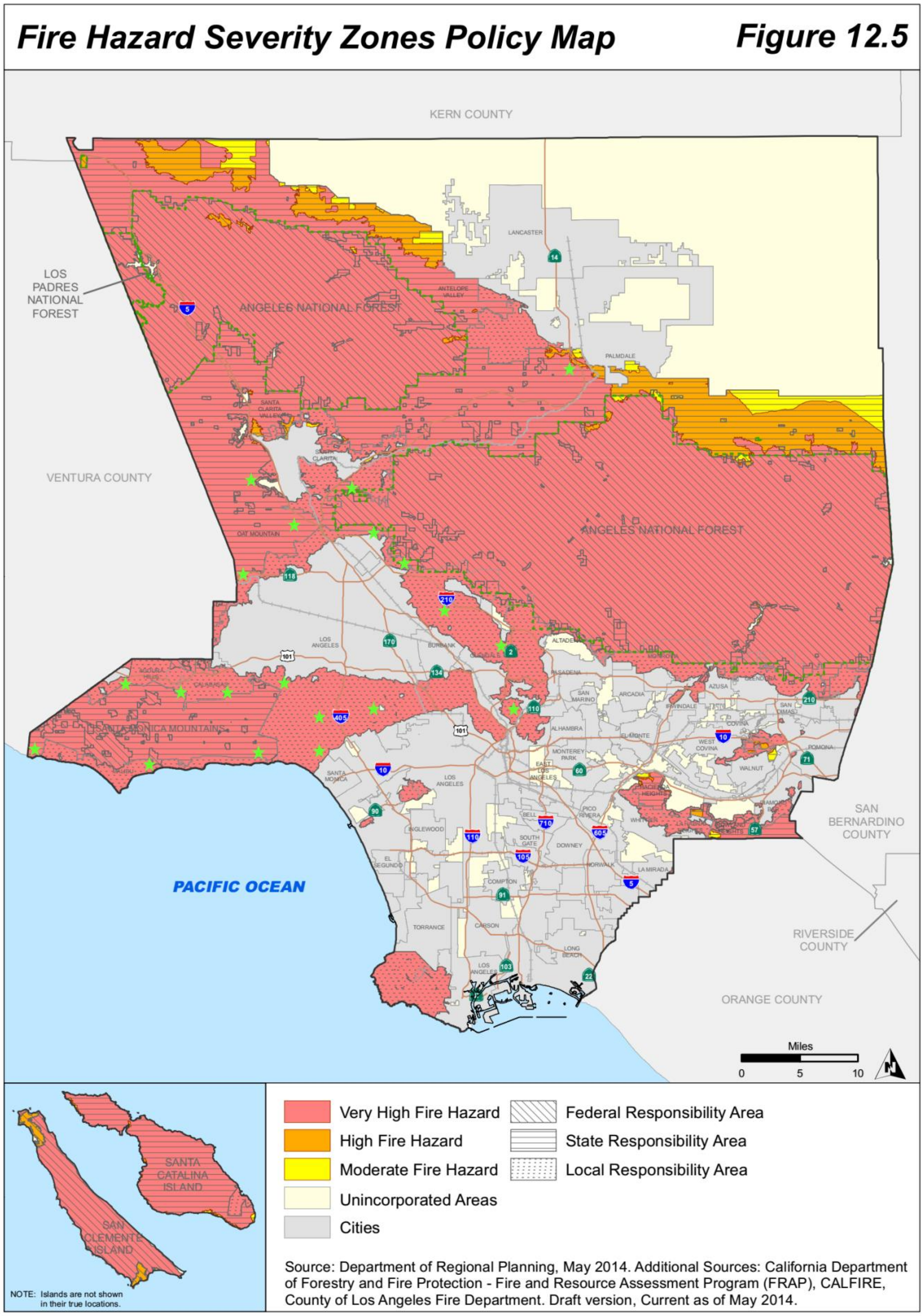
Photo: Bobcat Fire
Source: InciWeb – Incident Information

As of September 25, 2020, the Bobcat Fire is affecting the MRCA area in the Angeles National Forest in Azusa. The fire began on September 6 and the cause is under investigation. It is 55% contained and has burned approximately 114,000 acres so far. A significant warming and drying trend will induce record temperatures and extremely low humidity, accompanied by windy conditions.

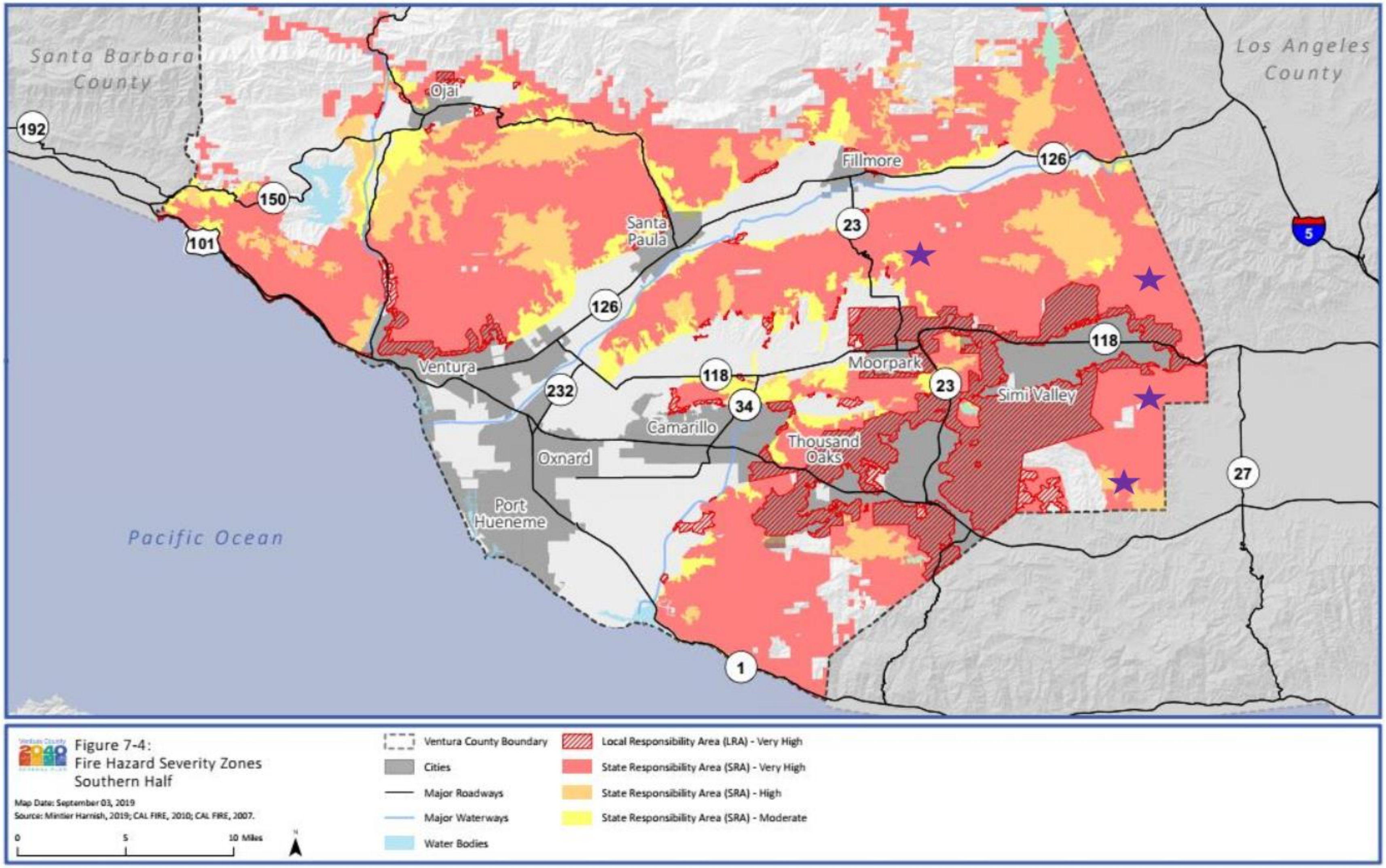
Photo: Bobcat Fire
Source: InciWeb – Incident Information

Below **Maps: Fire Hazard Severity Zones Policy Map** and **Fire Hazard Map – Southern Half** show the potential risk of wildfires in Los Angeles and Ventura Counties to MRCA.

Map: Fire Hazard Severity Zones - Los Angeles County
(Source: County of Los Angeles General Plan, 2015)
***Green star indicates MRCA Assets**



Map: Wildfire Hazard Severity Zones, Southern Half – Ventura County
(Source: Ventura County General Plan, 2040)
***Purple star indicates MRCA Assets**



Q&A | ELEMENT B: HAZARD IDENTIFICATION AND RISK ASSESSMENT | B3a.
Q: Is there a description of each hazard's **impacts** on each jurisdiction (what happens to structures, infrastructure, people, environment, etc.)? (Requirement §201.6(c)(2)(ii)) **A:** See **Impact of Wildfire in the MRCA** below.

Impact of Wildfire in the MRCA

Wildfires and their impact vary by location and severity of any given wildfire event. Based on the risk assessment, it is evident that wildfires will continue to have potentially devastating economic impacts to the MRCA. Impacts that are not quantified, but anticipated in future events, include:

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

Impacts of Climate Change on Wildfires

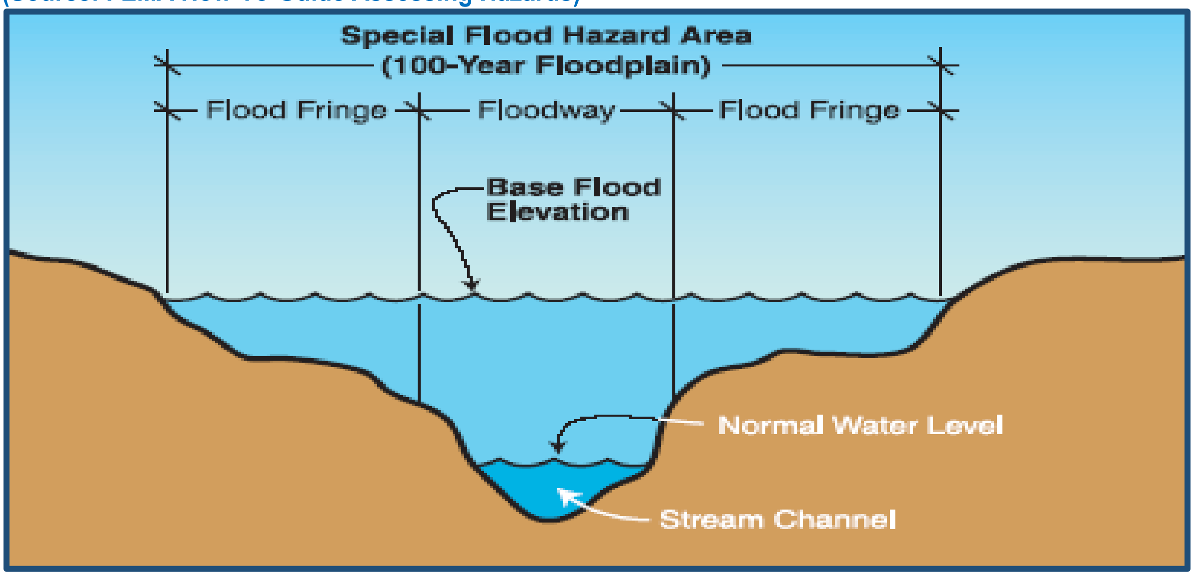
According to California's Fourth Climate Change Assessment, Los Angeles Region Report (2018), climate change is projected to have several effects on the Los Angeles and Ventura counties pertaining to wildfire. With continued warming across the region, average maximum temperatures are projected to increase around 4-5 degrees F by the mid-century, and 5-8 degrees F by the late-century. Extreme temperatures are also expected to increase. The hottest day of the year may be up to 10 degrees F warmer for many locations across the LA region by the late-century under Representative Concentration Pathway 8.5. The number of extremely hot days is also expected to increase across the region. Projections indicate that wildfire may increase over southern California, but there remains uncertainty in quantifying future changes of burned area over the LA region. However, with the increase in temperatures and drying out of vegetation, it is evident that wildfire hazards are at risk from climate change.

Flood Hazards

Hazard Definition

A floodplain is a land area adjacent to a river, stream, lake, estuary, or other water body that is subject to flooding. This area, if left undisturbed, acts to store excess flood water. The floodplain is made up of two sections: the floodway and the flood fringe. The 100-year flooding event is the flood having a one percent chance of being equaled or exceeded in magnitude in any given year. Contrary to popular belief, it is not a flood occurring once every 100 years. The 100-year floodplain is the area adjoining a river, stream, or watercourse covered by water in the event of a 100-year flood. Schematic: Floodplain and Floodway shows the relationship of the floodplain and the floodway.

Figure: Floodplain and Floodway
(Source: FEMA How-To-Guide Assessing Hazards)



Types of Flooding

Two types of flooding primarily affect the region: slow-rise or flash flooding. Slow-rise floods may be preceded by a warning period of hours or days. Evacuation and sandbagging for slow-rise floods have often effectively lessened flood related damage. Conversely, flash floods are most difficult to prepare for, due to extremely limited, if any, advance warning and preparation time.

Q&A | ELEMENT B: HAZARD IDENTIFICATION AND RISK ASSESSMENT | B2a.
Q: Does the plan include information on **previous occurrences** of hazard events for each jurisdiction? (Requirement §201.6(c)(2)(i))   **A:** See **Previous Occurrences of Flooding in the MRCA** below.

Previous Occurrences of Flooding in the MRCA

The most recent significant flooding events in Los Angeles County were the severe Winter storms in January 2017. According to the NOAA Storm Events Database, two to six inches of rain fell across the area. This heavy rain resulted in flash flooding across southern Los Angeles county. In the mountains, strong southerly winds were reported as well as significant snowfall at the resort level. According to the County of Los Angeles All-Hazards Mitigation Plan (2019), the federal government has declared 13 flooding emergencies affecting Los Angeles County, including:

Table: Los Angeles County Presidential Declarations - Flooding
(Source: County of Los Angeles AHMP, 2019)

Date	Description
February 5, 1954	California Flood and Erosion (Disaster Declaration # [DR]-15)
December 23, 1955	California Flooding (DR-47)
April 4, 1958	California Heavy Rainstorms, Flood (DR-82)
March 6, 1962	California Floods (DR-122)
October 24, 1962	California Severe Storms, Flooding (DR-138)
February 25, 1963	California Severe Storms, Heavy Rains, Flooding (DR-145)
August 15, 1969	California Flooding (DR-270)
February 15, 1978	California Winter Storms Flooding (DR-547)
February 7 and 21, 1980	Southern California Winter Storms (DR-615)
December 21, 1988	Coastal Storms (DR-812)
February 12 and 19, 1992	California Winter Storms (DR-935)
January 7, 1993-February 19, 1993	California Winter Storms (DR-979)
January 18, 2017-January 23, 2017	California Severe Winter Storms, Flooding, and Mudslides (DR-4305)

Ventura County has also been affected by flooding, and the most recent event occurred on February 21, 2005. According to the National Oceanic and Atmospheric Administration (NOAA) Storm Events Database, this event brought rainfall ranging from 4 to 8 inches over coastal areas to between 10 and 20 inches in the mountains. State Route 150 was closed at the Dennison Grade due to flash flooding and mudslides. Preliminary damage estimates from this storm range between $8-10 million with agricultural interests in Ventura County accounting for most of the monetary damage. The following table illustrates the flooding events that have impacted Ventura County:

Table: Flooding Events Affecting Ventura County (Source: NOAA Storm Events Database)

Date	Description
March 24, 1998	A Pacific storm brought another round of rain to Central and Southern California. Rainfall totals ranged from around one inch across coastal areas with up to four inches in the mountains.
May 5, 1998	Heavy rain produced minor urban flooding across Ventura county.
March 25, 1999	Moderate rainfall produced local urban flooding in the communities of Santa Barbara and Camarillo.
April 11, 1999	Moderate to locally heavy rainfall produced minor street flooding across coastal areas of Ventura and Los Angeles Counties.
February 20, 2000	A powerful winter storm brought heavy rain and snow to Central and Southern California. Heavy rain, totaling 2 to 6 inches, produced flash flooding across Santa Barbara, Ventura and Los Angeles counties. In the mountains, 12 to 22 inches of new snow was reported. Numerous thunderstorms were reported across the area, producing small hail and even a waterspout south of Santa Barbara airport.
April 17, 2000	A pacific storm brough heavy rain to Southern California. Rainfall totals ranged from 1 to 4 inches across the area.
January 11, 2001	An extremely large swell, combined with high astronomical tides, produced heavy surf and flooding of coastal areas along Central and Southern California.
March 5, 2001	A powerful and slow-moving storm brought heavy rain, strong winds and snow to Central and Southern California. Across Ventura and Los Angeles counties, rainfall totals were somewhat less, but still very significant. Ventura county received between 3 and 12 inches of rainfall. In the mountains of Ventura and Los Angeles counties, winter storm conditions developed with snowfall accumulations of 6 to 12 inches, gusty southeast winds and visibilities near zero in blowing snow and dense fog.
November 12, 2001	A cold front moved through Ventura county, producing brief heavy rain and street flooding. Reports of street flooding in the communities of Ventura, El Rio and Newbury Park were received from weather spotters and local newspapers.
November 24, 2001	A strong cold front produced heavy rain and street flooding across sections of Southern California. Reports of street flooding in the communities of Santa Barbara, Ventura and Carson were received from weather spotters and local newspapers.
December 20, 2001	A weather spotter reported street flooding in the community of Ventura.
December 17, 2002	The combination of large westerly swell and high astronomical tides produced coastal flooding along the coasts of Ventura and southern Santa Barbara counties.
March 15, 2003	A powerful winter storm brought heavy rain and flooding; coastal areas received between 1 to 3 inches of rainfall with the foothills and mountains receiving up to 7 inches of rainfall. In Ventura county, urban flooding was reported due to runoff from the heavy rain, including the community of Oakview.
February 21, 2005	A powerful Pacific storm tapped into a subtropical moisture source to produce heavy rain and flash flooding across Southwestern California. Overall, rainfall totals ranged from 4 to 8 inches over coastal areas to between 10 and 20 inches in the mountains. In Ventura county, State Route 150 was closed at the Dennison Grade due to flash flooding and mudslides.

Q&A | ELEMENT B: HAZARD IDENTIFICATION AND RISK ASSESSMENT | B1a.
Q: Does the plan include a general **description** of all natural hazards that can affect each jurisdiction? (Requirement §201.6(c)(2)(i)) **A:** See **Regional Conditions** below.
Q&A | ELEMENT B: HAZARD IDENTIFICATION AND RISK ASSESSMENT | B3b.
Q: Is there a description of each identified hazard's overall **vulnerability** (structures, systems, populations, or other community assets defined by the community that are identified as being susceptible to damage and loss from hazard events) for each jurisdiction? (Requirement §201.6(c)(2)(ii)) **A:** See **Regional Conditions** below.

Regional Conditions

According to the County of Los Angeles All-Hazards Mitigation Plan (2019), Los Angeles County has a long history of moderate to severe flooding during major storms. In the Los Angeles basin area, an extensive flood control system has eliminated much of this problem. However, in the less densely populated areas where relatively few flood controls have been constructed, flooding remains a problem. In areas with alluvial fans, flood flows discharge from the mountainous canyons in an uncontrolled manner onto the desert floor, thereby resulting in widespread damage to agricultural land, buildings, and infrastructure. In the foothill areas that experience intense rainfall, mudflows pose a risk to those downstream. Finally, along the coast, waves generated by winter storms in combination with high astronomical tides and strong winds can cause a significant wave runup, resulting in erosion and coastal flooding to low-lying portions of the shoreline. Floods can occur at any time but are most common with winter storms packed with subtropical moisture.

Major flood sources in Los Angeles County still include Ballona Creek, Los Angeles River, Malibu Creek, Pacific Ocean, Rio Hondo River, San Gabriel River and its tributaries, Santa Clara River, Topanga Canyon, and the Pacific Ocean. In the unincorporated areas of Los Angeles County, flooding sources include:

• **Little Rock and Big Rock Washes**: Flooding occurs when the flows reach the valley floor where the channels flatten out. This allows the flows to spread over great distances, inundating the surrounding areas.

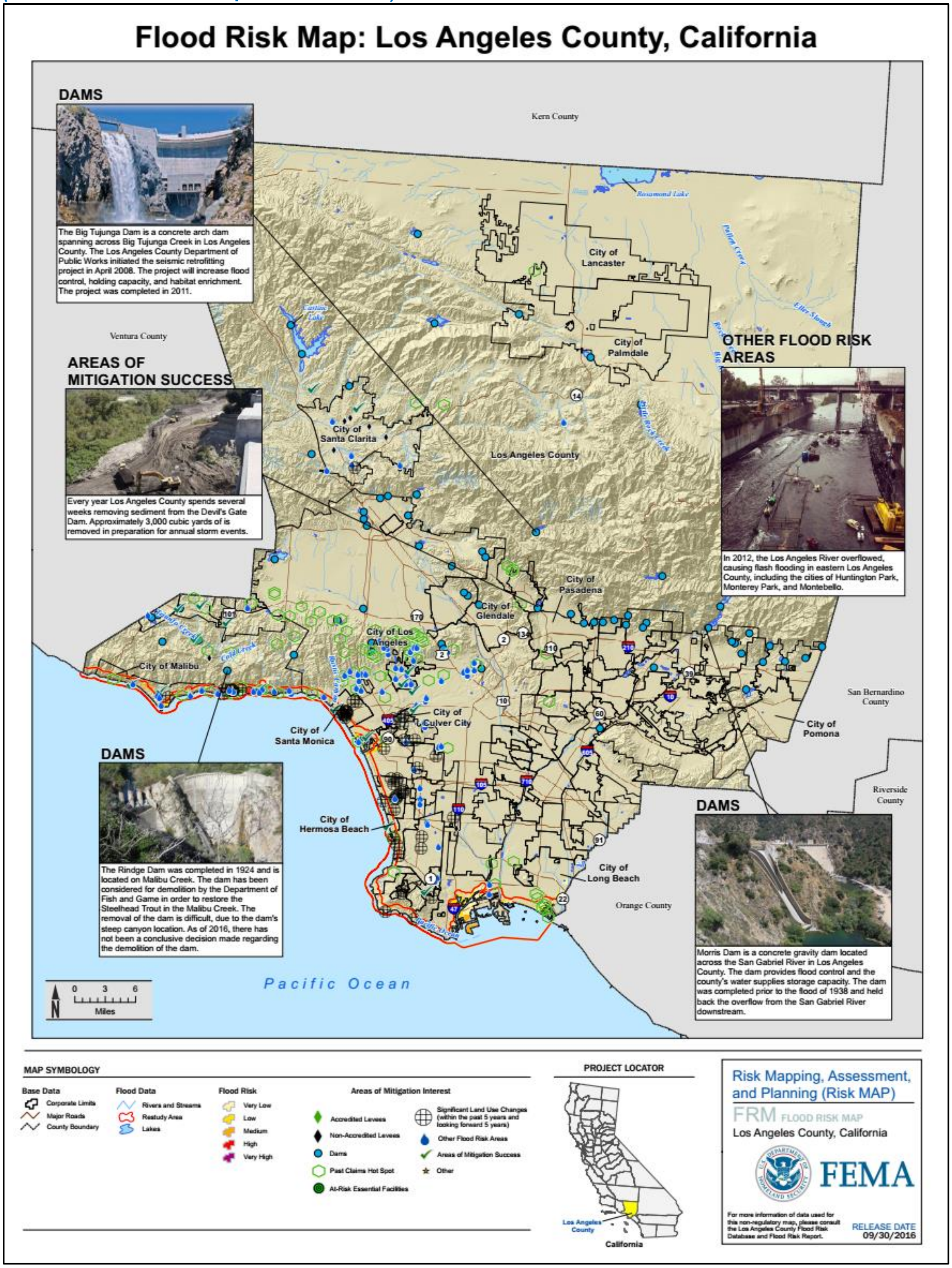
• **Antelope Valley**: Flooding occurs when flows from the mountains reach the broad alluvial plan in the Antelope Valley are northerly from the mountains across the broad alluvial plain. During minor storms, much of the flow percolates into the ground. In major storms, flows reach the lake at the northern county limits, where flood flows pond until evaporated.

• **Foothills of Santa Clarita**: Flooding and mudflows occur in the foothill areas during intense rainfall, usually following fires in the upstream watershed.

• **Coastline**: Flooding is caused by waves generated by winter storms. The occurrence of such a storm event in combination with high astronomical tides and strong winds can cause a significant wave runup and allow storm waves to reach higher than normal elevations along the coastline.

The Ventura County Multi-Hazard Mitigation Plan (2015) indicates flooding affects areas all throughout Ventura County. Areas of likely flooding are defined by a 100-year and a 500-year flood zone. While the entire County has population in the 100-year flood zone, the cities of Camarillo, Santa Paula and Simi Valley are most vulnerable.

Map: Flood Risk Map - Los Angeles County, California
(Source: FEMA Flood Map Service Center)



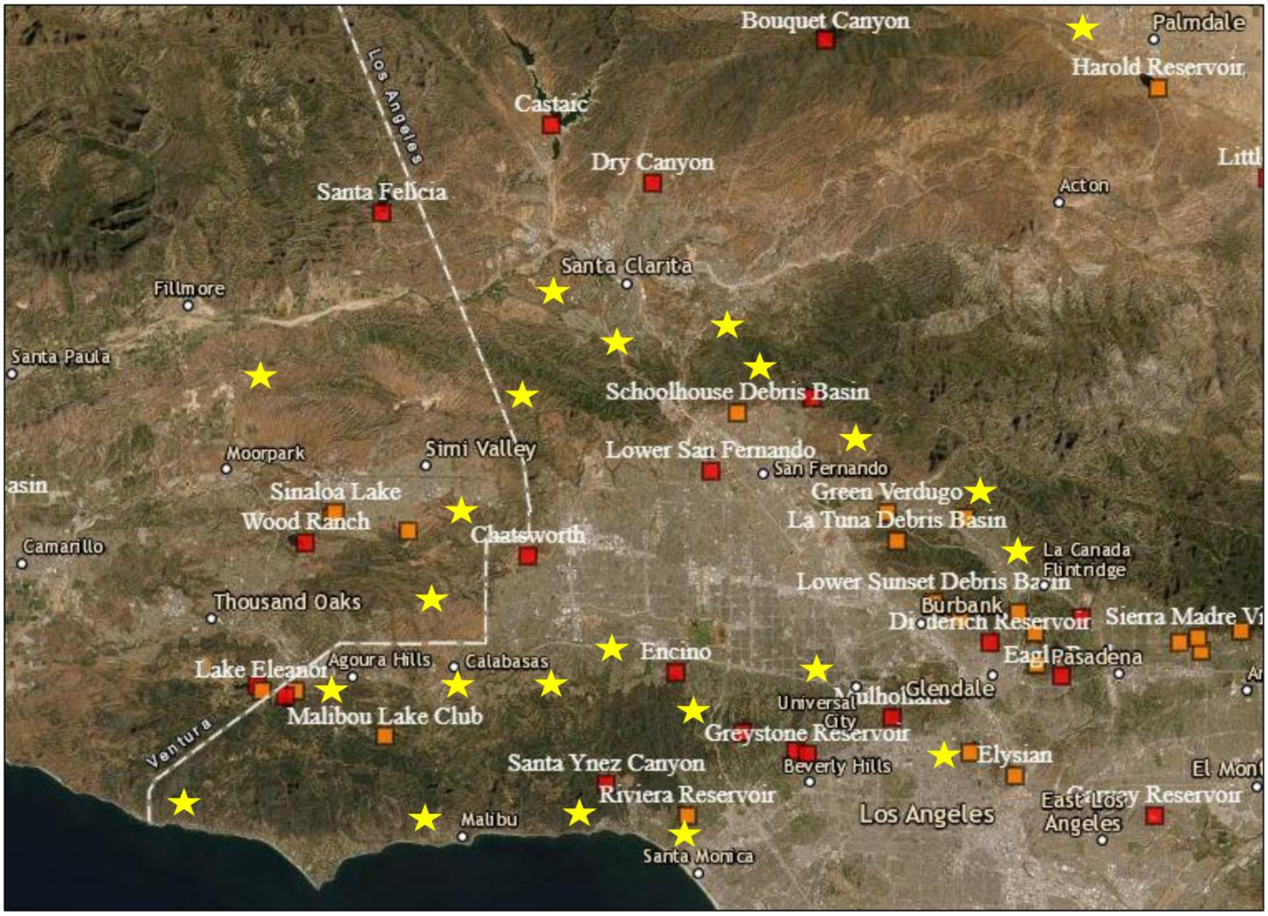
Map: Special Flood Hazard Areas – Ventura County
(Source: Ventura County Multi-Hazard Mitigation Plan)

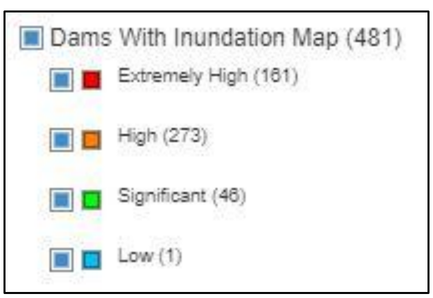
Dam Failure

According to the Los Angeles County All-Hazards Mitigation Plan (2019), the California Department of Water Resource's Division of Safety of Dams (DSOD) reports there are 90 dams under State jurisdiction in Los Angeles County. A dam breach inundation map shows flooding that could result from a hypothetical failure of a dam or its critical appurtenant structure. In 2017, the California Legislature passed a law requiring all State jurisdictional dam owners, except for owners of low-hazard dams, to develop inundation maps approved by DSOD and emergency action plans approved by Cal OES.

FEMA has developed three categories in increasing severity for downstream hazards: Low, Significant, and High. DSOD adds a fourth category of Extremely High. In Los Angeles County there are 40 dams that are classified as High, with the potential impact expected to cause loss of at least one human life, and 30 dams classified as Extremely High, with the potential impact expected to cause considerable loss of human life or result in an inundation area with a population of 1,000 or more. As noted in the **Map: Dam Failure Inundation Areas – Los Angeles County,** nine Extremely High hazard dams and three High hazard dams in the county have approved dam breach inundation maps for a total of 45.70 square miles (0.96 %) in Los Angeles County, and a total of 13.37 square miles (0.44 %) in the unincorporated areas of Los Angeles County.

Map: Dam Failure Inundation Areas - Los Angeles County and Ventura County
(Source: California Dam Breach Inundation Maps, Department of Water Resources)
***Yellow star indicates MRCA Assets**



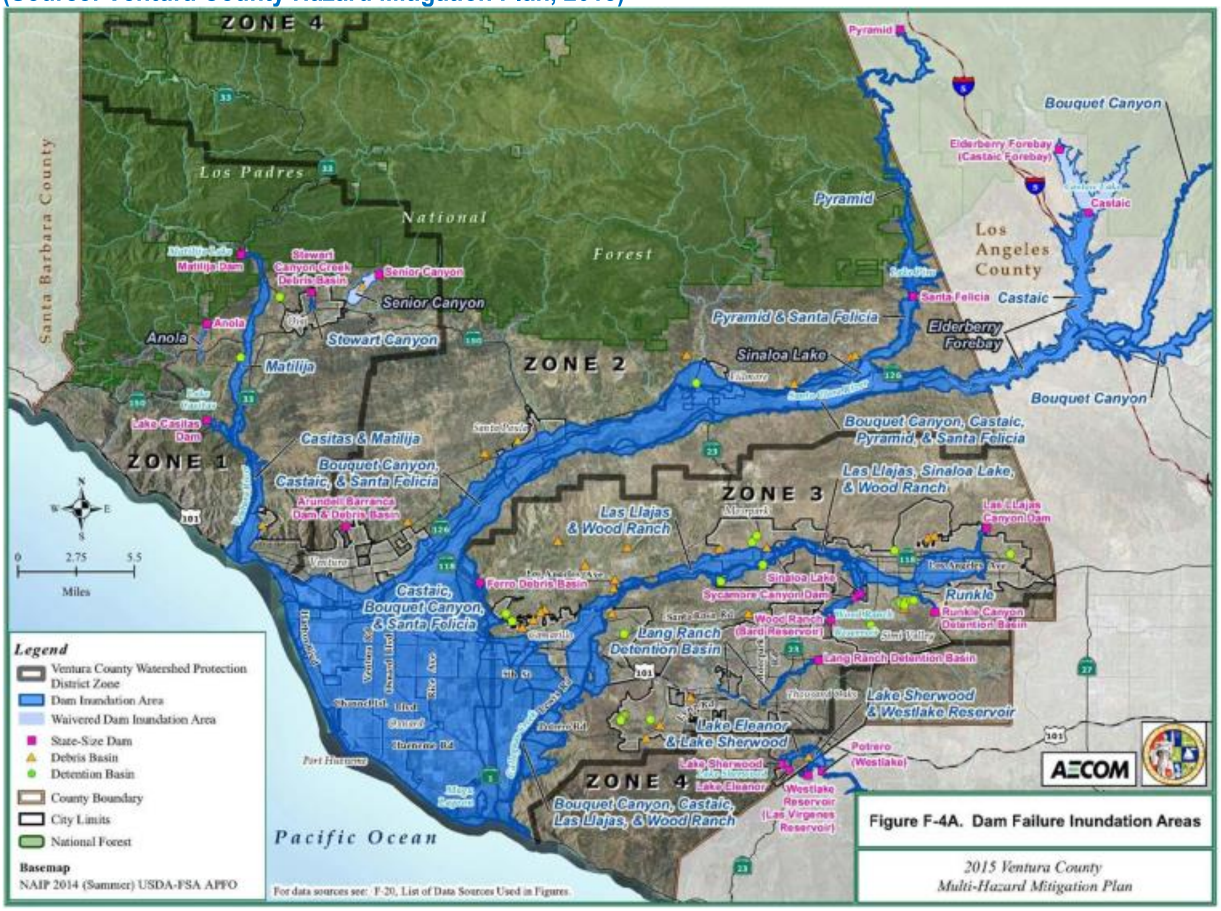


Map: Dam Failure Inundation Areas – Los Angeles County
(Source: County of Los Angeles All-Hazards Mitigation Plan, 2019)

According to the Ventura County Hazard Mitigation Plan (2015), the **Map: Dam Failure Inundation Areas – Ventura County** map below shows the name, location, and extent of the dam failure inundation areas for every dam failure that would affect Ventura County. It is not anticipated that every dam would fail at the same time; this map is designed to simply provide an approximate assessment of total risk for the County. **Map: Individual Dam Failure Inundation Areas – Ventura County** illustrates dam failure inundation areas for particular dams. In some instances, if one dam fails there is potential that another dam downstream will also fail (for example if the Pyramid Dam fails, the Santa Felicia Dam will likely fail too). This map does not illustrate cumulative effects. The map shows that dam failures may occur outside Ventura County but still pose a threat of inundation within the County. In particular, if dams in the Santa Clara River watershed in Los Angeles County fail, the resulting flood would affect the Santa Clara River corridor, which includes the cities of Santa Paula and Oxnard, as demonstrated by the 1928 event (mentioned above).

FEMA characterizes a dam as a high hazard if it stores more than 1,000 acre-feet of water, is taller than 150 feet, and has the potential to cause downstream property damage. The hazard ratings for dams are set by FEMA and confirmed with site visits by engineers. Most dams in the county are characterized by increased hazard potential because of downstream development and increased risk as a result of structural deterioration or inadequate spillway capacity. The Division of Safety of Dams (DSOD) regulates state-size dams and inspects them annually to ensure that they are in good operating condition. Also, as required by DSOD regulations, the flood inundation limits resulting from a dam breach during the design storm are established for each state-size dam.

Map: Dam Failure Inundation Areas – Ventura County
(Source: Ventura County Hazard Mitigation Plan, 2015)



Mountains Recreation & Conservation Authority

Map: Individual Dam Failure Inundation Areas – Ventura County (Source: Ventura County Hazard Mitigation Plan, 2015)

Q&A | ELEMENT C. MITIGATION STRATEGY | C2
Q: Does the Plan address each jurisdiction's participation in the NFIP and continued compliance with NFIP requirements, as appropriate? (Requirement §201.6(c)(3)(ii)) **A:** See **NFIP Participation** below.

National Flood Insurance Program

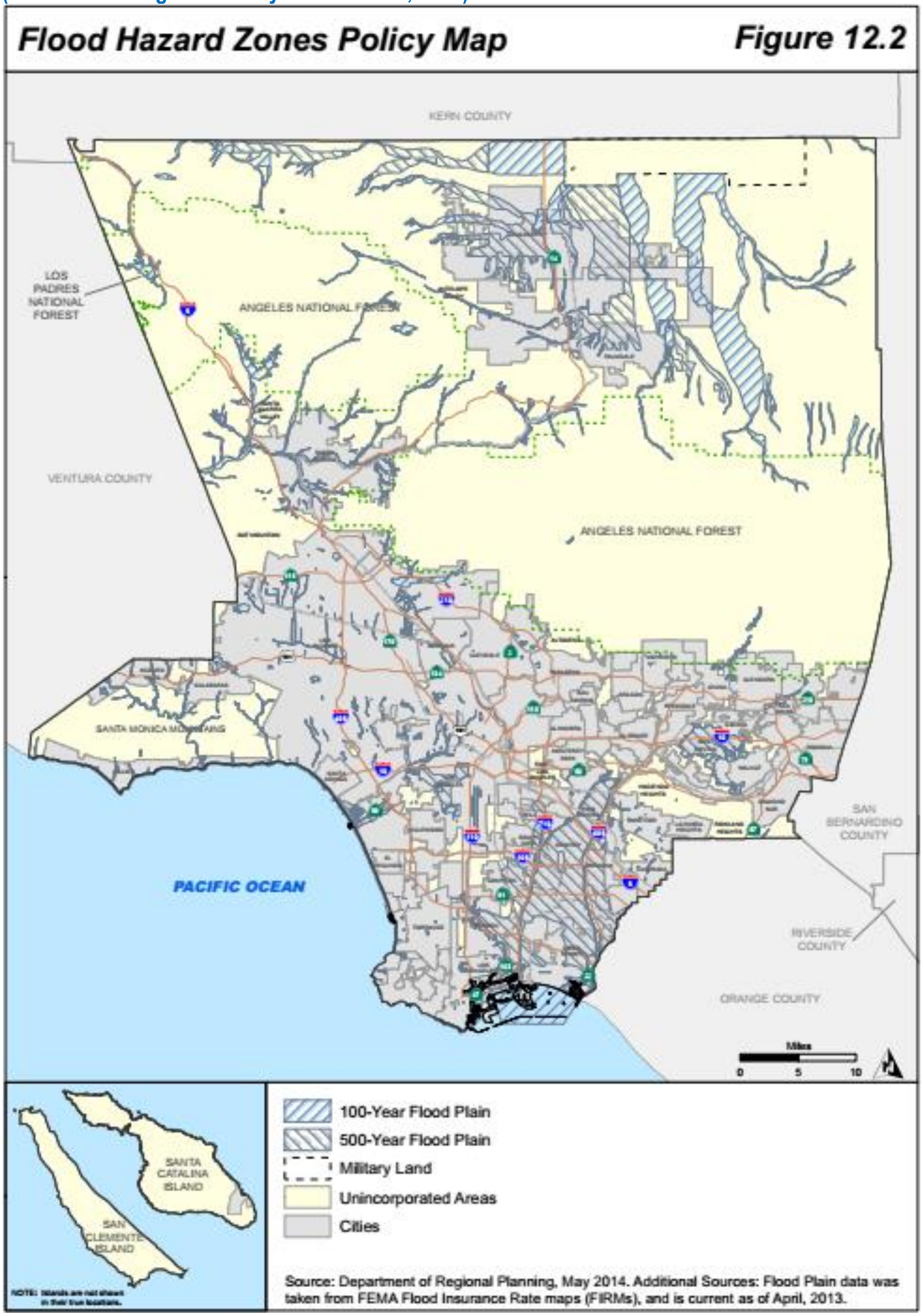
Both Los Angeles and Ventura Counties participate in the National Flood Insurance Program (NFIP). Created by Congress in 1968, the NFIP makes flood insurance available in communities that enact minimum floodplain management rules consistent with the Code of Federal Regulations §60.3.

MRCA is located in the County of Los Angeles, who participates in NFIP and the FEMA FIRM maps for the County were last updated on December 21, 2018. The MRCA project area is also located in Ventura County, who participates in NFIP and the FEMA FIRM maps for the County were last updated on January 29, 2021. It's important to note that FEMA flood maps are not entirely accurate. The studies and maps represent flood risk at the point in time when FEMA completed the studies and does not incorporate planning for floodplain changes in the future due to new development. Although FEMA is considering changing that policy, it is optional for local communities. See **Flood Hazards** for information on flood hazards impacting the service area.

According to FEMA, the MRCA Project Area includes a broad range of flood zone designations. The County of Los Angeles All Hazards Mitigation Plan identifies that the Los Angeles County DFIRM identifies 4.19 square miles (0.09%) with a 1% annual chance of flooding (100-year floodplain), and 243.32 square miles (5.11%) with a 0.2% annual chance of flooding (500-year floodplain). These areas are highlighted below in **Map: Flood Hazard Zones** from the Los Angeles County General Plan, 2015.

According to the Ventura County Multi-Hazard Mitigation Plan (2015), Unincorporated Ventura County and its cities participate in the NFIP. The NFIP makes federally backed flood insurance available to homeowners, renters, and business owners in communities that adopt and enforce floodplain management ordinances to reduce future flood damage. As participants of the NFIP, Unincorporated Ventura County and each of its cities enforce a floodplain management ordinance and participate in FEMA's Community Assisted Visits, which occur on a 3-to 5-year cycle.

Map: Flood Hazard Zones – Los Angeles County
(Source: Los Angeles County General Plan, 2015)



Map: Special Flood Hazard Areas – Ventura County
(Source: Ventura County Multi-Hazard Mitigation Plan, 2015)

According to the County of Los Angeles All-Hazards Mitigation Plan (2019), there are 55 Repetitive Loss (RL) properties in 22 RL areas of unincorporated Los Angeles County as of the last submitted 2019 Community Rating System (CRS) Recertification. A Repetitive Loss (RL) property is any insurable building for which two or more claims of more than $1,000 were paid by the National Flood Insurance Program (NFIP) in any rolling 10-year period, since 1978. Updated location information about RL properties in the unincorporated areas of Los Angeles County were not available during the drafting of this plan. Data from 2011 showed that 26 RL properties were located in the SFHA. At the time, Los Angeles County Public Works stated, “the majority of the repetitive losses are associated with localized urban drainage flood problems, even for properties within a FEMA-designated flood zone.” Los Angeles County Public Works oversees RL mitigation projects.

According to the Ventura County Multi-Hazard Mitigation Plan (2015), the County contains a total of 74 repetitive loss properties and 6 severe repetitive loss properties. None of the properties are under the control of MRCA.

Map: Repetitive Loss Properties – Ventura County
(Source: Ventura County Multi-Hazard Mitigation Plan, 2015)

Definitions of FEMA Flood Zone Designations

Flood zones are geographic areas that the FEMA has defined according to varying levels of flood risk. These zones are depicted on a community's Flood Insurance Rate Map (FIRM) or Flood Hazard Boundary Map. Each zone reflects the severity or type of flooding in the area.

Moderate to Low Risk Areas

In communities that participate in the NFIP, flood insurance is available to all property owners and renters in these zones:

ZONE	DESCRIPTION
B and X (shaded)	Area of moderate flood hazard, usually the area between the limits of the 100-year and 500-year floods. B Zones are also used to designate base floodplains of lesser hazards, such as areas protected by levees from 100-year flood, or shallow flooding areas with average depths of less than one foot or drainage areas less than 1 square mile.
C and X (unshaded)	Area of minimal flood hazard usually depicted on FIRMs as above the 500-year flood level. Zone C may have ponding and local drainage problems that do not warrant a detailed study or designation as base floodplain. Zone X is the area determined to be outside the 500-year flood and protected by levee from 100-year flood.

High Risk Areas

In communities that participate in the NFIP, mandatory flood insurance purchase requirements apply to all of these zones:

ZONE	DESCRIPTION
A	Areas with a 1% annual chance of flooding and a 26% chance of flooding over the life of a 30-year mortgage. Because detailed analyses are not performed for such areas; no depths or base flood elevations are shown within these zones.
AE	The base floodplain where base flood elevations are provided. AE Zones are now used on new format FIRMs instead of A1-A30 Zones.
A1-30	These are known as numbered A Zones (e.g., A7 or A14). This is the base floodplain where the FIRM shows a BFE (old format).
AH	Areas with a 1% annual chance of shallow flooding, usually in the form of a pond, with an average depth ranging from 1 to 3 feet. These areas have a 26% chance of flooding over the life of a 30-year mortgage. Base flood elevations derived from detailed analyses are shown at selected intervals within these zones.
AO	River or stream flood hazard areas, and areas 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. These areas have a 26% chance of flooding over the life of a 30-year mortgage. Average flood depths derived from detailed analyses are shown within these zones.
AR	Areas with a temporarily increased flood risk due to the building or restoration of a flood control system (such as a levee or a dam). Mandatory flood insurance purchase requirements will apply, but rates will not exceed the rates for unnumbered A zones if the structure is built or restored in compliance with Zone AR floodplain management regulations.
A99	Areas with a 1% annual chance of flooding that will be protected by a Federal flood control system where construction has reached specified legal requirements. No depths or base flood elevations are shown within these zones.

Undetermined Risk Areas

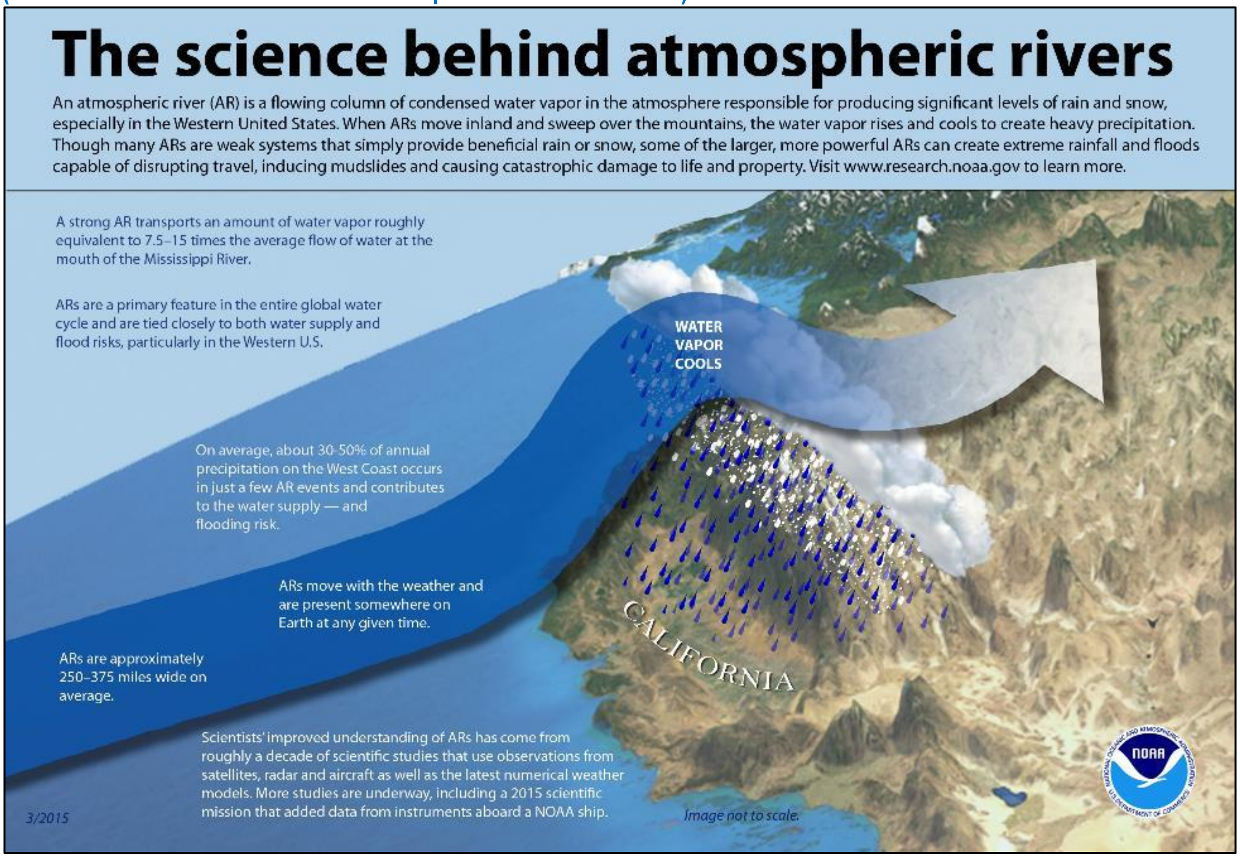
ZONE	DESCRIPTION
D	Areas with possible but undetermined flood hazards. No flood hazard analysis has been conducted. Flood insurance rates are commensurate with the uncertainty of the flood risk.

Atmospheric Rivers

According to the National Oceanic and Atmospheric Administration (NOAA), atmospheric rivers are relatively long, narrow regions in the atmosphere – like rivers in the sky – that transport most of the water vapor outside of the tropics. These columns of vapor move with the weather, carrying an amount of water vapor roughly equivalent to the average flow of water at the mouth of the Mississippi River. When the atmospheric rivers make landfall, they often release this water vapor in the form of rain or snow.

Although atmospheric rivers come in many shapes and sizes, those that contain the largest amounts of water vapor and the strongest winds can create extreme rainfall and floods, often by stalling over watersheds vulnerable to flooding. These events can disrupt travel, induce mudslides, and cause catastrophic damage to life and property. A well-known example is the "Pineapple Express," a strong atmospheric river that can bring moisture from the tropics near Hawaii over to the U.S. West Coast.

Graphic: Atmospheric Rivers
(Source: National Oceanic and Atmospheric Administration)



While atmospheric rivers are responsible for great quantities of rain that can produce flooding, they also contribute to beneficial increases in snowpack. A series of atmospheric rivers fueled the strong winter storms that battered the U.S. West Coast from western Washington to southern California from December 10–22, 2010, producing 11 to 25 inches of rain in certain areas. These rivers also contributed to the snowpack in the Sierras, which received 75 percent of its annual snow by December 22, the first full day of winter.

NOAA research (e.g., NOAA Hydrometeorological Testbed and Cal Water) uses satellite, radar, aircraft and other observations, as well as major numerical weather model improvements, to better understand atmospheric rivers and their importance to both weather and climate.

Q&A | ELEMENT B: HAZARD IDENTIFICATION AND RISK ASSESSMENT | B3a.
Q: Is there a description of each hazard's **impacts** on each jurisdiction (what happens to structures, infrastructure, people, environment, etc.)? (Requirement §201.6(c)(2)(ii)) **A:** See **Impact of Flooding in the MRCA** below.

Impact of Flooding in the MRCA

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

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

Impacts of Climate Change on Flooding

Climate change could result in an increase in flooding due to changes in the frequency, duration and intensity of storm events. Rising snowlines caused by climate change will allow additional mountain areas to contribute to peak storm runoff. High frequency flood events (e.g. 10-year floods) will likely increase with a changing climate. Along with reductions in the amount of the snowpack and accelerated snowmelt, scientists project greater storm intensity, resulting in more direct runoff and flooding. Changes in watershed vegetation and soil moisture conditions will likewise change runoff and recharge patterns.

As stream flows and velocities change, erosion patterns will also change, altering channel shapes and depths, possibly increasing sedimentation behind dams, and affecting habitat and water quality. With potential increases in the frequency and intensity of wildfires due to climate change, there is potential for more floods following fire, which increase sediment loads and water quality impacts. As hydrology changes, what is currently considered a 100-year flood may occur more often, leaving many communities at greater risk.

As peak flows and precipitation change over time, planners will need to factor a new level of safety into the design, operation, and regulation of flood protection facilities such as dams, floodways, bypass channels and levees, as well as the design of local sewers and storm drains. Use of historical data has long been the standard of practice for designing and operating flood protection projects, developing flood forecasting models, and forecasting snowmelt runoff. The use of past data for forecasting assumes that the climate of the future will be similar to that of the period of historical record. However, the historical hydrologic record cannot be used to predict increases in the frequency and severity of extreme events such as floods and droughts. National resource managers have concluded the following:

- Historical hydrologic patterns can no longer be solely relied upon to forecast the water future.
- Precipitation and runoff patterns are changing, increasing the uncertainty for water supply and quality, flood management and ecosystem functions.
- Extreme climate events will become more frequent, necessitating improvement in flood protection, drought preparedness and emergency response.

In light of these conclusions, model calibration or statistical relation development in the future must happen more frequently, new forecast-based tools must be developed, and a standard of practice that explicitly considers climate change must be adopted.

Extreme Weather Hazards

Hazard Definition

Severe weather conditions can cause substantial damage to property and infrastructure. Like other natural hazards, weather can also negatively impact daily economic activity and potentially result in injuries and/or loss of life.

Q&A | ELEMENT B: HAZARD IDENTIFICATION AND RISK ASSESSMENT | B2a.
Q: Does the plan include information on **previous occurrences** of hazard events for each jurisdiction? (Requirement §201.6(c)(2)(i))
A: See **Previous Occurrences of Extreme Weather in the MRCA** below.

Previous Occurrences of Extreme Weather in the MRCA

Significant wind events and excessive heat have been known to negatively affect the Project Area.

Los Angeles County

The most recent significant Extreme Weather event to affect MRCA in Los Angeles County were the temperature increases over the past century. According to California's Fourth Climate Change Assessment (2018), based on 1896-2015 temperature records for the California South Coast NOAA Climate Division, which encompasses the LA region, He and Gautam (2016) found significant trends in annual average, maximum, and minimum temperature around 0.16°C per decade. Every month has experienced significant positive trends in monthly average, maximum, and minimum temperature. Monthly average and minimum temperatures have increased the most in September and monthly maximum temperatures have increased the most in January, with each trend exceeding 0.2°C per decade. Recently, the California South Coast Climate Division has experienced sustained record warmth. The top 5 warmest years in terms of annual average temperature have all occurred since 2012: 2014 was the warmest, followed by 2015, 2017, 2016, and 2012.

Ventura County

The most recent significant Extreme Weather event to affect MRCA was the Presidential Disaster Declaration in 2007. According to the Ventura County Hazard Mitigation Plan (2015), Ventura County was included in the Presidential Disaster Declarations for freezing and severe winter storms that occurred in December 1998 and January 2007. The 1998 freeze was particularly damaging to citrus crops. According to NOAA's National Climatic Data Center (NCDC) database, 105 storms causing high winds occurred in Ventura County over the last 10 years. These storms included wind speeds of up to 76 miles per hour; in one case, the storm caused a death. Storms with high winds also knocked down trees and power lines. Also, according to the NCDC database, 31 winter storms causing snow and ice have occurred in Ventura County over the last 10 years. Some of the storms also caused hail; in addition, two hailstorms have been recorded in Ventura County since 2005, with reported hail of up to 1.5 inches in diameter.

Q&A | ELEMENT B: HAZARD IDENTIFICATION AND RISK ASSESSMENT | B1a.

Q: Does the plan include a general **description** of all natural hazards that can affect each jurisdiction? (Requirement §201.6(c)(2)(i))

A: See **Regional Conditions** below.

Q&A | ELEMENT B: HAZARD IDENTIFICATION AND RISK ASSESSMENT | B3b.

Q: Is there a description of each identified hazard's overall **vulnerability** (structures, systems, populations, or other community assets defined by the community that are identified as being susceptible to damage and loss from hazard events) for each jurisdiction? (Requirement §201.6(c)(2)(ii))

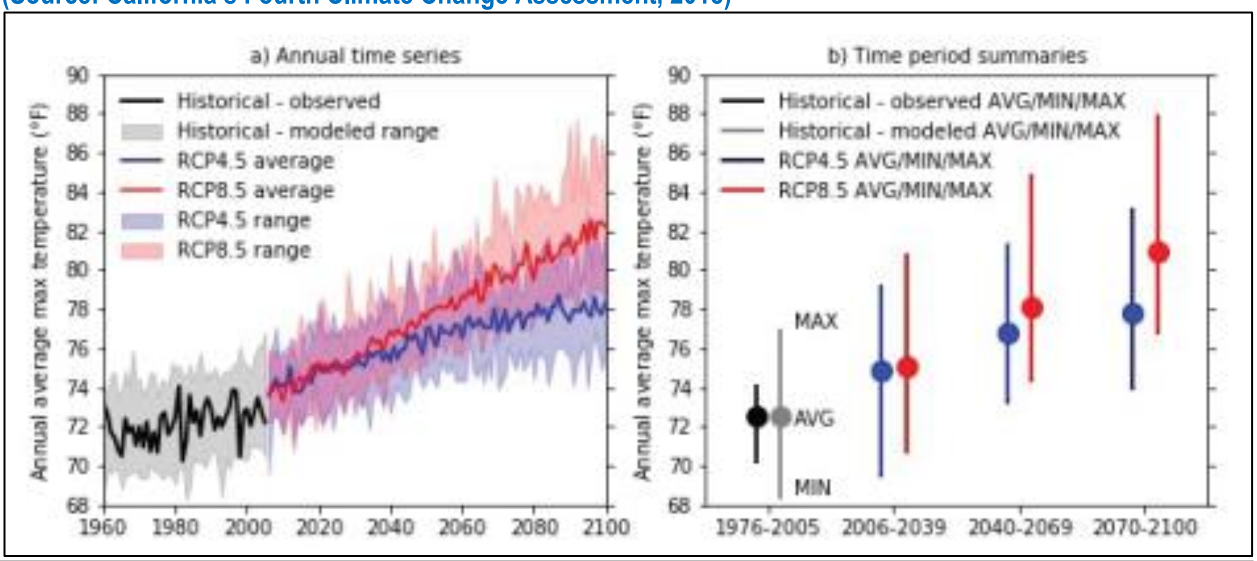
A: See **Regional Conditions** below.

Regional Conditions

Los Angeles County

According to California's Fourth Climate Change Assessment (2018), warming is expected to increase across the LA region in the coming decades. Specifically, compared to the historical annual average maximum temperature of 72.5°F, future model average values are projected to increase to 74.8°F (model range of 69.5 - 79.1°F) by the early 21st century, 76.7°F (73.3 - 81.2°F) by the mid-21st century, and 77.8°F (74.0 - 83.1°F) by the late 21st century under RCP4.5. Corresponding model-average projections under RCP8.5 are 75.1°F (70.7 - 80.7°F) by the early-21st century, 78.2°F (74.4 - 84.8°F) by the mid-21st century, and 80.9°F (76.9 - 87.8°F) by the late-21st century (red dots and lines). Note that the data in the **Graph: Historical and Projected Annual Average Maximum Temperature** combines inter-annual variability and model variability, resulting in apparent increases in future variability over the region.

Graph: Historical and Projected Annual Average Maximum Temperature
(Source: California's Fourth Climate Change Assessment, 2018)



Ventura County

According to the Ventura County Hazard Mitigation Plan (2015), the climate on California's southern coast is hot Mediterranean, in which summers are hot and dry and winters are cool and damp. A dominating factor in the weather of California is the semi-permanent high pressure area of the North Pacific Ocean, sometimes called the Pacific High. This pressure center moves northward in summer, holding storm tracks well to the north; as a result, California receives little or no precipitation during that period. The Pacific High decreases in intensity in winter and moves farther south, permitting storms to move into and across the state and producing high winds, widespread rain at low elevations, and snow at high elevations. Occasionally the state's circulation pattern permits a series of storm centers to move into California from the southwest. This type of storm pattern is responsible for occasional heavy rains that can cause serious winter flooding. The rainy season is from mid-autumn to mid-spring. During these months, winter storms may occur. In addition to high winds and flooding, winter storms may bring hail, lightning, and extended periods of freezing temperatures to all areas of the county.

Many events described above affected all of Ventura County. The entire county is susceptible to winter storms and damage from wind. However, only the higher elevation areas (typically at or above 4,000 to 5,000 feet) experience snowfall, while lower elevation areas experience heavy rains. Hail has occurred throughout the county. A winter storm can cause high rains, flooding, up to 18 inches of snow at the highest elevations in the county (e.g., Mount Pinos), and wind speeds of up to 70 miles per hour. Hail of up to 1.5 inches in diameter has been recorded. Based on recent history, a winter storm can occur every year, but those causing injury or damage occur about once every 10 years.

Q&A | ELEMENT B: HAZARD IDENTIFICATION AND RISK ASSESSMENT | B3a.
Q: Is there a description of each hazard's **impacts** on each jurisdiction (what happens to structures, infrastructure, people, environment, etc.)? (Requirement §201.6(c)(2)(ii)) **A:** See **Impact of Extreme Weather in the MRCA** below.

Impacts of Extreme Weather in the MRCA

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

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

Impacts of Climate Change on Extreme Weather

According to California's Fourth Climate Change Assessment (2018), Southern California lies between two large-scale zones of opposing projected precipitation change: general wetting in the northern mid-latitudes versus general drying in the southern sub-tropics. Consequently, model projections disagree on the sign of future precipitation change over southern California, but generally project small mean changes (either positive or negative) compared to the region's large historical variability. Despite small changes in average precipitation, dry and wet extremes are both expected to increase in the future. By the late-21st century, the wettest day of the year is expected to increase across most of the LA region, with some locations experiencing 25-30% increases under RCP8.5 (Representative Concentration Pathway). Extreme precipitation often arrives via "atmospheric rivers", and possible changes to these and other extreme storms are discussed further in the subsequent section. Extremely dry years are also projected to increase over southern California, potentially a doubling or more in frequency by the late-21st century.

The intensity and frequency of extreme heat are also projected to increase over the LA region. The average hottest day of the year is expected to increase roughly 4-7°F under RCP4.5 and 7-10°F under RCP8.5 by the late- 21st century. Similar to the spatial pattern in annual max temperature changes, the largest changes in extremes are found in the interior of the region, and particularly the valleys, while the smallest changes are generally confined to coastal regions.

Epidemic/Pandemic/Vector-Borne Diseases Hazards

Hazard Definition

According to the California State Hazard Mitigation Plan (2018), the California Department of Public Health has identified epidemics, pandemics, and vector-borne diseases as specific hazards that would have a significant impact throughout the State.

According to the Centers for Disease Control (CDC), an epidemic refers to an increase, often sudden, in the number of cases of a disease above what is normally expected in that population area. A pandemic refers to an epidemic that has spread over several countries or continents, usually affecting a large number of people. Vector-borne diseases are human illnesses caused by parasites, viruses and bacteria that are transmitted by vectors – living organisms that can transmit infectious pathogens between humans, or from animals to humans.

Seasonal Influenza

Seasonal influenza, also known as the flu, is a disease that attacks the respiratory system (nose, throat, and lungs) in humans. Seasonal influenza occurs every year. In the U.S., the influenza season typically occurs from October through May, peaking in January or February with yearly epidemics of varying severity. Although mild cases may be similar to a viral "cold," influenza is typically much more severe. Influenza usually comes on suddenly; may include fever, headache, tiredness (which may be extreme), dry cough, sore throat, nasal congestion, and body aches; and can result in complications such as pneumonia. Persons aged 65 and older, those with chronic health conditions, pregnant women, and young children are at the highest risk for serious complications, including death.

Pandemic Influenza

A pandemic influenza occurs when a new influenza virus, for which there is little or no human immunity, emerges and spreads on a worldwide scale, infecting a large proportion of the human population. The 20th century saw three such pandemics. The most notable pandemic was the 1918 Spanish influenza pandemic that was responsible for 20 million to 40 million deaths throughout the world. There have been two pandemics in the 21st century; H1N1 in 2009, and the most recent COVID-19 outbreak in 2019. As demonstrated historically and currently, pandemic influenza has the potential to cause serious illness and death among people of all age groups and have a major impact on society. These societal impacts include significant economic disruption that can occur due to death, loss of employee work time, and costs of treating or preventing the spread of influenza.

H1N1 Influenza

In 2009 a pandemic of H1N1 influenza, popularly referred to as the swine flu, resulted in many hospitalizations and deaths. Pandemic H1N1 influenza is spread in the same way as seasonal influenza, from person to person through coughing or sneezing by infected people. In April 2009, two kids living more than 100 miles apart in Southern California came down with the flu. By mid-April, their illnesses had been diagnosed as being caused by a new strain of H1N1 influenza. Persons infected with H1N1 experienced fever and mild respiratory symptoms, such as coughing, runny nose, and congestion. In some cases, symptoms were severe and included diarrhea, chills, and vomiting, and in rare cases respiratory failure occurred. The H1N1 virus caused relatively few deaths in humans. In the United States, for example, it caused fewer deaths (between 8,870 and 18,300) than seasonal influenza, which, based on data for the years 2014–2019, causes an average of about 40,000 deaths each year. The H1N1 virus was most lethal in individuals affected by chronic disease or other underlying health conditions.

COVID-19

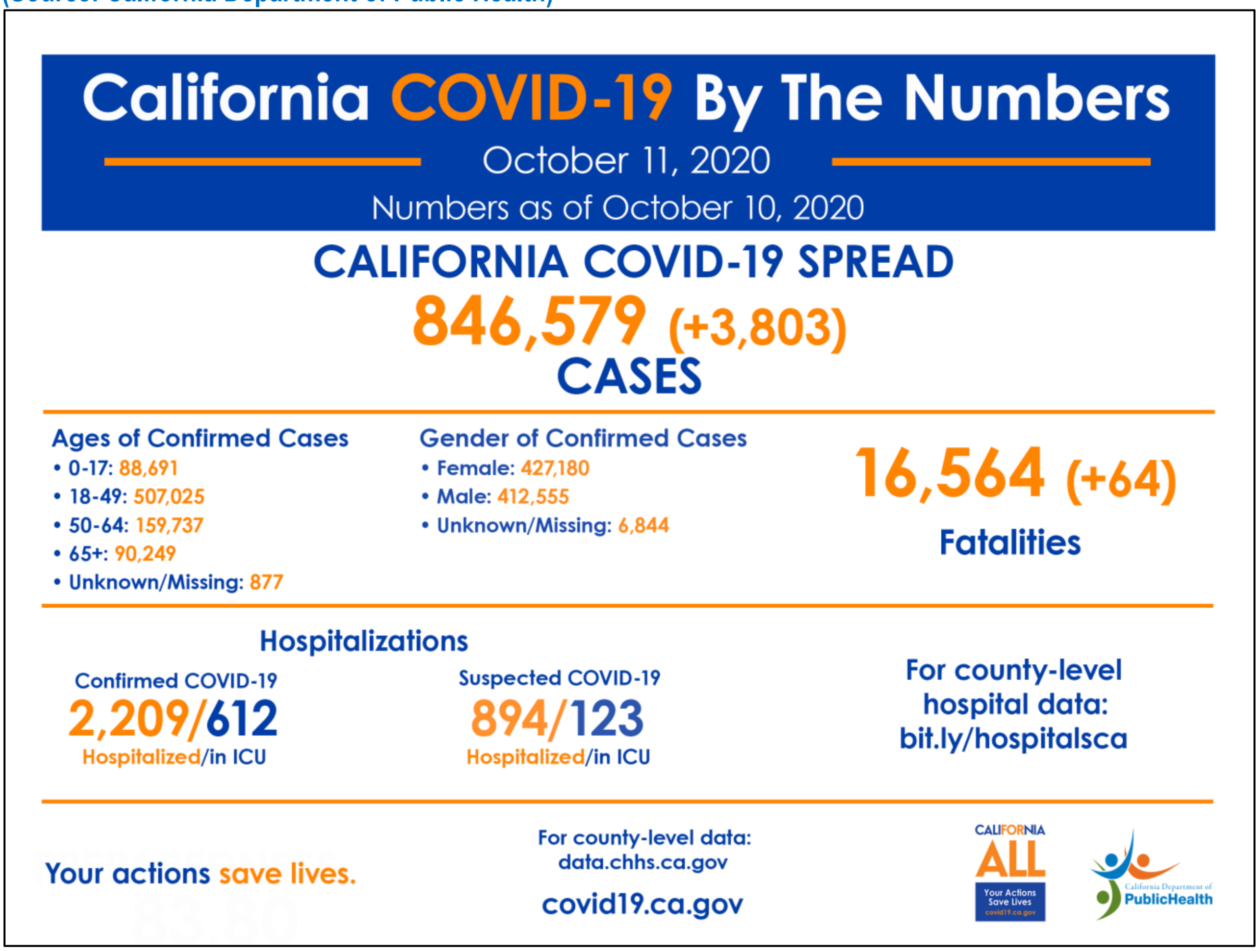
As of 2020, the CDC is responding to a pandemic of respiratory disease spreading from person to person caused by a novel (new) coronavirus. The disease has been named “Coronavirus Disease 2019” (abbreviated “COVID-19”). Coronaviruses are a large family of viruses that are common in people and many different species of animals, including camels, cattle, cats, and bats. Rarely, animal coronaviruses can infect people and then spread between people such as with Middle East Respiratory Syndrome (MERS) and Severe Acute Respiratory Syndrome (SARS).

According to the CDC, many of the patients at the epicenter of the outbreak in Wuhan, Hubei Province, China had some link to a large seafood and live animal market, suggesting animal-to-person spread. Later, a growing number of patients reportedly did not have exposure to animal markets, indicating person-to-person spread. Person-to-person spread was subsequently reported outside Hubei and in countries outside China, including in the United States. Most international destinations now have ongoing community spread with the virus that causes COVID-19, as does the United States.

On March 4, 2020, Governor Newsom proclaimed a state of emergency in the California in response to the COVID-19 outbreak. On March 19, 2020, Governor Newsom issued an executive order directing all residents immediately to heed current State public health directives to stay home, except as needed to maintain continuity of operations of essential critical infrastructure sectors.

According to the California Department of Public Health, as of October 11, 2020, the state of California had 846,579 confirmed cases of COVID-19 and 16,564 people have died.

Figure: California COVID-19 by the Numbers
(Source: California Department of Public Health)



Avian Influenza

Avian Influenza, commonly referred to as "Bird Flu," remains a looming pandemic threat. Avian Influenza primarily spreads from birds to birds and rarely to humans. Public health experts continue to be alert to the possibility that an avian virus may mutate or change so that it can be passed from birds to humans, potentially causing a pandemic in humans. Some strains of the Avian Influenza could arise from Asia or other continents where people have very close contact with infected birds. This disease could have spread from poultry farmers or visitors to live poultry markets who had been in very close contact with infected birds and contracted fatal strains of Avian Influenza. Thus far, Avian Influenza viruses have not mutated and have not demonstrated easy transmission from person to person. However, if Avian Influenza viruses were to mutate into a highly virulent form and become easily transmissible from person to person, the public health community would be very concerned about the potential for an influenza pandemic. Such a pandemic could disrupt all aspects of society and severely affect the economy.

Vector-Borne Diseases

Vector-borne diseases are human illnesses caused by parasites, viruses and bacteria that are transmitted by vectors. Every year there are more than 700,000 deaths from diseases such as malaria, dengue, schistosomiasis, human African trypanosomiasis, leishmaniasis, Chagas disease, yellow fever, Japanese encephalitis and onchocerciasis. Vectors are living organisms that can transmit infectious pathogens between humans, or from animals to humans. Many of these vectors are bloodsucking insects, which ingest disease-producing microorganisms during a blood meal from an infected host (human or animal) and later transmit it into a new host, after the pathogen has replicated. Often, once a vector becomes infectious, they can transmit the pathogen for the rest of their life during each subsequent bite/blood meal.

Mosquito-Borne Viruses

Mosquito-borne viruses belong to a group of viruses commonly referred to as arboviruses (for arthropod-borne). Although 12 mosquito-borne viruses are known to occur in California, only West Nile virus (WNV), western equine encephalomyelitis virus (WEE), and St. Louis encephalitis virus (SLE) are significant causes of human disease. WNV continues to seriously affect the health of humans, horses, and wild birds throughout the state. Since 2003, there have been over 6,000 WNV human cases with 248 deaths, and over 1,200 equine cases.

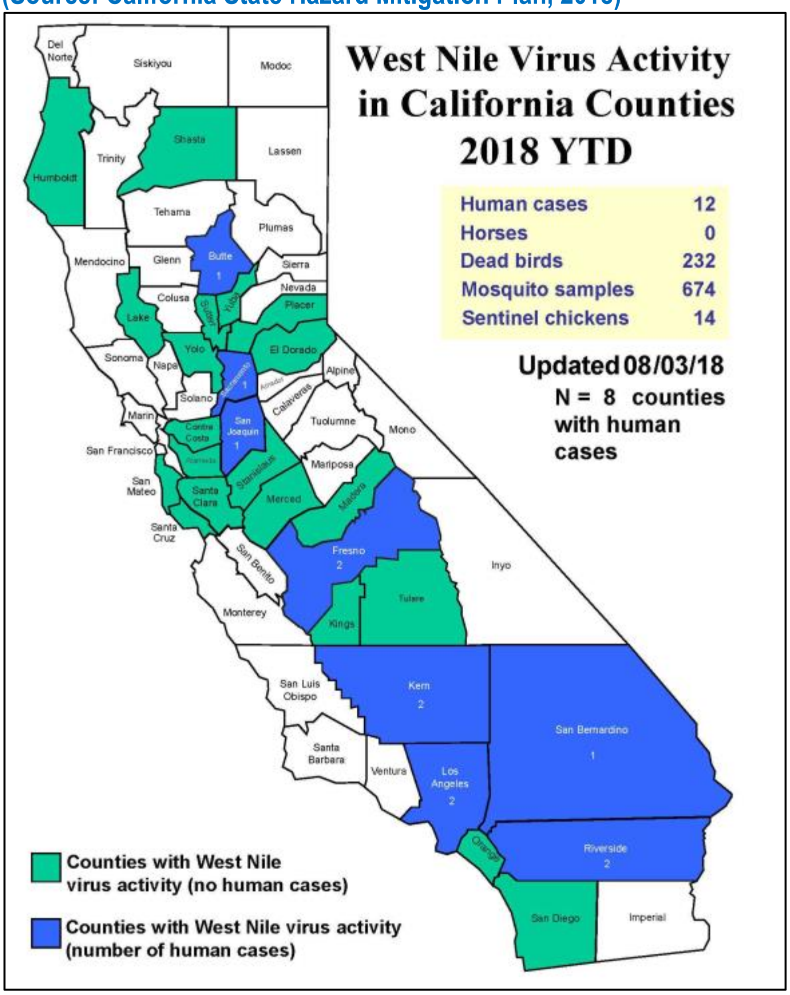
WNV first appeared in the United States in 1999 in New York and rapidly spread across the country to California in subsequent years. California has historically maintained a comprehensive mosquito-borne disease surveillance and control program including the Mosquito-borne Virus Surveillance and Response Plan, which is updated annually in consultation with local vector control agencies.

Climate change will likely affect vector-borne disease transmission patterns. Changes in temperature and precipitation can influence seasonality, distribution, and prevalence of vector-borne diseases. A changing climate may also create conditions favorable for the establishment of invasive mosquito vectors in California.

For most Californians, WNV poses the greatest mosquito-borne disease threat. Above-normal temperatures are among the most consistent factors associated with WNV outbreaks. Mild winters are associated with increased WNV transmission due, in part, to less mosquito and resident bird mortality. Warmer winter and spring seasons may also allow for transmission to start earlier. Such conditions also allow more time for virus amplification in bird-mosquito cycles, increasing the potential for mosquitoes to transmit WNV to people.

The effects of increased temperature are primarily through acceleration of physiological processes within mosquitoes, resulting in faster larval development and shorter generation times, more frequent mosquito biting, and shortening of the incubation period time required for infected mosquitoes to transmit WNV. During periods of drought, especially in urban areas, mosquitoes tend to thrive more due to changes in stormwater management practices. Mosquitoes in urban areas can reach higher abundance due to stagnation of water in underground stormwater systems that would otherwise be flushed by rainfall. Runoff from landscape irrigation systems mixed with organic matter can also create ideal mosquito habitat. Drought conditions may also force birds to increase their utilization of suburban areas where water is more available, bringing these WNV hosts into contact with urban vectors.

Map: West Nile Virus Activity in California Counties
(Source: California State Hazard Mitigation Plan, 2018)

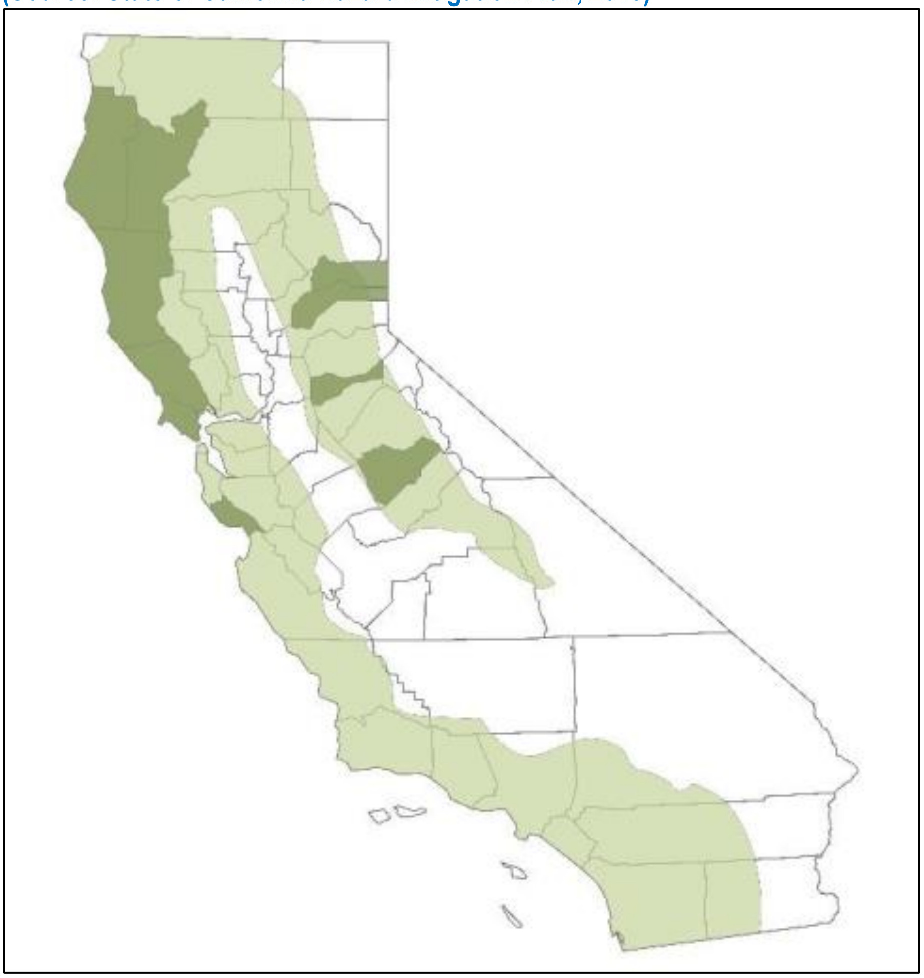


Lyme Disease

Lyme disease is caused by a spirochete (a corkscrew-shaped bacteria) called Borrelia burgdorferi and is transmitted by the Western black-legged tick. Lyme disease was first described in North America in the 1970s in Lyme, Connecticut, the town for which it was then named. Though the tick has been reported from 56 of the 58 counties in California, the highest incidence of disease occurs in the northwest coastal counties and northern Sierra Nevada counties with western-facing slopes. Ticks prefer cool, moist areas and can be found in wild grasses and low vegetation in both urban and rural areas.

The map below shows Western black-legged tick and Lyme disease incidence in California. The Western black-legged tick is commonly found in all green areas shown on the map; dark green areas on the map show where reported Lyme disease cases most often had exposure.

Map: Tick and Lyme Disease Incidence in California
(Source: State of California Hazard Mitigation Plan, 2018)



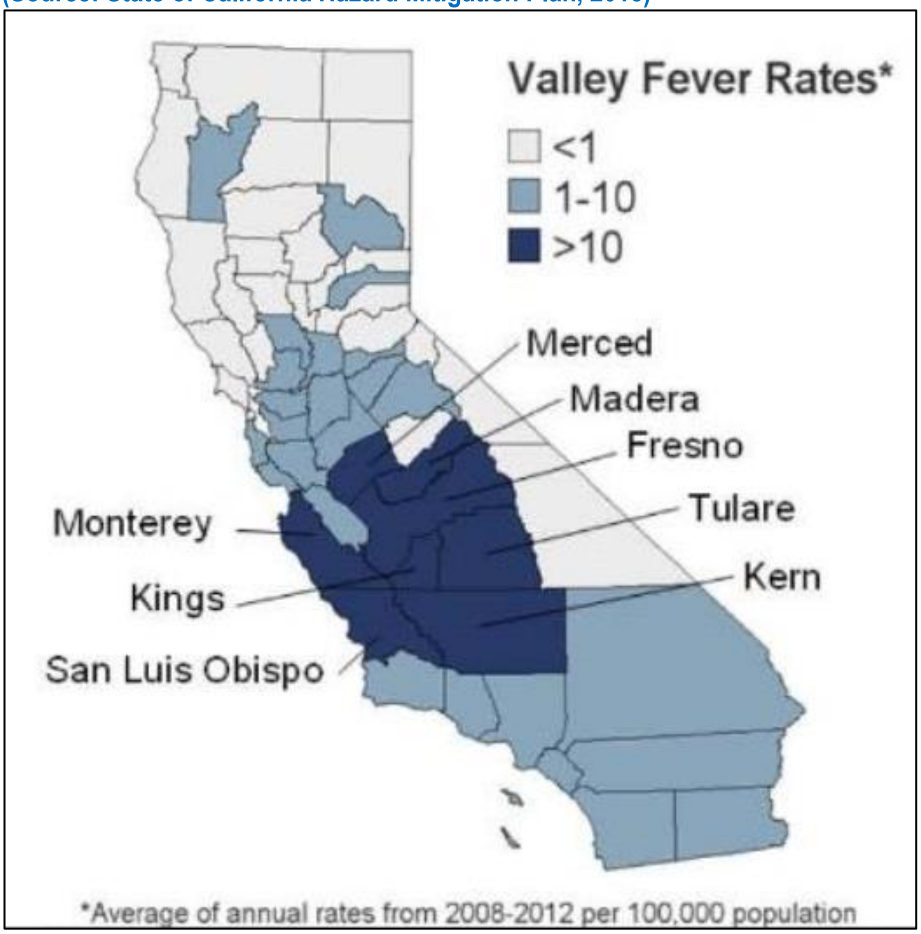
Valley Fever

Valley Fever is caused by Coccidioides, a fungus that lives in the soil in the southwestern United States and parts of Mexico, Central America, and South America. Inhaling the airborne fungal spores can cause an infection called coccidioidomycosis, which is also known as “cocci” or “Valley Fever.”

Most people who are exposed to the fungus do not get sick, but some people develop flu-like symptoms that may last for weeks to months. In a very small proportion of people who get Valley Fever, the infection can spread from the lungs to other parts of the body and cause more severe conditions, such as meningitis or even death. Valley Fever cannot spread from person to person.

Most cases of Valley Fever in the U.S. occur in people who live in or have traveled to the southwestern United States, especially Arizona and California. The map below shows the areas where the fungus that causes Valley Fever is thought to be endemic, or native and common in the environment. The full extent of the current endemic areas is unknown and is a subject for further study

Map: Valley Fever Average Annual Rates by California County
(Source: State of California Hazard Mitigation Plan, 2018)



Q&A | ELEMENT B: HAZARD IDENTIFICATION AND RISK ASSESSMENT | B2a.
Q: Does the plan include information on **previous occurrences** of hazard events for each jurisdiction? (Requirement §201.6(c)(2)(i)) **A:** See **Previous Occurrences of Epidemic/Pandemic and Vector-Borne Diseases in the MRCA** below.

Previous Occurrences of Epidemic/Pandemic and Vector-Borne Diseases in the MRCA

The tables below show previous occurrences of West Nile and Influenza cases affecting Los Angeles County:

Table: Confirmed West Nile Infections and Fatalities in Los Angeles County by Year
(Source: Acute Communicable Disease Control, County of Los Angeles Public Health, 2019)

Year	Infections	Hospitalizations	Deaths
2015	300	262	24
2016	153	131	6
2017	268	224	27
2018	47	37	3
2019	29	24	3

Table: Los Angeles County Influenza Surveillance Summary, 2018-19 Influenza Season
(Source: Influenza in Los Angeles County, County of Los Angeles Public Health, 2019)

Year	Influenza	Respiratory Outbreak (Influenza)	Unknown Respiratory Outbreak	Deaths
2017-2018	12,429	43	113	289
2018-2019	6,429	25	21	125

Table: West Nile Virus Cases - Ventura
(Source: Mosquito Control and Vector Borne Disease Prevention Assessment for Fiscal Year 2019-2020, Engineer's Report, 2019)

Year	Human	Bird	Equine	Mosquito Pools*	Chickens**
2017-2018	1	3	0	3	0
2018-2019	1	0	0	0	0

* Each mosquito pool consists of approximately 50 mosquitoes.
** Sentinel chickens maintained by the Environmental Health Division
***WNV positive chickens were from sentinel chicken flock maintained by the City of Moorpark

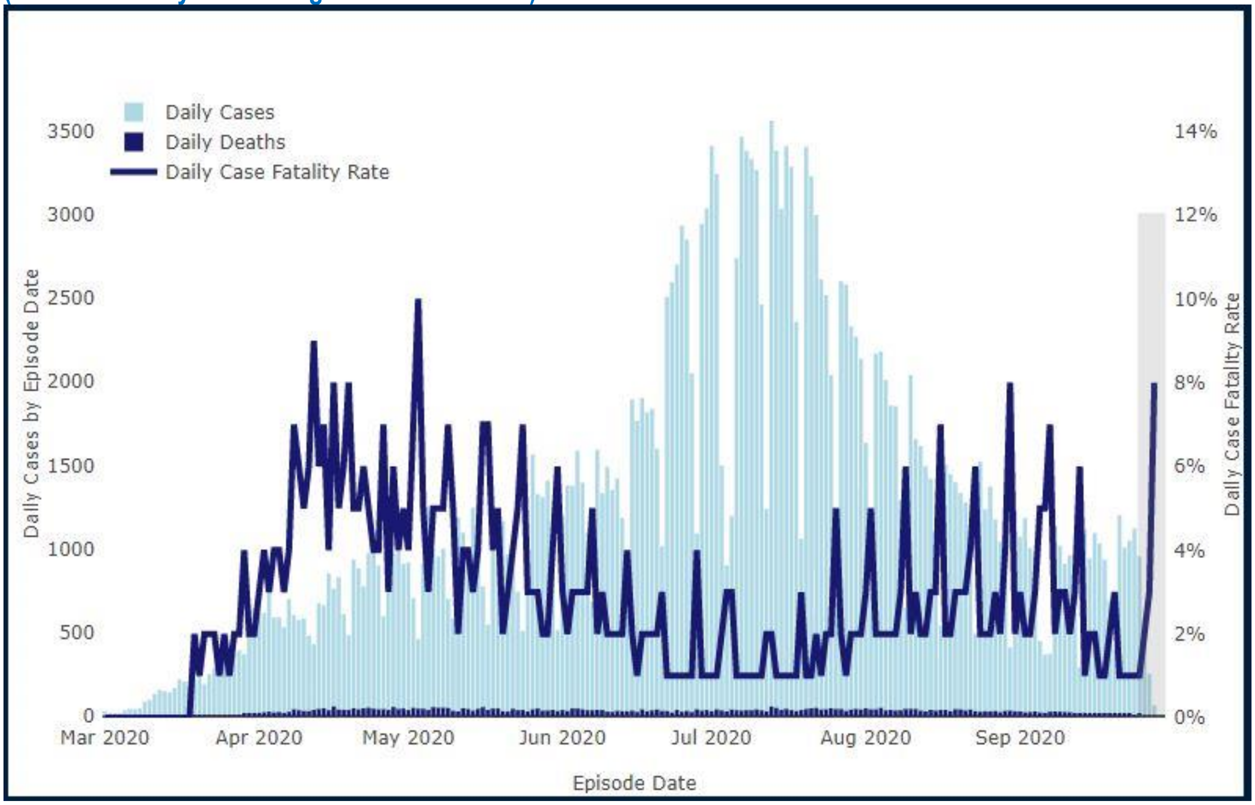
Q&A | ELEMENT B: HAZARD IDENTIFICATION AND RISK ASSESSMENT | B1a.
Q: Does the plan include a general description of all natural hazards that can affect each jurisdiction? (Requirement §201.6(c)(2)(i)) **A:** See **Regional Conditions** below.
Q&A | ELEMENT B: HAZARD IDENTIFICATION AND RISK ASSESSMENT | B3b.
Q: Is there a description of each identified hazard's overall **vulnerability** (structures, systems, populations, or other community assets defined by the community that are identified as being susceptible to damage and loss from hazard events) for each jurisdiction? (Requirement §201.6(c)(2)(ii)) **A:** See **Regional Conditions** below.

Regional Conditions

Epidemic/Pandemic in Los Angeles County

While the variety of influenza, vector borne, and mosquito borne diseases continue to affect the Project Area, COVID-19 currently has the biggest impact. According to the County of Los Angeles Public Health Department, as of October 11, 2020, there were 971 new cases reported, contributing to the 282,135 total cases reported. COVID related deaths have taken 6,771 lives in Los Angeles County.

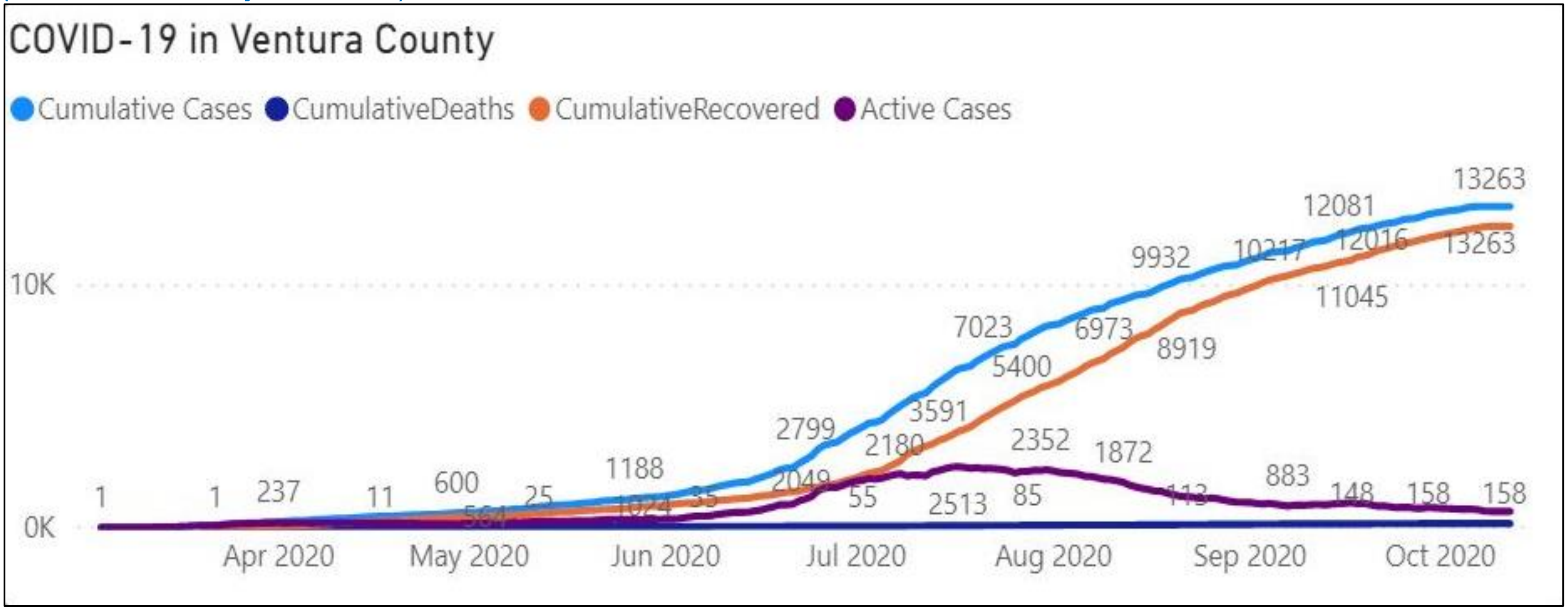
Graph: Daily Cases and Deaths by Episode Date: COVID-19
(Source: County of Los Angeles Public Health)



Epidemic/Pandemic in Ventura County

According to the Ventura County Public Health website on October 9, 2020, the county had 39 new cases, for a total of 13,263 cases overall and 158 deaths. The graph below displays this data:

Graph: COVID-19 Data – Ventura County
(Source: Ventura County Public Health)



Graph: COVID-19 Cases in the State
(Source: CA.gov)

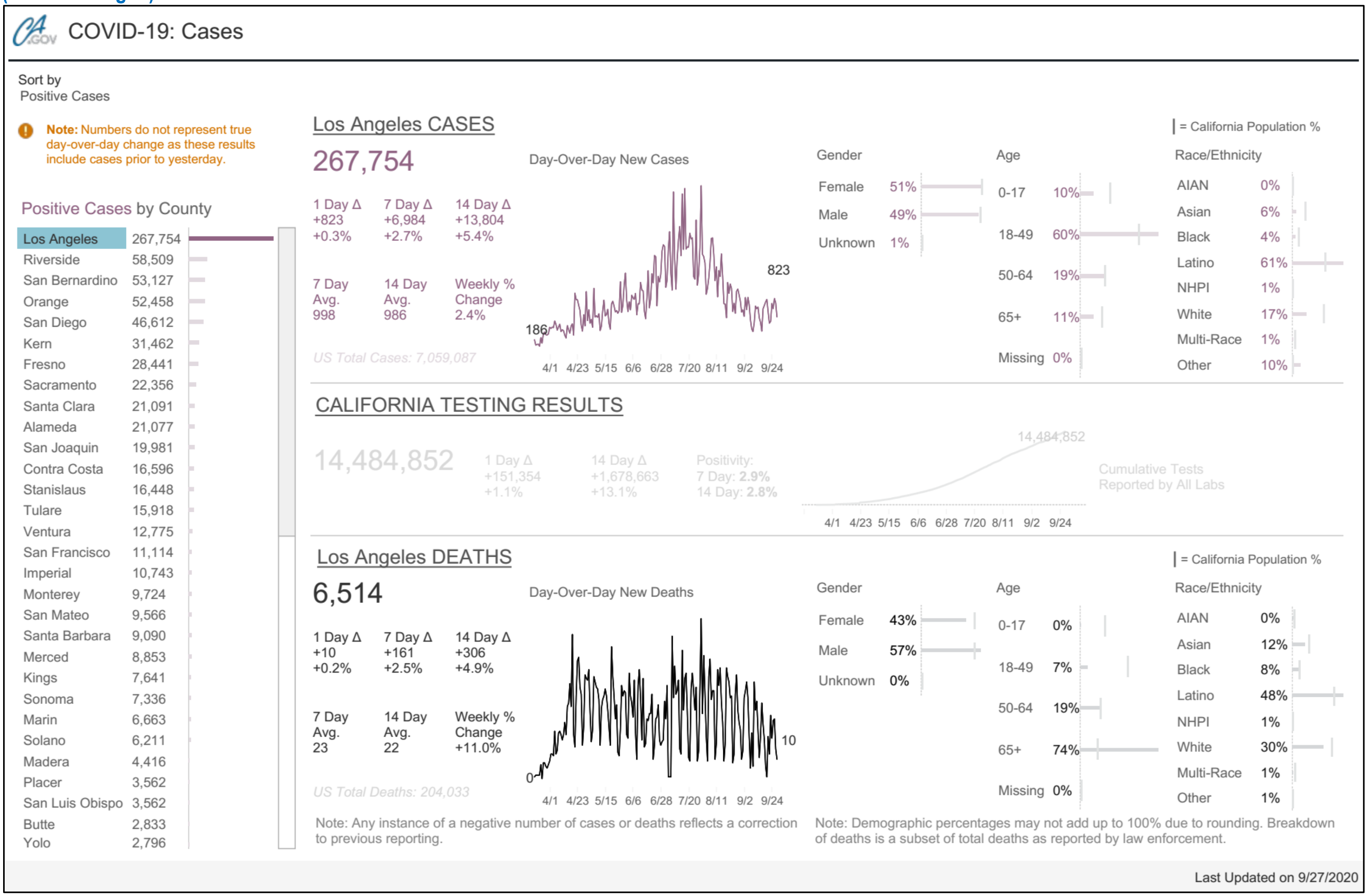


Table: Los Angeles County Influenza Surveillance Summary, 2018-19 Influenza Season (Source: Influenza in Los Angeles County, County of Los Angeles Public Health, 2019)

Influenza Type	2017-2018	2018-2019
Influenza	12,429	6,429
Respiratory Outbreak (Influenza)	43	25
Unknown Respiratory Outbreak	113	21
Deaths	289	125

Vector-Borne

The County of Los Angeles is also susceptible to West Nile and Influenza. The regional conditions affecting the County are as follows:

Table: Confirmed West Nile Infections and Fatalities in Los Angeles County by Year (Source: Acute Communicable Disease Control, County of Los Angeles Public Health, 2019)

Year	Infections	Hospitalizations	Deaths
2015	300	262	24
2016	153	131	6
2017	268	224	27
2018	47	37	3
2019	29	24	3

Q&A | ELEMENT B: HAZARD IDENTIFICATION AND RISK ASSESSMENT | B3a.
Q: Is there a description of each hazard's impacts on each jurisdiction (what happens to structures, infrastructure, people, environment, etc.)? (Requirement §201.6(c)(2)(ii))
A: See **Impact of Epidemic/Pandemic and Vector-Borne Diseases in the MRCA** below.

Impact of Epidemic/Pandemic and Vector-Borne Diseases in the MRCA

Based on the risk assessment, it is evident that Epidemic/Pandemic and Vector-Borne Diseases will continue to have potentially devastating economic impacts to the MRCA. Impacts that are not quantified, but can be anticipated in future events, include:

- ✓ Injury and loss of life
- ✓ Disruption of public infrastructure
- ✓ Disruption of the educational process
- ✓ Significant economic impact (jobs, sales, tax revenue) upon the community
- ✓ Negative impact on commercial and residential property values
- ✓ Closure of businesses and public services
- ✓ Reduction of transportation services

Impacts of Climate Change on Extreme Weather

According to California's Fourth Climate Change Assessment (2018), climate influences the population size, geographic distribution, and reproduction of vectors (rodents, mosquitoes, ticks, fleas, and others) that transmit diseases to humans. The many factors that contribute to the incidence of vector-borne diseases—such as land use patterns and human behavior present challenges in projecting their spread. However, current patterns provide some clues. For instance, reported cases of West Nile Virus increase during warm weather. While incidence of West Nile Virus human cases and fatalities fluctuate greatly from year to year, 2017 showed the greatest number of human West Nile Virus deaths ever recorded in LA County. Models for North America project increases in West Nile Virus infections in humans, caused by increasing temperatures and declines in rainfall. In recent years, invasive Aedes mosquitoes (Aedes albopictus and to a lesser extent Aedes aegyptii) have appeared in LA County. These mosquitoes are known vectors for dengue fever, Zika virus, and chikungunya virus. While there have as yet been no known locally acquired human cases of these diseases, there remains the possibility of local transmission occurring as travelers return from affected regions.

PART III: MITIGATION STRATEGIES

Mitigation Strategies

Overview of Mitigation Strategy

As the cost of damage from disasters continues to increase nationwide, the MRCA recognizes the importance of identifying effective ways to reduce vulnerability to disasters. Mitigation Plans assist communities in reducing risk from natural hazards by identifying resources, information and strategies for risk reduction, while helping to guide and coordinate mitigation activities at the MRCA facilities.

The plan provides a set of action items to reduce risk from hazards through education and outreach programs, and to foster the development of partnerships. Further, the plan provides for the implementation of preventative activities.

The resources and information within the Mitigation Plan:

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

The Mitigation Plan is integrated with other Project Area plans including the MRCA Emergency Operations Plan, Capital Improvement Program, as well as department-specific standard operating procedures.

Mitigation Measure Categories

Following is FEMA's list of mitigation categories. The activities identified by the Planning Team are consistent with the six broad categories of mitigation actions outlined in FEMA publication 386-3 *Developing the Mitigation Plan: Identifying Mitigation Actions and Implementing Strategies*.

- ✓ **Prevention:** Government administrative or regulatory actions or processes that influence the way land and buildings are developed and built. These actions also include public activities to reduce hazard losses. Examples include planning and zoning, building codes, capital improvement programs, open space preservation, and storm water management regulations.
- ✓ **Property Protection:** Actions that involve modification of existing buildings or structures to protect them from a hazard, or removal from the hazard area. Examples include acquisition, elevation, relocation, structural retrofits, storm shutters, and shatter-resistant glass.
- ✓ **Public Education and Awareness:** Actions to inform and educate citizens, property owners, and elected officials about hazards and potential ways to mitigate them.

  Such actions include outreach projects, real estate disclosure, hazard information centers, and school-age and adult education programs.
- ✓ **Natural Resource Protection:** Actions that, in addition to minimizing hazard losses preserve or restore the functions of natural systems. Examples include sediment and

erosion control, stream corridor restoration, watershed management, forest and vegetation management, and wetland restoration and preservation.

- ✓ **Emergency Services:** Actions that protect people and property during and immediately following a disaster or hazard event. Services include warning systems, emergency response services, and protection of critical facilities.
- ✓ **Structural Projects:** Actions that involve the construction of structures to reduce the impact of a hazard. Such structures include dams, levees, floodwalls, retaining walls, and safe rooms.

Q&A | ELEMENT C. MITIGATION STRATEGY | C3
Q: Does the plan include goals to reduce/avoid long-term vulnerabilities to the identified hazards? (Requirement §201.6(c)(3)(i)) **A:** See **Goals** below.
Q&A | ELEMENT D. MITIGATION STRATEGY | D3
Q: Was the plan revised to reflect changes in priorities? (Requirement §201.6(d)(3)) **A:** See **Mitigation Actions Matrix** below.

Goals

The Planning Team identified the overall goal to guide the direction of future activities aimed at reducing risk and preventing loss from natural hazards. The Planning Team agreed to the overall goal as well as the five mitigation goals as identified below.

The Planning Team established goals based on the risk assessment that represent a long-term vision for hazard reduction and enhanced mitigation capabilities.

Each goal is supported by mitigation action items. The Planning Team developed these action items through its knowledge of the local area, risk assessment, review of past efforts, identification of mitigation activities, and qualitative analysis.

The five mitigation goals and descriptions are listed below.

Protect Life and Property

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

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

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

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.

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.

Partnerships and Implementation

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

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

Emergency Services

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

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

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

How is the Mitigation Actions Matrix Organized?

The Matrix consists of mitigation-related actionable items that include details as to timeline, assignment, priorities, and other factors that will assist the Planning Team in implementing the Mitigation Plan.

The action items are organized within the following **Mitigation Actions Matrix**, which lists all of the multi-hazard (actions that reduce risks for more than one specific hazard) and hazard-specific action items included in the mitigation plan. The Matrix includes the following information for each action item:

Mitigation Action Items

Each of the items is written as a measurable objective. As an example, “proactively clean-out storm drains in advance of heavy storms” constitutes mitigation because it is a way to minimize the impact of heavy rains combined with loose debris before a storm.

Funding Source and Planning Mechanism

<u>Funding Source</u>
The action items can be funded through a variety of sources, possibly including operating budget/general fund, development fees, Community Development Block Grant (CDBG), Hazard

Mitigation Grant Program (HMGP), other Grants, private funding, Capital Improvement Program, and other funding opportunities.

Planning Mechanism

It's important that each action item be implemented. Perhaps the best way to ensure implementation is through integration with one or many of MRCA's existing "planning mechanisms" including the Capital Improvement Program, General Fund, State Capital Grant Program, and other Grants. Opportunities for integration will be simple and easy in cases where the action item is already compatible with the content of the planning mechanism.

The Capital Improvement Program (CIP), depending on the budgetary environment, is updated every 5 years. The CIP includes infrastructure projects built and owned by MRCA. As such, the CIP is an excellent medium for funding and implementing action items from the Mitigation Plan. The Mitigation Actions Matrix includes several items from the existing CIP. The authors of the CIP served on the Planning Team and are already looking to funding addition Mitigation Plan action items in future CIPs.

The General Fund is the budget document that guides all of the MRCA's expenditures and is updated on an annual basis. Although primarily a funding mechanism, it also includes descriptions and details associated with tasks and projects.

Grants come from a wide variety of sources – some annually and other triggered by events like disasters. Whatever the source, MRCA uses the General Fund to identify successful grants as funding sources.

Lead Assignment

The Matrix assigns primary responsibility for each of the action items. The hierarchies of the assignments vary – from positions to departments to committees. The primary responsibility for implementing the action items falls to the entity shown as the "Lead Assignment". The assignment must be given to someone in the project area's organization. The individua/department must have the regulatory responsibility to address hazards, or be willing and able to organize resources, find appropriate funding, and oversee activity implementation, monitoring, and evaluation.

Plan Goals Addressed

The plan goals addressed by each action item are included as a way to monitor and evaluate how well the mitigation plan is achieving its goals once implementation begins.

The plan goals are organized into the following five areas:

- ✓ Protect Life and Property
- ✓ Enhance Public Awareness
- ✓ Preserve Natural Systems

Building and Infrastructure

This addresses the issue of whether or not a particular action item results in the reduction of the effects of hazards on new and existing buildings and infrastructure.

Comments

The purpose of the “Comments” is to capture the notes and status of the various action items. Since Planning Team members frequently change between plan updates and biannual reviews, the Comments provide a sort of history to help in tracking the progress and status of each action. Since this is MRCA’s first HMP, the comments are essentially notes capturing additional thoughts to either explain/justify the action item or provide insights for implementation.

Q&A | ELEMENT C. MITIGATION STRATEGY | C5a.
Q: Does the plan explain how the mitigation actions and projects will be prioritized (including cost benefit review)? (Requirement §201.6(c)(3)(iv)); (Requirement §201.6(c)(3)(iii)) **A:** See **Benefit/Cost Ratings** and **Priority Rating** below.

Benefit/Cost Ratings

The benefits of proposed projects were weighed against estimated costs as part of the project prioritization process. The benefit/cost analysis was not of the detailed variety required by FEMA for project grant eligibility under the Hazard Mitigation Grant Program (HMGP) and Pre-Disaster Mitigation (PDM) grant program. A less formal approach was used because some projects may not be implemented for up to 10 years, and associated costs and benefits could change dramatically in that time. Therefore, a review of the apparent benefits versus the apparent cost of each project was performed. Parameters were established for assigning subjective ratings (high, medium, and low) to the costs and benefits of these projects.

Cost ratings were defined as follows:

High: Existing jurisdictional funding will not cover the cost of the action item so other sources of revenue would be required.

Medium: The action item could be funded through existing jurisdictional funding but would require budget modifications.

Low: The action item could be funded under existing jurisdictional funding.

Benefit ratings were defined as follows:

High: The action item will provide short-term and long-term impacts on the reduction of risk exposure to life and property.

Medium: The action item will have long-term impacts on the reduction of risk exposure to life and property.

Low: The action item will have only short-term impacts on the reduction of risk exposure to life and property.

Priority Rating

The Planning Team utilized the following Priority Rating method. Designations of "High", "Medium", and "Low" priority have been assigned to all of the action item using the following criteria:

Does the Action:

- ☐ solve the problem?
- ☐ address Vulnerability Assessment?
- ☐ reduce the exposure or vulnerability to the highest priority hazard?
- ☐ address multiple hazards?
- ☐ benefits equal or exceed costs?
- ☐ implement a goal, policy, or project identified in the General Plan or Capital Improvement Plan?

Can the Action:

- ☐ be implemented with existing funds?
- ☐ be implemented by existing state or federal grant programs?
- ☐ be completed within the 5-year life cycle of the LHMP?
- ☐ be implemented with currently available technologies?

Will the Action:

- ☐ be accepted by the community?
- ☐ be supported by community leaders?
- ☐ adversely impact segments of the population or neighborhoods?
- ☐ require a change in local ordinances or zoning laws?
- ☐ positive or neutral impact on the environment?
- ☐ comply with all local, state and federal environmental laws and regulations?

Is there:

- ☐ sufficient staffing to undertake the project?
- ☐ existing authority to undertake the project?

As mitigation action items were updated or written the Planning Team, representatives were provided worksheets for each of their assigned action items. Answers to the criteria above determined the priority according to the following scale.

- 1-6 = Low priority
- 7-12 = Medium priority
- 13-18 = High priority

Q&A | ELEMENT C. MITIGATION STRATEGY | C1b.
Q: Does the plan document each jurisdiction's ability to expand on and improve these existing policies and programs? (Requirement §201.6(c)(3)) **A:** See **Mitigation Actions Matrix** below.
Q&A | ELEMENT C. MITIGATION STRATEGY | C4a.
Q: Does the plan identify and analyze a comprehensive range (different alternatives) of specific mitigation actions and projects to reduce the impacts from hazards? (Requirement §201.6(c)(3)(ii)) **A:** See **Mitigation Actions Matrix** below.
Q&A | ELEMENT C. MITIGATION STRATEGY | C4b.
Q: Does the plan identify mitigation actions for every hazard posing a threat to each participating jurisdiction? (Requirement §201.6(c)(3)(ii)) **A:** See **Mitigation Actions Matrix** below.
Q&A | ELEMENT C. MITIGATION STRATEGY | C4c.
Q: Do the identified mitigation actions and projects have an emphasis on new and existing buildings and infrastructure? (Requirement §201.6(c)(3)(ii)) **A:** See **Mitigation Actions Matrix** below.
Q&A | ELEMENT C. MITIGATION STRATEGY | C5a.
Q: Does the plan explain how the mitigation actions and projects will be prioritized (including cost benefit review)? (Requirement §201.6(c)(3)(iv)); (Requirement §201.6(c)(3)(iii)) **A:** See **Mitigation Actions Matrix** below.
Q&A | ELEMENT C. MITIGATION STRATEGY | C5b.
Q: Does the plan identify the position, office, department, or agency responsible for implementing and administering the action/project, potential funding sources and expected timeframes for completion? (Requirement §201.6(c)(3)(iv)); (Requirement §201.6(c)(3)(iii)) **A:** See **Mitigation Actions Matrix** below.
Q&A | ELEMENT D. MITIGATION STRATEGY | D1
Q: Was the plan revised to reflect changes in development? (Requirement §201.6(d)(3)) **A:** See **Mitigation Actions Matrix** below.
Q&A | ELEMENT D. MITIGATION STRATEGY | D2
Q: Was the plan revised to reflect progress in local mitigation efforts? (Requirement §201.6(d)(3)) **A:** See **Mitigation Actions Matrix** below.
Q&A | ELEMENT D. MITIGATION STRATEGY | D3
Q: Was the plan revised to reflect changes in priorities? (Requirement §201.6(d)(3)) **A:** See **Mitigation Actions Matrix** below.
Q&A | ELEMENT C. MITIGATION STRATEGY | C6c.
Q: The updated plan must explain how the jurisdiction(s) incorporated the mitigation plan, when appropriate, into other planning mechanisms as a demonstration of progress in local hazard mitigation efforts. (Requirement §201.6(c)(4)(ii)) **A:** See **Mitigation Actions Matrix** below.

Mitigation Actions Matrix

Following is **Table: Mitigation Actions Matrix** which identifies the existing and future mitigation activities developed by the Planning Team.

Mitigation Action Item	**Lead Assignment (e.g. Department)**	**Timeline**	**Goal**: Protect Life and Property	**Goal**: Public Awareness	**Goal**: Natural Systems	**Goal**: Emergency Services	**Goal**: Partnerships and Implementation	**Buildings & Infrastructure:** Does the Action item involve New and/or Existing Buildings and/or Infrastructure? Yes (Y) or No (N)	**Funding Source and Planning Mechanism:** GF-General Fund, SCGP-State Capital Grant Program, HMGP-Hazard Mitigation Grant Program, PDM-Pre Disaster Mitigation Grant, BRIC-Building Resilient Infrastructure and Communities	**Benefit:** L-Low, M-Medium, H-High	**Cost:** L-Low, M-Medium, H-High	**Priority:** L-Low, M-Medium, H-High
Multi-Hazard Action Items												
MH-1 Research, Purchase, and Install Energy Backup and Communication Systems (repeaters, generators, antennae, radios, etc.) at Various Locations.	Operations	1-5 years	X	X		X	X	Y	GF, SCGP, HMGP, PDM, BRIC	H	L-H	H
MH-2 Research, Purchase, and Install Camera System at Michael D. Antonovich Regional Park at Joughin Ranch.	Operations	1-5 years	X	X		X	X	Y	GF, SCGP, HMGP, PDM, BRIC	H	L-H	H
MH-3 Research, Purchase, and Install Camera System in the Parking Lot at Tuna Canyon Park.	Operations	1-5 years	X	X		X	X	Y	GF, SCGP, HMGP, PDM, BRIC	H	L-H	H
MH-4 Research, Purchase, and Install Fixed Camera Locations for Trailheads etc. to Monitor Sites for Hazards and Safety.	Operations	1-5 years	X	X		X	X	Y	GF, SCGP, HMGP, PDM, BRIC	H	L-H	H
MH-5 Research, Purchase, and Install Cameras at Robin's Nest.	Operations	1-5 years	X	X		X	X	Y	GF, SCGP, HMGP, PDM, BRIC	H	L-H	H
MH-6 Research, Purchase, and Install Cameras at Stickleback Ranch.	Operations	1-5 years	X	X		X	X	Y	GF, SCGP, HMGP, PDM, BRIC	H	L-H	H

Mitigation Action Item	**Lead Assignment (e.g. Department)**	**Timeline**	**Goal:** Protect Life and Property	**Goal:** Public Awareness	**Goal:** Natural Systems	**Goal:** Emergency Services	**Goal:** Partnerships and Implementation	**Buildings & Infrastructure:** Does the Action item involve New and/or Existing Buildings and/or Infrastructure? Yes (Y) or No (N)	**Funding Source and Planning Mechanism:** GF-General Fund, SCGP-State Capital Grant Program, HMGP-Hazard Mitigation Grant Program, PDM-Pre Disaster Mitigation Grant, BRIC-Building Resilient Infrastructure and Communities	**Benefit:** L-Low, M-Medium, H-High	**Cost:** L-Low, M-Medium, H-High	**Priority:** L-Low, M-Medium, H-High
MH-7 Purchase and install a generator and/or backup power source at the following sites: Los Angeles River Center & Gardens, Franklin Canyon Park, King Gillette Ranch, Temescal Gateway Park, Vista Hermosa Natural Park, and staff residences.	Construction	1 year	X			X		Y	GF, SCGP, HMGP, PDM, BRIC	H	L-H	H
MH-8 Purchase and install a generator and/or backup power source at the following sites: Upper Las Virgenes Canyon Open Space Preserve, Holiday Camp, Ramirez Canyon Park, Robin's Nest.	Construction	1 year	X			X		Y	GF, SCGP, HMGP, PDM, BRIC	H	L-H	H
MH-9 Removal of hazardous trees (dead highly flammable, or subject to wind damage) in Red Rock Canyon Park.	Fire Division	1 year	X		X			Y	GF, SCGP, HMGP, PDM, BRIC	H	L-H	H
MH-10 Hazardous Tree Removal (of dead and highly flammable trees) in Temescal Gateway Park.	Developed Resources	1 year	X		X			Y	GF, SCGP, HMGP, PDM, BRIC	H	L-H	H
MH-11 Hazardous Tree Removal (of dead and highly flammable trees) in Ramirez Canyon Park.	Developed Resources	1 year	X		X			Y	GF, SCGP, HMGP, PDM, BRIC	H	L-H	H

Mitigation Action Item	**Lead Assignment (e.g. Department)**	**Timeline**	**Goal:** Protect Life and Property	**Goal:** Public Awareness	**Goal:** Natural Systems	**Goal:** Emergency Services	**Goal:** Partnerships and Implementation	**Buildings & Infrastructure:** Does the Action item involve New and/or Existing Buildings and/or Infrastructure? Yes (Y) or No (N)	**Funding Source and Planning Mechanism:** GF-General Fund, SCGP-State Capital Grant Program, HMGP-Hazard Mitigation Grant Program, PDM-Pre Disaster Mitigation Grant, BRIC-Building Resilient Infrastructure and Communities	**Benefit:** L-Low, M-Medium, H-High	**Cost:** L-Low, M-Medium, H-High	**Priority:** L-Low, M-Medium, H-High
MH-12 Remove hazardous (dead and highly flammable) trees in various sites.	Fire Division	1 year	X		X			Y	GF, SCGP, HMGP, PDM, BRIC	H	L-H	H
MH-13 Install guardrails at Franklin Canyon Park.	Construction	1-5 years	X	X	X	X	X	Y	GF, SCGP, HMGP, PDM, BRIC	H	L-H	H
MH-14 Upgrade the road to meet NFPA standards in Hidden Creek and Upper Las Virgenes Canyon Open Space Preserve.	Construction	1-5 years	X	X	X	X	X	Y	GF, SCGP, HMGP, PDM, BRIC	H	L-H	H
MH-15 Replace mobile homes (8 total) in various sites.	Construction	1-5 years	X	X	X	X	X	Y	GF, SCGP, HMGP, PDM, BRIC	H	L-H	H
MH-16 Install solar power with battery backup for critical buildings at various sites.	Construction	1-5 years	X	X	X	X	X	Y	GF, SCGP, HMGP, PDM, BRIC	H	L-H	H
MH-17 Utility improvements at Upper Las Virgenes Canyon Open Space Preserve to include municipal water connection and piping.	Construction	1-3 years	X	X	X	X	X	Y	GF, SCGP, HMGP, PDM, BRIC	H	L-H	H
MH-18 Develop property management database.	Administration	1-5 years	X	X	X	X	X	Y	GF, SCGP, HMGP, PDM, BRIC	H	L-H	H
MH-19 General Renovation to Upper Las Virgenes Canyon Open Space Preserve, including parking and circulation.	Park Development	3-5 years	X	X	X	X	X	Y	GF, SCGP, HMGP, PDM, BRIC	H	L-H	H
MH-20 General Renovation to King Gillette Ranch, specifically the Brandt House.	Park Development	1-5 years	X	X	X	X	X	Y	GF, SCGP, HMGP, PDM, BRIC	H	L-H	H

Mitigation Action Item	Lead Assignment (e.g. Department)	Timeline	**Goal:** Protect Life and Property	**Goal:** Public Awareness	**Goal:** Natural Systems	**Goal:** Emergency Services	**Goal:** Partnerships and Implementation	**Buildings & Infrastructure:** Does the Action item involve New and/or Existing Buildings and/or Infrastructure? Yes (Y) or No (N)	**Funding Source and Planning Mechanism:** GF-General Fund, SCGP-State Capital Grant Program, HMGP-Hazard Mitigation Grant Program, PDM-Pre Disaster Mitigation Grant, BRIC-Building Resilient Infrastructure and Communities	**Benefit:** L-Low, M-Medium, H-High	**Cost:** L-Low, M-Medium, H-High	**Priority:** L-Low, M-Medium, H-High
MH-21 General Renovation to King Gillette Ranch, specifically to the Frisk House.	Construction	1-5 years	X	X	X	X	X	Y	GF, SCGP, HMGP, PDM, BRIC	H	L-H	H
MH-22 General Renovation to the King Gillette Ranch, specifically to the Gatehouse.	Construction	1-5 years	X	X	X	X	X	Y	GF, SCGP, HMGP, PDM, BRIC	H	L-H	H
MH-23 General Renovation to Ramirez Canyon Park, including retrofitting the Art Deco house for offices.	Construction	1-5 years	X	X	X	X	X	Y	GF, SCGP, HMGP, PDM, BRIC	H	L-H	H
MH-24 General Renovation to the Sara Wan Trailhead at Corral Canyon, including general trailhead renovation.	Park Development	Completed										
MH-25 Improve infrastructure to Ramirez Canyon Park, including constructing a bridge from the tennis court to Barwood.	Construction	1-5 years	X	X	X	X	X	Y	GF, SCGP, HMGP, PDM, BRIC	H	L-H	H
MH-26 Add a new park facility for Elephant Hill Open Space, NELA. This should include a multi-modal trail.	Park Development	1-5 years	X	X	X	X	X	Y	GF, SCGP, HMGP, PDM, BRIC	H	L-H	H
MH-27 Add a new park facility for La Vina trails. This should include a multi-modal trail.	Park Development	Ongoing	X	X	X	X	X	Y	GF, SCGP, HMGP, PDM, BRIC	H	L-H	H

Mountains Recreation & Conservation Authority

Mitigation Action Item	Lead Assignment (e.g. Department)	Timeline	**Goal:** Protect Life and Property	**Goal:** Public Awareness	**Goal:** Natural Systems	**Goal:** Emergency Services	**Goal:** Partnerships and Implementation	**Buildings & Infrastructure:** Does the Action item involve New and/or Existing Buildings and/or Infrastructure? Yes (Y) or No (N)	**Funding Source and Planning Mechanism:** GF-General Fund, SCGP-State Capital Grant Program, HMGP-Hazard Mitigation Grant Program, PDM-Pre Disaster Mitigation Grant, BRIC-Building Resilient Infrastructure and Communities	**Benefit:** L-Low, M-Medium, H-High	**Cost:** L-Low, M-Medium, H-High	**Priority:** L-Low, M-Medium, H-High
MH-28 Add a new park facility for Liberty Canyon. This new facility should account for wildlife crossing over the 101 Freeway.	Planning	1-5 years	X	X	X	X	X	Y	GF, SCGP, HMGP, PDM, BRIC	H	L-H	H
MH-29 Add a new park facility for Rocky Peak Park. This new facility should include a mountain bike chair lift.	Planning	1-5 years	X	X	X	X	X	Y	GF, SCGP, HMGP, PDM, BRIC	H	L-H	H
MH-30 Add a new park facility for El Dorado Park (new MRCA site). This new facility should include an urban park with stormwater capture and cleaning.	Park Development	1-3 years	X	X	X	X	X	Y	GF, SCGP, HMGP, PDM, BRIC	H	L-H	H
MH-31 Add a new park facility for the Coastal Slope Trail. This new facility should include multi-modal trails.	Planning	1-5 years	X	X	X	X	X	Y	GF, SCGP, HMGP, PDM, BRIC	H	L-H	H
MH-32 Add a new park facility for Ramirez Canyon Park. This new facility should include campground amenities.	Coastal Access	1-5 years	X	X	X	X	X	Y	GF, SCGP, HMGP, PDM, BRIC	H	L-H	H
MH-33 Add a new park facility for Ramona Gardens, adjacent (new site). This new facility should include an urban park with stormwater capture and cleaning.	Park Development	3-7 years	X	X	X	X	X	Y	GF, SCGP, HMGP, PDM, BRIC	H	L-H	H
MH-34 Add a new park facility for Reseda Park (new MRCA site). This new facility	Park Development	3-5 years	X	X	X	X	X	Y	GF, SCGP, HMGP, PDM, BRIC	H	L-H	H

Mitigation Action Item	**Lead Assignment (e.g. Department)**	**Timeline**	**Goal:** Protect Life and Property	**Goal:** Public Awareness	**Goal:** Natural Systems	**Goal:** Emergency Services	**Goal:** Partnerships and Implementation	**Buildings & Infrastructure:** Does the Action item involve New and/or Existing Buildings and/or Infrastructure? Yes (Y) or No (N)	**Funding Source and Planning Mechanism:** GF-General Fund, SCGP-State Capital Grant Program, HMGP-Hazard Mitigation Grant Program, PDM-Pre Disaster Mitigation Grant, BRIC-Building Resilient Infrastructure and Communities	**Benefit:** L-Low, M-Medium, H-High	**Cost:** L-Low, M-Medium, H-High	**Priority:** L-Low, M-Medium, H-High
should include an urban park with stormwater capture and cleaning.												
MH-35 Add a new park facility for Confluence Park. This new facility should include Phase 2 development.	Park Development	3-5 years	X	X	X	X	X	Y	GF, SCGP, HMGP, PDM, BRIC	H	L-H	H
MH-36 Accommodating for climate change, utility improvements to King Gillette Ranch including addition of HVAC to dorm upper levels, replace boiler, and replace chiller.	Construction	3-5 years	X	X	X	X	X	Y	GF, SCGP, HMGP, PDM, BRIC	H	L-H	H
MH-37 Utility Improvements for Vista Hermosa Natural Park, specifically addressing finding and fixing leaks.	Development Resources	1-3 years	X	X	X	X	X	Y	GF, SCGP, HMGP, PDM, BRIC	H	L-H	H
Earthquake Action Items									GF, SCGP, HMGP, PDM, BRIC			
EQ-1 Seismically retrofit the Los Angeles River Center & Gardens including offices, warehouse, and staff residence (need engineering analysis).	Construction	1-5 years	X	X	X	X	X	Y	GF, SCGP, HMGP, PDM, BRIC	H	L-H	H
EQ-2 Seismically retrofit the King Gillette Ranch including offices, staff residences, cultural landmark, miscellaneous	Construction	1-5 years	X	X	X	X	X	Y	GF, SCGP, HMGP, PDM, BRIC	H	L-H	H

Mitigation Action Item	**Lead Assignment (e.g. Department)**	**Timeline**	**Goal:** Protect Life and Property	**Goal:** Public Awareness	**Goal:** Natural Systems	**Goal:** Emergency Services	**Goal:** Partnerships and Implementation	**Buildings & Infrastructure:** Does the Action item involve New and/or Existing Buildings and/or Infrastructure? Yes (Y) or No (N)	**Funding Source and Planning Mechanism:** GF-General Fund, SCGP-State Capital Grant Program, HMGP-Hazard Mitigation Grant Program, PDM-Pre Disaster Mitigation Grant, BRIC-Building Resilient Infrastructure and Communities	**Benefit:** L-Low, M-Medium, H-High	**Cost:** L-Low, M-Medium, H-High	**Priority:** L-Low, M-Medium, H-High
structures, and outbuildings (need engineering analysis).												
EQ-3 Seismically retrofit the Ramirez Canyon Park including offices and staff residence (need engineering analysis).	Construction	1-5 years	X	X	X	X	X	Y	GF, SCGP, HMGP, PDM, BRIC	H	L-H	H
EQ-4 Seismically retrofit the Temescal Gateway Park including the offices, staff residences, meeting rooms, miscellaneous outbuildings and restrooms (need engineering analysis).	Construction	1-5 years	X	X	X	X	X	Y	GF, SCGP, HMGP, PDM, BRIC	H	L-H	H
EQ-5 Seismically retrofit the Ed Davis Park at Towsley Canyon Park including the lodge, staff residence and restrooms (need engineering analysis).	Construction	1-5 years	X	X	X	X	X	Y	GF, SCGP, HMGP, PDM, BRIC	H	L-H	H
EQ-6 Seismically retrofit the Upper Las Virgenes Canyon Open Space Preserve including the staff residences, main house and miscellaneous outbuildings (need engineering analysis).	Construction	1-5 years	X	X	X	X	X	Y	GF, SCGP, HMGP, PDM, BRIC	H	L-H	H
EQ-7 Seismically retrofit the Lopez Canyon Park including the staff residence, barn & miscellaneous outbuildings (need engineering analysis).	Construction	1-5 years	X	X	X	X	X	Y	GF, SCGP, HMGP, PDM, BRIC	H	L-H	H

Mitigation Action Item	Lead Assignment (e.g. Department)	Timeline	**Goal:** Protect Life and Property	**Goal:** Public Awareness	**Goal:** Natural Systems	**Goal:** Emergency Services	**Goal:** Partnerships and Implementation	**Buildings & Infrastructure:** Does the Action item involve New and/or Existing Buildings and/or Infrastructure? Yes (Y) or No (N)	**Funding Source and Planning Mechanism:** GF-General Fund, SCGP-State Capital Grant Program, HMGP-Hazard Mitigation Grant Program, PDM-Pre Disaster Mitigation Grant, BRIC-Building Resilient Infrastructure and Communities	**Benefit:** L-Low, M-Medium, H-High	**Cost:** L-Low, M-Medium, H-High	**Priority:** L-Low, M-Medium, H-High
EQ-8 Seismically retrofit the Mentryville including the historic buildings, staff residence, restroom, and miscellaneous outbuildings (need engineering analysis).	Construction	1-5 years	X	X	X	X	X	Y	GF, SCGP, HMGP, PDM, BRIC	H	L-H	H
EQ-9 Seismically retrofit the San Vicente Mountain Park including the staff residence, restroom, lookout tower, and outbuildings (need engineering analysis).	Construction	1-5 years	X	X	X	X	X	Y	GF, SCGP, HMGP, PDM, BRIC	H	L-H	H
EQ-10 - Seismically retrofit the Carbon Canyon including the staff residence (need engineering analysis).	Construction	1-5 years	X	X	X	X	X	Y	GF, SCGP, HMGP, PDM, BRIC	H	L-H	H
EQ-11 Seismically retrofit the East & Rice Canyon including the staff residence and tenant structures (need engineering analysis).	Construction	1-5 years	X	X	X	X	X	Y	GF, SCGP, HMGP, PDM, BRIC	H	L-H	H
EQ-12 Seismically retrofit the Red Rock Canyon Park including the staff residence, lodge, and outbuildings (need engineering analysis).	Construction	1-5 years	X	X	X	X	X	Y	GF, SCGP, HMGP, PDM, BRIC	H	L-H	H
EQ-13 Seismically retrofit the Sage Ranch Park including the staff residence and outbuildings (need engineering analysis).	Construction	1-5 years	X	X	X	X	X	Y	GF, SCGP, HMGP, PDM, BRIC	H	L-H	H

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EQ-14 Seismically retrofit the Wilacre Park including the staff residence (need engineering analysis).	Construction	1-5 years	X	X	X	X	X	Y	GF, SCGP, HMGP, PDM, BRIC	H	L-H	H
EQ-15 Seismically retrofit the Holiday Camp including the staff residence, bunk house, meeting rooms, outbuildings (need engineering analysis).	Construction	1-5 years	X	X	X	X	X	Y	GF, SCGP, HMGP, PDM, BRIC	H	L-H	H
EQ-16 Seismically retrofit the Franklin Canyon Park including the staff residences, offices, nature center, restrooms, and outbuildings (need engineering analysis).	Construction	1-5 years	X	X	X	X	X	Y	GF, SCGP, HMGP, PDM, BRIC	H	L-H	H
EQ-17 Seismically retrofit the Robin's Nest (need engineering analysis).	Construction	1-5 years	X	X	X	X	X	Y	GF, SCGP, HMGP, PDM, BRIC	H	L-H	H
EQ-18 Seismically retrofit the Stickleback Ranch (need engineering analysis).	Construction	1-5 years	X	X	X	X	X	Y	GF, SCGP, HMGP, PDM, BRIC	H	L-H	H
EQ-19 Seismically retrofit the Greenbriar including the staff residence (need engineering analysis).	Construction	1-5 years	X	X	X	X	X	Y	GF, SCGP, HMGP, PDM, BRIC	H	L-H	H
EQ-20 Seismically retrofit the Elyria Canyon Park including the staff residence, barn, and miscellaneous outbuildings (need engineering analysis).	Construction	1-5 years	X	X	X	X	X	Y	GF, SCGP, HMGP, PDM, BRIC	H	L-H	H

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EQ-21 Seismically retrofit the Whitney Canyon Park including the staff residence (need engineering analysis).	Construction	1-5 years	X	X	X	X	X	Y	GF, SCGP, HMGP, PDM, BRIC	H	L-H	H
EQ-22 Seismically retrofit the Whittier-Catalina Drive including the staff residence (need engineering analysis).	Construction	1-5 years	X	X	X	X	X	Y	GF, SCGP, HMGP, PDM, BRIC	H	L-H	H
EQ-23 Seismically retrofit the Lewis MacAdams Riverfront Park including the warehouse (need engineering analysis).	Construction	1-5 years	X	X	X	X	X	Y	GF, SCGP, HMGP, PDM, BRIC	H	L-H	H
EQ-24 Seismically retrofit the Robin's Nest (need engineering evaluation).	Construction	1-5 years	X	X	X	X	X	Y	GF, SCGP, HMGP, PDM, BRIC	H	L-H	H
Epidemic / Pandemic / Vector-Borne Action Items												
EPV-1 Prepare protocols to minimize or eliminate threats associated with epidemics, pandemics, or vector-borne diseases.	Administration	1-5 years	X	X	X	X	X	Y	GF, SCGP, HMGP, PDM, BRIC	H	L-H	H
EPV-2 Purchase monitoring devices and other equipment to minimize the spread of epidemics, pandemics, or vector-borne diseases.	Administration	1-5 years	X	X	X	X	X	Y	GF, SCGP, HMGP, PDM, BRIC	H	L-H	H

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EPV-3 Assess and mitigate existing (and emerging) pandemics impacting the MRCA Workplace by: • Developing and maintain a HIPPA compliant database to track workplace spread. • Comply with Cal OSHA posting and monitoring requirements. • Adopt Local Heal Department's notification recommendations and requirements. • Deliver safety messaging through various communication channels including newsletters, staff meetings and tailgate safety briefings. • Authorize modified work schedules and alternate work locations (including home office). • Implement targeted office space cleaning and visitor/staff monitoring programs.	Administration	1-2 years	X	X				Y	GF, SCGP, HMGP, PDM, BRIC	H	L	H

Mitigation Action Item	Lead Assignment (e.g. Department)	Timeline	**Goal:** Protect Life and Property	**Goal:** Public Awareness	**Goal:** Natural Systems	**Goal:** Emergency Services	**Goal:** Partnerships and Implementation	**Buildings & Infrastructure:** Does the Action item involve New and/or Existing Buildings and/or Infrastructure? Yes (Y) or No (N)	**Funding Source and Planning Mechanism:** GF-General Fund, SCGP-State Capital Grant Program, HMGP-Hazard Mitigation Grant Program, PDM-Pre Disaster Mitigation Grant, BRIC-Building Resilient Infrastructure and Communities	**Benefit:** L-Low, M-Medium, H-High	**Cost:** L-Low, M-Medium, H-High	**Priority:** L-Low, M-Medium, H-High
• Ensure adequate PPE supplies, and provide all required associated training regarding PPE use. • For airborne pathogens, upgrade ventilation systems with filters and UV lights. • Expand access to online resources and implement digital information systems to reduce the need for employees and the public to physically visit offices.												
Flooding Action Items												
FLD-1 Drainage Improvements at King Gillette Ranch including Pond Work.	Developed Resources	1-5 years	X	X	X	X	X	Y	GF, SCGP, HMGP, PDM, BRIC	H	L-H	H
FLD-2 Drainage Improvements at Franklin Canyon Park including Pond Work.	Developed Resources	1-5 years	X	X	X	X	X	Y	GF, SCGP, HMGP, PDM, BRIC	H	L-H	H
FLD-3 Drainage Improvements at Various Locations including Addition of Storm Drains.	Developed Resources	1-5 years	X	X	X	X	X	Y	GF, SCGP, HMGP, PDM, BRIC	H	L-H	H

Mitigation Action Item	**Lead Assignment (e.g. Department)**	**Timeline**	**Goal:** Protect Life and Property	**Goal:** Public Awareness	**Goal:** Natural Systems	**Goal:** Emergency Services	**Goal:** Partnerships and Implementation	**Buildings & Infrastructure:** Does the Action item involve New and/or Existing Buildings and/or Infrastructure? Yes (Y) or No (N)	**Funding Source and Planning Mechanism:** GF-General Fund, SCGP-State Capital Grant Program, HMGP-Hazard Mitigation Grant Program, PDM-Pre Disaster Mitigation Grant, BRIC-Building Resilient Infrastructure and Communities	**Benefit:** L-Low, M-Medium, H-High	**Cost:** L-Low, M-Medium, H-High	**Priority:** L-Low, M-Medium, H-High
FLD-4 Drainage Improvements at various locations including conversion of culvert crossings to box culverts.	Construction	1-5 years	X	X	X	X	X	Y	GF, SCGP, HMGP, PDM, BRIC	H	L-H	H
FLD-5 Drainage Improvements at Dixie Canyon Park including Chronic Problems.	Construction	1-5 years	X	X	X	X	X	Y	GF, SCGP, HMGP, PDM, BRIC	H	L-H	H
FLD-6 Drainage Improvements at Stickleback Ranch including Erosion Protection. Armor Road, Pool, etc.	Restoration	1-5 years	X	X	X	X	X	Y	GF, SCGP, HMGP, PDM, BRIC	H	L-H	H
FLD-7 General Renovations at Elysian Valley Gateway Park. Full Park Renovation and Redesign including Stormwater Capture and Treatment.	Park Development	1-5 years	X	X	X	X	X	Y	GF, SCGP, HMGP, PDM, BRIC	H	L-H	H
FLD-8 General Renovations at Elysian Valley Gateway Park including full park renovation and redesign, stormwater capture and treatment.	Park Development	1-5 years	X	X	X	X	X	Y	GF, SCGP, HMGP, PDM, BRIC	H	L-H	H
FLD-9 Infrastructure: Replace culvert lost in previous flood in Escondido Canyon Park.	Construction	1-5 years	X	X	X	X	X	Y	GF, SCGP, HMGP, PDM, BRIC	H	L-H	H
FLD-10 Infrastructure: Enlarge/upgrade the culvert in Ed Davis Park at Towsley Canyon Park.	Construction	1-5 years	X	X	X	X	X	Y	GF, SCGP, HMGP, PDM, BRIC	H	L-H	H

Mitigation Action Item	**Lead Assignment (e.g. Department)**	**Timeline**	**Goal:** Protect Life and Property	**Goal:** Public Awareness	**Goal:** Natural Systems	**Goal:** Emergency Services	**Goal:** Partnerships and Implementation	**Buildings & Infrastructure:** Does the Action item involve New and/or Existing Buildings and/or Infrastructure? Yes (Y) or No (N)	**Funding Source and Planning Mechanism:** GF-General Fund, SCGP-State Capital Grant Program, HMGP-Hazard Mitigation Grant Program, PDM-Pre Disaster Mitigation Grant, BRIC-Building Resilient Infrastructure and Communities	**Benefit:** L-Low, M-Medium, H-High	**Cost:** L-Low, M-Medium, H-High	**Priority:** L-Low, M-Medium, H-High
FLD-11 Infrastructure: Enlarge/upgrade the culvert in Ramirez Canyon Park.	Construction	1-5 years	X	X	X	X	X	Y	GF, SCGP, HMGP, PDM, BRIC	H	L-H	H
FLD-12 Infrastructure: Replace culvert lost in previous flood in Cameron Nature Preserve at Puerco Canyon.	Construction	1-5 years	X	X	X	X	X	Y	GF, SCGP, HMGP, PDM, BRIC	H	L-H	H
FLD-13 Infrastructure: Enlarge/upgrade the culvert in Temescal Gateway Park.	Construction	1-5 years	X	X	X	X	X	Y	GF, SCGP, HMGP, PDM, BRIC	H	L-H	H
FLD-14 Infrastructure: Enlarge/upgrade the culvert in Mentryville, Upper Las Virgenes Canyon Open Space Preserve, Red Rock Canyon Park, East & Rice Canyon, Whitney Canyon Park, Wilson Canyon Park, and Westridge-Canyonback Wilderness Park (which could be City owned).	Construction	1-5 years	X	X	X	X	X	Y	GF, SCGP, HMGP, PDM, BRIC	H	L-H	H
FLD-15 Construct a new facility to include beach access stairs and equipped to withstand flooding and sea level rise in the Big Rock Beach.	Coastal Access	1-5 years	X	X	X	X	X	Y	GF, SCGP, HMGP, PDM, BRIC	H	L-H	H
FLD-16 Construct a new facility for Caballero Creek Park; an urban park to include stormwater capture and filtration.	Park Development	1-5 years	X	X	X	X	X	Y	GF, SCGP, HMGP, PDM, BRIC	H	L-H	H

Mitigation Action Item	Lead Assignment (e.g. Department)	Timeline	**Goal:** Protect Life and Property	**Goal:** Public Awareness	**Goal:** Natural Systems	**Goal:** Emergency Services	**Goal:** Partnerships and Implementation	**Buildings & Infrastructure:** Does the Action item involve New and/or Existing Buildings and/or Infrastructure? Yes (Y) or No (N)	**Funding Source and Planning Mechanism:** GF-General Fund, SCGP-State Capital Grant Program, HMGP-Hazard Mitigation Grant Program, PDM-Pre Disaster Mitigation Grant, BRIC-Building Resilient Infrastructure and Communities	**Benefit:** L-Low, M-Medium, H-High	**Cost:** L-Low, M-Medium, H-High	**Priority:** L-Low, M-Medium, H-High
FLD-17 Construct a new facility for G2; an urban park to include stormwater capture and filtration.	Park Development	1-5 years	X	X	X	X	X	Y	GF, SCGP, HMGP, PDM, BRIC	H	L-H	H
FLD-18 Construct new parking and restroom at Lechuza Beach.	Coastal Access	1-5 years	X	X	X	X	X	Y	GF, SCGP, HMGP, PDM, BRIC	H	L-H	H
FLD-19 Construct new beach access stairs at Malibu Pier to withstand flooding/sea level rise.	Coastal Access	1-5 years	X	X	X	X	X	Y	GF, SCGP, HMGP, PDM, BRIC	H	L-H	H
FLD-20 Replace roof at Ed Davis Park at Towsley Canyon Park to include the lodge and staff residence.	Construction	1-5 years	X	X	X	X	X	Y	GF, SCGP, HMGP, PDM, BRIC	H	L-H	H
FLD-21 Replace roof at Los Angeles River Center & Gardens to include the Barbacoa.	Construction	1-5 years	X	X	X	X	X	Y	GF, SCGP, HMGP, PDM, BRIC	H	L-H	H
FLD-22 To minimize flooding, design and construct general renovation of the motor court of King Gillette Ranch.	Park Development	3-5 years	X	X	X	X	X	Y	GF, SCGP, HMGP, PDM, BRIC	H	L-H	H
FLD-23 To minimize flooding, design and construct general renovation of Upper Las Virgenes Canyon Open Space Preserve, including parking and circulation.	Park Development	3-5 years	X	X	X	X	X	Y	GF, SCGP, HMGP, PDM, BRIC	H	L-H	H
FLD-24 To minimize flooding, design and construct general renovation of Zev	Park Development	1-2 years	X	X	X	X	X	Y	GF, SCGP, HMGP, PDM, BRIC	H	L-H	H

Mountains Recreation & Conservation Authority

Mitigation Action Item	**Lead Assignment (e.g. Department)**	**Timeline**	**Goal:** Protect Life and Property	**Goal:** Public Awareness	**Goal:** Natural Systems	**Goal:** Emergency Services	**Goal:** Partnerships and Implementation	**Buildings & Infrastructure:** Does the Action item involve New and/or Existing Buildings and/or Infrastructure? Yes (Y) or No (N)	**Funding Source and Planning Mechanism:** GF-General Fund, SCGP-State Capital Grant Program, HMGP-Hazard Mitigation Grant Program, PDM-Pre Disaster Mitigation Grant, BRIC-Building Resilient Infrastructure and Communities	**Benefit:** L-Low, M-Medium, H-High	**Cost:** L-Low, M-Medium, H-High	**Priority:** L-Low, M-Medium, H-High
Yaroslavsky Studio City Greenway, including renovating, planting and installing an irrigation system.												
FLD-25 Add a new park facility for Rocky Peak Park. This new facility should include stormwater capture and filtration.	Construction	3-5 years	X	X	X	X	X	Y	GF, SCGP, HMGP, PDM, BRIC	H	L-H	H
Extreme Weather Action Items												
EX-1 For the following locations, consider undergrounding utilities: Carbon Canyon, East and Rice Canyon, Ed Davis Park – Towsley Canyon Park, Mentryvill, Red Rock Canyon Park, Sage Ranch, San Vicente Mountain Park, Temescal Gateway Park, Upper Las Virgenes Canyon Open Space, Ramirez Canyon, and Malibu Bluffs.	Operations	2-5 years	X		X	X		Y	GF, SCGP, HMGP, PDM, BRIC	H	H	H
EX-2 For the following locations, consider improved drainage, storm water runoff and recontouring of roads to facilitate runoff, etc.: Carbon Canyon, East and Rice Canyon, Ed Davis Park – Towsley Canyon Park, Mentryvill, Red Rock Canyon Park,	Operations	2-5 years	X		X	X		Y	GF, SCGP, HMGP, PDM, BRIC	H	H	H

Mitigation Action Item	**Lead Assignment (e.g. Department)**	**Timeline**	**Goal:** Protect Life and Property	**Goal:** Public Awareness	**Goal:** Natural Systems	**Goal:** Emergency Services	**Goal:** Partnerships and Implementation	**Buildings & Infrastructure:** Does the Action item involve New and/or Existing Buildings and/or Infrastructure? Yes (Y) or No (N)	**Funding Source and Planning Mechanism:** GF-General Fund, SCGP-State Capital Grant Program, HMGP-Hazard Mitigation Grant Program, PDM-Pre Disaster Mitigation Grant, BRIC-Building Resilient Infrastructure and Communities	**Benefit:** L-Low, M-Medium, H-High	**Cost:** L-Low, M-Medium, H-High	**Priority:** L-Low, M-Medium, H-High
Sage Ranch, San Vicente Mountain Park, Temescal Gateway Park, Upper Las Virgenes Canyon Open Space, Ramirez Canyon, and Malibu Bluffs.												
EX-3 For the following locations, mitigate against heat island effects:Los Angeles River Center and Gardens, Lewis McAdams Riverfront Park, and Vista Hermosa Natural Park.	Operations	2-5 years	X		X	X		Y	GF, SCGP, HMGP, PDM, BRIC	H	H	H
Windstorm Action Items												
WND-1 For the following locations, consider improvements to power utility line clearance: Carbon Canyon, East and Rice Canyon, Ed Davis Park – Towsley Canyon Park, Mentryvill, Red Rock Canyon Park, Sage Ranch, San Vicente Mountain Park, Temescal Gateway Park, Upper Las Virgenes Canyon Open Space, Ramirez Canyon, and Malibu Bluffs.	Operations	2-5 years	X		X	X		Y	GF, SCGP, HMGP, PDM, BRIC	H	M	H
Wildfire Action Items												

Mitigation Action Item	Lead Assignment (e.g. Department)	Timeline	**Goal:** Protect Life and Property	**Goal:** Public Awareness	**Goal:** Natural Systems	**Goal:** Emergency Services	**Goal:** Partnerships and Implementation	**Buildings & Infrastructure:** Does the Action item involve New and/or Existing Buildings and/or Infrastructure? Yes (Y) or No (N)	**Funding Source and Planning Mechanism:** GF-General Fund, SCGP-State Capital Grant Program, HMGP-Hazard Mitigation Grant Program, PDM-Pre Disaster Mitigation Grant, BRIC-Building Resilient Infrastructure and Communities	**Benefit:** L-Low, M-Medium, H-High	**Cost:** L-Low, M-Medium, H-High	**Priority:** L-Low, M-Medium, H-High
WF-1 Fire Resiliency Improvements at Carbon Canyon including Building Hardening.	Construction	1-5 years	X	X	X	X	X	Y	GF, SCGP, HMGP, PDM, BRIC	H	L-H	H
WF-2 Fire Resiliency Improvements at East and Rice Canyon including Building Hardening.	Construction	1-5 years	X	X	X	X	X	Y	GF, SCGP, HMGP, PDM, BRIC	H	L-H	H
WF-3 Fire Resiliency Improvements at Ed Davis Park - Towsley Canyon Park including Building Hardening.	Construction	1-5 years	X	X	X	X	X	Y	GF, SCGP, HMGP, PDM, BRIC	H	L-H	H
WF-4 Fire Resiliency Improvements at Mentryville including Building Hardening.	Construction	1-5 years	X	X	X	X	X	Y	GF, SCGP, HMGP, PDM, BRIC	H	L-H	H
WF-5 Fire Resiliency Improvements at Red Rock Canyon Park including Building Hardening.	Construction	1-5 years	X	X	X	X	X	Y	GF, SCGP, HMGP, PDM, BRIC	H	L-H	H
WF-6 Fire Resiliency Improvements at Sage Ranch Park including Building Hardening.	Construction	1-5 years	X	X	X	X	X	Y	GF, SCGP, HMGP, PDM, BRIC	H	L-H	H
WF-7 Fire Resiliency Improvements at San Vicente Mountain Park including Building Hardening.	Construction	1-5 years	X	X	X	X	X	Y	GF, SCGP, HMGP, PDM, BRIC	H	L-H	H

Mitigation Action Item	Lead Assignment (e.g. Department)	Timeline	Goal: Protect Life and Property	Goal: Public Awareness	Goal: Natural Systems	Goal: Emergency Services	Goal: Partnerships and Implementation	Buildings & Infrastructure: Does the Action item involve New and/or Existing Buildings and/or Infrastructure? Yes (Y) or No (N)	Funding Source and Planning Mechanism: GF-General Fund, SCGP-State Capital Grant Program, HMGP-Hazard Mitigation Grant Program, PDM-Pre Disaster Mitigation Grant, BRIC-Building Resilient Infrastructure and Communities	Benefit: L-Low, M-Medium, H-High	Cost: L-Low, M-Medium, H-High	Priority: L-Low, M-Medium, H-High
WF-8 Fire Resiliency Improvements at Temescal Gateway Park including Building Hardening.	Construction	1-5 years	X	X	X	X	X	Y	GF, SCGP, HMGP, PDM, BRIC	H	L-H	H
WF-9 Fire Resiliency Improvements at Upper Las Virgenes Canyon Open Space Preserve including Building Hardening.	Construction	1-5 years	X	X	X	X	X	Y	GF, SCGP, HMGP, PDM, BRIC	H	L-H	H
WF-10 Fire Resiliency Improvements at Ramirez Canyon Park including Building Hardening.	Construction	1-5 years	X	X	X	X	X	Y	GF, SCGP, HMGP, PDM, BRIC	H	L-H	H
WF-11 Park facility improvements at Ventura County including campground improvements.	Construction	1-5 years	X	X	X	X	X	Y	GF, SCGP, HMGP, PDM, BRIC	H	L-H	H
WF-12 Park facility improvements at Malibu Bluffs including campground improvements.	Coastal Access, Planning	1-5 years	X	X	X	X	X	Y	GF, SCGP, HMGP, PDM, BRIC	H	L-H	H
WF-13 Park facility improvements at Mission Canyon (new MRCA site) including trail improvements.	Coastal Access	1-5 years	X	X	X	X	X	Y	GF, SCGP, HMGP, PDM, BRIC	H	L-H	H
WF-14 Park facility improvements at Rocky Peak Park including trailhead and parking lot improvements.	Park Development	1-5 years	X	X	X	X	X	Y	GF, SCGP, HMGP, PDM, BRIC	H	L-H	H

Mitigation Action Item	Lead Assignment (e.g. Department)	Timeline	**Goal:** Protect Life and Property	**Goal:** Public Awareness	**Goal:** Natural Systems	**Goal:** Emergency Services	**Goal:** Partnerships and Implementation	**Buildings & Infrastructure:** Does the Action item involve New and/or Existing Buildings and/or Infrastructure? Yes (Y) or No (N)	**Funding Source and Planning Mechanism:** GF-General Fund, SCGP-State Capital Grant Program, HMGP-Hazard Mitigation Grant Program, PDM-Pre Disaster Mitigation Grant, BRIC-Building Resilient Infrastructure and Communities	**Benefit:** L-Low, M-Medium, H-High	**Cost:** L-Low, M-Medium, H-High	**Priority:** L-Low, M-Medium, H-High
WF-15 Park facility improvements at Tuna Canyon including trailhead and parking lot improvements.	Planning								GF, SCGP, HMGP, PDM, BRIC			
WF-16 Park facility improvements at Dirt Mulholland including trailhead and parking lot improvements.	Park Development								GF, SCGP, HMGP, PDM, BRIC			
WF-17 Utility improvements at Cameron Nature Preserve at Puerco Canyon including well replacement and expanding tank & distribution lines.	Coastal Access								GF, SCGP, HMGP, PDM, BRIC			
WF-18 Utility improvements at Ramirez Canyon Park including water tank replacements.	Construction	Ongoing	X		X	X			GF, SCGP, HMGP, PDM, BRIC			
WF-19 Utility improvements at Sage Ranch Park including adding backup power to water pumps.	Construction	1-5 years	X	X	X	X	X	Y	GF, SCGP, HMGP, PDM, BRIC	H	L-H	H
WF-20 Utility improvements at Whitney Canyon Park including adding backup power to water pumps.	Construction	1-5 years	X	X	X	X	X	Y	GF, SCGP, HMGP, PDM, BRIC	H	L-H	H
WF-21 Utility improvements at Lopez Canyon park including adding backup power to water pumps.	Construction	1-5 years	X	X	X	X	X	Y	GF, SCGP, HMGP, PDM, BRIC	H	L-H	H

Mitigation Action Item	Lead Assignment (e.g. Department)	Timeline	**Goal:** Protect Life and Property	**Goal:** Public Awareness	**Goal:** Natural Systems	**Goal:** Emergency Services	**Goal:** Partnerships and Implementation	**Buildings & Infrastructure:** Does the Action item involve New and/or Existing Buildings and/or Infrastructure? Yes (Y) or No (N)	**Funding Source and Planning Mechanism:** GF-General Fund, SCGP-State Capital Grant Program, HMGP-Hazard Mitigation Grant Program, PDM-Pre Disaster Mitigation Grant, BRIC-Building Resilient Infrastructure and Communities	**Benefit:** L-Low, M-Medium, H-High	**Cost:** L-Low, M-Medium, H-High	**Priority:** L-Low, M-Medium, H-High
WF-22 Utility improvements at San Vincente Mountain Park including adding backup power to water pumps.	Operations	1-5 years	X	X	X	X	X	Y	GF, SCGP, HMGP, PDM, BRIC	H	L-H	H
WF-23 Utility improvements at Upper Las Virgenes Canyon Open Space Preserve including adding backup power to water pumps.	Construction	1-5 years	X	X	X	X	X	Y	GF, SCGP, HMGP, PDM, BRIC	H	L-H	H
WF-24 Add a new park facility for Cameron Nature Preserve at Puerco Canyon. This new facility should include a trailhead, a restroom, and should incorporate measures to improve wildfire response. (Parking area TBD.)	Coastal Access	1-5 years	X	X	X	X	X	Y	GF, SCGP, HMGP, PDM, BRIC	H	L-H	H
WF-25 Vegetation management at various sites to include clearance of flammable materials.	Fire Division	1-5 years	X	X	X	X	X	Y	GF, SCGP, HMGP, PDM, BRIC	H	L-H	H
Tsunami Action Items												
TSU-1 Improve public awareness and better prepare citizens for evacuation during a tsunami on MRCA property located within the Tsunami induction zone	Operations	2-5 years	X	X				Y	GF, SCGP, HMGP, PDM, BRIC	H	L	M

Mitigation Action Item	Lead Assignment (e.g. Department)	Timeline	Goal: Protect Life and Property	Goal: Public Awareness	Goal: Natural Systems	Goal: Emergency Services	Goal: Partnerships and Implementation	Buildings & Infrastructure: Does the Action item involve New and/or Existing Buildings and/or Infrastructure? Yes (Y) or No (N)	Funding Source and Planning Mechanism: GF-General Fund, SCGP-State Capital Grant Program, HMGP-Hazard Mitigation Grant Program, PDM-Pre Disaster Mitigation Grant, BRIC-Building Resilient Infrastructure and Communities	Benefit: L-Low, M-Medium, H-High	Cost: L-Low, M-Medium, H-High	Priority: L-Low, M-Medium, H-High
through Tsunami warning and evacuation zone signage.												
TSU-2 At Las Tunas Beach ensure infrastructure are adequately protected from tsunami inundation by requiring coastal structures to be built to standards that allow for proper vertical evacuation and to be specially designed and constructed to resist both tsunami and earthquake loads. Also, install sirens and other technologies to provide warnings to the public	Planning	2-5 years	X			X		Y	GF, SCGP, HMGP, PDM, BRIC	H	H	M
TSU-3 At Corral Canyon Parking lot, maintain native vegetation and allow natural processes in inundation zones and prohibit new structures. Also, install sirens and other technologies to provide warnings to the public. Protect again fire following tsunami on the larger open space property by performing regular brush clearance.	Operations	2-5 years	X					Y	GF, SCGP, HMGP, PDM, BRIC	H	H	M
TSU-4 At Lechuza Beach, ensure infrastructure are adequately protected from tsunami inundation by requiring	Planning	2-5 years	X		X	X		Y	GF, SCGP, HMGP, PDM, BRIC	H	H	M

Mitigation Action Item	Lead Assignment (e.g. Department)	Timeline	Goal: Protect Life and Property	Goal: Public Awareness	Goal: Natural Systems	Goal: Emergency Services	Goal: Partnerships and Implementation	Buildings & Infrastructure: Does the Action item involve New and/or Existing Buildings and/or Infrastructure? Yes (Y) or No (N)	Funding Source and Planning Mechanism: GF-General Fund, SCGP-State Capital Grant Program, HMGP-Hazard Mitigation Grant Program, PDM-Pre Disaster Mitigation Grant, BRIC-Building Resilient Infrastructure and Communities	Benefit: L-Low, M-Medium, H-High	Cost: L-Low, M-Medium, H-High	Priority: L-Low, M-Medium, H-High
coastal access structures to be built to standards that allow for proper vertical evacuation and to be specially designed and constructed to resist both tsunami and earthquake loads. Also, install sirens and other technologies to provide warnings to the public.												

Plan Maintenance

The plan maintenance process includes a schedule for monitoring and evaluating the Plan biannually and producing a plan revision every five years. This section describes how the MRCA will integrate public participation throughout the plan maintenance process.

Local Mitigation Officer

The Planning Team that was involved in research and writing of the Plan will also be responsible for implementation. The Planning Team will be led by the Planning Team Chair Sally Garcia who will be referred to as the Local Mitigation Officer. Under the direction of the Local Mitigation Officer, the Planning Team will take responsibility for plan maintenance and implementation. The Local Mitigation Officer will facilitate the Planning Team meetings and will assign tasks such as updating and presenting the Plan to the members of the Planning Team. Plan implementation and evaluation will be a shared responsibility among all of the Planning Team members. The Local Mitigation Officer will coordinate with the MRCA leadership to ensure funding for 5-year updates to Plan as required by FEMA.

The Planning Team will be responsible for coordinating implementation of plan action items and undertaking the formal review process. The Local Mitigation Officer will be authorized to make changes in assignments to the current Planning Team.

The Planning Team will meet no less than biannually. Meeting dates will be scheduled once the final Planning Team has been established. These meetings will provide an opportunity to discuss the progress of the action items and maintain the partnerships that are essential for the sustainability of the mitigation plan. The Local Mitigation Officer or designee will be responsible for contacting the Planning Team members and organizing the biannual meeting which will take place at the every six months from Plan's approval date.

Method and Scheduling of Plan Implementation

	Year 1	Year 2	Year 3	Year 4	Year 5
Monitoring	XX	XX	XX	XX	XX
Evaluating					
Internal Planning Team Evaluation	X	X	X	X	X
Cal OES and FEMA Evaluation					XXXX
Updating					X

Monitoring and Implementing the Plan

Plan Adoption

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

Q&A | ELEMENT A: PLANNING PROCESS | A6a.
Q: Does the plan identify how, when, and by whom the plan will be **monitored** (how will implementation be tracked) over time? (Requirement §201.6(c)(4)(i))   **A:** See **Monitoring the Plan** below.

Monitoring the Plan

The Local Mitigation Officer will hold quarterly meetings with representatives from the coordinating agencies in order to gather status updates on the mitigation action items. These meetings will provide an opportunity to discuss the progress of the action items and maintain the partnerships that are essential for the sustainability of the mitigation plan. See the **Biannual Implementation Report** discussed below which will be a valuable tool for the Planning Team to measure the success of the Multi-Hazard Mitigation Plan. The focus of the biannual meeting will be on the progress and changes to the Mitigation Action Items.

Q&A | ELEMENT C. MITIGATION STRATEGY | C6a.
Q: Does the plan identify the local planning mechanisms where hazard mitigation information and/or actions may be incorporated? (Requirement §201.6(c)(4)(ii))   **A:** See **Implementation through Existing Program** below.
Q&A | ELEMENT C. MITIGATION STRATEGY | C6b.
Q: Does the plan describe each community's process to integrate the data, information, and hazard mitigation goals and actions into other planning mechanisms? (Requirement §201.6(c)(4)(ii))   **A:** See **Implementation through Existing Programs** below.
Q&A | ELEMENT C. MITIGATION STRATEGY | C6c.
Q: The updated plan must explain how the jurisdiction(s) incorporated the mitigation plan, when appropriate, into other planning mechanisms as a demonstration of progress in local hazard mitigation efforts. (Requirement §201.6(c)(4)(ii))   **A:** See **Implementation through Existing Programs** below.

Implementation through Existing Programs

The MRCA addresses statewide planning goals and legislative requirements through the Capital Improvement Program, General Fund, and Grants. The Mitigation Plan provides a series of recommendations - many of which are closely related to the goals and objectives of existing planning programs. The MRCA will implement recommended mitigation action items through existing programs and procedures.

The MRCA is responsible for adhering to the State of California's Building and Safety Codes. In addition, the MRCA may work with other agencies at the state level to review, develop and ensure Building and Safety Codes are adequate to mitigate or present damage by hazards. This is to ensure that life-safety criteria are met for new construction.

Some of the goals and action items in the Mitigation Plan will be achieved through activities recommended in the strategic and other budget documents. The various departments involved in developing the Plan will review it on a biannual basis. Upon review, the Planning Team will work with the departments to identify areas that the Mitigation Plan action items are consistent with the strategic and budget documents to ensure the Mitigation Plan goals and action items are implemented in a timely fashion.

Upon FEMA approval, the Planning Team will begin the process of incorporating risk information and mitigation action items into existing planning mechanisms including the General Fund (Operating Budget and Capital Projects - see Mitigation Actions Matrix for links between individual action items and associated planning mechanism). The biannual meetings of the Planning Team will provide an opportunity for Planning Team members to report back on the progress made on the integration of mitigation planning elements into the MRCA's planning documents and procedures.

Specifically, the Planning Team will utilize the updates of the following documents to implement the Mitigation Plan:

- ✓ Risk Assessment, Project Area Profile, Planning Process (stakeholders) – Emergency Operations Plan, Climate Action Plan, etc.
- ✓ Mitigation Actions Matrix – General Fund, Capital Projects, Grants

Biannual Implementation Report

The Biannual Implementation Matrix is the same as the Mitigation Actions Matrix but with a column added to track the biannual status of each Action Item. Upon approval and adoption of the Plan, the entire Biannual Implementation Report will be added to the Appendix of the Plan. Following is a view of the Biannual Implementation Matrix:

Insert here

An equal part of the monitoring process is the need to maintain a strategic planning process which needs to include funding and organizational support. In that light, at least one year in advance of the FEMA-mandated 5-year submission of an update, the Local Mitigation Officer will convene the Planning Team to discuss funding and timing of the update planning process. On the fifth year of the planning cycles, the Planning Team will broaden its scope to include discussions and research on all of the sections within the Plan with particular attention given to goal achievement and public participation.

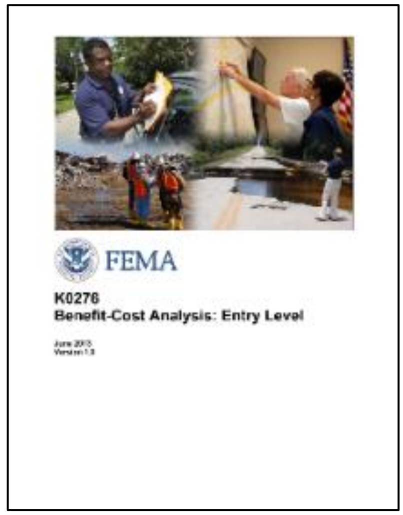
Economic Analysis of Mitigation Projects

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

Conducting benefit/cost analysis for a mitigation activity can assist communities in determining whether a project is worth undertaking now, in order to avoid disaster-related damages later. Cost-effectiveness analysis evaluates how best to spend a given amount of money to achieve a specific goal. Determining the economic feasibility of mitigating hazards can provide decision-makers with an understanding of the potential benefits and costs of an activity, as well as a basis upon which to compare alternative projects.

Given federal funding, the Planning Team will use a FEMA-approved benefit/cost analysis approach to identify and prioritize mitigation action items. For other projects and funding sources, the Planning Team will use other approaches to understand the costs and benefits of each action item and develop a prioritized list.

The “benefit”, “cost”, and overall “priority” of each mitigation action item was included in the Mitigation Actions Matrix located in Part III: Mitigation Strategies. A more technical assessment will be required in the event grant funding is pursued through the Hazard Mitigation Grant Program. FEMA Benefit-Cost Analysis Guidelines are discussed below.



FEMA Benefit-Cost Analysis Guidelines

The Stafford Act authorizes the President to establish a program to provide technical and financial assistance to state and local governments to assist in the implementation of hazard mitigation measures that are cost effective and designed to substantially reduce injuries, loss of life, hardship, or the risk of future damage and destruction of property. To evaluate proposed hazard mitigation projects prior to funding FEMA requires a Benefit-Cost Analysis (BCA) to validate cost effectiveness. BCA is the method by which the future benefits of a mitigation project are estimated and compared to its cost. The end result is a benefit-cost ratio (BCR), which is derived from a project’s total net benefits divided by its total project cost. The BCR is a numerical expression of the cost effectiveness of a project. A project is considered to be cost effective when the BCR is 1.0 or greater, indicating the benefits of a prospective hazard mitigation project are sufficient to justify the costs.

Although the preparation of a BCA is a technical process, FEMA has developed software, written materials, and training to support the effort and assist with estimating the expected future benefits over the useful life of a retrofit project. It is imperative to conduct a BCA early in the project development process to ensure the likelihood of meeting the cost-effective eligibility requirement in the Stafford Act.

The BCA program consists of guidelines, methodologies, and software modules for a range of major natural hazards including:

- ✓ Flood (Riverine, Coastal Zone A, Coastal Zone V)
- ✓ Hurricane Wind
- ✓ Hurricane Safe Room
- ✓ Damage-Frequency Assessment
- ✓ Tornado Safe Room
- ✓ Earthquake
- ✓ Wildfire

The BCA program provides up to date program data, up to date default and standard values, user manuals and training. Overall, the program makes it easier for users and evaluators to conduct and review BCAs and to address multiple buildings and hazards in a single BCA module run.

Evaluating and Updating the Plan

Q&A | ELEMENT A: PLANNING PROCESS | A6b.
Q: Does the plan identify how, when, and by whom the plan will be **evaluated** (assessing the effectiveness of the plan at achieving stated purpose and goals) over time? (Requirement §201.6(c)(4)(i)) **A:** See **Evaluation** below.

Evaluation

At the conclusion of the Fourth Quarter Implementation Meeting, the Local Mitigation Officer will lead a discussion with the Planning Team on the success (or failure) of the Mitigation Plan to meet the plan goals. The results of that discussion will be added to the Evaluation portion of the Biannual Implementation Report and inclusion in the 5-year update to the Plan. Efforts will be made immediately by the Local Mitigation Officer to address any failed plan goals.

Q&A | ELEMENT A: PLANNING PROCESS | A6c.
Q: Does the plan identify how, when, and by whom the plan will be **updated** during the 5-year cycle? (Requirement §201.6(c)(4)(i)) **A:** See **Formal Update Process** below.

Formal Update Process

As identified above, the Mitigation Action Items will be monitored for status on a biannual basis as well as an evaluation of the Plan's goals. The Local Mitigation Officer or designee will be responsible for contacting the Planning Team members and organizing the biannual meeting which will take place each six months following the Plan's date approval. Planning Team members will also be responsible for participating in the formal update to the Plan every fifth year of the planning cycle.

The Planning Team will begin the update process with a review the goals and mitigation action items to determine their relevance to changing situations within the MRCA as well as changes in State or Federal policy, and to ensure they are addressing current and expected conditions. The Planning Team will also review the Plan's **Risk Assessment** portion of the Plan to determine if this information should be updated or modified, given any new available data. The **coordinating organizations** responsible for the various action items will report on the status of their projects, including the success of various implementation processes, difficulties encountered, success of coordination efforts, and which strategies should be revised. Amending will be made to the Mitigation Actions Matrix and other sections in the Plan as deemed necessary by the Planning Team.

Q&A | ELEMENT A: PLANNING PROCESS | A5
Q: Is there discussion of how the community(ies) will continue public participation in the plan maintenance process? (Requirement §201.6(c)(4)(iii)) **A:** See **Continued Public Involvement** below.

Continued Public Involvement

The MRCA is dedicated to involving the public directly in the continual review and updates to the Mitigation Plan. Copies of the plan will be made available on the MRCA's website with links to social media. This site will also contain an email address and phone number where people can direct their comments and concerns. At the discretion of the Local Mitigation Officer, a public meeting may be held after the Biannual Implementation Meeting. The meeting would provide the public a forum in which interested individuals and/or agencies could express their concerns, opinions, or ideas about the plan.

The Local Mitigation Officer will be responsible for using the MRCA resources to publicize any public meetings and always free to maintain public involvement through the public access channel, web page, and newspaper.

Attachments

FEMA Letter of Approval

Governing Board Adoption Resolution

Staff Report to Governing Board

Secondary Stakeholders Involvement

Date Invited to Provide Input or Input Gathered	Agency Represented, Name, Position Title	Information Received	How Information was Incorporated into Plan

External agencies listed above were invited via email and provided with an electronic link to the MRCA website. Following is the email distributed along with the invitation to contribute to the planning process:

External Agencies Email Invite

Planning Team Minutes: Meeting #1 – September 16, 2020

Mountain Recreation and Conservation Authority
Hazard Mitigation Plan
Planning Team Meeting #1
September 16, 2020
(Note: Virtual meeting so initials entered electronically)

Name	Department
Sally Garcia	SG
Rorie Skei	RS
Tim Miller	TM
Walt Young	WY
Ken Nelson	KN
Cara Meyer	CM
Carolyn Harshman	CH

Emergency Planning Consultants

Planning Team Minutes: Meeting #2 – October 2, 2020

Mountain Recreation and Conservation Authority
Hazard Mitigation Plan
Planning Team Meeting #2
October 2, 2020
(Note: Virtual meeting so initials entered electronically)

Name	Department
Sally Garcia	SG
Tim Miller	TM
Walt Young	WY
Fernando Gomez	FG
Ken Nelson	KN
Cara Meyer	CM
Carolyn Harshman	CH

Emergency Planning Consultants

Planning Team Minutes: Meeting #3 – November 6, 2020

Mountain Recreation and Conservation Authority
Hazard Mitigation Plan
Planning Team Meeting #3
November 6, 2020
(Note: Virtual meeting so initials entered electronically)

Name	Department
Sally Garcia	SG
Tim Miller	TM
Walt Young	WY
Ken Nelson	KN
Cara Meyer	CM
Carolyn Harshman	CH

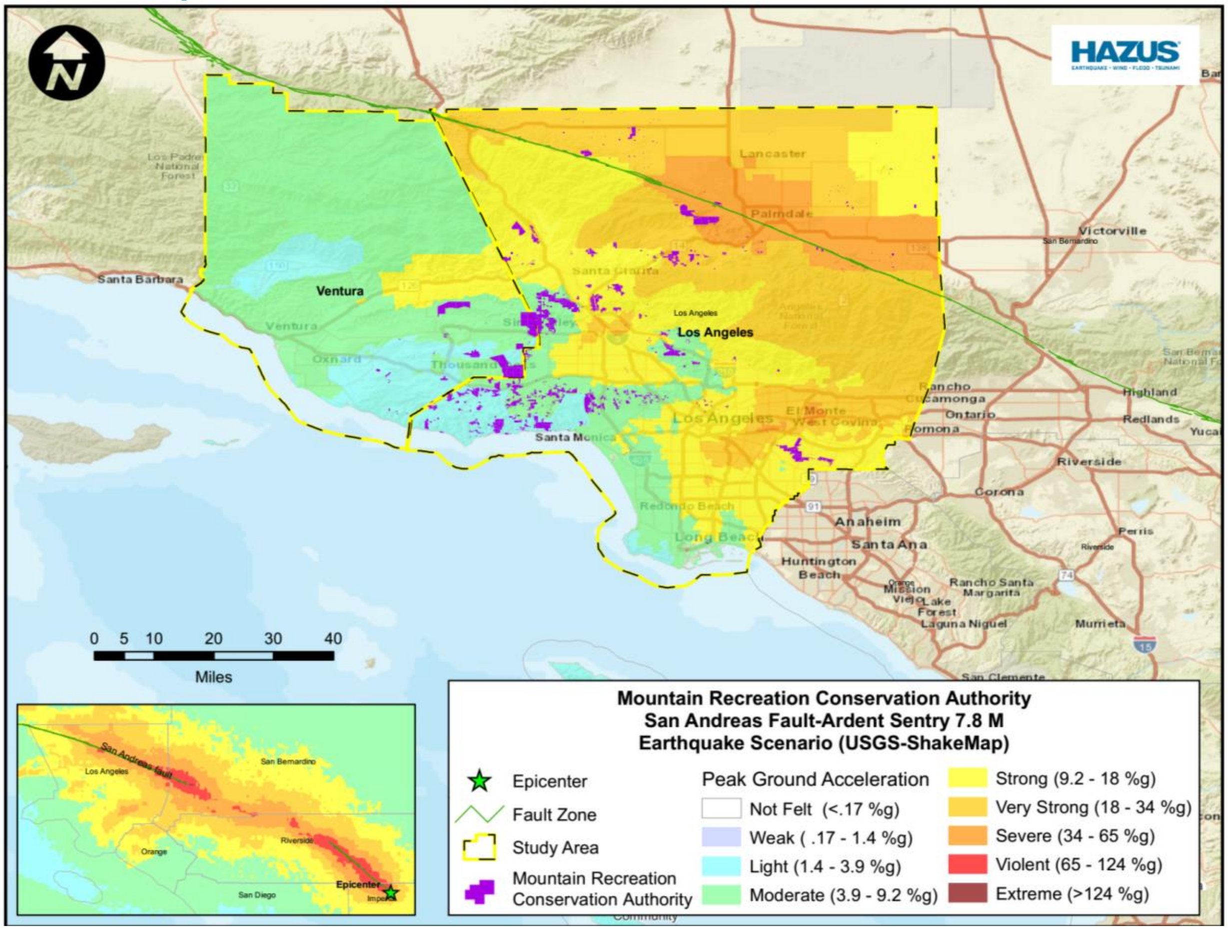
Planning Team Minutes: Meeting #4 – January 19, 2021

Mountain Recreation and Conservation Authority
Hazard Mitigation Plan
Planning Team Meeting #4
January 19, 2021
(Note: Virtual meeting so initials entered electronically)

Name	Department
Sally Garcia	SG
Rorie Skei	RS
Tim Miller	TM
Cara Meyer	CM
Carolyn Harshman	CH

Emergency Planning Consultants

HAZUS Map – San Andreas M7.8



HAZUS Report – San Andreas M7.8

HAZUS
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FEMA

RiskMAP
Increasing Resilience Together

Hazus-MH: Earthquake Global Risk Report

Region Name: MRCA_EQ

Earthquake Scenario: M7.8-Ardent Sentry 2015 Scenario v1

Print Date: October 01, 2020

Disclaimer:
This version of Hazus utilizes 2010 Census Data.
Totals only reflect data for those census tracts/blocks included in the user's study region.

The estimates of social and economic impacts contained in this report were produced using Hazus loss estimation methodology software which is based on current scientific and engineering knowledge. There are uncertainties inherent in any loss estimation technique. Therefore, there may be significant differences between the modeled results contained in this report and the actual social and economic losses following a specific earthquake. These results can be improved by using enhanced inventory, geotechnical, and observed ground motion data.

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Appendix A: County Listing for the Region

Appendix B: Regional Population and Building Value Data

General Description of the Region

Hazus-MH is a regional earthquake loss estimation model that was developed by the Federal Emergency Management Agency (FEMA) and the National Institute of Building Sciences. The primary purpose of Hazus is to provide a 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 stimulate efforts to reduce risks from multi-hazards and to prepare for emergency response and recovery.

The earthquake loss estimates provided in this report was based on a region that includes 2 county(ies) from the following state(s):

California

Note:
Appendix A contains a complete listing of the counties contained in the region.

The geographical size of the region is 5,940.49 square miles and contains 2,516 census tracts. There are over 3,508 thousand households in the region which has a total population of 10,641,923 people (2010 Census Bureau data). The distribution of population by Total Region and County is provided in Appendix B.

There are an estimated 2,642 thousand buildings in the region with a total building replacement value (excluding contents) of 1,241,848 (millions of dollars). Approximately 91.00 % of the buildings (and 77.00% of the building value) are associated with residential housing.

The replacement value of the transportation and utility lifeline systems is estimated to be 87,032 and 50,075 (millions of dollars) , respectively.

Building and Lifeline Inventory

Building Inventory

Hazus estimates that there are 2,642 thousand buildings in the region which have an aggregate total replacement value of 1,241,848 (millions of dollars) . Appendix B provides a general distribution of the building value by Total Region and County.

In terms of building construction types found in the region, wood frame construction makes up 88% of the building inventory. The remaining percentage is distributed between the other general building types.

Critical Facility Inventory

Hazus breaks critical facilities into two (2) groups: essential facilities and high potential loss facilities (HPL). Essential facilities include hospitals, medical clinics, schools, fire stations, police stations and emergency operations facilities. High potential loss facilities include dams, levees, military installations, nuclear power plants and hazardous material sites.

For essential facilities, there are 156 hospitals in the region with a total bed capacity of 30,043 beds. There are 4,018 schools, 454 fire stations, 167 police stations and 59 emergency operation facilities. With respect to high potential loss facilities (HPL), there are no dams identified within the inventory. The inventory also includes 1,770 hazardous material sites, no military installations and no nuclear power plants.

Transportation and Utility Lifeline Inventory

Within Hazus, the lifeline inventory is divided between transportation and utility lifeline systems. There are seven (7) transportation systems that include highways, railways, light rail, bus, ports, ferry and airports. There are six (6) utility systems that include potable water, wastewater, natural gas, crude & refined oil, electric power and communications. The lifeline inventory data are provided in Tables 1 and 2.

The total value of the lifeline inventory is over 137,107.00 (millions of dollars). This inventory includes over 3,526.28 miles of highways, 4,033 bridges, 92,018.83 miles of pipes.

Table 1: Transportation System Lifeline Inventory

System	Component	# Locations/ # Segments	Replacement value (millions of dollars)
Highway	Bridges	4,033	28758.6609
	Segments	4,836	42119.2052
	Tunnels	46	678.9663
		Subtotal	**71556.8324**
Railways	Bridges	407	2328.3207
	Facilities	52	138.4760
	Segments	3,962	3480.4675
	Tunnels	0	0.0000
		Subtotal	**5947.2642**
Light Rail	Bridges	28	6.1737
	Facilities	97	355.1404
	Segments	99	801.6737
	Tunnels	0	0.0000
		Subtotal	**1162.9878**
Bus	Facilities	48	87.8697
		Subtotal	**87.8697**
Ferry	Facilities	12	15.9720
		Subtotal	**15.9720**
Port	Facilities	134	484.4737
		Subtotal	**484.4737**
Airport	Facilities	56	4180.9239
	Runways	35	3596.0747
		Subtotal	**7776.9986**
		Total	**87,032.40**

Table 2: Utility System Lifeline Inventory

System	Component	# Locations / Segments	Replacement value (millions of dollars)
Potable Water	Distribution Lines	NA	1841.3365
	Facilities	20	785.8800
	Pipelines	0	0.0000
		Subtotal	**2627.2165**
Waste Water	Distribution Lines	NA	1104.8019
	Facilities	66	10798.3737
	Pipelines	0	0.0000
		Subtotal	**11903.1756**
Natural Gas	Distribution Lines	NA	736.5346
	Facilities	7	14.0156
	Pipelines	92	612.0022
		Subtotal	**1362.5524**
Oil Systems	Facilities	46	5.4280
	Pipelines	0	0.0000
		Subtotal	**5.4280**
Electrical Power	Facilities	87	34162.8144
		Subtotal	**34162.8144**
Communication	Facilities	119	14.0420
		Subtotal	**14.0420**
		Total	**50,075.20**

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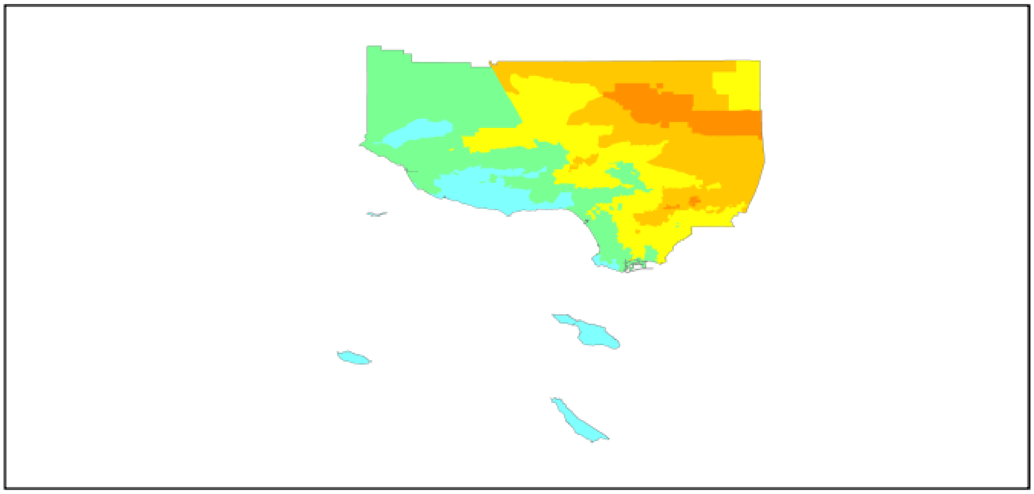
Earthquake Scenario

Hazus uses the following set of information to define the earthquake parameters used for the earthquake loss estimate provided in this report.



Scenario Name	M7.8-Ardent Sentry 2015 Scenario v1
Type of Earthquake	
Fault Name	NA
Historical Epicenter ID #	NA
Probabilistic Return Period	NA
Longitude of Epicenter	0.00
Latitude of Epicenter	0.00
Earthquake Magnitude	7.80
Depth (km)	0.00
Rupture Length (Km)	0.00
Rupture Orientation (degrees)	0.00
Attenuation Function	

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Direct Earthquake Damage

Building Damage

Hazus estimates that about 71,332 buildings will be at least moderately damaged. This is over 3.00 % of the buildings in the region. There are an estimated 3,871 buildings that will be damaged beyond repair. The definition of the 'damage states' is provided in Volume 1: Chapter 5 of the Hazus technical manual. Table 3 below summarizes the expected damage by general occupancy for the buildings in the region. Table 4 below summarizes the expected damage by general building type.

Damage Categories by General Occupancy Type

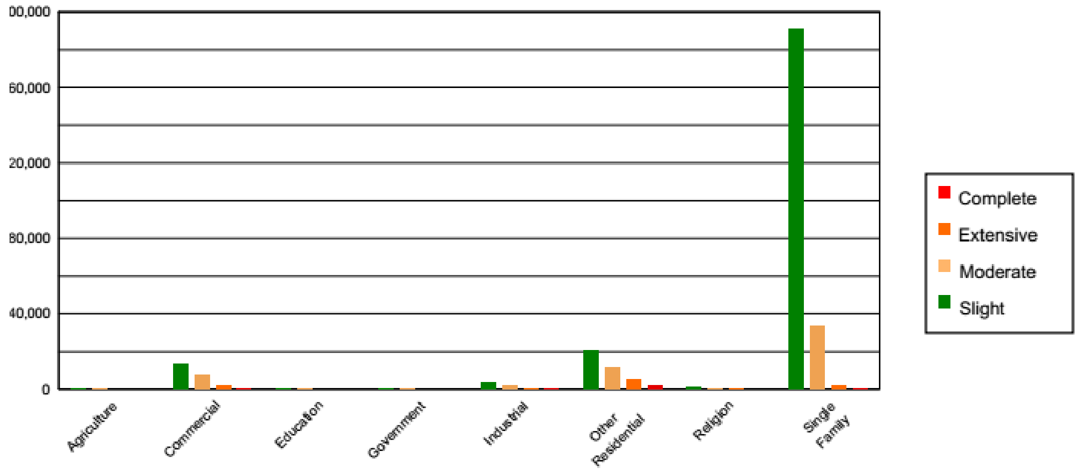


Table 3: Expected Building Damage by Occupancy

	None		Slight		Moderate		Extensive		Complete	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Agriculture	3398.71	0.15	307.13	0.13	161.50	0.29	53.74	0.49	24.92	0.64
Commercial	144979.27	6.19	13411.74	5.82	7344.47	12.98	2141.42	19.66	793.10	20.48
Education	5531.68	0.24	465.48	0.20	199.13	0.35	53.33	0.49	18.37	0.47
Government	2653.71	0.11	235.20	0.10	131.52	0.23	43.98	0.40	19.60	0.51
Industrial	34398.99	1.47	3677.38	1.60	2328.47	4.12	737.93	6.78	298.23	7.70
Other Residential	206785.62	8.83	20504.35	8.90	12078.87	21.35	5595.56	51.38	2073.60	53.56
Religion	11475.21	0.49	1051.51	0.46	517.31	0.91	162.88	1.50	66.09	1.71
Single Family	1931542.59	82.52	190645.18	82.78	33809.56	59.77	2100.80	19.29	577.79	14.92
Total	2,340,766		230,298		56,571		10,890		3,872	

Table 4: Expected Building Damage by Building Type (All Design Levels)

	None		Slight		Moderate		Extensive		Complete	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Wood	2082752.01	88.98	202449.25	87.91	35354.73	62.50	2185.81	20.07	687.78	17.76
Steel	45141.19	1.93	4822.43	2.09	3408.86	6.03	1120.28	10.29	487.84	12.60
Concrete	44900.75	1.92	4114.87	1.79	1934.48	3.42	655.56	6.02	294.57	7.61
Precast	38995.50	1.67	3844.36	1.67	2511.35	4.44	647.02	5.94	167.91	4.34
RM	74566.86	3.19	4468.12	1.94	2865.65	5.07	848.59	7.79	184.82	4.77
URM	13018.27	0.56	1656.56	0.72	837.42	1.48	217.71	2.00	88.34	2.28
MH	41391.22	1.77	8942.37	3.88	9658.32	17.07	5214.65	47.89	1960.44	50.64
Total	**2,340,766**		**230,298**		**56,571**		**10,890**		**3,872**	

*Note:

RM Reinforced Masonry
URM Unreinforced Masonry
MH Manufactured Housing

Essential Facility Damage

Before the earthquake, the region had 30,043 hospital beds available for use. On the day of the earthquake, the model estimates that only 25,929 hospital beds (86.00%) are available for use by patients already in the hospital and those injured by the earthquake. After one week, 94.00% of the beds will be back in service. By 30 days, 99.00% will be operational.

Table 5: Expected Damage to Essential Facilities

		# Facilities		
Classification	Total	At Least Moderate Damage > 50%	Complete Damage > 50%	With Functionality > 50% on day 1
Hospitals	156	0	0	150
Schools	4,018	11	1	3,835
EOCs	59	0	0	54
PoliceStations	167	0	0	160
FireStations	454	1	1	435

Transportation Lifeline Damage

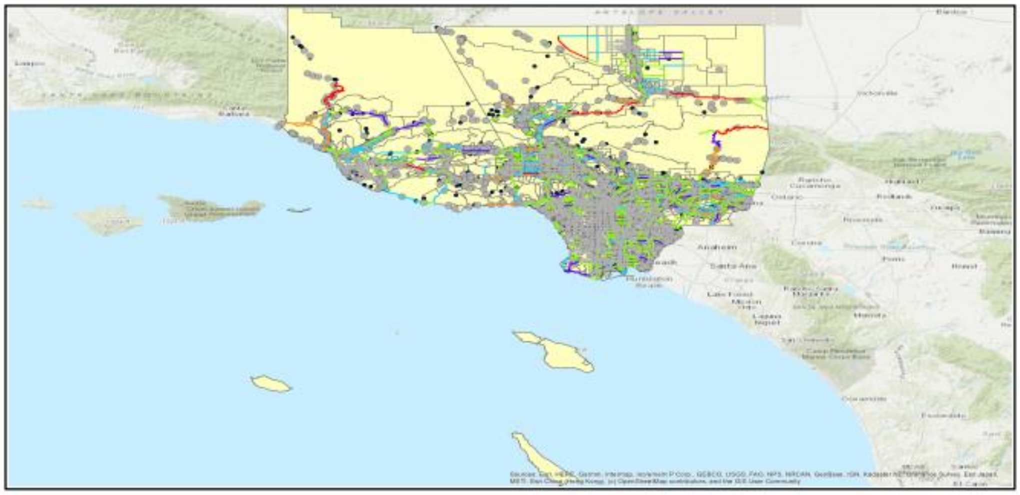


Table 6: Expected Damage to the Transportation Systems

System	Component	Number of Locations				
		Locations/ Segments	With at Least Mod. Damage	With Complete Damage	With Functionality > 50 %	
					After Day 1	After Day 7
Highway	Segments	4,836	0	0	4,836	4,836
	Bridges	4,033	15	1	4,018	4,029
	Tunnels	46	0	0	46	46
Railways	Segments	3,962	0	0	3,962	3,962
	Bridges	407	0	0	407	407
	Tunnels	0	0	0	0	0
	Facilities	52	0	0	52	52
Light Rail	Segments	99	0	0	99	99
	Bridges	28	0	0	28	28
	Tunnels	0	0	0	0	0
	Facilities	97	0	0	97	97
Bus	Facilities	48	2	0	48	48
Ferry	Facilities	12	0	0	12	12
Port	Facilities	134	0	0	134	134
Airport	Facilities	56	0	0	56	56
	Runways	35	0	0	35	35

Table 6 provides damage estimates for the transportation system.

Note: Roadway segments, railroad tracks and light rail tracks are assumed to be damaged by ground failure only. If ground failure maps are not provided, damage estimates to these components will not be computed.

Tables 7-9 provide information on the damage to the utility lifeline systems. Table 7 provides damage to the utility system facilities. Table 8 provides estimates on the number of leaks and breaks by the pipelines of the utility systems. For electric power and potable water, Hazus performs a simplified system performance analysis. Table 9 provides a summary of the system performance information.

Table 7 : Expected Utility System Facility Damage

System	# of Locations				
	Total #	With at Least Moderate Damage	With Complete Damage	with Functionality > 50 %	
				After Day 1	After Day 7
Potable Water	20	1	0	19	20
Waste Water	66	2	0	64	66
Natural Gas	7	1	0	6	7
Oil Systems	46	0	0	46	46
Electrical Power	87	22	0	81	87
Communication	119	3	0	119	119

Table 8 : Expected Utility System Pipeline Damage (Site Specific)

System	Total Pipelines Length (miles)	Number of Leaks	Number of Breaks
Potable Water	57,208	87302	21825
Waste Water	34,325	43854	10963
Natural Gas	487	0	0
Oil	0	0	0

Table 9: Expected Potable Water and Electric Power System Performance

	Total # of Households	Number of Households without Service				
		At Day 1	At Day 3	At Day 7	At Day 30	At Day 90
Potable Water	3,508,124	2,900,768	2,893,567	2,879,909	2,840,420	2,778,048
Electric Power		43,684	25,648	9,752	1,747	64

Induced Earthquake Damage

Fire Following Earthquake

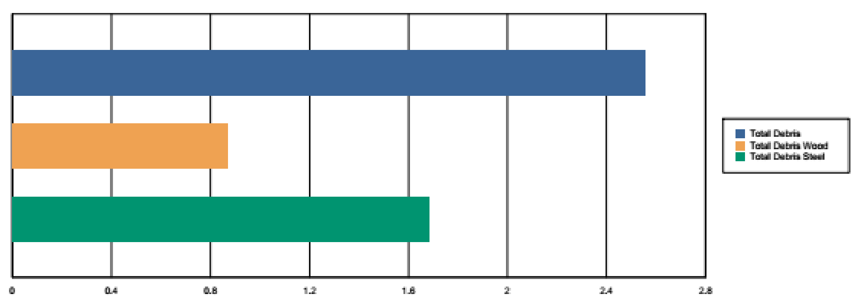
Fires often occur after an earthquake. Because of the number of fires and the lack of water to fight the fires, they can often burn out of control. Hazus uses a Monte Carlo simulation model to estimate the number of ignitions and the amount of burnt area. For this scenario, the model estimates that there will be 131 ignitions that will burn about 0.89 sq. mi 0.01 % of the region's total area.) The model also estimates that the fires will displace about 11,108 people and burn about 1,009 (millions of dollars) of building value.

Debris Generation

Hazus estimates the amount of debris that will be generated by the earthquake. The model breaks the debris into two general categories: a) Brick/Wood and b) Reinforced Concrete/Steel. This distinction is made because of the different types of material handling equipment required to handle the debris.

The model estimates that a total of 2,556,000 tons of debris will be generated. Of the total amount, Brick/Wood comprises 34.00% of the total, with the remainder being Reinforced Concrete/Steel. If the debris tonnage is converted to an estimated number of truckloads, it will require 102,240 truckloads (@25 tons/truck) to remove the debris generated by the earthquake.

Earthquake Debris (millions of tons)



Brick/ Wood	Reinforced Concrete/Steel	Total Debris	Truck Load
0.87	1.69	2.56	102,240 (@25 tons/truck)

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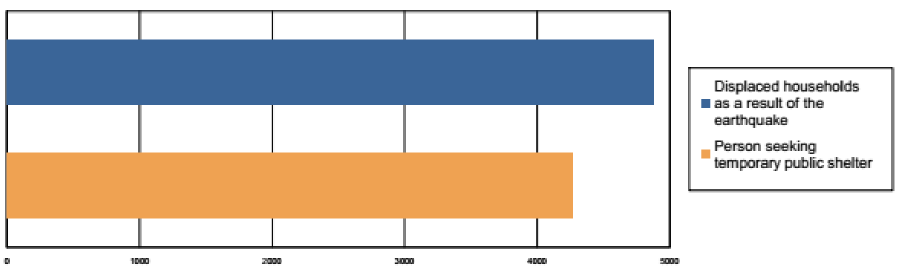
Social Impact

Shelter Requirement

Hazus estimates the number of households that are expected to be displaced from their homes due to the earthquake and the number of displaced people that will require accommodations in temporary public shelters. The model estimates 4,885 households to be displaced due to the earthquake. Of these, 4,268 people (out of a total population of 10,641,923) will seek temporary shelter in public shelters.

Displaced Households/ Persons Seeking Short Term Public Shelter



Displaced households as a result of the earthquake	Persons seeking temporary public shelter
4,885	4,268

Casualties

Hazus estimates the number of people that will be injured and killed by the earthquake. The casualties are broken down into four (4) severity levels that describe the extent of the injuries. The levels are described as follows;

- Severity Level 1: Injuries will require medical attention but hospitalization is not needed.
- Severity Level 2: Injuries will require hospitalization but are not considered life-threatening
- Severity Level 3: Injuries will require hospitalization and can become life threatening if not promptly treated.
- Severity Level 4: Victims are killed by the earthquake.

The casualty estimates are provided for three (3) times of day: 2:00 AM, 2:00 PM and 5:00 PM. These times represent the periods of the day that different sectors of the community are at their peak occupancy loads. The 2:00 AM estimate considers that the residential occupancy load is maximum, the 2:00 PM estimate considers that the educational, commercial and industrial sector loads are maximum and 5:00 PM represents peak commute time.

Table 10 provides a summary of the casualties estimated for this earthquake

Table 10: Casualty Estimates

		Level 1	Level 2	Level 3	Level 4
2 AM	Commercial	57.33	13.98	2.09	4.12
	Commuting	0.00	0.00	0.00	0.00
	Educational	0.00	0.00	0.00	0.00
	Hotels	0.00	0.00	0.00	0.00
	Industrial	89.93	21.68	3.04	5.97
	Other-Residential	951.19	188.24	19.46	36.73
	Single Family	784.23	75.21	3.42	6.06
	Total	**1,883**	**299**	**28**	**53**
2 PM	Commercial	3415.92	834.94	125.03	245.19
	Commuting	0.00	0.00	0.00	0.00
	Educational	1283.47	328.77	51.56	100.79
	Hotels	0.00	0.00	0.00	0.00
	Industrial	661.76	159.30	22.45	43.58
	Other-Residential	215.45	43.82	4.74	8.77
	Single Family	169.01	16.85	0.89	1.35
	Total	**5,746**	**1,384**	**205**	**400**
5 PM	Commercial	2426.87	593.31	89.27	172.83
	Commuting	0.00	0.00	0.00	0.00
	Educational	143.18	36.26	5.65	11.07
	Hotels	0.00	0.00	0.00	0.00
	Industrial	413.60	99.56	14.03	27.24
	Other-Residential	351.67	70.03	7.43	13.72
	Single Family	294.73	29.24	1.53	2.33
	Total	**3,630**	**828**	**118**	**227**

Economic Loss

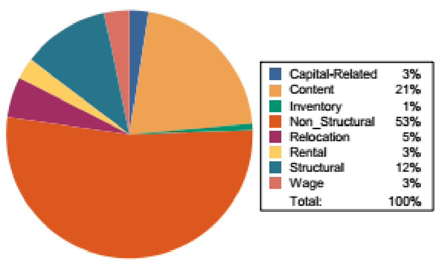
The total economic loss estimated for the earthquake is 18,400.28 (millions of dollars), which includes building and lifeline related losses based on the region's available inventory. The following three sections provide more detailed information about these losses.

Building-Related Losses

The building losses are broken into two categories: direct building losses and business interruption losses. The direct building losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability to operate a business because of the damage sustained during the earthquake. Business interruption losses also include the temporary living expenses for those people displaced from their homes because of the earthquake.

The total building-related losses were 15,525.73 (millions of dollars); 14 % of the estimated losses were related to the business interruption of the region. By far, the largest loss was sustained by the residential occupancies which made up over 52 % of the total loss. Table 11 below provides a summary of the losses associated with the building damage.

Earthquake Losses by Loss Type ($ millions)



Earthquake Losses by Occupancy Type ($ millions)

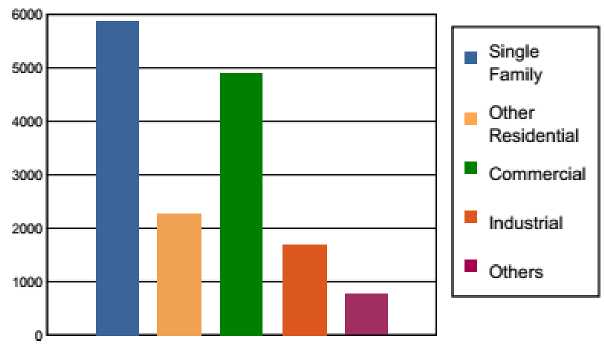


Table 11: Building-Related Economic Loss Estimates

(Millions of dollars)

Category	Area	Single Family	Other Residential	Commercial	Industrial	Others	Total
Income Losses							
	Wage	0.0000	22.9410	440.5374	27.3336	21.4868	512.2988
	Capital-Related	0.0000	9.7578	373.7820	17.0912	5.4278	406.0588
	Rental	78.7167	86.7566	220.8947	10.8764	11.0550	408.2994
	Relocation	261.0203	85.7852	329.5298	53.2549	81.4058	810.9960
	Subtotal	**339.7370**	**205.2406**	**1364.7439**	**108.5561**	**119.3754**	**2137.6530**
Capital Stock Losses							
	Structural	642.2040	246.9104	596.4105	203.8032	100.9423	1,790.2704
	Non_Structural	3660.0987	1462.4171	1944.9612	778.3886	369.2720	8,215.1376
	Content	1240.0711	353.7342	976.0386	522.0701	182.6615	3,274.5755
	Inventory	0.0000	0.0000	26.5319	80.3299	1.2366	108.0984
	Subtotal	**5542.3738**	**2063.0617**	**3543.9422**	**1584.5918**	**654.1124**	**13388.0819**
	Total	**5882.11**	**2268.30**	**4908.69**	**1693.15**	**773.49**	**15525.73**

Transportation and Utility Lifeline Losses

For the transportation and utility lifeline systems, Hazus computes the direct repair cost for each component only. There are no losses computed by Hazus for business interruption due to lifeline outages. Tables 12 & 13 provide a detailed breakdown in the expected lifeline losses.

Table 12: Transportation System Economic Losses
(Millions of dollars)

System	Component	Inventory Value	Economic Loss	Loss Ratio (%)
Highway	Segments	42119.2052	0.0000	0.00
	Bridges	28758.6609	192.5541	0.67
	Tunnels	678.9663	0.8810	0.13
	Subtotal	**71556.8324**	**193.4351**	
Railways	Segments	3480.4675	0.0000	0.00
	Bridges	2328.3207	14.3027	0.61
	Tunnels	0.0000	0.0000	0.00
	Facilities	138.4760	11.8481	8.56
	Subtotal	**5947.2642**	**26.1508**	
Light Rail	Segments	801.6737	0.0000	0.00
	Bridges	6.1737	0.0239	0.39
	Tunnels	0.0000	0.0000	0.00
	Facilities	355.1404	29.2112	8.23
	Subtotal	**1162.9878**	**29.2351**	
Bus	Facilities	87.8697	8.0764	9.19
	Subtotal	**87.8697**	**8.0764**	
Ferry	Facilities	15.9720	0.4083	2.56
	Subtotal	**15.9720**	**0.4083**	
Port	Facilities	484.4737	13.5963	2.81
	Subtotal	**484.4737**	**13.5963**	
Airport	Facilities	4180.9239	132.3573	3.17
	Runways	3596.0747	0.0000	0.00
	Subtotal	**7776.9986**	**132.3573**	
	Total	**87,032.40**	**403.26**	

Table 13: Utility System Economic Losses

(Millions of dollars)

System	Component	Inventory Value	Economic Loss	Loss Ratio (%)
Potable Water	Pipelines	0.0000	0.0000	0.00
	Facilities	785.8800	26.9290	3.43
	Distribution Lines	1841.3365	392.8577	21.34
	Subtotal	**2627.2165**	**419.7867**	
Waste Water	Pipelines	0.0000	0.0000	0.00
	Facilities	10798.3737	240.6565	2.23
	Distribution Lines	1104.8019	197.3425	17.86
	Subtotal	**11903.1756**	**437.9990**	
Natural Gas	Pipelines	612.0022	0.0000	0.00
	Facilities	14.0156	0.7321	5.22
	Distribution Lines	736.5346	0.0000	0.00
	Subtotal	**1362.5524**	**0.7321**	
Oil Systems	Pipelines	0.0000	0.0000	0.00
	Facilities	5.4280	0.1108	2.04
	Subtotal	**5.4280**	**0.1108**	
Electrical Power	Facilities	34162.8144	1612.2787	4.72
	Subtotal	**34162.8144**	**1612.2787**	
Communication	Facilities	14.0420	0.3779	2.69
	Subtotal	**14.0420**	**0.3779**	
	Total	**50,075.23**	**2,471.29**	

Appendix A: County Listing for the Region

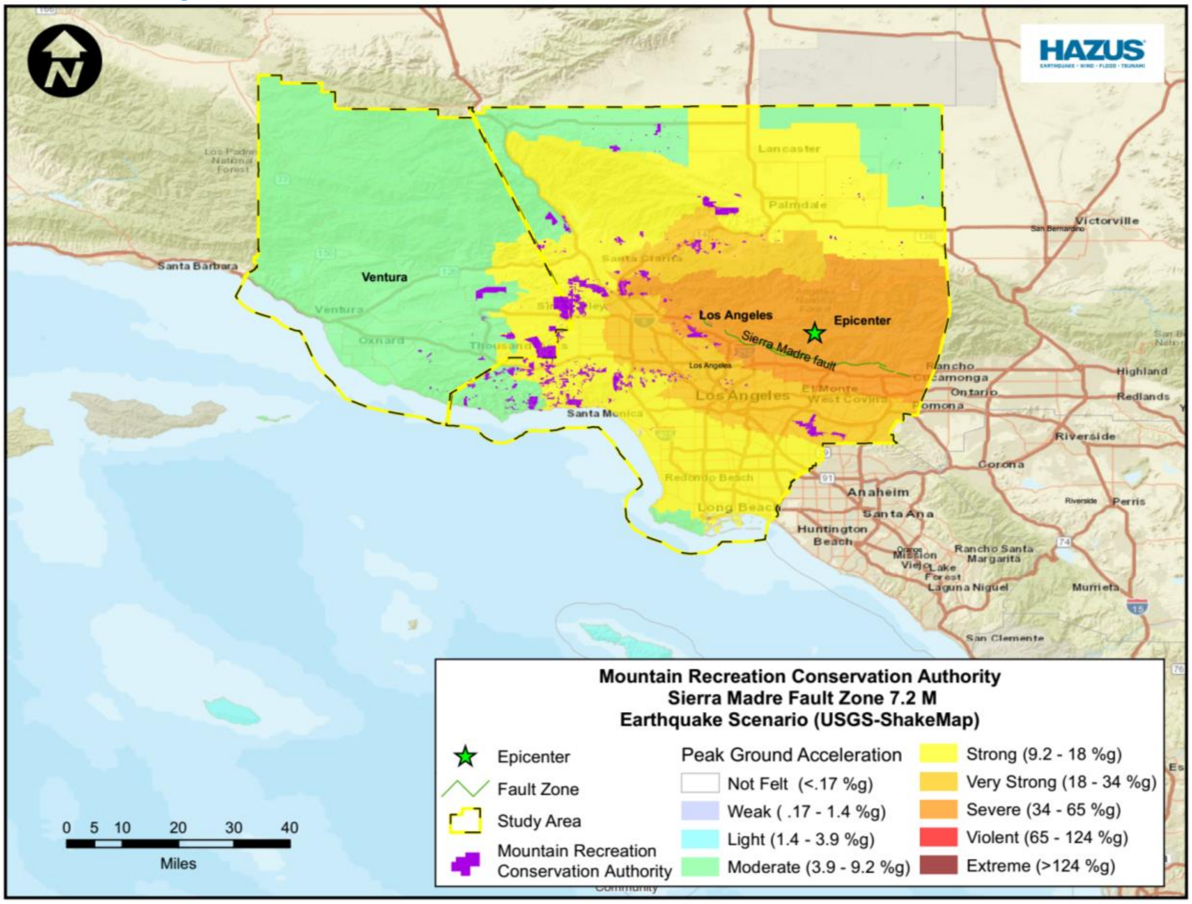
Los Angeles,CA

Ventura,CA

Appendix B: Regional Population and Building Value Data

State	County Name	Population	Building Value (millions of dollars)		
			Residential	Non-Residential	Total
California					
	Los Angeles	9,818,605	868,901	265,229	1,134,130
	Ventura	823,318	87,922	19,795	107,718
Total Region		10,641,923	956,823	285,024	1,241,848

HAZUS Map – Sierra Madre M7.2



HAZUS Report – Sierra Madre M7.2

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FEMA

RiskMAP
Increasing Resilience Together

Hazus-MH: Earthquake Global Risk Report

Region Name: MRCA_EQ

Earthquake Scenario: M7.2-Sierra Madre v11

Print Date: October 03, 2020

Disclaimer:
This version of Hazus utilizes 2010 Census Data.
Totals only reflect data for those census tracts/blocks included in the user's study region.

The estimates of social and economic impacts contained in this report were produced using Hazus loss estimation methodology software which is based on current scientific and engineering knowledge. There are uncertainties inherent in any loss estimation technique. Therefore, there may be significant differences between the modeled results contained in this report and the actual social and economic losses following a specific earthquake. These results can be improved by using enhanced inventory, geotechnical, and observed ground motion data.

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FEMA

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Appendix A: County Listing for the Region

Appendix B: Regional Population and Building Value Data

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General Description of the Region

Hazus-MH is a regional earthquake loss estimation model that was developed by the Federal Emergency Management Agency (FEMA) and the National Institute of Building Sciences. The primary purpose of Hazus is to provide a 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 stimulate efforts to reduce risks from multi-hazards and to prepare for emergency response and recovery.

The earthquake loss estimates provided in this report was based on a region that includes 2 county(ies) from the following state(s):

California

Note:
Appendix A contains a complete listing of the counties contained in the region.

The geographical size of the region is 5,940.49 square miles and contains 2,516 census tracts. There are over 3,508 thousand households in the region which has a total population of 10,641,923 people (2010 Census Bureau data). The distribution of population by Total Region and County is provided in Appendix B.

There are an estimated 2,642 thousand buildings in the region with a total building replacement value (excluding contents) of 1,241,848 (millions of dollars). Approximately 91.00 % of the buildings (and 77.00% of the building value) are associated with residential housing.

The replacement value of the transportation and utility lifeline systems is estimated to be 87,032 and 50,075 (millions of dollars) , respectively.

Building and Lifeline Inventory

Building Inventory

Hazus estimates that there are 2,642 thousand buildings in the region which have an aggregate total replacement value of 1,241,848 (millions of dollars) . Appendix B provides a general distribution of the building value by Total Region and County.

In terms of building construction types found in the region, wood frame construction makes up 88% of the building inventory. The remaining percentage is distributed between the other general building types.

Critical Facility Inventory

Hazus breaks critical facilities into two (2) groups: essential facilities and high potential loss facilities (HPL). Essential facilities include hospitals, medical clinics, schools, fire stations, police stations and emergency operations facilities. High potential loss facilities include dams, levees, military installations, nuclear power plants and hazardous material sites.

For essential facilities, there are 156 hospitals in the region with a total bed capacity of 30,043 beds. There are 4,018 schools, 454 fire stations, 167 police stations and 59 emergency operation facilities. With respect to high potential loss facilities (HPL), there are no dams identified within the inventory. The inventory also includes 1,770 hazardous material sites, no military installations and no nuclear power plants.

Transportation and Utility Lifeline Inventory

Within Hazus, the lifeline inventory is divided between transportation and utility lifeline systems. There are seven (7) transportation systems that include highways, railways, light rail, bus, ports, ferry and airports. There are six (6) utility systems that include potable water, wastewater, natural gas, crude & refined oil, electric power and communications. The lifeline inventory data are provided in Tables 1 and 2.

The total value of the lifeline inventory is over 137,107.00 (millions of dollars). This inventory includes over 3,526.28 miles of highways, 4,033 bridges, 92,018.83 miles of pipes.

Table 1: Transportation System Lifeline Inventory

System	Component	# Locations/ # Segments	Replacement value (millions of dollars)
Highway	Bridges	4,033	28758.6609
	Segments	4,836	42119.2052
	Tunnels	46	678.9663
		Subtotal	**71556.8324**
Railways	Bridges	407	2328.3207
	Facilities	52	138.4760
	Segments	3,962	3480.4675
	Tunnels	0	0.0000
		Subtotal	**5947.2642**
Light Rail	Bridges	28	6.1737
	Facilities	97	355.1404
	Segments	99	801.6737
	Tunnels	0	0.0000
		Subtotal	**1162.9878**
Bus	Facilities	48	87.8697
		Subtotal	**87.8697**
Ferry	Facilities	12	15.9720
		Subtotal	**15.9720**
Port	Facilities	134	484.4737
		Subtotal	**484.4737**
Airport	Facilities	56	4180.9239
	Runways	35	3596.0747
		Subtotal	**7776.9986**
		Total	**87,032.40**

Table 2: Utility System Lifeline Inventory

System	Component	# Locations / Segments	Replacement value (millions of dollars)
Potable Water	Distribution Lines	NA	1841.3365
	Facilities	20	785.8800
	Pipelines	0	0.0000
		Subtotal	**2627.2165**
Waste Water	Distribution Lines	NA	1104.8019
	Facilities	66	10798.3737
	Pipelines	0	0.0000
		Subtotal	**11903.1756**
Natural Gas	Distribution Lines	NA	736.5346
	Facilities	7	14.0156
	Pipelines	92	612.0022
		Subtotal	**1362.5524**
Oil Systems	Facilities	46	5.4280
	Pipelines	0	0.0000
		Subtotal	**5.4280**
Electrical Power	Facilities	87	34162.8144
		Subtotal	**34162.8144**
Communication	Facilities	119	14.0420
		Subtotal	**14.0420**
		Total	**50,075.20**

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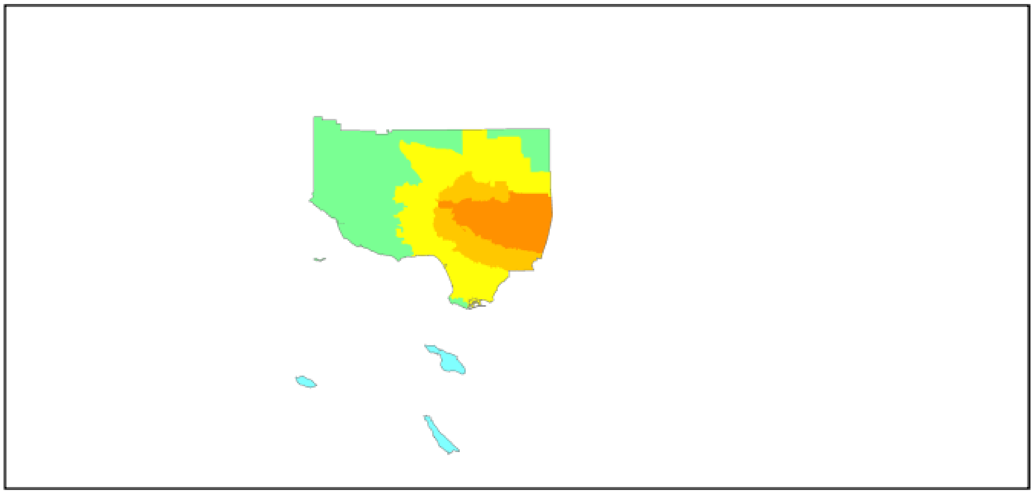
Earthquake Scenario

Hazus uses the following set of information to define the earthquake parameters used for the earthquake loss estimate provided in this report.



Scenario Name	M7.2-Sierra Madre v11
Type of Earthquake	
Fault Name	NA
Historical Epicenter ID #	NA
Probabilistic Return Period	NA
Longitude of Epicenter	0.00
Latitude of Epicenter	0.00
Earthquake Magnitude	7.16
Depth (km)	0.00
Rupture Length (Km)	0.00
Rupture Orientation (degrees)	0.00
Attenuation Function	

Direct Earthquake Damage

Building Damage

Hazus estimates that about 247,579 buildings will be at least moderately damaged. This is over 9.00 % of the buildings in the region. There are an estimated 8,677 buildings that will be damaged beyond repair. The definition of the 'damage states' is provided in Volume 1: Chapter 5 of the Hazus technical manual. Table 3 below summarizes the expected damage by general occupancy for the buildings in the region. Table 4 below summarizes the expected damage by general building type.

Damage Categories by General Occupancy Type

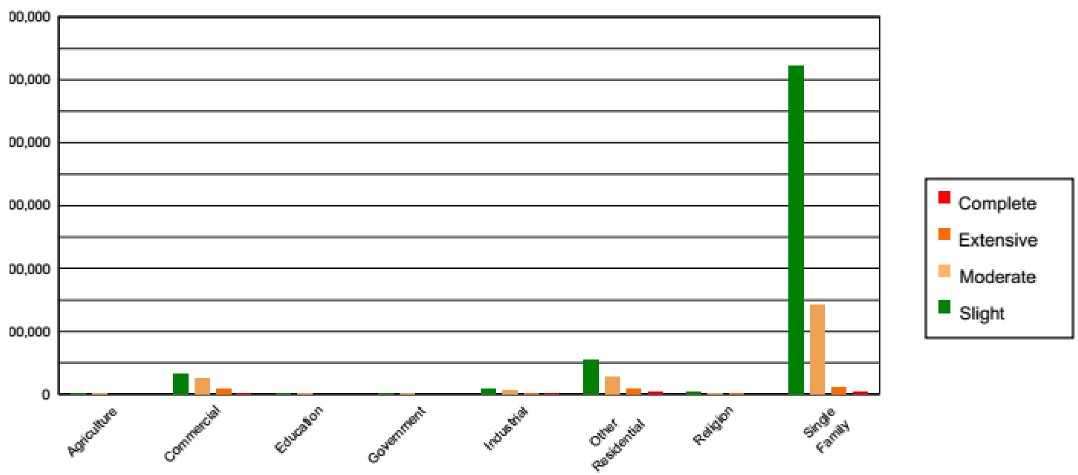


Table 3: Expected Building Damage by Occupancy

	None		Slight		Moderate		Extensive		Complete	
	Count	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**
Agriculture	2575.92	0.15	716.93	0.12	457.20	0.22	148.38	0.47	47.57	0.55
Commercial	101031.87	5.70	32480.28	5.22	24843.22	12.00	8237.36	25.82	2077.27	23.94
Education	4024.51	0.23	1239.91	0.20	740.46	0.36	215.52	0.68	47.60	0.55
Government	1930.24	0.11	567.58	0.09	412.70	0.20	139.65	0.44	33.83	0.39
Industrial	23629.46	1.33	7884.45	1.27	6807.70	3.29	2444.07	7.66	675.32	7.78
Other Residential	151381.36	8.54	54250.56	8.73	28533.44	13.78	9940.34	31.16	2932.29	33.79
Religion	8221.39	0.46	2593.58	0.42	1713.78	0.83	586.20	1.84	158.05	1.82
Single Family	1480306.01	83.49	521982.50	83.96	143495.99	69.32	10185.74	31.93	2705.67	31.18
Total	**1,773,101**		**621,716**		**207,004**		**31,897**		**8,678**	

Table 4: Expected Building Damage by Building Type (All Design Levels)

	None		Slight		Moderate		Extensive		Complete	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Wood	1591007.71	89.73	564590.35	90.81	154260.07	74.52	10595.21	33.22	2976.25	34.30
Steel	31126.67	1.76	9952.84	1.60	9597.47	4.64	3402.24	10.67	901.39	10.39
Concrete	31291.32	1.76	10541.27	1.70	6924.71	3.35	2533.48	7.94	609.45	7.02
Precast	25688.42	1.45	8585.48	1.38	8311.01	4.01	2924.54	9.17	656.68	7.57
RM	56125.10	3.17	11881.21	1.91	10478.52	5.06	3847.33	12.06	601.90	6.94
URM	8209.93	0.46	3325.04	0.53	2709.35	1.31	1060.28	3.32	513.70	5.92
MH	29651.61	1.67	12839.60	2.07	14723.37	7.11	7534.18	23.62	2418.25	27.87
Total	**1,773,101**		**621,716**		**207,004**		**31,897**		**8,678**	

*Note:
RM Reinforced Masonry
URM Unreinforced Masonry
MH Manufactured Housing

Essential Facility Damage

Before the earthquake, the region had 30,043 hospital beds available for use. On the day of the earthquake, the model estimates that only 18,290 hospital beds (61.00%) are available for use by patients already in the hospital and those injured by the earthquake. After one week, 77.00% of the beds will be back in service. By 30 days, 92.00% will be operational.

Table 5: Expected Damage to Essential Facilities

Classification	Total	# Facilities		
		At Least Moderate Damage > 50%	Complete Damage > 50%	With Functionality > 50% on day 1
Hospitals	156	24	0	103
Schools	4,018	671	0	2,424
EOCs	59	11	0	33
PoliceStations	167	23	0	111
FireStations	454	70	0	294

Transportation Lifeline Damage

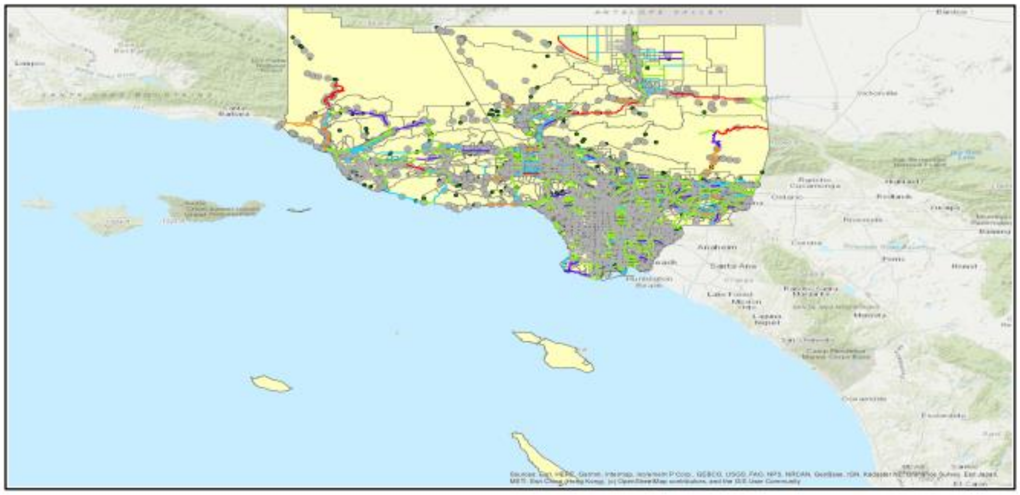


Table 6: Expected Damage to the Transportation Systems

System	Component	Number of Locations				
		Locations/ Segments	With at Least Mod. Damage	With Complete Damage	With Functionality > 50 %	
					After Day 1	After Day 7
Highway	Segments	4,836	0	0	4,836	4,836
	Bridges	4,033	23	1	4,012	4,020
	Tunnels	46	0	0	46	46
Railways	Segments	3,962	0	0	3,962	3,962
	Bridges	407	0	0	407	407
	Tunnels	0	0	0	0	0
	Facilities	52	1	0	52	52
Light Rail	Segments	99	0	0	99	99
	Bridges	28	0	0	28	28
	Tunnels	0	0	0	0	0
	Facilities	97	4	0	97	97
Bus	Facilities	48	3	0	48	48
Ferry	Facilities	12	0	0	12	12
Port	Facilities	134	0	0	134	134
Airport	Facilities	56	5	0	55	56
	Runways	35	0	0	35	35

Table 6 provides damage estimates for the transportation system.

Note: Roadway segments, railroad tracks and light rail tracks are assumed to be damaged by ground failure only. If ground failure maps are not provided, damage estimates to these components will not be computed.

Tables 7-9 provide information on the damage to the utility lifeline systems. Table 7 provides damage to the utility system facilities. Table 8 provides estimates on the number of leaks and breaks by the pipelines of the utility systems. For electric power and potable water, Hazus performs a simplified system performance analysis. Table 9 provides a summary of the system performance information.

Table 7 : Expected Utility System Facility Damage

System	# of Locations				
	Total #	With at Least Moderate Damage	With Complete Damage	with Functionality > 50 %	
				After Day 1	After Day 7
Potable Water	20	3	0	17	20
Waste Water	66	4	0	54	66
Natural Gas	7	0	0	7	7
Oil Systems	46	0	0	46	46
Electrical Power	87	9	0	86	87
Communication	119	50	0	78	119

Table 8 : Expected Utility System Pipeline Damage (Site Specific)

System	Total Pipelines Length (miles)	Number of Leaks	Number of Breaks
Potable Water	57,208	9339	2335
Waste Water	34,325	4691	1173
Natural Gas	487	40	10
Oil	0	0	0

Table 9: Expected Potable Water and Electric Power System Performance

	Total # of Households	Number of Households without Service				
		At Day 1	At Day 3	At Day 7	At Day 30	At Day 90
Potable Water	3,508,124	250,324	238,321	214,890	98,854	0
Electric Power		133,488	78,204	29,595	5,277	195

Induced Earthquake Damage

Fire Following Earthquake

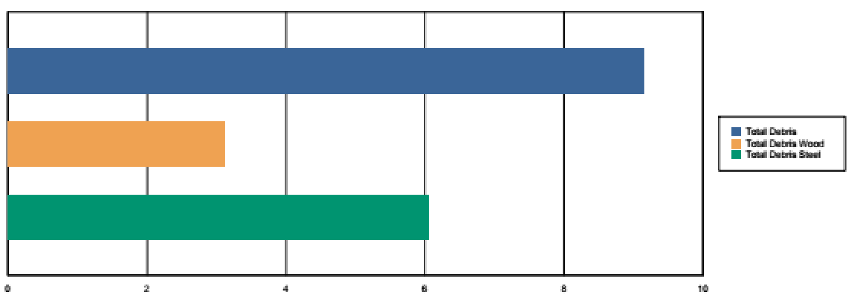
Fires often occur after an earthquake. Because of the number of fires and the lack of water to fight the fires, they can often burn out of control. Hazus uses a Monte Carlo simulation model to estimate the number of ignitions and the amount of burnt area. For this scenario, the model estimates that there will be 153 ignitions that will burn about 1.40 sq. mi 0.02 % of the region's total area.) The model also estimates that the fires will displace about 16,649 people and burn about 1,521 (millions of dollars) of building value.

Debris Generation

Hazus estimates the amount of debris that will be generated by the earthquake. The model breaks the debris into two general categories: a) Brick/Wood and b) Reinforced Concrete/Steel. This distinction is made because of the different types of material handling equipment required to handle the debris.

The model estimates that a total of 9,150,000 tons of debris will be generated. Of the total amount, Brick/Wood comprises 34.00% of the total, with the remainder being Reinforced Concrete/Steel. If the debris tonnage is converted to an estimated number of truckloads, it will require 366,000 truckloads (@25 tons/truck) to remove the debris generated by the earthquake.

Earthquake Debris (millions of tons)



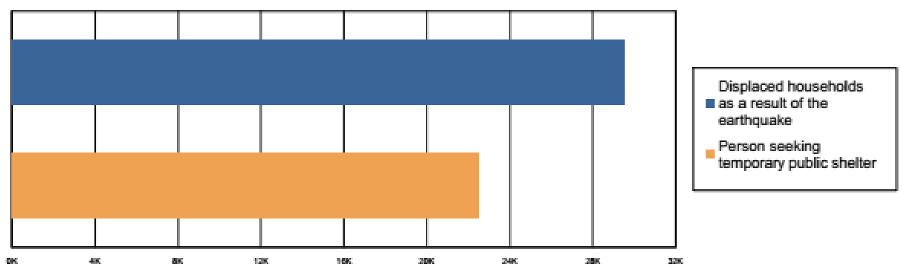
Brick/ Wood	Reinforced Concrete/Steel	Total Debris	Truck Load
3.11	6.04	9.15	366,000 (@25 tons/truck)

Social Impact

Shelter Requirement

Hazus estimates the number of households that are expected to be displaced from their homes due to the earthquake and the number of displaced people that will require accommodations in temporary public shelters. The model estimates 29,554 households to be displaced due to the earthquake. Of these, 22,520 people (out of a total population of 10,641,923) will seek temporary shelter in public shelters.

Displaced Households/ Persons Seeking Short Term Public Shelter



Displaced households as a result of the earthquake	Persons seeking temporary public shelter
29,554	22,520

Casualties

Hazus estimates the number of people that will be injured and killed by the earthquake. The casualties are broken down into four (4) severity levels that describe the extent of the injuries. The levels are described as follows;

- Severity Level 1: Injuries will require medical attention but hospitalization is not needed.
- Severity Level 2: Injuries will require hospitalization but are not considered life-threatening
- Severity Level 3: Injuries will require hospitalization and can become life threatening if not promptly treated.
- Severity Level 4: Victims are killed by the earthquake.

The casualty estimates are provided for three (3) times of day: 2:00 AM, 2:00 PM and 5:00 PM. These times represent the periods of the day that different sectors of the community are at their peak occupancy loads. The 2:00 AM estimate considers that the residential occupancy load is maximum, the 2:00 PM estimate considers that the educational, commercial and industrial sector loads are maximum and 5:00 PM represents peak commute time.

Table 10 provides a summary of the casualties estimated for this earthquake

Table 10: Casualty Estimates

		Level 1	Level 2	Level 3	Level 4
2 AM	Commercial	160.04	36.72	5.25	10.35
	Commuting	0.33	0.61	0.83	0.17
	Educational	0.00	0.00	0.00	0.00
	Hotels	0.00	0.00	0.00	0.00
	Industrial	192.98	42.99	5.76	11.30
	Other-Residential	2905.76	528.94	55.65	106.71
	Single Family	2897.44	320.24	12.23	20.81
	Total	**6,157**	**929**	**80**	**149**
2 PM	Commercial	9249.53	2121.63	303.70	595.56
	Commuting	2.98	5.51	7.45	1.54
	Educational	2529.63	568.28	81.60	159.16
	Hotels	0.00	0.00	0.00	0.00
	Industrial	1419.05	315.89	42.54	82.61
	Other-Residential	610.94	113.03	12.23	22.62
	Single Family	615.41	69.70	3.19	4.54
	Total	**14,428**	**3,194**	**451**	**866**
5 PM	Commercial	6440.31	1476.77	212.33	411.10
	Commuting	56.41	103.27	140.38	28.91
	Educational	335.44	76.83	11.17	21.86
	Hotels	0.00	0.00	0.00	0.00
	Industrial	886.91	197.43	26.59	51.63
	Other-Residential	1098.16	202.51	22.05	40.80
	Single Family	1101.39	124.91	5.74	8.15
	Total	**9,919**	**2,182**	**418**	**562**

Economic Loss

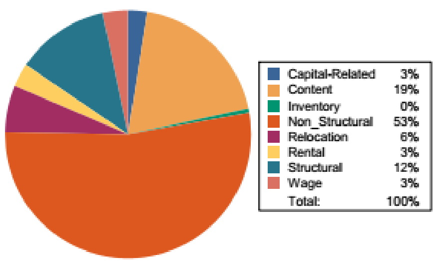
The total economic loss estimated for the earthquake is 56,256.33 (millions of dollars), which includes building and lifeline related losses based on the region's available inventory. The following three sections provide more detailed information about these losses.

Building-Related Losses

The building losses are broken into two categories: direct building losses and business interruption losses. The direct building losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability to operate a business because of the damage sustained during the earthquake. Business interruption losses also include the temporary living expenses for those people displaced from their homes because of the earthquake.

The total building-related losses were 52,912.49 (millions of dollars); 15 % of the estimated losses were related to the business interruption of the region. By far, the largest loss was sustained by the residential occupancies which made up over 57 % of the total loss. Table 11 below provides a summary of the losses associated with the building damage.

Earthquake Losses by Loss Type ($ millions)



Earthquake Losses by Occupancy Type ($ millions)

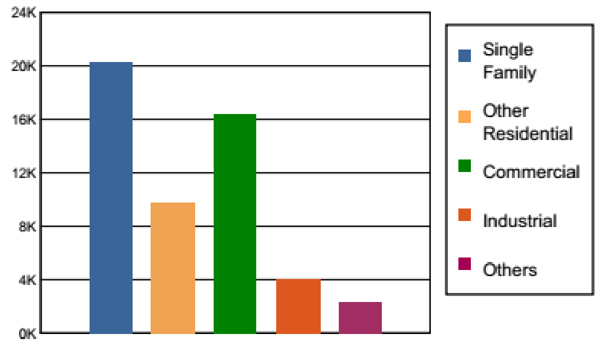


Table 11: Building-Related Economic Loss Estimates

(Millions of dollars)

Category	Area	Single Family	Other Residential	Commercial	Industrial	Others	Total
Income Losses							
	Wage	0.0000	107.8251	1464.2538	68.4369	68.4148	1,708.9306
	Capital-Related	0.0000	45.8270	1270.7624	42.3819	18.0119	1,376.9832
	Rental	329.1622	446.2021	819.7540	29.4197	35.7496	1,660.2876
	Relocation	1153.8170	347.8609	1268.9837	154.4392	278.6737	3,203.7745
	Subtotal	**1482.9792**	**947.7151**	**4823.7539**	**294.6777**	**400.8500**	**7949.9759**
Capital Stock Losses							
	Structural	2450.1907	1003.5115	2170.9376	537.3759	312.4983	6,474.5140
	Non_Structural	12568.9388	6336.4644	6356.0550	1810.5809	1108.3163	28,180.3554
	Content	3782.5564	1514.4148	3020.5027	1204.8836	534.9047	10,057.2622
	Inventory	0.0000	0.0000	73.7893	173.6083	2.9828	250.3804
	Subtotal	**18801.6859**	**8854.3907**	**11621.2846**	**3726.4487**	**1958.7021**	**44962.5120**
	Total	**20284.67**	**9802.11**	**16445.04**	**4021.13**	**2359.55**	**52912.49**

Transportation and Utility Lifeline Losses

For the transportation and utility lifeline systems, Hazus computes the direct repair cost for each component only. There are no losses computed by Hazus for business interruption due to lifeline outages. Tables 12 & 13 provide a detailed breakdown in the expected lifeline losses.

Table 12: Transportation System Economic Losses
(Millions of dollars)

System	Component	Inventory Value	Economic Loss	Loss Ratio (%)
Highway	Segments	42119.2052	0.0000	0.00
	Bridges	28758.6609	431.3097	1.50
	Tunnels	678.9663	8.1267	1.20
	Subtotal	**71556.8324**	**439.4364**	
Railways	Segments	3480.4675	0.0000	0.00
	Bridges	2328.3207	24.0637	1.03
	Tunnels	0.0000	0.0000	0.00
	Facilities	138.4760	16.5430	11.95
	Subtotal	**5947.2642**	**40.6067**	
Light Rail	Segments	801.6737	0.0000	0.00
	Bridges	6.1737	0.1177	1.91
	Tunnels	0.0000	0.0000	0.00
	Facilities	355.1404	55.0583	15.50
	Subtotal	**1162.9878**	**55.1760**	
Bus	Facilities	87.8697	12.5058	14.23
	Subtotal	**87.8697**	**12.5058**	
Ferry	Facilities	15.9720	0.6767	4.24
	Subtotal	**15.9720**	**0.6767**	
Port	Facilities	484.4737	24.8842	5.14
	Subtotal	**484.4737**	**24.8842**	
Airport	Facilities	4180.9239	425.7445	10.18
	Runways	3596.0747	0.0000	0.00
	Subtotal	**7776.9986**	**425.7445**	
	Total	**87,032.40**	**999.03**	

Table 13: Utility System Economic Losses

(Millions of dollars)

System	Component	Inventory Value	Economic Loss	Loss Ratio (%)
Potable Water	Pipelines	0.0000	0.0000	0.00
	Facilities	785.8800	55.2533	7.03
	Distribution Lines	1841.3365	42.0260	2.28
	Subtotal	**2627.2165**	**97.2793**	
Waste Water	Pipelines	0.0000	0.0000	0.00
	Facilities	10798.3737	398.2898	3.69
	Distribution Lines	1104.8019	21.1107	1.91
	Subtotal	**11903.1756**	**419.4005**	
Natural Gas	Pipelines	612.0022	0.0000	0.00
	Facilities	14.0156	0.5339	3.81
	Distribution Lines	736.5346	6.3994	0.87
	Subtotal	**1362.5524**	**6.9333**	
Oil Systems	Pipelines	0.0000	0.0000	0.00
	Facilities	5.4280	0.1977	3.64
	Subtotal	**5.4280**	**0.1977**	
Electrical Power	Facilities	34162.8144	1818.6503	5.32
	Subtotal	**34162.8144**	**1818.6503**	
Communication	Facilities	14.0420	2.3516	16.75
	Subtotal	**14.0420**	**2.3516**	
	Total	**50,075.23**	**2,344.81**	

Appendix A: County Listing for the Region

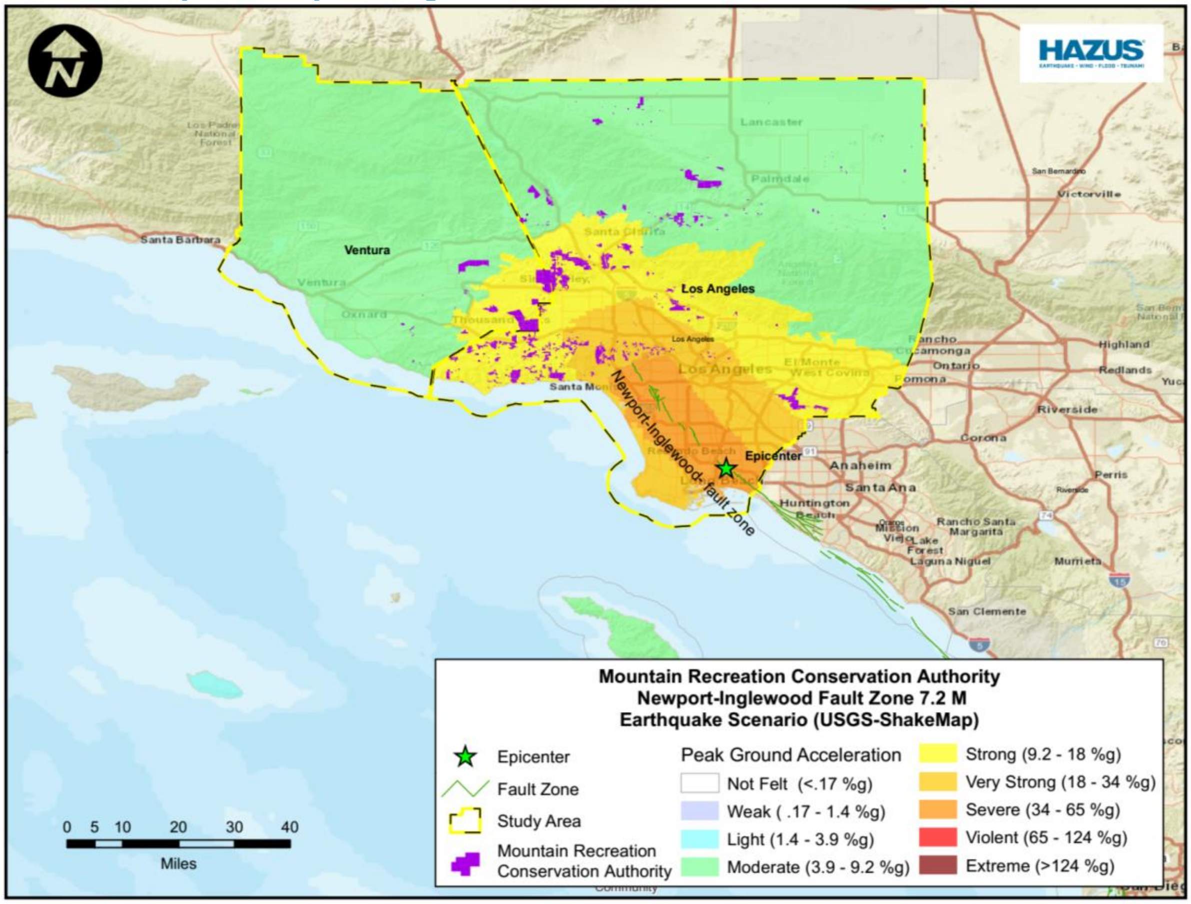
Los Angeles,CA

Ventura,CA

Appendix B: Regional Population and Building Value Data

State	County Name	Population	Building Value (millions of dollars)		
			Residential	Non-Residential	Total
California					
	Los Angeles	9,818,605	868,901	265,229	1,134,130
	Ventura	823,318	87,922	19,795	107,718
Total Region		**10,641,923**	**956,823**	**285,024**	**1,241,848**

HAZUS Map – Newport Inglewood M7.2



HAZUS Report – Newport Inglewood M7.2

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RiskMAP
Increasing Resilience Together

Hazus-MH: Earthquake Global Risk Report

Region Name: MRCA_EQ

Earthquake Scenario: M7.2-Newport-Inglewood alt 2 v10

Print Date: October 01, 2020

Disclaimer:
This version of Hazus utilizes 2010 Census Data.
Totals only reflect data for those census tracts/blocks included in the user's study region.

The estimates of social and economic impacts contained in this report were produced using Hazus loss estimation methodology software which is based on current scientific and engineering knowledge. There are uncertainties inherent in any loss estimation technique. Therefore, there may be significant differences between the modeled results contained in this report and the actual social and economic losses following a specific earthquake. These results can be improved by using enhanced inventory, geotechnical, and observed ground motion data.

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Appendix A: County Listing for the Region

Appendix B: Regional Population and Building Value Data

General Description of the Region

Hazus-MH is a regional earthquake loss estimation model that was developed by the Federal Emergency Management Agency (FEMA) and the National Institute of Building Sciences. The primary purpose of Hazus is to provide a 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 stimulate efforts to reduce risks from multi-hazards and to prepare for emergency response and recovery.

The earthquake loss estimates provided in this report was based on a region that includes 2 county(ies) from the following state(s):

California

Note:
Appendix A contains a complete listing of the counties contained in the region.

The geographical size of the region is 5,940.49 square miles and contains 2,516 census tracts. There are over 3,508 thousand households in the region which has a total population of 10,641,923 people (2010 Census Bureau data). The distribution of population by Total Region and County is provided in Appendix B.

There are an estimated 2,642 thousand buildings in the region with a total building replacement value (excluding contents) of 1,241,848 (millions of dollars). Approximately 91.00 % of the buildings (and 77.00% of the building value) are associated with residential housing.

The replacement value of the transportation and utility lifeline systems is estimated to be 87,032 and 50,075 (millions of dollars) , respectively.

Building and Lifeline Inventory

Building Inventory

Hazus estimates that there are 2,642 thousand buildings in the region which have an aggregate total replacement value of 1,241,848 (millions of dollars) . Appendix B provides a general distribution of the building value by Total Region and County.

In terms of building construction types found in the region, wood frame construction makes up 88% of the building inventory. The remaining percentage is distributed between the other general building types.

Critical Facility Inventory

Hazus breaks critical facilities into two (2) groups: essential facilities and high potential loss facilities (HPL). Essential facilities include hospitals, medical clinics, schools, fire stations, police stations and emergency operations facilities. High potential loss facilities include dams, levees, military installations, nuclear power plants and hazardous material sites.

For essential facilities, there are 156 hospitals in the region with a total bed capacity of 30,043 beds. There are 4,018 schools, 454 fire stations, 167 police stations and 59 emergency operation facilities. With respect to high potential loss facilities (HPL), there are no dams identified within the inventory. The inventory also includes 1,770 hazardous material sites, no military installations and no nuclear power plants.

Transportation and Utility Lifeline Inventory

Within Hazus, the lifeline inventory is divided between transportation and utility lifeline systems. There are seven (7) transportation systems that include highways, railways, light rail, bus, ports, ferry and airports. There are six (6) utility systems that include potable water, wastewater, natural gas, crude & refined oil, electric power and communications. The lifeline inventory data are provided in Tables 1 and 2.

The total value of the lifeline inventory is over 137,107.00 (millions of dollars). This inventory includes over 3,526.28 miles of highways, 4,033 bridges, 92,018.83 miles of pipes.

Table 1: Transportation System Lifeline Inventory

System	Component	# Locations/ # Segments	Replacement value (millions of dollars)
Highway	Bridges	4,033	28758.6609
	Segments	4,836	42119.2052
	Tunnels	46	678.9663
		Subtotal	**71556.8324**
Railways	Bridges	407	2328.3207
	Facilities	52	138.4760
	Segments	3,962	3480.4675
	Tunnels	0	0.0000
		Subtotal	**5947.2642**
Light Rail	Bridges	28	6.1737
	Facilities	97	355.1404
	Segments	99	801.6737
	Tunnels	0	0.0000
		Subtotal	**1162.9878**
Bus	Facilities	48	87.8697
		Subtotal	**87.8697**
Ferry	Facilities	12	15.9720
		Subtotal	**15.9720**
Port	Facilities	134	484.4737
		Subtotal	**484.4737**
Airport	Facilities	56	4180.9239
	Runways	35	3596.0747
		Subtotal	**7776.9986**
		Total	**87,032.40**

Table 2: Utility System Lifeline Inventory

System	Component	# Locations / Segments	Replacement value (millions of dollars)
Potable Water	Distribution Lines	NA	1841.3365
	Facilities	20	785.8800
	Pipelines	0	0.0000
		Subtotal	**2627.2165**
Waste Water	Distribution Lines	NA	1104.8019
	Facilities	66	10798.3737
	Pipelines	0	0.0000
		Subtotal	**11903.1756**
Natural Gas	Distribution Lines	NA	736.5346
	Facilities	7	14.0156
	Pipelines	92	612.0022
		Subtotal	**1362.5524**
Oil Systems	Facilities	46	5.4280
	Pipelines	0	0.0000
		Subtotal	**5.4280**
Electrical Power	Facilities	87	34162.8144
		Subtotal	**34162.8144**
Communication	Facilities	119	14.0420
		Subtotal	**14.0420**
		Total	**50,075.20**

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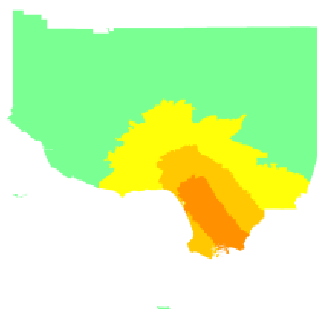
Earthquake Scenario

Hazus uses the following set of information to define the earthquake parameters used for the earthquake loss estimate provided in this report.



Scenario Name	M7.2-Newport-Inglewood alt 2 v10
Type of Earthquake	
Fault Name	NA
Historical Epicenter ID #	NA
Probabilistic Return Period	NA
Longitude of Epicenter	0.00
Latitude of Epicenter	0.00
Earthquake Magnitude	7.15
Depth (km)	0.00
Rupture Length (Km)	0.00
Rupture Orientation (degrees)	0.00
Attenuation Function	

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Direct Earthquake Damage

Building Damage

Hazus estimates that about 352,126 buildings will be at least moderately damaged. This is over 13.00 % of the buildings in the region. There are an estimated 21,565 buildings that will be damaged beyond repair. The definition of the 'damage states' is provided in Volume 1: Chapter 5 of the Hazus technical manual. Table 3 below summarizes the expected damage by general occupancy for the buildings in the region. Table 4 below summarizes the expected damage by general building type.

Damage Categories by General Occupancy Type

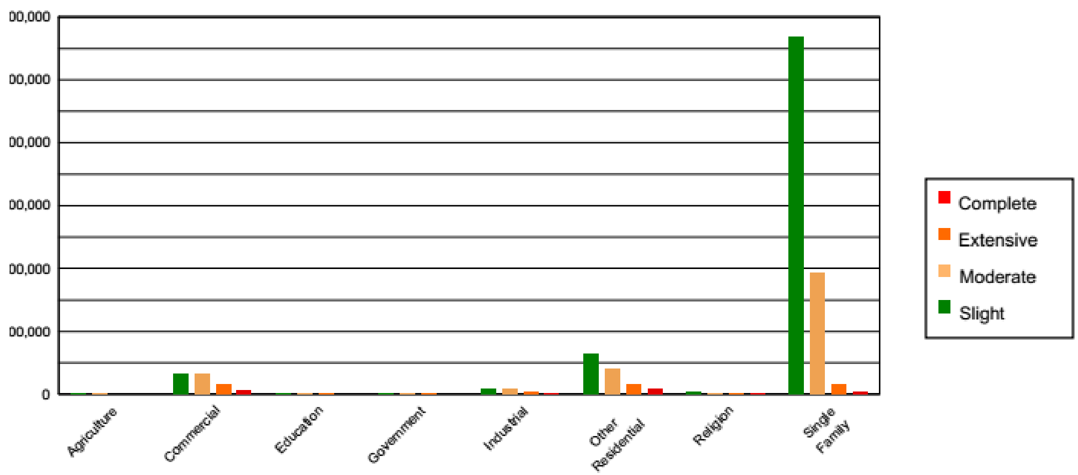


Table 3: Expected Building Damage by Occupancy

	None		Slight		Moderate		Extensive		Complete	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Agriculture	2459.14	0.15	715.08	0.11	497.09	0.18	189.23	0.36	85.46	0.40
Commercial	80555.91	5.00	33150.44	4.88	32682.22	11.79	15587.77	29.27	6693.67	31.04
Education	3530.83	0.22	1318.43	0.19	939.66	0.34	354.39	0.67	124.70	0.58
Government	1543.57	0.10	596.65	0.09	549.66	0.20	275.06	0.52	119.07	0.55
Industrial	19915.33	1.24	7678.27	1.13	8091.50	2.92	3964.62	7.44	1791.28	8.31
Other Residential	118613.84	7.37	65030.33	9.57	39597.10	14.28	15804.26	29.68	7992.46	37.06
Religion	6557.90	0.41	2731.43	0.40	2311.58	0.83	1145.32	2.15	526.78	2.44
Single Family	1377284.74	85.52	568587.19	83.64	192638.27	69.47	15933.32	29.92	4232.39	19.63
Total	**1,610,461**		**679,808**		**277,307**		**53,254**		**21,566**	

Table 4: Expected Building Damage by Building Type (All Design Levels)

	None		Slight		Moderate		Extensive		Complete	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Wood	1459243.92	90.61	625088.43	91.95	215558.17	77.73	18202.00	34.18	5337.06	24.75
Steel	23210.56	1.44	9067.58	1.33	12179.41	4.39	7320.31	13.75	3202.76	14.85
Concrete	24028.00	1.49	11146.51	1.64	9425.15	3.40	4990.70	9.37	2309.87	10.71
Precast	20434.20	1.27	8498.98	1.25	10380.26	3.74	4969.55	9.33	1883.14	8.73
RM	46632.06	2.90	13170.57	1.94	14259.00	5.14	6876.51	12.91	1995.91	9.25
URM	5907.79	0.37	3049.44	0.45	3414.51	1.23	1912.72	3.59	1533.84	7.11
MH	31004.71	1.93	9786.32	1.44	12090.57	4.36	8982.16	16.87	5303.25	24.59
Total	**1,610,461**		**679,808**		**277,307**		**53,254**		**21,566**	

*Note:
RM Reinforced Masonry
URM Unreinforced Masonry
MH Manufactured Housing

Essential Facility Damage

Before the earthquake, the region had 30,043 hospital beds available for use. On the day of the earthquake, the model estimates that only 14,920 hospital beds (50.00%) are available for use by patients already in the hospital and those injured by the earthquake. After one week, 66.00% of the beds will be back in service. By 30 days, 84.00% will be operational.

Table 5: Expected Damage to Essential Facilities

Classification	Total	# Facilities		
		At Least Moderate Damage > 50%	Complete Damage > 50%	With Functionality > 50% on day 1
Hospitals	156	40	8	77
Schools	4,018	1,220	195	2,008
EOCs	59	16	1	34
PoliceStations	167	50	3	96
FireStations	454	125	17	248

Transportation Lifeline Damage

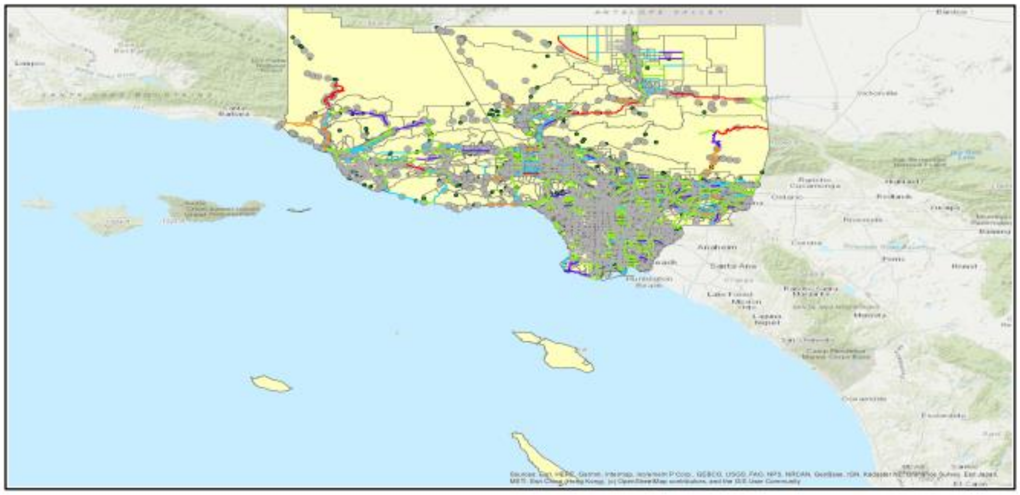


Table 6: Expected Damage to the Transportation Systems

System	Component	Number of Locations				
		Locations/ Segments	With at Least Mod. Damage	With Complete Damage	With Functionality > 50 %	
					After Day 1	After Day 7
Highway	Segments	4,836	0	0	4,836	4,836
	Bridges	4,033	125	17	3,921	3,964
	Tunnels	46	0	0	46	46
Railways	Segments	3,962	0	0	3,962	3,962
	Bridges	407	0	0	407	407
	Tunnels	0	0	0	0	0
	Facilities	52	8	0	52	52
Light Rail	Segments	99	0	0	99	99
	Bridges	28	0	0	28	28
	Tunnels	0	0	0	0	0
	Facilities	97	20	0	97	97
Bus	Facilities	48	6	0	48	48
Ferry	Facilities	12	2	0	12	12
Port	Facilities	134	1	0	134	134
Airport	Facilities	56	4	0	56	56
	Runways	35	0	0	35	35

Table 6 provides damage estimates for the transportation system.

Note: Roadway segments, railroad tracks and light rail tracks are assumed to be damaged by ground failure only. If ground failure maps are not provided, damage estimates to these components will not be computed.

Tables 7-9 provide information on the damage to the utility lifeline systems. Table 7 provides damage to the utility system facilities. Table 8 provides estimates on the number of leaks and breaks by the pipelines of the utility systems. For electric power and potable water, Hazus performs a simplified system performance analysis. Table 9 provides a summary of the system performance information.

Table 7 : Expected Utility System Facility Damage

System	# of Locations				
	Total #	With at Least Moderate Damage	With Complete Damage	with Functionality > 50 %	
				After Day 1	After Day 7
Potable Water	20	4	0	15	20
Waste Water	66	8	0	46	66
Natural Gas	7	3	0	4	7
Oil Systems	46	29	0	11	39
Electrical Power	87	26	0	76	87
Communication	119	3	0	119	119

Table 8 : Expected Utility System Pipeline Damage (Site Specific)

System	Total Pipelines Length (miles)	Number of Leaks	Number of Breaks
Potable Water	57,208	16192	4048
Waste Water	34,325	8134	2033
Natural Gas	487	0	0
Oil	0	0	0

Table 9: Expected Potable Water and Electric Power System Performance

	Total # of Households	Number of Households without Service				
		At Day 1	At Day 3	At Day 7	At Day 30	At Day 90
Potable Water	3,508,124	719,662	705,440	676,954	513,391	137,395
Electric Power		384,597	221,101	81,310	14,108	574

Induced Earthquake Damage

Fire Following Earthquake

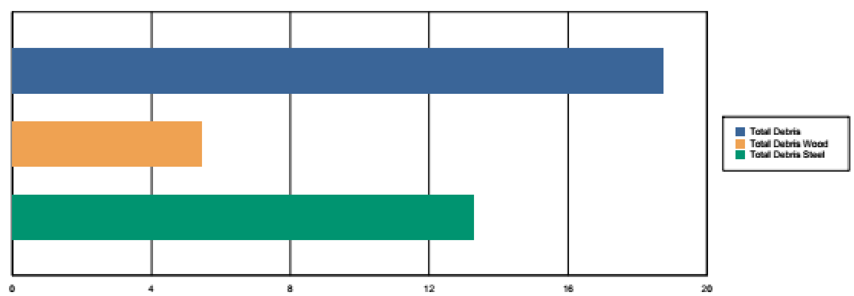
Fires often occur after an earthquake. Because of the number of fires and the lack of water to fight the fires, they can often burn out of control. Hazus uses a Monte Carlo simulation model to estimate the number of ignitions and the amount of burnt area. For this scenario, the model estimates that there will be 191 ignitions that will burn about 3.09 sq. mi 0.05 % of the region's total area.) The model also estimates that the fires will displace about 41,764 people and burn about 4,093 (millions of dollars) of building value.

Debris Generation

Hazus estimates the amount of debris that will be generated by the earthquake. The model breaks the debris into two general categories: a) Brick/Wood and b) Reinforced Concrete/Steel. This distinction is made because of the different types of material handling equipment required to handle the debris.

The model estimates that a total of 18,726,000 tons of debris will be generated. Of the total amount, Brick/Wood comprises 29.00% of the total, with the remainder being Reinforced Concrete/Steel. If the debris tonnage is converted to an estimated number of truckloads, it will require 749,040 truckloads (@25 tons/truck) to remove the debris generated by the earthquake.

Earthquake Debris (millions of tons)



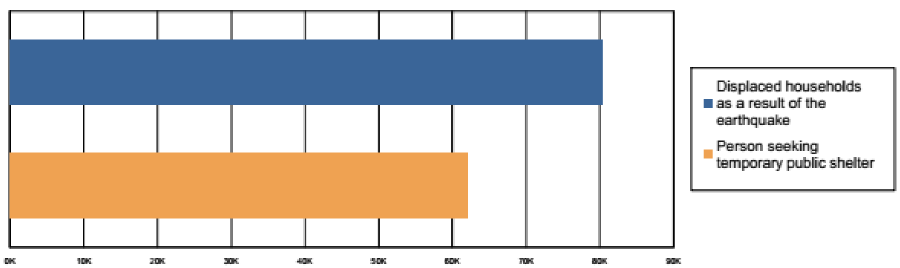
Brick/ Wood	Reinforced Concrete/Steel	Total Debris	Truck Load
5.43	13.30	18.73	749,040 (@25 tons/truck)

Social Impact

Shelter Requirement

Hazus estimates the number of households that are expected to be displaced from their homes due to the earthquake and the number of displaced people that will require accommodations in temporary public shelters. The model estimates 80,389 households to be displaced due to the earthquake. Of these, 62,082 people (out of a total population of 10,641,923) will seek temporary shelter in public shelters.

Displaced Households/ Persons Seeking Short Term Public Shelter



Displaced households as a result of the earthquake	Persons seeking temporary public shelter
80,389	62,082

Casualties

Hazus estimates the number of people that will be injured and killed by the earthquake. The casualties are broken down into four (4) severity levels that describe the extent of the injuries. The levels are described as follows;

- Severity Level 1: Injuries will require medical attention but hospitalization is not needed.
- Severity Level 2: Injuries will require hospitalization but are not considered life-threatening
- Severity Level 3: Injuries will require hospitalization and can become life threatening if not promptly treated.
- Severity Level 4: Victims are killed by the earthquake.

The casualty estimates are provided for three (3) times of day: 2:00 AM, 2:00 PM and 5:00 PM. These times represent the periods of the day that different sectors of the community are at their peak occupancy loads. The 2:00 AM estimate considers that the residential occupancy load is maximum, the 2:00 PM estimate considers that the educational, commercial and industrial sector loads are maximum and 5:00 PM represents peak commute time.

Table 10 provides a summary of the casualties estimated for this earthquake

Table 10: Casualty Estimates

		Level 1	Level 2	Level 3	Level 4
2 AM	Commercial	375.73	100.74	15.76	31.12
	Commuting	0.00	0.00	0.00	0.00
	Educational	0.00	0.00	0.00	0.00
	Hotels	0.00	0.00	0.00	0.00
	Industrial	439.79	114.81	16.93	33.24
	Other-Residential	7867.14	1850.10	242.67	470.95
	Single Family	3991.69	502.64	23.55	41.15
	Total	**12,674**	**2,568**	**299**	**576**
2 PM	Commercial	21768.88	5836.28	914.71	1796.72
	Commuting	0.00	0.00	0.00	0.00
	Educational	5615.59	1492.48	237.08	463.48
	Hotels	0.00	0.00	0.00	0.00
	Industrial	3237.68	843.69	124.93	242.90
	Other-Residential	1641.51	388.94	51.95	97.45
	Single Family	862.00	110.92	6.06	9.02
	Total	**33,126**	**8,672**	**1,335**	**2,610**
5 PM	Commercial	15164.07	4058.77	638.51	1238.83
	Commuting	0.00	0.00	0.00	0.00
	Educational	681.21	180.56	28.63	56.09
	Hotels	0.00	0.00	0.00	0.00
	Industrial	2023.55	527.31	78.08	151.81
	Other-Residential	3010.40	712.80	95.59	179.37
	Single Family	1528.44	196.17	10.69	15.91
	Total	**22,408**	**5,676**	**851**	**1,642**

Economic Loss

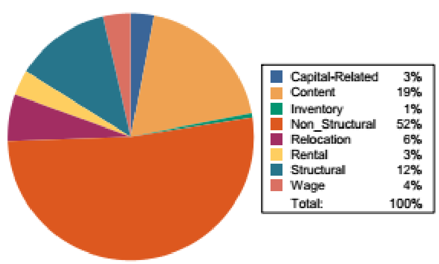
The total economic loss estimated for the earthquake is 98,999.64 (millions of dollars), which includes building and lifeline related losses based on the region's available inventory. The following three sections provide more detailed information about these losses.

Building-Related Losses

The building losses are broken into two categories: direct building losses and business interruption losses. The direct building losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability to operate a business because of the damage sustained during the earthquake. Business interruption losses also include the temporary living expenses for those people displaced from their homes because of the earthquake.

The total building-related losses were 91,993.81 (millions of dollars); 16 % of the estimated losses were related to the business interruption of the region. By far, the largest loss was sustained by the residential occupancies which made up over 50 % of the total loss. Table 11 below provides a summary of the losses associated with the building damage.

Earthquake Losses by Loss Type ($ millions)



Earthquake Losses by Occupancy Type ($ millions)

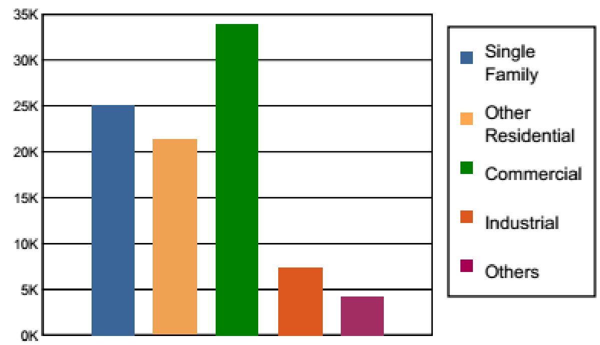


Table 11: Building-Related Economic Loss Estimates

(Millions of dollars)

Category	Area	Single Family	Other Residential	Commercial	Industrial	Others	Total
Income Losses							
	Wage	0.0000	234.6137	2889.8629	120.2716	122.0944	3,366.8426
	Capital-Related	0.0000	99.9932	2584.8797	74.5744	29.7606	2,789.2079
	Rental	434.9630	1072.0975	1584.7055	49.9668	66.1253	3,207.8581
	Relocation	1548.2420	759.1685	2451.8540	245.2713	494.4113	5,498.9471
	Subtotal	**1983.2050**	**2165.8729**	**9511.3021**	**490.0841**	**712.3916**	**14862.8557**
Capital Stock Losses							
	Structural	3011.5253	2188.6486	4636.0363	981.2860	575.3614	11,392.8576
	Non_Structural	15414.0035	13702.4137	13421.1491	3385.4652	1986.4820	47,909.5135
	Content	4709.9277	3274.7441	6186.3650	2259.4205	917.0471	17,347.5044
	Inventory	0.0000	0.0000	151.7871	325.2017	4.0899	481.0787
	Subtotal	**23135.4565**	**19165.8064**	**24395.3375**	**6951.3734**	**3482.9804**	**77130.9542**
	Total	**25118.66**	**21331.68**	**33906.64**	**7441.46**	**4195.37**	**91993.81**

Transportation and Utility Lifeline Losses

For the transportation and utility lifeline systems, Hazus computes the direct repair cost for each component only. There are no losses computed by Hazus for business interruption due to lifeline outages. Tables 12 & 13 provide a detailed breakdown in the expected lifeline losses.

Table 12: Transportation System Economic Losses
(Millions of dollars)

System	Component	Inventory Value	Economic Loss	Loss Ratio (%)
Highway	Segments	42119.2052	0.0000	0.00
	Bridges	28758.6609	1104.0969	3.84
	Tunnels	678.9663	19.2607	2.84
	Subtotal	**71556.8324**	**1123.3576**	
Railways	Segments	3480.4675	0.0000	0.00
	Bridges	2328.3207	63.6448	2.73
	Tunnels	0.0000	0.0000	0.00
	Facilities	138.4760	29.6281	21.40
	Subtotal	**5947.2642**	**93.2729**	
Light Rail	Segments	801.6737	0.0000	0.00
	Bridges	6.1737	0.3394	5.50
	Tunnels	0.0000	0.0000	0.00
	Facilities	355.1404	79.4623	22.37
	Subtotal	**1162.9878**	**79.8017**	
Bus	Facilities	87.8697	15.5912	17.74
	Subtotal	**87.8697**	**15.5912**	
Ferry	Facilities	15.9720	3.0270	18.95
	Subtotal	**15.9720**	**3.0270**	
Port	Facilities	484.4737	96.1845	19.85
	Subtotal	**484.4737**	**96.1845**	
Airport	Facilities	4180.9239	1194.9445	28.58
	Runways	3596.0747	0.0000	0.00
	Subtotal	**7776.9986**	**1194.9445**	
	Total	**87,032.40**	**2,606.18**	

Table 13: Utility System Economic Losses

(Millions of dollars)

System	Component	Inventory Value	Economic Loss	Loss Ratio (%)
Potable Water	Pipelines	0.0000	0.0000	0.00
	Facilities	785.8800	55.9543	7.12
	Distribution Lines	1841.3365	72.8641	3.96
	Subtotal	**2627.2165**	**128.8184**	
Waste Water	Pipelines	0.0000	0.0000	0.00
	Facilities	10798.3737	612.4233	5.67
	Distribution Lines	1104.8019	36.6015	3.31
	Subtotal	**11903.1756**	**649.0248**	
Natural Gas	Pipelines	612.0022	0.0000	0.00
	Facilities	14.0156	2.0869	14.89
	Distribution Lines	736.5346	0.0000	0.00
	Subtotal	**1362.5524**	**2.0869**	
Oil Systems	Pipelines	0.0000	0.0000	0.00
	Facilities	5.4280	1.0406	19.17
	Subtotal	**5.4280**	**1.0406**	
Electrical Power	Facilities	34162.8144	3618.3003	10.59
	Subtotal	**34162.8144**	**3618.3003**	
Communication	Facilities	14.0420	0.3779	2.69
	Subtotal	**14.0420**	**0.3779**	
	Total	**50,075.23**	**4,399.65**	

Appendix A: County Listing for the Region

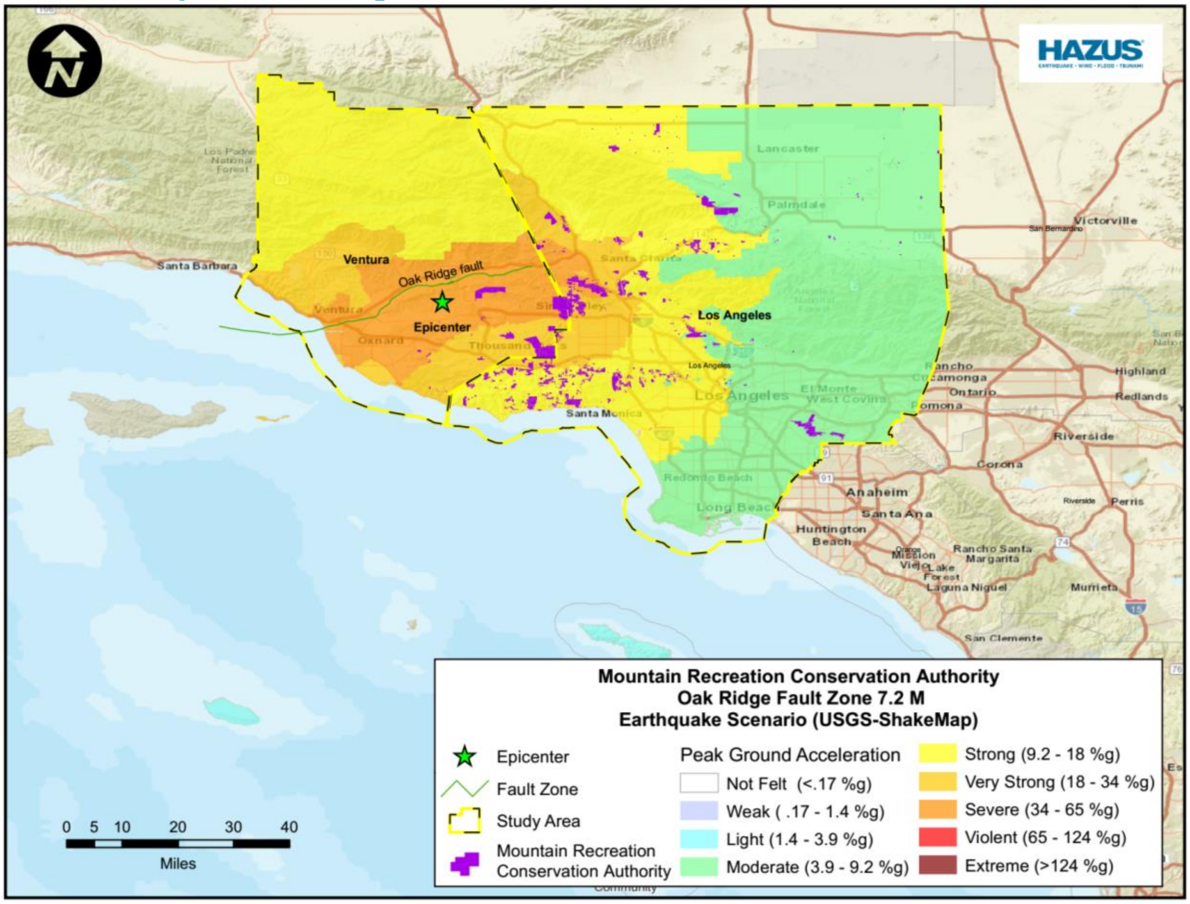
Los Angeles,CA

Ventura,CA

Appendix B: Regional Population and Building Value Data

State	County Name	Population	Building Value (millions of dollars)		
			Residential	Non-Residential	Total
California					
	Los Angeles	9,818,605	868,901	265,229	1,134,130
	Ventura	823,318	87,922	19,795	107,718
Total Region		**10,641,923**	**956,823**	**285,024**	**1,241,848**

HAZUS Map – Oak Ridge M7.2



HAZUS Report – Oak Ridge M7.2

Hazus-MH: Earthquake Global Risk Report

Region Name:	MRCA_EQ
Earthquake Scenario:	M7.2-Oak Ridge (Onshore) v10
Print Date:	October 02, 2020

Disclaimer:
This version of Hazus utilizes 2010 Census Data.
Totals only reflect data for those census tracts/blocks included in the user's study region.

The estimates of social and economic impacts contained in this report were produced using Hazus loss estimation methodology software which is based on current scientific and engineering knowledge. There are uncertainties inherent in any loss estimation technique. Therefore, there may be significant differences between the modeled results contained in this report and the actual social and economic losses following a specific earthquake. These results can be improved by using enhanced inventory, geotechnical, and observed ground motion data.

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Appendix A: County Listing for the Region

Appendix B: Regional Population and Building Value Data

General Description of the Region

Hazus-MH is a regional earthquake loss estimation model that was developed by the Federal Emergency Management Agency (FEMA) and the National Institute of Building Sciences. The primary purpose of Hazus is to provide a 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 stimulate efforts to reduce risks from multi-hazards and to prepare for emergency response and recovery.

The earthquake loss estimates provided in this report was based on a region that includes 2 county(ies) from the following state(s):

California

Note:
Appendix A contains a complete listing of the counties contained in the region.

The geographical size of the region is 5,940.49 square miles and contains 2,516 census tracts. There are over 3,508 thousand households in the region which has a total population of 10,641,923 people (2010 Census Bureau data). The distribution of population by Total Region and County is provided in Appendix B.

There are an estimated 2,642 thousand buildings in the region with a total building replacement value (excluding contents) of 1,241,848 (millions of dollars). Approximately 91.00 % of the buildings (and 77.00% of the building value) are associated with residential housing.

The replacement value of the transportation and utility lifeline systems is estimated to be 87,032 and 50,075 (millions of dollars) , respectively.

Building and Lifeline Inventory

Building Inventory

Hazus estimates that there are 2,642 thousand buildings in the region which have an aggregate total replacement value of 1,241,848 (millions of dollars) . Appendix B provides a general distribution of the building value by Total Region and County.

In terms of building construction types found in the region, wood frame construction makes up 88% of the building inventory. The remaining percentage is distributed between the other general building types.

Critical Facility Inventory

Hazus breaks critical facilities into two (2) groups: essential facilities and high potential loss facilities (HPL). Essential facilities include hospitals, medical clinics, schools, fire stations, police stations and emergency operations facilities. High potential loss facilities include dams, levees, military installations, nuclear power plants and hazardous material sites.

For essential facilities, there are 156 hospitals in the region with a total bed capacity of 30,043 beds. There are 4,018 schools, 454 fire stations, 167 police stations and 59 emergency operation facilities. With respect to high potential loss facilities (HPL), there are no dams identified within the inventory. The inventory also includes 1,770 hazardous material sites, no military installations and no nuclear power plants.

Transportation and Utility Lifeline Inventory

Within Hazus, the lifeline inventory is divided between transportation and utility lifeline systems. There are seven (7) transportation systems that include highways, railways, light rail, bus, ports, ferry and airports. There are six (6) utility systems that include potable water, wastewater, natural gas, crude & refined oil, electric power and communications. The lifeline inventory data are provided in Tables 1 and 2.

The total value of the lifeline inventory is over 137,107.00 (millions of dollars). This inventory includes over 3,526.28 miles of highways, 4,033 bridges, 92,018.83 miles of pipes.

Table 1: Transportation System Lifeline Inventory

System	Component	# Locations/ # Segments	Replacement value (millions of dollars)
Highway	Bridges	4,033	28758.6609
	Segments	4,836	42119.2052
	Tunnels	46	678.9663
		Subtotal	**71556.8324**
Railways	Bridges	407	2328.3207
	Facilities	52	138.4760
	Segments	3,962	3480.4675
	Tunnels	0	0.0000
		Subtotal	**5947.2642**
Light Rail	Bridges	28	6.1737
	Facilities	97	355.1404
	Segments	99	801.6737
	Tunnels	0	0.0000
		Subtotal	**1162.9878**
Bus	Facilities	48	87.8697
		Subtotal	**87.8697**
Ferry	Facilities	12	15.9720
		Subtotal	**15.9720**
Port	Facilities	134	484.4737
		Subtotal	**484.4737**
Airport	Facilities	56	4180.9239
	Runways	35	3596.0747
		Subtotal	**7776.9986**
		Total	**87,032.40**

Table 2: Utility System Lifeline Inventory

System	Component	# Locations / Segments	Replacement value (millions of dollars)
Potable Water	Distribution Lines	NA	1841.3365
	Facilities	20	785.8800
	Pipelines	0	0.0000
		Subtotal	**2627.2165**
Waste Water	Distribution Lines	NA	1104.8019
	Facilities	66	10798.3737
	Pipelines	0	0.0000
		Subtotal	**11903.1756**
Natural Gas	Distribution Lines	NA	736.5346
	Facilities	7	14.0156
	Pipelines	92	612.0022
		Subtotal	**1362.5524**
Oil Systems	Facilities	46	5.4280
	Pipelines	0	0.0000
		Subtotal	**5.4280**
Electrical Power	Facilities	87	34162.8144
		Subtotal	**34162.8144**
Communication	Facilities	119	14.0420
		Subtotal	**14.0420**
		Total	**50,075.20**

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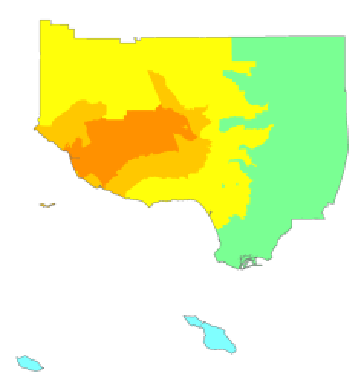
Earthquake Scenario

Hazus uses the following set of information to define the earthquake parameters used for the earthquake loss estimate provided in this report.



Scenario Name	M7.2-Oak Ridge (Onshore) v10
Type of Earthquake	
Fault Name	NA
Historical Epicenter ID #	NA
Probabilistic Return Period	NA
Longitude of Epicenter	0.00
Latitude of Epicenter	0.00
Earthquake Magnitude	7.16
Depth (km)	0.00
Rupture Length (Km)	0.00
Rupture Orientation (degrees)	0.00
Attenuation Function	

Direct Earthquake Damage

Building Damage

Hazus estimates that about 126,892 buildings will be at least moderately damaged. This is over 5.00 % of the buildings in the region. There are an estimated 6,435 buildings that will be damaged beyond repair. The definition of the 'damage states' is provided in Volume 1: Chapter 5 of the Hazus technical manual. Table 3 below summarizes the expected damage by general occupancy for the buildings in the region. Table 4 below summarizes the expected damage by general building type.

Damage Categories by General Occupancy Type

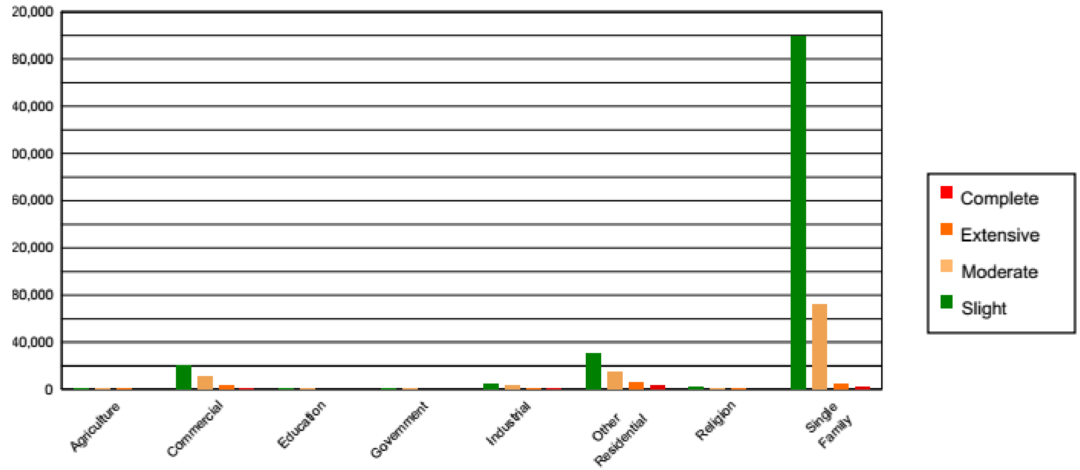


Table 3: Expected Building Damage by Occupancy

	None		Slight		Moderate		Extensive		Complete	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Agriculture	2731.84	0.13	602.39	0.17	394.52	0.38	146.33	0.88	70.93	1.10
Commercial	132523.37	6.14	19667.80	5.50	11708.71	11.28	3534.97	21.20	1235.14	19.19
Education	5141.70	0.24	686.22	0.19	325.75	0.31	87.22	0.52	27.11	0.42
Government	2444.91	0.11	324.25	0.09	196.98	0.19	78.06	0.47	39.80	0.62
Industrial	31046.53	1.44	5163.79	1.44	3606.77	3.48	1193.06	7.16	430.85	6.69
Other Residential	191621.81	8.88	30909.94	8.64	15157.26	14.60	6200.50	37.19	3148.48	48.92
Religion	10769.10	0.50	1459.36	0.41	736.56	0.71	224.48	1.35	83.50	1.30
Single Family	1781424.78	82.56	298985.88	83.56	71655.96	69.04	5209.15	31.24	1400.15	21.76
Total	**2,157,704**		**357,800**		**103,783**		**16,674**		**6,436**	

Table 4: Expected Building Damage by Building Type (All Design Levels)

	None		Slight		Moderate		Extensive		Complete	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Wood	1920515.60	89.01	320581.02	89.60	75454.08	72.70	5318.99	31.90	1559.90	24.24
Steel	42010.51	1.95	6310.91	1.76	4544.83	4.38	1513.72	9.08	600.64	9.33
Concrete	41260.64	1.91	6176.59	1.73	3098.11	2.99	1005.91	6.03	358.97	5.58
Precast	34732.13	1.61	5500.14	1.54	4255.48	4.10	1299.82	7.80	378.56	5.88
RM	68752.98	3.19	6948.75	1.94	5157.71	4.97	1704.37	10.22	370.25	5.75
URM	11377.61	0.53	2305.27	0.64	1399.88	1.35	461.34	2.77	274.20	4.26
MH	39054.58	1.81	9976.94	2.79	9872.43	9.51	5369.62	32.20	2893.45	44.96
Total	**2,157,704**		**357,800**		**103,783**		**16,674**		**6,436**	

*Note:

RM Reinforced Masonry
URM Unreinforced Masonry
MH Manufactured Housing

Essential Facility Damage

Before the earthquake, the region had 30,043 hospital beds available for use. On the day of the earthquake, the model estimates that only 23,689 hospital beds (79.00%) are available for use by patients already in the hospital and those injured by the earthquake. After one week, 90.00% of the beds will be back in service. By 30 days, 97.00% will be operational.

Table 5: Expected Damage to Essential Facilities

		# Facilities		
Classification	Total	At Least Moderate Damage > 50%	Complete Damage > 50%	With Functionality > 50% on day 1
Hospitals	156	3	0	139
Schools	4,018	119	6	3,643
EOCs	59	1	1	53
PoliceStations	167	7	1	146
FireStations	454	9	2	406

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Transportation Lifeline Damage

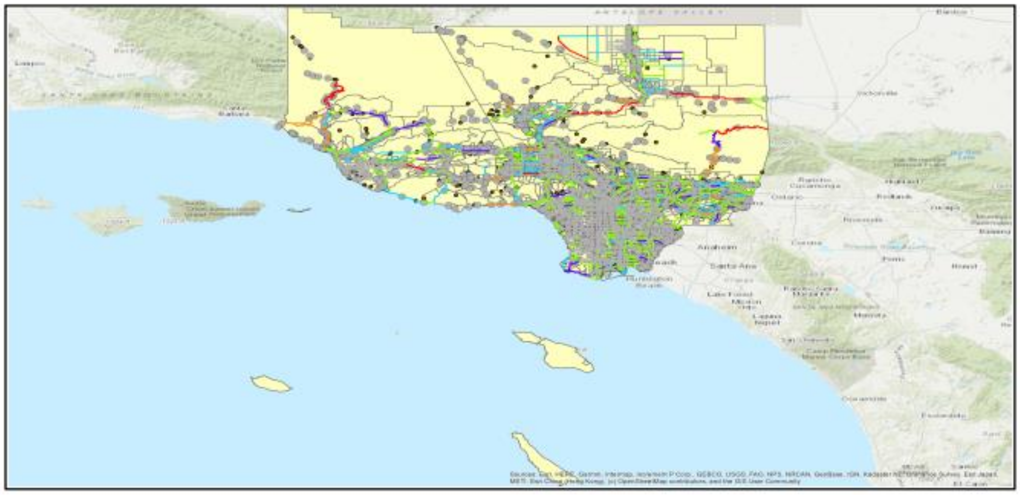


Table 6: Expected Damage to the Transportation Systems

System	Component	Number of Locations				
		Locations/ Segments	With at Least Mod. Damage	With Complete Damage	With Functionality > 50 %	
					After Day 1	After Day 7
Highway	Segments	4,836	0	0	4,836	4,836
	Bridges	4,033	21	2	4,017	4,027
	Tunnels	46	0	0	46	46
Railways	Segments	3,962	0	0	3,962	3,962
	Bridges	407	0	0	407	407
	Tunnels	0	0	0	0	0
	Facilities	52	3	0	52	52
Light Rail	Segments	99	0	0	99	99
	Bridges	28	0	0	28	28
	Tunnels	0	0	0	0	0
	Facilities	97	4	0	97	97
Bus	Facilities	48	5	0	48	48
Ferry	Facilities	12	1	0	12	12
Port	Facilities	134	6	0	134	134
Airport	Facilities	56	2	0	56	56
	Runways	35	0	0	35	35

Table 6 provides damage estimates for the transportation system.

Note: Roadway segments, railroad tracks and light rail tracks are assumed to be damaged by ground failure only. If ground failure maps are not provided, damage estimates to these components will not be computed.

Tables 7-9 provide information on the damage to the utility lifeline systems. Table 7 provides damage to the utility system facilities. Table 8 provides estimates on the number of leaks and breaks by the pipelines of the utility systems. For electric power and potable water, Hazus performs a simplified system performance analysis. Table 9 provides a summary of the system performance information.

Table 7 : Expected Utility System Facility Damage

System	# of Locations				
	Total #	With at Least Moderate Damage	With Complete Damage	with Functionality > 50 %	
				After Day 1	After Day 7
Potable Water	20	3	0	16	20
Waste Water	66	22	0	34	66
Natural Gas	7	3	0	4	7
Oil Systems	46	1	0	45	46
Electrical Power	87	8	0	82	87
Communication	119	13	0	111	119

Table 8 : Expected Utility System Pipeline Damage (Site Specific)

System	Total Pipelines Length (miles)	Number of Leaks	Number of Breaks
Potable Water	57,208	8263	2066
Waste Water	34,325	4151	1038
Natural Gas	487	40	10
Oil	0	0	0

Table 9: Expected Potable Water and Electric Power System Performance

	Total # of Households	Number of Households without Service				
		At Day 1	At Day 3	At Day 7	At Day 30	At Day 90
Potable Water	3,508,124	139,171	134,843	125,764	68,004	0
Electric Power		88,633	51,004	18,784	3,262	132

Induced Earthquake Damage

Fire Following Earthquake

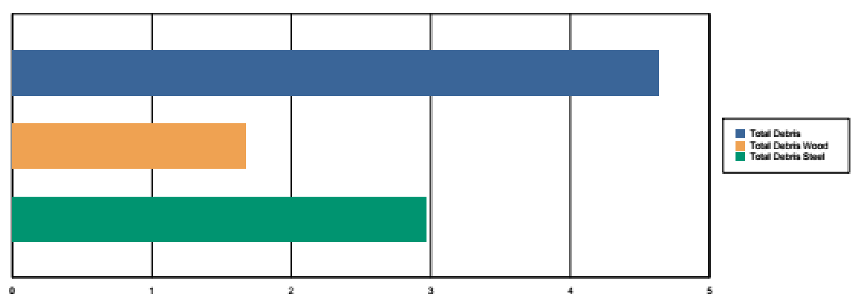
Fires often occur after an earthquake. Because of the number of fires and the lack of water to fight the fires, they can often burn out of control. Hazus uses a Monte Carlo simulation model to estimate the number of ignitions and the amount of burnt area. For this scenario, the model estimates that there will be 134 ignitions that will burn about 1.44 sq. mi 0.02 % of the region's total area.) The model also estimates that the fires will displace about 17,207 people and burn about 1,525 (millions of dollars) of building value.

Debris Generation

Hazus estimates the amount of debris that will be generated by the earthquake. The model breaks the debris into two general categories: a) Brick/Wood and b) Reinforced Concrete/Steel. This distinction is made because of the different types of material handling equipment required to handle the debris.

The model estimates that a total of 4,635,000 tons of debris will be generated. Of the total amount, Brick/Wood comprises 36.00% of the total, with the remainder being Reinforced Concrete/Steel. If the debris tonnage is converted to an estimated number of truckloads, it will require 185,400 truckloads (@25 tons/truck) to remove the debris generated by the earthquake.

Earthquake Debris (millions of tons)



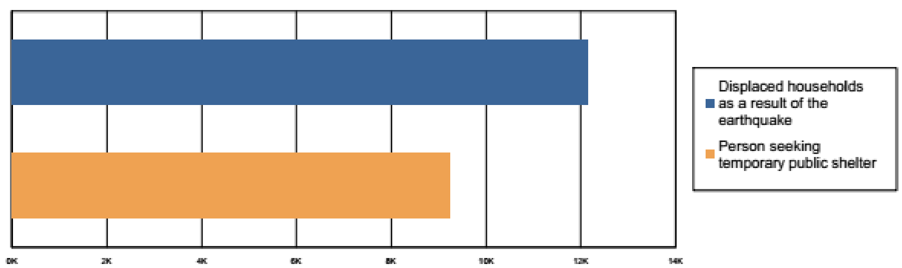
Brick/ Wood	Reinforced Concrete/Steel	Total Debris	Truck Load
1.67	2.97	4.64	185,400 (@25 tons/truck)

Social Impact

Shelter Requirement

Hazus estimates the number of households that are expected to be displaced from their homes due to the earthquake and the number of displaced people that will require accommodations in temporary public shelters. The model estimates 12,144 households to be displaced due to the earthquake. Of these, 9,224 people (out of a total population of 10,641,923) will seek temporary shelter in public shelters.

Displaced Households/ Persons Seeking Short Term Public Shelter



Displaced households as a result of the earthquake	Persons seeking temporary public shelter
12,144	9,224

Casualties

Hazus estimates the number of people that will be injured and killed by the earthquake. The casualties are broken down into four (4) severity levels that describe the extent of the injuries. The levels are described as follows;

- Severity Level 1: Injuries will require medical attention but hospitalization is not needed.
- Severity Level 2: Injuries will require hospitalization but are not considered life-threatening
- Severity Level 3: Injuries will require hospitalization and can become life threatening if not promptly treated.
- Severity Level 4: Victims are killed by the earthquake.

The casualty estimates are provided for three (3) times of day: 2:00 AM, 2:00 PM and 5:00 PM. These times represent the periods of the day that different sectors of the community are at their peak occupancy loads. The 2:00 AM estimate considers that the residential occupancy load is maximum, the 2:00 PM estimate considers that the educational, commercial and industrial sector loads are maximum and 5:00 PM represents peak commute time.

Table 10 provides a summary of the casualties estimated for this earthquake

Table 10: Casualty Estimates

		Level 1	Level 2	Level 3	Level 4
2 AM	Commercial	93.04	22.70	3.37	6.64
	Commuting	0.00	0.00	0.00	0.00
	Educational	0.00	0.00	0.00	0.00
	Hotels	0.00	0.00	0.00	0.00
	Industrial	113.19	27.08	3.79	7.43
	Other-Residential	1571.96	305.63	30.55	57.45
	Single Family	1509.11	165.97	7.08	12.26
	Total	**3,287**	**521**	**45**	**84**
2 PM	Commercial	5372.53	1312.66	195.35	383.07
	Commuting	0.00	0.00	0.00	0.00
	Educational	1457.20	354.76	54.02	105.59
	Hotels	0.00	0.00	0.00	0.00
	Industrial	832.52	199.01	27.97	54.30
	Other-Residential	312.17	61.14	6.22	11.38
	Single Family	300.45	33.56	1.68	2.46
	Total	**8,275**	**1,961**	**285**	**557**
5 PM	Commercial	3832.02	939.79	140.81	272.46
	Commuting	0.00	0.00	0.00	0.00
	Educational	154.27	36.62	5.50	10.76
	Hotels	0.00	0.00	0.00	0.00
	Industrial	520.32	124.38	17.48	33.94
	Other-Residential	585.92	114.92	11.87	21.76
	Single Family	572.78	64.74	3.26	4.76
	Total	**5,665**	**1,280**	**179**	**344**

Economic Loss

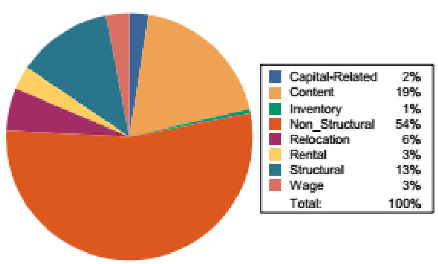
The total economic loss estimated for the earthquake is 30,354.09 (millions of dollars), which includes building and lifeline related losses based on the region's available inventory. The following three sections provide more detailed information about these losses.

Building-Related Losses

The building losses are broken into two categories: direct building losses and business interruption losses. The direct building losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability to operate a business because of the damage sustained during the earthquake. Business interruption losses also include the temporary living expenses for those people displaced from their homes because of the earthquake.

The total building-related losses were 27,180.35 (millions of dollars); 14 % of the estimated losses were related to the business interruption of the region. By far, the largest loss was sustained by the residential occupancies which made up over 57 % of the total loss. Table 11 below provides a summary of the losses associated with the building damage.

Earthquake Losses by Loss Type ($ millions)



Earthquake Losses by Occupancy Type ($ millions)

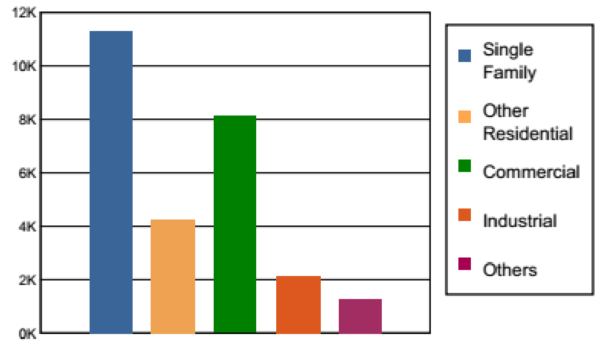


Table 11: Building-Related Economic Loss Estimates

(Millions of dollars)

Category	Area	Single Family	Other Residential	Commercial	Industrial	Others	Total
Income Losses							
	Wage	0.0000	34.6331	705.0530	35.8618	36.0757	811.6236
	Capital-Related	0.0000	14.7500	629.3577	21.9142	9.1078	675.1297
	Rental	173.5289	187.4857	405.5360	15.5061	17.4085	799.4652
	Relocation	599.8024	160.4217	592.3345	79.3744	127.8948	1,559.8278
	Subtotal	**773.3313**	**397.2905**	**2332.2812**	**152.6565**	**190.4868**	**3846.0463**
Capital Stock Losses							
	Structural	1398.0053	467.2127	1053.1784	282.1369	214.6215	3,415.1548
	Non_Structural	7083.1169	2790.4846	3209.5446	986.1925	592.4221	14,661.7607
	Content	2058.0872	625.9287	1499.2632	644.6857	293.1093	5,121.0741
	Inventory	0.0000	0.0000	36.5646	92.6596	7.0869	136.3111
	Subtotal	**10539.2094**	**3883.6260**	**5798.5508**	**2005.6747**	**1107.2398**	**23334.3007**
	Total	**11312.54**	**4280.92**	**8130.83**	**2158.33**	**1297.73**	**27180.35**

Transportation and Utility Lifeline Losses

For the transportation and utility lifeline systems, Hazus computes the direct repair cost for each component only. There are no losses computed by Hazus for business interruption due to lifeline outages. Tables 12 & 13 provide a detailed breakdown in the expected lifeline losses.

Table 12: Transportation System Economic Losses
(Millions of dollars)

System	Component	Inventory Value	Economic Loss	Loss Ratio (%)
Highway	Segments	42119.2052	0.0000	0.00
	Bridges	28758.6609	180.8531	0.63
	Tunnels	678.9663	0.5842	0.09
	Subtotal	**71556.8324**	**181.4373**	
Railways	Segments	3480.4675	0.0000	0.00
	Bridges	2328.3207	21.8337	0.94
	Tunnels	0.0000	0.0000	0.00
	Facilities	138.4760	10.7466	7.76
	Subtotal	**5947.2642**	**32.5803**	
Light Rail	Segments	801.6737	0.0000	0.00
	Bridges	6.1737	0.0003	0.00
	Tunnels	0.0000	0.0000	0.00
	Facilities	355.1404	26.1666	7.37
	Subtotal	**1162.9878**	**26.1669**	
Bus	Facilities	87.8697	9.3727	10.67
	Subtotal	**87.8697**	**9.3727**	
Ferry	Facilities	15.9720	0.9631	6.03
	Subtotal	**15.9720**	**0.9631**	
Port	Facilities	484.4737	35.2839	7.28
	Subtotal	**484.4737**	**35.2839**	
Airport	Facilities	4180.9239	265.5267	6.35
	Runways	3596.0747	0.0000	0.00
	Subtotal	**7776.9986**	**265.5267**	
	Total	**87,032.40**	**551.33**	

Table 13: Utility System Economic Losses

(Millions of dollars)

System	Component	Inventory Value	Economic Loss	Loss Ratio (%)
Potable Water	Pipelines	0.0000	0.0000	0.00
	Facilities	785.8800	65.9664	8.39
	Distribution Lines	1841.3365	37.1855	2.02
	Subtotal	**2627.2165**	**103.1519**	
Waste Water	Pipelines	0.0000	0.0000	0.00
	Facilities	10798.3737	1171.8265	10.85
	Distribution Lines	1104.8019	18.6792	1.69
	Subtotal	**11903.1756**	**1190.5057**	
Natural Gas	Pipelines	612.0022	0.0000	0.00
	Facilities	14.0156	1.6909	12.06
	Distribution Lines	736.5346	6.3994	0.87
	Subtotal	**1362.5524**	**8.0903**	
Oil Systems	Pipelines	0.0000	0.0000	0.00
	Facilities	5.4280	0.1019	1.88
	Subtotal	**5.4280**	**0.1019**	
Electrical Power	Facilities	34162.8144	1319.7972	3.86
	Subtotal	**34162.8144**	**1319.7972**	
Communication	Facilities	14.0420	0.7654	5.45
	Subtotal	**14.0420**	**0.7654**	
	Total	**50,075.23**	**2,622.41**	

Appendix A: County Listing for the Region

Los Angeles,CA

Ventura,CA

Appendix B: Regional Population and Building Value Data

State	County Name	Population	Building Value (millions of dollars)		
			Residential	Non-Residential	Total
California					
	Los Angeles	9,818,605	868,901	265,229	1,134,130
	Ventura	823,318	87,922	19,795	107,718
Total Region		10,641,923	956,823	285,024	1,241,848